CMS NOTES de la SMC

IN THIS ISSUE
DANS CE NUMÉRO



# MESSAGE FROM THE VICE-PRESIDENT ATLANTIC REGION

Jason I. Brown
Dalhousie University

Is mathematical research finally becoming cool? I pose that question as I ponder a few recent events:

Movies (and big name stars) seem to be drawn recently to mathematicians and their lives. *Good Will Hunting* had Matt Damon playing a janitor who had a knack for solving algebraic combinatorial problems. As an added plus, he dates Minnie Driver on the side. This movie made us all aware of the danger of leaving open research problems on the blackboard overnight.

In *A Beautiful Mind*, Russell Crowe played John Nash, the famous game theorist. While Hollywood has taken some liberties (did John Nash really discover game theory while thinking about dating in a bar?), it has added a dimension of interest and excitement to the process of mathematical research.

Most recently, Oscar winners Anthony Hopkins and Gwyneth Paltrow costar in *Proof*, a story of mathematics, insanity and family. (Have you noticed that all the mathematicians in these films are either under psychiatric care or in the process of losing their grip on reality – are all of us that close to the edge? I'm of two minds on that.)

Television has been catching up as well. The show NUMB3RS depicts mathematics in solving crime. Its web site, **www.cbs.com/primetime/numb3rs/ti/index.shtml**, is cosponsored by Texas Instruments. To quote CBS' own description of the show, "Inspired by actual cases, the series depicts how the confluence of police work and mathematics provides unexpected revelations and answers to the most perplexing criminal questions." (I am still waiting to help an officer with the basics of catching speeders and the Mean Value Theorem.) The site also boasts the headlines "Use Mathematics Every Day", and promises to offer viewers an interactive mathematics quiz.

I have met the Governor General's award-winning playwright John Mighton when I visited the Fields Institute, where we chatted about research mathematics for a bit. John, in case you don't know, is not only a "knotty" researcher. He founded the charity JUMP (Junior Undiscovered Math Prodigies) to provide free tutoring to students. Reaching out to even those with learning disabilities, it has received much well-deserved press. All this and playwriting!

*français page 17*

And I am in the midst of reading a couple of fascinating books. One is by Jeffrey Rosenthal (a U of T Statistics professor), and is entitled *Struck by Lightning*. It is an interesting general read on probability theory. Another couple of good ones are by John Allen Paulos. The first, *A Mathematician reads the Newspaper* touches on a variety of topics, from logic to calculus and statistics, all with an easy going, conversational tone. It gives readers some insight into how the world can be viewed not through rose-coloured glasses, but through the eyes of a mathematician. The second, more recent book, *A Mathematician Plays the Stock Market*, reassures the reader that mathematicians are only human, and can be "fooled" just like anyone else.

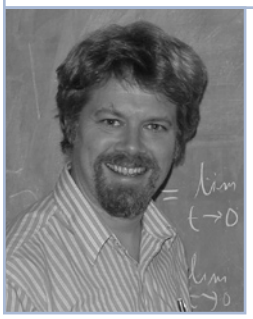
Finally, I have a number of non-mathematician acquaintances who are Sudoku-crazy. Who would have thought that in a day and age where technology rules leisure time a a puzzle in combinatorics involving Latin squares would generate the interest it has?

What I am left with is a general feeling that mathematics and mathematicians have become "cool". No longer are we expected to have eyes framed by horn-rimmed glasses, pants firmly

*continued page 4*

# EDITORIAL

**by Robert J. MacG. Dawson**
*Saint Mary's University, Halifax, NS*



## OFFENSIVE MATHEMATICS?

One of the big news stories in the last month involved the publication, by a Danish newspaper, of a set of cartoons, most of which portrayed the prophet Mohammed, a few in a slightly unflattering light. For a while this excited little comment, even (for instance) when an Egyptian newspaper reprinted them. However, when a Danish Muslim activist mischievously linked them with some completely unrelated, scurrilous, and deservedly obscure lampoons that had circulated, until then, only on a few photocopiers, rioting and even deaths resulted. One result of this affair was a heated debate on freedom of the press and related freedoms, including academic freedom - and, in particular, to what extent such freedoms were limited by possible offense caused to others.

We often find it productive in mathematics to try to find analogies between unrelated ideas. For instance, we might ask what topology captures the geometry of algebraic curves, or what a one-and-a-halfth derivative might be. This month I was wondering - where, if at all, does mathematics come into this debate?

To a large extent, we are in the fortunate position of working in a field in which giving offence, at least by our research work, is genuinely difficult. Some versions of the apocryphal tale of the discovery of the irrational numbers suggest that the Pythagoreans were affronted by the suggestion that such a flaw could exist in their sacred mathematics and therefore killed the discoverer. Accounts of the so-called "Battle of the Frogs and the Mice" between proponents and detractors of intuitionism suggest actual indignation on both sides. Sharp opinions have been voiced about fuzzy sets. But it is probably safe to say that there has been nothing within pure mathematics to parallel, for instance, the "Bayesian Wars" in statistics, or the bitter debates on math education.

There have been rare and regrettable cases in which certain mathematicians' political views - generally extremist - have led them to attack the type of mathematics supposedly done by a group they dislike. While much of this denunciation (of so-called "Jewish mathematics" by the Nazis, or of "bourgeois mathematics" under Commmunist regimes) has originated outside the mainstream mathematical community, it must be admitted that there have been occasional mathematicians of repute who sank to this level (Bieberbach being perhaps one of the best-known examples.) A milder but particularly prolonged example was the refusal of many British mathematicians in the eighteenth century, in misplaced solidarity with Newton against Leibnitz, to adopt the discoveries or notation of Continental European mathematics.

Once the dust has settled, though, it is generally accepted that the attackers have been in the wrong. It is not the nature of mathematics to be offensive - and it is not, in general, the nature of mathematicians to take offense. Even the local angle trisector often gets a more polite response than the quality of his work perhaps merits. This is probably more due to the nature of our subject than to any unusual virtue on our own parts – but it is good.

## DES MATHÉMATIQUES CHOQUANTES?

La publication dans un journal danois de quelques dessins satiriques illustrants le prophète Mahomet sous un jour peu flatteur a marqué la couverture médiatique du mois dernier. Pendant un certain temps, ces dessins ont suscité peu de réactions, même après qu'un journal égyptien les ait réimprimés. Toutefois, il a suffit qu'un militant musulman danois les associe malicieusement à de virulentes et calomnieuses satires absolument sans rapport qui n'avaient circulé, à ce jour, que d'un photocopieur à l'autre, pour que des bagarres éclatent et que des gens meurent. Il est ressorti de cette affaire un débat houleux sur la liberté de presse et les libertés connexes, notamment sur la liberté universitaire et,

**NOTES de la SMC**
Les *Notes de la SMC* sont publiés par la Société mathématique du Canada (SMC) huit fois par année (février, mars, avril, mai, septembre, octobre, novembre et décembre).

**CMS NOTES**
The *CMS Notes* are published by the Canadian Mathematical Society (CMS) eight times a year (February, March, April, May, September, October, November and December).



**Canadian Mathematical Society - Société mathématique du Canada**

577 King Edward, Ottawa, Ontario, Canada K1N 6N5
T: (613) 562-5702 | F: (613) 565-1539
notes-articles@smc.math.ca
www.smc.math.ca | www.cms.math.ca
ISSN :1193-9273 (imprimé/print)
1496-4295 (électronique/electronic)

# ÉDITORIAL

**by Robert J. MacG. Dawson**
*Université Saint Mary's, Halifax, N.-É.*

en particulier, sur la mesure dans laquelle de telles libertés sont limitées par des torts potentiels causés à autrui.

En mathématiques, il est souvent utile de chercher des analogies entre des idées en apparence non reliées. On pourrait, par exemple, tenter de définir la topologie de la géométrie des courbes algébriques, ou encore de définir une première-et-demi dérivée. Au cours du dernier mois, je me suis demandé quelle était la place des mathématiques – s'il y a lieu – dans tout ce débat?

En général, nous avons la chance de travailler dans un domaine où il est très difficile – du moins dans nos recherches – de choquer ou d'offusquer qui que ce soit. Selon certaines versions de l'histoire apocryphe de la découverte des nombres irrationnels, les Pythagoréens, choqués que l'on ose suggérer que leurs sacro-saintes mathématiques présentent quelque défaut, auraient tué la personne qui en aurait fait la découverte… Des récits regroupés sous le nom de « bataille des grenouilles et des souris » entre les partisans et les détracteurs de l'intuitionnisme relatent l'indignation des deux côtés. Des opinions tranchées ont également été émises au sujet des ensembles flous. Mais on peut dire avec assez de certitude que les mathématiques pures n'ont rien connu de comparable aux « guerres bayésiennes » dans le domaine des statistiques, ou aux vifs débats en enseignement des mathématiques.

Dans certains cas – rares et regrettables –, les opinions politiques, généralement extrémistes, de certains mathématiciens ont poussé ces gens à attaquer le type de mathématiques que faisaient des personnes qu'ils détestaient. Si une bonne partie de cette dénonciation (d'ainsi nommé « mathématiques juives » par les Nazis, ou « mathématiques bourgeoises » sous les régimes communistes) n'est pas issue du courant mathématique dominant, il faut admettre que des mathématiciens sont, à l'occasion, tombés sous ce niveau (Bieberbach étant probablement l'exemple le mieux connu). Un exemple moins radical, mais qui a duré plus longtemps, est le refus de nombreux mathématiciens britanniques du XVIII$^{e}$ siècle, par solidarité déplacée envers Newton contre Leibnitz, d'adopter les découvertes ou la notation des mathématiciens du continent européen.

Une fois la poussière retombée, par contre, on accepte généralement que les opposants avaient tort. Les mathématiques ne sont pas « offensantes » par nature. Même le trisecteur local des angles obtient souvent une réponse plus polie que la qualité de son travail ne le mériterait. Cela tient probablement davantage à la nature de nos sujets qu'à une vertu inhabituelle de notre part, mais le résultat est néanmoins positif.

## Letters to the Editors
## Lettres aux Rédacteurs

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

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

## 2006 CMS MEMBERSHIPS / ADHÉSIONS 2006 À LA SMC

**Membership renewal notices have been mailed. Please renew your membership now. To renew electronically please visit our website.**

**`www.cms.math.ca/members/`**

**Les avis d.adhésion ont été postés. Veuillez renouveller votre adhésion maintenant. Vous pouvez aussi renouveller au site Web.**

**`www.cms.math.ca/members.f/`**

fastened with a belt neatly just below our armpits, and grooming that suggest that we may be aware of many things, but that a mirror is not one of them. Mathematicians now grace the media sporting T-shirts, leather jackets and good-looking companions.

And this is a good thing! Too often it has been hard to "sell" mathematics as a career option to students, who don't see what we see in mathematics. I think I can safely say that none of us entered the ranks of mathematicians to make a lot of money or to attract others (mathematical "groupies" are likely $o(1)$). We chose mathematics because mathematics is cool, plain and simple.

So let's take advantage of mathematics' rising fortunes. Give talks to a general audience. Draw connections between mathematics and the world around us. I spent some time last term bringing my guitar to calculus class and talking about mathematics, physics and sound. The students loved it, and the "performances" showed them a side of mathematics (and me) they wouldn't see otherwise. Student surveys showed they hadn't forgotten this part of the course.

If each one of us can reach out to a handful of students and convey to them just how cool mathematics can be, we will have done ourselves and our mathematical community a great service. Whether these students end up in mathematics or not, I think they will take with them a glimpse into the beauty of mathematics and the thrill of discovery. And if that isn't cool, what is?



## CMS Summer 2006 Meeting
**Host: University of Calgary**
**Westin Hotel, Calgary, AB**
**June 3 - 5**

**The most up-to-date information for the Summer 2006 Meeting of the Canadian Mathematical Society (CMS) concerning the programme, scheduling and invited speakers list is available on our website, as well as online registration and abstract submission forms.**

**www.cms.math.ca/Events/summer06/**

**The Meeting registration form can also be found in the February 2006 issue of the CMS Notes.**

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

## Réunion d'été 2006 de la SMC
**Hôte : Université de Calgary**
**Westin Hotel, Calgary, AB**
**3 - 5 juin**

**L'information la plus récente de la Réunion d'été 2006 de la Société mathématiques du Canada (SMC), concernant le programme, les horaires et la liste des conférenciers est disponible sur notre site web, ainsi que nos formulaires électroniques d'enregistrement et soumission de résumés.**

**www.smc.math.ca/reunions/ete06/**

**Le formulaire d'enregistrement est aussi publié dans les Notes de la SMC de fevrier 2006.**

**Les résumés de conférences paraîtront sur le site dès qu'ils seront disponibles.**

# Prix de mathématiques André-Aisenstadt
# André-Aisenstadt Mathematics Prize

## Appel de candidatures

Le Centre de recherches mathématiques (CRM) lance un nouvel appel de candidatures pour le Prix de mathématiques André-Aisenstadt visant à reconnaître le talent des jeunes mathématiciens canadiens. Le Prix de mathématiques André-Aisenstadt, comprenant une bourse de 3 000 $ ainsi qu'une médaille, souligne des résultats exceptionnels de recherche en mathématiques pures ou appliquées, réalisés par un jeune mathématicien ou mathématicienne canadien.

Le récipiendaire est choisi par le Comité consultatif du CRM. Le prix est normalement accordé annuellement bien qu'il puisse survenir une année où l'on décide de ne pas l'attribuer. Les candidats doivent être citoyens canadiens ou résidents permanents du Canada et avoir terminé leur doctorat depuis sept ans ou moins. Le récipiendaire est invité à prononcer une conférence au CRM et à présenter un résumé de ses travaux pour publication dans le Bulletin du CRM.

Les candidatures doivent être parrainées par au moins deux personnes et présentées avant le **1er octobre 2006** au Directeur du CRM. Les dossiers devront inclure les documents suivants:

- un curriculum vitae,
- une liste des publications,
- une lettre justificative,
- au plus quatre tirés à part,
- et un maximum de quatre lettres de référence.

À moins que les candidats ne décident de les retirer, les candidatures non retenues sont automatiquement remises en concours durant les deux années suivantes, à condition que la règle concernant l'obtention du doctorat depuis sept ans ou moins soit toujours satisfaite. Des mises à jour des dossiers peuvent être effectuées.

Crée en 1991, le Prix André-Aisenstadt souligne l'excellence de la recherche en mathématiques pures ou appliquées effectuée par de jeunes mathématiciens canadiens. Les récipiendaires du Prix de mathématiques André-Aisensadt ont été: Niky Kamran (McGill), Ian Putnam (Victoria), Michael Ward (UBC), Nigel Higson (Penn State), Adrian S. Lewis (Waterloo), Lisa Jeffrey (Toronto), Henri Darmon (McGill), Boris Khesin (Toronto), John Toth (McGill), Changfeng Gui (Connecticut), Eckhard Meinrenken (Toronto), Jinyi Chen (UBC), Alexander Brudnyi (Calgary), Vinayak Vatsal (UBC), Ravi Vakil (Stanford), Iosif Polterovich (Montréal) et Tai-Peng Tsai (UBC).

Prière de soumettre les dossiers au : Directeur, Centre de recherches mathématiques, Université de Montréal, C.P. 6128, Succursale Centre-ville, Montréal, QC H3C 3J7 Canada, Fax: (514) 343-2254, **directeur@crm.umontreal.ca.**

## Call for nominations

The Centre de recherches mathématiques (CRM) solicits nominations for the André-Aisenstadt Mathematics Prize awarded to recognize talented young Canadian mathematicians. The André-Aisenstadt Mathematics Prize, which recognizes out standing research achievement by a young Canadian mathematician in pure or applied mathematics, consists of a $3,000 award and a medal.

The recipient is chosen by CRM's advisory committee. The prize is generally awarded yearly, although in a given year the decision may be made not to award it. At the time of consideration, candidates must be Canadian citizens or permanent residents of Canada, and no more than seven years from their Ph.D. The recipient is invited to deliver a lecture at CRM, at a time mutually agreed upon, and to write a brief article on his or her work for publication in the CRM's Bulletin.

Nominations must be submitted by **October 1, 2006** to the Director of the CRM, by at least two sponsors who are responsible for providing the following information:

- a curriculum vitae,
- a list of publications,
- a covering letter explaining the basis of the nomination,
- up to four reprints, and
- a maximum of four letters of support.

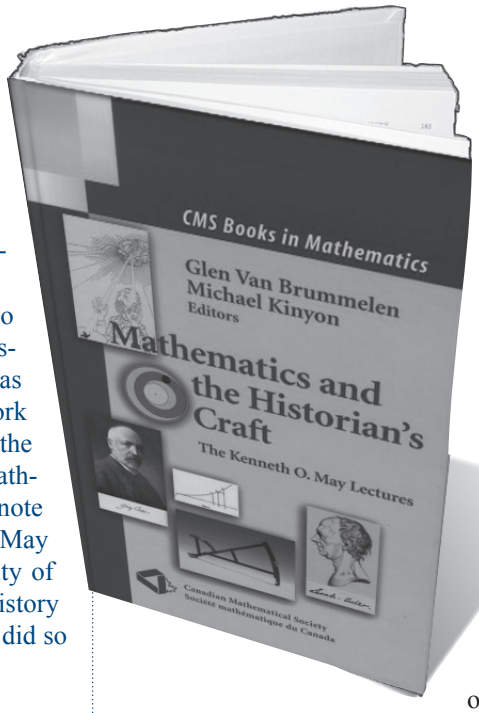
Unsuccessful nominations remain active for two further years if not withdrawn and if the rule regarding the completion of the Ph.D. within seven years is still satisfied. The nominations can be updated if desired.

Created in 1991, the André-Aisenstadt Mathematics Prize is intended to recognize and reward research achievements in pure or applied mathematics by talented young Canadian mathematicians. Previous recipients of the André-Aisensadt Prize: Niky Kamran (McGill), Ian Putnam (Victoria), Michael Ward (UBC), Nigel Higson (Penn State), Adrian S. Lewis (Waterloo), Lisa Jeffrey (Toronto), Henri Darmon (McGill), Boris Khesin (Toronto), John Toth (McGill), Changfeng Gui (Connecticut), Eckhard Meinrenken (Toronto), Jinyi Chen (UBC), Alexander Brudnyi (Calgary), Vinayak Vatsal (UBC), Ravi Vakil (Stanford), Iosif Polterovich (Montréal) and Tai-Peng Tsai (UBC).

Please submit nominations to: Directeur, Centre de recherches mathématiques, Université de Montréal, C.P. 6128, Succursale Centre-ville, Montréal, QC H3C 3J7 Canada, Fax: (514) 343-2254, **directeur@crm.umontreal.ca.**

## *Mathematics and the Historian's Craft: The Kenneth O. May Lectures*

***eds Glen Van Brummelen and Michael Kinyon***
***CMS Books in Mathematics #21***
***Springer 2005, xvi + 357 pp***




**This volume represents a** cooperative effort of two Canadian societies concerned with mathematics and its history. Published by the Canadian Mathematical Society as Number 21 in its "Books in Mathematics" series, the work contains twelve keynote addresses from the meetings of the the Canadian Society for the History and Philosophy of Mathematics. Delivered over the years 1990 – 2003, the keynote lectures, past and future, were designated the Kenneth O. May Lectures in 2002, in honor of K. O. May of the University of Toronto. It was a fitting tribute to a man who fathered the history of mathematics as a professional discipline in Canada and did so much to promote it worldwide.

All twelve lectures have appeared, over the years, in the *Proceedings* of the annual meetings of the CSHPM/SCHPM, which are distributed only to members. And polished versions of six lectures have also appeared in such venues as the *American Mathematical Monthly* and *Philosophia Mathematica*. But the book does more than just make conveniently available what has previously appeared. By bringing these twelve works together the editors have added value by providing a chance for the reader to see common themes addressed by different authors in different contexts.

The work begins with I. Grattan-Guinness's "History or Heritage,"[1] which argues for making a distinction between those two concepts. The former is the concern of professionally trained historians of mathematics, and the latter usually typifyies the concerns and approach of the working mathematician. Grattan-Guinness argues, and the reviewer concurs, that both activities address legitimate concerns, but, as he shows, trouble has arisen when one is confused with the other.

In "Ptolemy's Mathematical Models and their Meaning" A. Jones shows, with admirable clarity, how Ptolemy's models for astronomy, astrology, human vision, cartography, and harmonious sound are all parts of the "structure imposed for the sake of the Good by minds upon a world that would otherwise be governed by disorder."

The following three essays deal with mathematics and its applications in the period 1600 – 1800. In the first, "Mathematics, Instruments, and Navigation , 1600 – 1800," J. Bennett studies four important developments in mathematics and instrumentation during that period, including Christopher Wren's study of cycles of change in magnetic variation over time and the solution to the problem of finding the longitude. Any readers of this review who were moved by NOVA's portrayal of John Harrison's heroic struggles to solve the problem of longitude should read Bennett's evidence for his salutary warning that "the past is more complex and interesting than we might have imagined." In the second of the three, J. Grabiner argues from a thorough study of the influence of Colin Maclaurin's *Treatise on Fluxions* on continental mathematicians that the answer to the question "Was Newton's Calculus a Dead End?" is an emphatic "No." She shows that, in fact, Maclaurin's treatments of maxima and minima of single-variable functions, the problem of the attraction of spheroids, his summation formula, and elliptic integrals influenced a number of continental mathematicians, including Lagrange and Euler. Concluding this group of three studies is R. Thiele's "Mathematics and Science of Leonhard Euler" – a rich survey of Euler's life and some of his most important work. (The piece ought to be required reading for those who planned the recent exhibition at the Art Gallery of Ontario, who managed to do a whole show on Catherine the Great and her Russian Empire without once mentioning the man who was, at that time, Russia's greatest scientist.)

The next two pieces are "Mathematics in Canada before 1845", by T. Archibald and L. Charbonneau, and K. Parshall's "Emergence of the American Mathematical Research Community." The first of the two is a pioneering survey which points to the kind of research that needs to be expanded on, and questions that need to be addressed, before the kind of broad survey that Parshall has composed for the United States can be written for Canada. An important step in this direction would be an initiative of the CMS to begin the work of archiving, and facilitating the study of, materials which are now available documenting the the explosive growth of Canadian mathematics from the early 60s up to the present. This should be a matter of some urgency, since at present there are many people with documents and memories of this period, but this will be much less the case in a decade or so.

Of the remaining five essays, one is J. Dauben's "The Battle for Cantorian Set Theory." Dauben documents both the variety of means Cantor used to support his new theories, such as the creation and/or exploitation of new venues for communicating mathematical research as well as the broad range of arguments (from rigorous mathematics to speculative theology) that he employed in defense of his ideas. A second is R. Thiels's second paper in this volume, "Hilbert and his Twenty-Four Problems."

In addition to providing an engaging account of how Hilbert worked and interacted with other mathematicians, Thiele gives one a good feeling for the different kinds of problems that made up the famous twenty-three problems that Hilbert published along with an account of why the twenty-fourth problem did not "make the cut."

The remaining three papers are, each in its own way, both interesting and thought-provoking. They call upon – variously – some acquaintance with issues in philosophy (V. Peckhaus's "19th Century Logic Between Philosophy and Mathematics", psychology (S. Shanker's "Turing and the Origins of AI"), and women's studies (A.H. Koblitz "Mathematics and Gender").

This attractive, well-illustrated, and nicely edited volume of thoughtful studies is a credit to its authors, its editors and to both of the sponsoring societies. One hopes they can find a way to make some more of the treasures hidden in the CSHPM *Proceedings* available to a wider mathematical public.

---

[1] For convenience in citation most titles have been slightly shortened.

**Online Resource for High School and College**

www.whyslopes.com

**Author:** A. Selby

550+ webpages on *fractions, logic, algebra, geometry, trig, functions, complex numbers, number theory, calculus and real analysis* offer starter lessons, ideas for curriculum shifts, and a full thought-based, development of skills, concepts and theorems. Please mention to your students and pre-college teachers.

**Wanted:** (i) CMS members impressed by site content to write letters of reference; (ii) a post in mathematics or mathematics education in Canada or the UK, secondary to university level, asap.

**David Brillinger FRSC, Professor of Statistics, University of California at Berkeley has been elected a Foreign member of the Norwegian Academy of Science and Arts and a Foreign Member of the Brazilian Academy of Science.**

## CMS Prize Lectureships and Awards Programmes
## Prix et bourses de la SMC

**The most up-to-date information concerning all CMS Prize Lectureships & Awards programmes, including complete lists of recipients, can be found at: `www.cms.math.ca/Prizes/`**

**Vous trouverez l'information la plus récente sur les prix et bourses de la SMC, y compris les listes de lauréats, sur le site Web suivant : `www.cms.math.ca/Prix/`**

**EARLY BIRD** **LÈVE TÔT**

**REGISTRATION** **INSCRIPTION**

**CMS Summer 2006 Meeting** — ***April 30, 2006***

**Réunion d'été 2006 de la SMC** — ***30 avril 2006***

Robert Rosebrugh
*Mount Allison University*

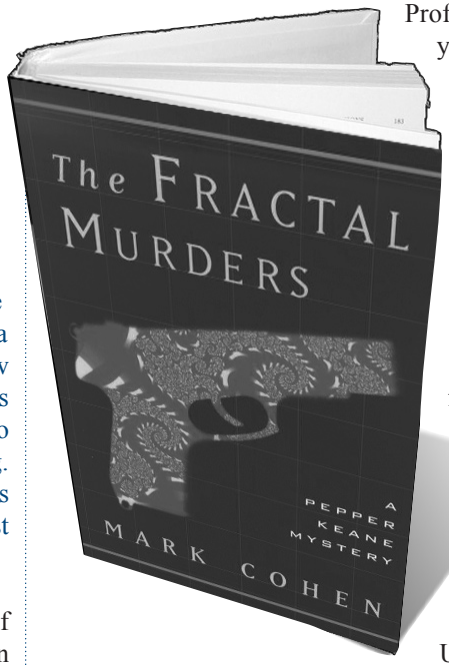
## *The Fractal Murders*

***by Mark Cohen***
***Mysterious Press***
***Warner Books 2004 vi + 311 pages***

**The cover of this** entertaining first novel proclaims it to be `a Pepper Keane mystery'. Until recently it was *the* Pepper Keane mystery, but a second of the series has now appeared. Undoubtedly the author anticipates an ongoing remunerative franchise like Sue Grafton's lettered books, or perhaps aspires to create a world like the Big Easy of James Lee Burke. The author's new novel indicates that we can't look forward to titles in the series like "An Elementary Catastrophe", "Fermat's Last Gasp", and so on. Indeed, Cohen sends Keane after bikers in his next outing. That's regrettable because there are enough interesting subjects in mathematics, or academe more generally, to keep a novelist occupied well into a successful career.

A title involving fractals is bound to attract the curiosity of mathematicians at least, and probably of others interested in an arcane-sounding intellectual subject that might bridge the gaps from geometry to computer graphics and financial mathematics. How does the author do at making sense of this sophisticated subject material? Happily, in this book not a lot of pages are spent in attempts to give the reader all the latest and greatest results of fractal geometry. There is some tentative exposition of fractals at what must be the mystery novel level. One imagines those not mathematically inclined glazing over pretty quickly during even those few paragraphs. Still, no obvious inaccuracies were spotted by this reviewer (who is not knowledgable about fractals) in the fairly slight descriptive content. In an interview Cohen claimed that he became a lawyer partly because math was his worst subject. He also admits that he later found our subject to be fascinating for its foundations and philosophy. In any case he is now obviously sympathetic to mathematics research and does give a vague idea of what it is like to be involved.

As well as the intellectual backdrop, there's a bit more that's fractal about this novel. The characters are somewhere between two and three dimensional. Not too bad when they are living a mystery where three murders are spread across the continent, made out to look unrelated, and in one case made to look like a gruesome suicide. The link among the victims, and fearful of being the next, is a youngish, accomplished and very attractive mathematician called Jayne Smyers.




Prof. Smyers hires former lawyer and part-time PI, Pepper Keane, to chase down whoever has done in her three colleagues. Like Smyers the victims are all fractal experts. Their connection with her varies but she is right that their deaths are not coincidental. In fact, the three have a potentially valuable application of fractals in common. The killer wants them all dead for reasons that only become clear very late in the story, but there is lots of fun in Keane's travels around the U.S.A. trying to find the link. Along the way he meets with a several colourful characters, mostly cops, who help and hinder his enquiries.

Like the protagonists of many a mystery, Keane has a past that makes him a bit of a misfit, and a mix of current interests meant to mark him as a non-conventional character. He's a rock music expert with a taste for hanging out with his dogs and geeky friends, and working out.

While his investigation progresses, Keane forms a non-professional attachment with his client that's complicated by his own messy past and therapeutic present. He's not the only one interested in Prof. Smyers, and the competition gets a little rough. In the end, of course, the bad guys are found out, the PI gets the professor, and the sun sets over the Rockies.

This novel makes an entertaining read for quiet nights on a research trip, so I'll gladly pick up the next Pepper Keane book in an airport somewhere.

And if you enjoy a light mystery story don't hesitate to check out "The Fractal Murders". It's a pleasant way to pass a few hours escaping into a fictional world that has some passing contact with ours.

**WANTED:**
**Books for Review**

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

**RECHERCHÉS :**
**Livres pour critiques littéraires**

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

**Peter Fillmore**
**Department of Mathematics and Statistics**
**Dalhousie University**
**Halifax NS B3H 3J5**

# BRIEF BOOK REVIEWS

**S. Swaminathan**
*Dalhousie University, Halifax, NS*

## *An Introduction to Nonlinear Analysis*

***by Martin Schechter***
***Cambridge Studies in Advanced Mathematics 95,***
***Cambridge 2005, xvii + 357pp. U.S. $75.***

Courses in analysis and applied mathematics are concerned mostly with linear problems. In dealing with these problems it is usually sufficient to apply Riemann integration to functions that are piecewise continuous and in considering convergence of series uniform convergence is adequate enough. Concepts from functional analysis are rarely needed; linear algebra techniques will do. But nonlinear problems do arise in applied mathematics. More theoretical background is needed to solve them. Students do not come into contact with substantial nonlinear theory until an advanced stage in their studies.

This book is devoted to nonlinear methods using the least background material possible and the simplest linear techniques. The author's approach is to explain first the methods of solving problems and then to give the proofs. Functional analysis and Lebesgue integration are introduced by explaining the essentials; students then have the option either to take them on faith or consult the references provided. Standard material concerning contraction mapping theorem, Picard's theorem, implicit function theorem, the Brouwer degree and fixed point theorems, Leray-Schauder degree, Peano's theorem, etc are included.

Four appendices give definitions and theorems, without proofs, from functional analysis, measure theory, metric spaces and pseudo-gradients. Each chapter concludes with a set of exercises. The book is an ideal accompanying text for advanced undergraduate and graduate courses or even for self-study.

## *Ratner's Theorems on Unipotent Flows*

***by Dave Witte Morris***
***Chicago Lectures in Mathematics Series***
***University of Chicago Press 2005 xi + 203 pp. US $ 20 (pb).***

Unipotent flows are well-behaved dynamical systems. The theorems of Berkeley mathematician Marina Ratner have guided key advances in the understanding of dynamical systems. In particular, Ratner has shown that the closure of every orbit of such a flow is of a simple algebraic or geometric form. This is known as the Ratner orbit closure theorem. Closely related results are the Ratner measure-classification theorem and the Ratner equidistribution theorem.

In this book the author provides an elementary introduction to the theorems and discusses some of their consequences. The first four chapters can be read independently. The first chapter is introductory. The following chapters discuss entropy, ergodic theory and the theory of algebraic groups.

## *Information Theory and Stochastics for Multiscale Nonlinear Systems*

***by Andrew J. Majda, Rafail V. Abramov***
***and Marcus J. Grote***
***CRM Monograph Series 25***
***AMS 2005 viii + 133 pp.***

This book is based on the Aisenstadt lectures (November 2004) of A. Majda at the University of Montreal.

It introduces mathematicians to the fascinating emerging mathematical interplay between ideas from stochastics and information theory and important practical issues in studying complex multiscale nonlinear systems. It emphasizes the synergy between modern applied mathematics and applications where rigorous analysis, the development of qualitative and/or asymptotic models, and numerical modeling all interact to explain complex phenomena.

After a brief introduction to the emerging issues in multiscale modeling, there are three chapters which can be read independently of each other. The first one is an introduction to information theory with novel applications to statistical mechanics, predictability, and Jupiter's Red Spot for geophysical flows. The second chapter discusses new mathematical issues regarding fluctuation-dissipation theorems of complex nonlinear systems including information flow, various approximations, and illustrates applications to various mathematical models. The third chapter is about stochastic modeling of complex nonlinear systems. After a general discussion, a new elementary model, motivated by issues in climate dynamics, is utilized to develop a self-contained example of stochastic reduction. New research material is presented in the second and third chapters.

The book will be useful to both faculty and graduate students in pure and applied mathematics. No background in geophysical flows is required.

## *Malliavin Calculus, with Applications to Stochastic Partial Differential Equations*

***by Marta Sanz-Solé***
***EPFL Press / CRC Press 2005 viii + 162 pp.***

Malliavin calculus is an infinite-dimensional calculus based on Wiener measure. It is regarded today as a fundamental approach to stochastic analysis. Originally, Malliavin introduced his calculus in order to give a probabilistic proof of Hörmander's theorem on hypoellipticity of degenerate second-order elliptic differential operators. It relies on the use of differential operators which apply to functionals on Wiener space, associated Sobolev spaces, and an integration by parts formula which relates derivations on the Wiener space and the Itô integral.

The aim of this book is to present applications of Malliavin's calculus to the analysis of probability laws of solutions to partial differential equations driven by Gaussian noises which are white in time and coloured in space, in a comprehensive way. The first five chapters are devoted to the introduction of the calculus itself based on general Gaussian space, going from a simple finite-dimensional setting to an infinite-dimensional one. The last three chapters are devoted to the applications mentioned above. Each chapter ends with some comments on the origin of the work with references.

## *Linear and Projective Representations of Symmetric Groups*

***by Alexander Kleshchev***

***Cambridge Tracts in Mathematics 163***

***Cambridge 2005 xiv + 274pp. U.S. $80.***

The representation theory of symmetric groups is one of the most beautiful, popular, and important parts of algebra, with many deep relations to other areas of mathematics, such as combinatorics, Lie theory, and algebraic geometry. In this book the author describes a new approach to the subject based on the recent works of Lascoux, Leclerc, Thibon, Ariki, Grojnowski, and Brudan, as well as his own. Much of the work has appeared previously only in the research literature. The author is mainly concerned with modular representation theory. Branching rules are built in from the outset resulting in an explanation and generalization of the link between modular branching rules and crystal graphs for affine Kac-Moody algebras. The methods are purely algebraic exploiting affine and cyclotomic Hecke algebras. For the first time in book form, the projective (or spin) representation theory is treated on the same lines as linear representation theory.

To make it accessible to graduate students the theory is developed from scratch, the only prerequisite being a standard course in abstract algebra.

**The soul, doubtless, is immortal--where a soul can be discerned.**

*****

**Yours for instance, you know physics, something of geology, Mathematics are your pastime; souls shall rise in their degree; Butterflies may dread extinction,--you'll not die, it cannot be!**

**Robert Browning, "A Toccata of Galluppi's", XII-XIII**

## *Elementary Number Theory in Nine Chapters, second edition*

***by James J. Tattersall***

***Cambridge 2005 xi+ 428pp. U.S. $85 (hb), $34.39 (pb).***

In the second edition of this textbook the organization and content remain the same as before. Information on several conjectures and updates on open questions noted in the first edition have been given. Over 375 supplementary exercises are added to the text. "The exercises are not just there to assure readers that they have mastered the material, but to make them think and grow in mathematical maturity." A number of historical vignettes are included to humanize the mathematics involved. A good discussion is given of an algorithm for the greatest common divisor of two integers devised by Nicholas Saunderson, the blind Lucasian professor of mathematics at Cambridge University in 1740 in his Elements of Algebra, simplifying the number of steps in the Euclidean algorithm process. Here is a sample exercise from the chapter on conditional linear congruences:

*U. S. Senator Riley was first elected in 1982. Her reelection is assured unless her campaign coincides with an attack of the seven-year itch such as hit her in 1978. When must she worry first? [For non-American readers: US senators are elected for a fixed term of six years.]*

Intended for a one-semester course, this book provides a stimulating and entertaining introduction to number theory.

For solution from 'answers to selected exercises' see page 17

**Are you sure that it is impossible to trisect the angle by Euclid? I have not to lament a single hour thrown away on the attempt, but fancy that it is rather a tact, a feeling than a proof, which makes us think that the thing cannot be done. But would Gauss's inscription of the regular polygon of seventeen sides have seemed, a century ago, much less an impossible thing, by line and circle?**

**William Rowan Hamilton**
**Letter to A. De Morgan, 1852.**

(NOTE: Pierre Wantzel had already shown in 1837 that trisection of an angle "by line and circle" was impossible. Hamilton lived at the end of a period when ignorance of Continental mathematics was fashionable in Britain – and presumably Ireland.)

by Ed Barbeau
*University of Toronto*

## LINEAR ALGEBRA

Linear algebra seems to be a poor relation when it comes to discussion of curricular reform, despite its increasing importance in advanced mathematics, both pure and applied. Accordingly, I thought that it would be useful to focus some attention on this topic and asked David Poole of Trent University to put matters into perspective for us. He has written a well-regarded textbook, **Linear algebra: a modern introduction** (Second edition, 2006) ISBN 0-534-40596-7, published by Thomson Brooks/Cole. This comes with and without a CD-ROM.

After David Poole's item, I want to draw attention to some possible problems that might be given and to a recent MAA source. Reference is made to the Linear Algebra Curriculum Study Group, established by the Mathematical Association of America. I am grateful to Professor Poole for the references *The College Mathematics Journal* 24 (1993), 41-46 and *Resources for teaching linear algebra* (edited by David Carlson *et al*), MAA Notes, 1997, in which a summary of the group's recommendations appear. I hope that readers will feel free to share their own views and approaches on linear algebra.

### Whither Linear Algebra?

There are times when it seems as though linear algebra is the Rodney Dangerfield of mathematics: it gets no respect. Or, rather, it is too easily ignored. It is not uncommon that, whenever mathematics curriculum reform is discussed, eventually the conversation turns to calculus and stays there. Anyone who has participated in or observed recent Canadian secondary school curriculum revision exercises will know what I mean. The same is true at the post-secondary level - witness the "reform calculus" movement and the debate it has generated versus the largely unknown work of the linear algebra curriculum study group, both occurring in the late 1980s and early 1990s.

Perhaps calculus is the problem child of mathematics and needs attention while linear algebra is the completely well-adjusted offspring. I am not sure about the former and am even less sure about the latter. That said, let me offer some thoughts about linear algebra, the way it is taught, and hopes for how it might evolve.

In high school, students are exposed to the basic tools of linear algebra: the arithmetic of vectors, matrices, and systems of linear equations. Linear algebra in university represents the transition from arithmetic to algebra. The notion of linearity is introduced and the ideas of vector spaces and linear transformations are developed. From the mid-20th century until the early 1970s, this meant that vector spaces, introduced axiomatically, were the first topic in a university linear algebra course, usually taught in the third or fourth year. From the 1970s onward, linear algebra began to be introduced more concretely, beginning with linear systems and relegating vector spaces to a later point in the first or second course. This trend was accompanied by linear algebra being introduced much earlier - in second or third year, as is still common. Because of linear algebra's importance in other mathematics courses and its applicability in other disciplines, there is no doubt that this was an appropriate shift.

However, the shift of vector spaces towards the end of the syllabus often meant a corresponding shift in the discussion of *vectors* as well. Consequently, any meaningful discussion of the relationship between geometry and linear algebra would be an endnote to an introductory course. This trend was exacerbated by the recommendation of the linear algebra curriculum discussion study group that a first course in linear algebra should be "matrix based", effectively purging vectors (if not vector spaces) from the introductory course altogether. Linear algebra appeared to be morphing into matrix analysis. So, should we return to a linear algebra curriculum that puts vector spaces first? Or do we stay the course and continue to lead off with the concrete computational methods associated with linear systems and matrices?

There is a third option. I firmly believe that the best way to teach linear algebra is to adopt a geometric point of view at the outset and to constantly refer to it. After all, this is the way most mathematicians think of linear algebra; to neglect to show students how to think geometrically is pedagogically unsound. However concrete and utilitarian the approach of leading off with linear systems and matrices may be, I believe that it gets students off on the wrong foot by setting a higher premium on the ability to do calculations than to understand what the calculations show. Hence, vectors (in $\mathbb{R}^2$, $\mathbb{R}^3$, then $\mathbb{R}^n$) and vector geometry should come first with linear systems and matrices following.

I also believe that it is important to introduce the main concepts of linear algebra as early as possible, always in a concrete setting. Thus the stage should carefully be set for such topics as linear independence, spanning sets, basis and dimension, linear transformations, eigenvectors and diagonalization, *etc*. All of these topics can be introduced in a concrete way early in a first course. In my experience, students are much more open to a theoretical discussion of these topics when they have had an introduction to them in concrete settings.

The view that linear algebra is a gateway into rigorous abstract mathematics has traditionally been served by emphasizing vector spaces and linear transformations and the axiomatic treatment that often accompanies them. Not surprisingly, this is usually the part of the course that students find most difficult. Nevertheless, I have never been persuaded that the axiomatic approach to vector spaces and the bevy of standard examples that accompanies it actually do what is claimed, namely introduce students to the beauty and power of linear algebra. I think this is partly due to the disclaimer - intended to be a reassurance - that usually accompanies the chapter on vector spaces: "We will find that a study of vector spaces is not much different from a study of $\mathbb{R}^n$ itself." While it is true that students see the unifying power of the axioms and are introduced to abstract reasoning, the examples are mostly over the real numbers so that the calculations are indeed no different that $\mathbb{R}^n$. (Once they catch on to the implicit isomorphism here, good

students can become bored; students of average ability often get the calculations correct, but lose sight of whether they are in $\mathbb{R}^n$ or an isomorphic space.) Complex vector spaces are one solution to this objection but not necessarily appropriate for a first course.

An approach that I favour is to discuss vector spaces over finite fields. There are several good reasons for this: it is easy to introduce students to finite fields via the modular arithmetic of $\mathbb{Z}_p$; examples of vectors over $\mathbb{Z}_p$ can be introduced near the beginning of the course and developed throughout, and there are nice and important applications (in particular to coding theory). I would also note that congruences are usually discussed in courses on discrete mathematics and number theory, while finite fields arise in upper-year abstract algebra courses and have important applications in computer science and engineering. Introducing these topics in a first linear algebra course strengthens the contention that linear algebra is as important as a foundation course as calculus by including additional material that students will encounter again. The fact that students need to be somewhat more careful when working over a finite field that the reals tends to make them more receptive to the axiomatic treatment of vector spaces, when it arrives.

Linear algebra is also rich in applications. I believe that it is important to expose all students - especially non-mathematics majors - to as many of these applications as possible. I particularly like applications that can be revisited throughout a course. Some examples are:

• *Graphs:* They can be introduced by adjacency matrices and incidence matrices; they can be connected with Markov chains (another application) by exploring the notion of random walks on graphs; all of this can then be connected with electrical networks (an application of systems of linear equations).

• *Codes:* After introducing modular arithmetic, UPC and ISBN codes can be covered; error-detecting and error-correcting codes use matrix methods; linear codes are examples of vector spaces, dual codes of orthogonal spaces.

• *Linear recurrence relations:* I have yet to meet a student who is not intrigued by the Fibonacci sequence. This topic, and recurrence relations generally, can be introduced as an application of eigenvalues and diagonalization, and also in the context of vector subspaces (of $\mathbb{R}^n$).

There are many other rich pedagogical applications – too many to cover in any one course. I have found that most applications make excellent independent or group study projects and I usually include them in my own course in this way. (Other topics appropriate for projects or independent study include the plethora of identities related to the cross product and many of the applications of determinants.)

I am a strong advocate of "flattening the curriculum" - that is, providing as many different entry points into mathematics as possible. Calculus is the traditional entry point (and gatekeeper); linear algebra – along with discrete mathematics, statistics and probability – is another. I would argue further that linear algebra actually connects better to other mathematics courses and to other disciplines than calculus does. We should be spending as must time thinking about the content of and the way we teach linear algebra as we do for calculus. Otherwise, I worry that the next article I write on the subject may be entitled "*Wither Linear Algebra?*".

*David Poole* (**dpoole@trentu.ca**)

## Classroom problems in linear algebra

Many years ago, when websites were young, somebody had the idea of making available a stock of linear algebra problems. I began to collect some problems, some from my own files and some from colleagues, but the project never matured. Recently, I discovered among my effects the collection of problems and it struck me that this column might be a useful outlet for them.

Some linear algebra courses begin with the axioms for a vector space, and there are two situations that your students might have come across that are the subjects of nice exercises that require practically nothing in the way of linear algebra background.

***The partial fraction decomposition.*** *Let $r_1$, $r_2$, …,$r_n$ be distinct real numbers and suppose that $g(x) = (x - r_1)(x - r_2)(x - r_3)\ldots(x - r_n)$. Let $V$ be the real vector space (with the usual operations on rational functions of the form $p(x)/q(x)$, where $p(x)$ is a polynomial of degree less than n.*

*(a) Show that the set $\{ x^k/g(x) : k = 0, 1, \ldots, n - 1 \}$ is a basis for $V$, so that $V$ is $n-$dimensional.*

*(b) Show that, for each i, the function $h_i(x) = 1/(x - r_i)$ belongs to $V$.*

*(c) Show that the set $\{ h_i(x) \}$ is linearly independent, and hence constitutes a basis for $V$.*

*(d) Suppose that $f(x)$ is a polynomial of degree less than n. Prove that there exist constants $a_i$ for which $f(x) = \sum a_i\, h_i(x)$.*

*Comments.* One can of course adapt the proof to deal with the situation in which the polynomial $g(x)$ has nonreal or repeated roots, but this blunts the point that one would want to make with this exercise in a linear algebra course. The other thing to note is that the theorem is an existence theorem that does not give you a way to determine the constants in (d). However, it does give you an identity with undetermined coefficients that can be utilized.

***The Fibonacci sequence.*** *Let $V$ be a vector space (with the usual operations) of all real sequences $\mathbf{x} = (x_1, x_2, \ldots, x_n, \ldots)$*

*that satisfy the condition $x_n = x_{n-1} + x_{n-2}$ for $n \geq 3$. Define the sequences* ***a*** *and* ***b*** *by*

$$\mathbf{a} = (1, 0, 1, 1, 2, 3, 5, \ldots)$$

$$\mathbf{b} = (0, 1, 1, 2, 3, 5, 8, \ldots)$$

(a) *Show that, if* $\boldsymbol{x} \in V$, *then* $\boldsymbol{x} = x_1\,\boldsymbol{a} + x_2\,\boldsymbol{b}$, *and deduce that $V$ is 2-dimensional.*

(b) *[The idea is to look for another basis of $V$ that has a simple description. Does $V$ have any geometric sequences?] Show that $V$ contains a geometric sequence $(r, r^2, r^3, \ldots)$ if and only if $r^2 = r + 1$. Deduce that $V$ contains precisely two geometric sequences* ***u*** *and* ***v***, *and show that these constitute a basis. What are the entries of* ***u*** *and* ***v***?

(c) *Let* $\boldsymbol{f} = (1, 1, 2, 3, 5, 8, \ldots)$ *be the Fibonacci sequence. Show that there exist constants $a$ and $b$ for which* $\boldsymbol{f} = a\boldsymbol{u} + b\boldsymbol{v}$. *Determine $a$ and $b$ by looking at the first two entries of* ***f***, *and deduce that the nth entry of* ***f*** *is*

$$\frac{1}{\sqrt{5}}\left[\left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\left(\frac{1-\sqrt{5}}{2}\right)^n\right)\right]$$

*Comment.* Another approach would be to relate the recurrences to points in $\mathbb{R}^2$ and relate the sum of two recurrences to the vector sum. The students can see geometrically how two pairs of points can constitute a basis. This exercise has an obvious generalization to any $m^{th}$ order recursion whose characteristic polynomial has distinct zeros. Students might be invited to explore the situation in which there are multiple zeros. Then we run short of geometric sequences to put into a basis and have to look elsewhere to make up for them.

Once students have been introduced to the inner product, there is a reasonably challenging and interesting exercise for them to gnaw away at: *Let n be a positive integer. Determine all possible values of k for which there are n+1 unit vectors* $\boldsymbol{x}_0, \boldsymbol{x}_1, \ldots, \boldsymbol{x}_n$ *in* $\mathbb{R}^n$ *for which* $\boldsymbol{x}_i \cdot \boldsymbol{x}_j = k$ *whenever* $i \neq j$.

Moving to the realm of matrices, we have this rather nice problem from Tony Thompson of Dalhousie University.

*A magic square matrix is one whose row, column and two diagonal sums are all equal. If all its broken diagonal sums are also equal to the other sums, it is said to be pandiagonal.*

*(a)* Prove that the inverse of a 3 × 3 magic square matrix is magic.

(b) Prove that the product of an odd number of 3 × 3 magic square matrices is magic.

(c) Prove that every odd power of a 3 × 3 magic square matrix is magic.

*Comment.* We use the bold superscript $(\,)^{\mathbf{T}}$ for the transpose.

(a) If $A$ is a 3 × 3 matric with row sum $r$, then $r$ is an eigenvalue with an eigenvector $(1, 1, \ldots, 1)^{\mathbf{T}}$; observe that $r$ is also the trace of $A$. The other eigenvales of $A$ have the form $u$ and $-u$. Note that $r^{-1}$ is an eigenvalue of $A^{-1}$ with the same eigenvector and that the trace of $A^{-1}$ is equal to $r^{-1} + u^{-1} - u^{-1} = r^{-1}$. By considering transposes, we find that $A^{-1}$ has column sums $r^{-1}$. For the cross-diagonal sum, apply this reasoning to $B = PA$, where

$$P = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}.$$

(b) Use the fact that the 3 ×3 magic square matrices constitute a three-dimensional vector space with basis $\{ E_1, E_2, E_3 \}$, where

$$E_1 = \begin{pmatrix} 0 & 1 & -1 \\ -1 & 0 & 1 \\ 1 & -1 & 0 \end{pmatrix} E_2 = \begin{pmatrix} 1 & -1 & 0 \\ -1 & 0 & 1 \\ 0 & 1 & -1 \end{pmatrix} E_3 = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}.$$

The products of pairs of these are the zero matrix except for the cases $E_1E_2 = -E_2E_1 = 3P - E_3$, $E_1^2 = -E_2^2 = E_3 - 3I$ and $E_3^2 = 3E_3$.

More on these magic matrices can be found in Thompson's paper in the *American Mathematical Monthly* 103 (1994), 339-342.

There are other problems in the collection that I will introduce from time to time. However, the Mathematical Association of America published a collection under the title of **Linear algebra gems: assets for undergraduate mathematics** under the auspices of its Linear Algebra Curriculum Study Group; it is number 59 in its *Notes* series and the ISBN is 0-88385-170-9. There are 74 items, most running only to two or three pages, that provide fresh ways of looking at associativity of matrix multiplication, the relationship between matrix products $AB$ and $BA$, properties and means of calculating the determant, Cramer's Rule, decomposition of matrices, systems of linear equations, matrix equations and a host of other topics. A collection of 123 class problems concludes the book. Here are a few results that caught my eye.

*If $A$ is a $(n-1)\times n$ matrix of integers whose row sums are all zero, then $\det(AA^{\mathbf{T}}) = nk^2$ for some integer $k$.* (p.43)

*A $n \times n$ matrix with integer entries has integer eigenvalues if and only if it can be expressed in the form*

$$\sum_{i=1}^{n-1} \mathrm{u}_i^{\mathrm{T}}\,\mathrm{v}_i + kI$$

*where* $\boldsymbol{u}_i$ *and* $\boldsymbol{v}_i$ *are row vectors with n integer entries that are pairwise orthogonal, k is an integer and I is the identity matrix.* (p. 63)

*Let* $\boldsymbol{p}$ *be a unit vector in* $\boldsymbol{R}^3$ *and define the operator P by* $P(\mathbf{x}) = \mathbf{p} \times \mathbf{x}$ *(where we have the cross product on the right). Then* $I + P^2$ *is the orthogonal projection onto the span of* $\mathbf{p}$ *and* $I + (\sin\theta)P + (1 - \cos\theta)P^2$ *is the rotation about the axis* $\mathbf{p}$ *through the angle* $\theta$. *(p. 113)*

*Here is a way of solving the matrix equation* $X^2 = A$ *for X (p. 153). We write* $(X - \lambda I)(X + \lambda I) = A - \lambda^2 I$ *and take determinants to find that* $p(\lambda)p(-\lambda) = q(\lambda^2)$ *where q is the known characteristic function of A and p is the unknown characteristic function of X. This allows us to cook up some candidates for p and thus, by the Cayley-Hamilton Theorem, provide some polynomial equations possibly satisfied by the unknown X. But we can replace* $X^2$ *by A, and so in fact get possible linear equations satisfied by X. Solve these linear equations and check which of them give the desired square root.* For those wanting to pursue this area, a reference to a paper by G. Cross and P. Lancaster in *Linear and Multilinear Algebra* 1 (1974), 289-293 is provided.

# First Joint SMM/CMS Meeting
# Première réunion conjointe de la SMM-SMC

<table>
<tr><th>Wednesday<br>September 20</th><th>Thursday<br>September 21</th><th>Friday<br>September 22</th><th>Saturday<br>September 23</th></tr>
<tr><td rowspan="5"></td><td>9:30 – 9:50<br>Opening Ceremony</td><td rowspan="2">9:30 – 10:20<br>Maciej Zworski</td><td>9:30 – 10:20<br>Jorge Urrutia</td></tr>
<tr><td>10:00 – 10:50<br>Francisco Gonzales-Acuña</td><td>10:20 – 10:50<br>Coffee Break</td><td rowspan="2">10:30 – 12:30<br>Special Sessions</td></tr>
<tr><td>10:50 – 11:30<br>Coffee Break</td><td rowspan="3">10:50 – 13:50<br>Special Sessions</td></tr>
<tr><td>11:30 – 13:30<br>Special Sessions</td><td>12:45 – 13:35<br>David Brydges</td></tr>
<tr><td rowspan="2">13:30 – 16:00<br>Lunch Break</td><td rowspan="2">13:50 – 16:00<br>Lunch Break</td><td>13:45 – 14:00<br>Closing Ceremony</td></tr>
<tr><td rowspan="3">16:00 – 20:00<br>Registration<br>Hotel Parador San Javier</td><td>16:00 – 18:00<br>Special Sessions</td><td>16:00 – 18:00<br>Special Sessions</td><td rowspan="3">Cultural Activity TBD</td></tr>
<tr><td>18:20 – 19:10<br>Pengfei Guan</td><td>18:20 – 19:10<br>Gonzalo Contreras</td></tr>
<tr><td>21:00 – 22:00<br>Complimentary Cocktail Party<br>Hotel Parador San Javier</td><td></td><td></td><td>20:00 – Midnight<br>Mexican Fiesta<br>Hotel Parador San Javier</td></tr>
</table>

The most up-to-date information concerning the program, including detailed schedules, will be made available at the meeting web site.

Vous trouverez l'information la plus récente sur les programmes, y compris les horaires, sur le site de la Réunion.

| CMS Summer 2006 Meeting | CMS Winter 2006 Meeting | CMS/MITACS Summer 2007 Meeting | CMS Winter 2007 Meeting |
|---|---|---|---|
| **Host: University of Calgary<br>June 3 - 5, 2006<br>Westin Hotel, Calgary** | **Host: University of Toronto<br>December 9 - 11, 2006<br>Sheraton Centre Toronto** | **Host: University of Manitoba<br>June 2007<br>Winnipeg, Manitoba** | **Host: University of Western Ontario<br>December 8 - 10, 2007<br>London, Ontario** |

## CALL FOR SITES
## *DEMANDES DE PROPOSITIONS D'EMPLACEMENTS*

### Interested in hosting a CMS Meeting?

**The summer and winter meeting sites are confirmed to the year 2008 (Summer Meeting - see Calendar of Events). The CMS Research Committee invites requests from departments interested in hosting a CMS Meeting for Winter 2008 onwards. The head of the department should write to the chair.**

### *Êtes-vous intéressés à être l'hôte d'une réunion de la SMC?*

**Les lieux des réunions d'été et d'hiver sont confirmés jusqu'à l'an 2008 (réunion d'été - voir le calendrier des événements). Le Comité de la recherche de la SMC invite les départements intéressés à tenir l'une de ces réunions en hiver 2008 ou plus tard à soumettre une proposition. Les chefs de département intéressés doivent soumettre leur propositions au président.**

**Dr. J.F. Jardine, Chair/Président : CMS Research Committee / Comité de recherches de la SMC**
**Department of Mathematics / The University of Western Ontario / London, Ontario N6A 5B7 Canada**

# CALL FOR NOMINATIONS / APPEL DE MISES EN CANDIDATURE

***The CMS Research Committee is inviting nominations for three prize lectureships. These prize lectureships are intended to recognize members of the Canadian mathematical community.***

***Le Comité de recherche de la SMC lance un appel de mises en candidatures pour trois de ses prix de conférence. Ces prix ont tous pour objectif de souligner l'excellence de membres de la communauté mathématique canadienne.***

## Prix Coxeter-James Prize Lectureship — 2007

Le prix Coxeter-James rend hommage à l'apport exceptionnel à la recherche de jeunes mathématiciens. Il est possible de proposer la candidature d'une personne qui a obtenu son doctorat il y a au plus dix ans. Les propositions pourront être mises à jour et demeureront actives pendant un an, à moins que la mise en candidature originale ne corresponde à la dixième année d'obtention du doctorat. La personne choisie présentera sa conférence à la Réunion d'hiver. Les lettres de mise en candidature devraient inclure les noms d'au moins trois répondants possibles ainsi qu'un curriculum vitae récent, si disponible. Le récipiendaire doit être membre de la communauté mathématique canadienne.

The Coxeter-James Prize Lectureship recognizes young mathematicians who have made outstanding contributions to mathematical research. Nominations may be made up to ten years from the candidate's Ph.D. A nomination can be updated and will remain active for a second year unless the original nomination is made in the tenth year from the candidate's Ph.D. The selected candidate will deliver the prize lecture at the Winter Meeting. Nomination letters should include at least three names of suggested referees as well as a recent curriculum vitae, if available. The recipient shall be a member of the Canadian mathematical community.

## Prix Jeffery-Williams Prize Lectureship — 2008

Le prix Jeffery-Williams rend hommage à l'apport exceptionnel à la recherche de mathématiciens d'expérience. Les propositions pourront être mises à jour et demeureront actives pendant trois ans. La conférence sera présentée à la Réunion d'été. Les lettres de mise en candidature devraient inclure les noms d'au moins trois répondants possibles ainsi qu'un curriculum vitae récent, si disponible. Le récipiendaire doit être membre de la communauté mathématique canadienne.

The Jeffery-Williams Prize Lectureship recognizes mathematicians who have made outstanding contributions to mathematical research. A nomination can be updated and will remain active for three years. The prize lecture will be delivered at the Summer Meeting. Nomination letters should include three names of suggested referees as well as a recent curriculum vitae, if available. The recipient shall be a member of the Canadian mathematical community.

## Prix Krieger-Nelson Prize Lectureship — 2008

Le prix Krieger-Nelson rend hommage à l'apport exceptionnel à la recherche de mathématiciennes. Les propositions pourront être mises à jour et demeureront actives pendant deux ans. La conférence sera présentée à la Réunion d'été. Les lettres de mise en candidature devraient inclure les noms d'au moins trois répondants possibles ainsi qu'un curriculum vitae récent, si disponible. Le récipiendaire doit être membre de la communauté mathématique canadienne.

The Krieger-Nelson Prize Lectureship recognizes outstanding research by a female mathematician. A nomination can be updated and will remain active for two years. The prize lecture will be delivered at the Summer Meeting. Nomination letters should include three names of suggested referees as well as a recent currculum vitae, if available. The recipient shall be a member of the Canadian mathematical community.

La date limite pour les mises en candidature est le **30 juin 2006**. Faire parvenir vos lettres à l'adresse suivante :
The deadline for nominations is June 30, 2006. Letters of nomination should be sent to the address below.

J.F. Jardine, Chair/Président
CMS Research Committee / Comité de recherches de la SMC
Department of Mathematics
The University of Western Ontario
London, Ontario N6A 5B7 Canada

The 2006 Krieger-Nelson and Coxeter-James Prizes will be presented at the CMS Summer 2006 Meeting in Calgary, Alberta, June 3 to 5.
Les prix Krieger-Nelson et Coxeter-James 2006 seront présentés à la Réunion d'été 2006 de la SMC à Calgary (Alberta) du 3 au 5 juin.

# MESSAGE DU VICE-PRÉSIDENT - RÉGION DE L'ATLANTIQUE

**par Jason I. Brown**
*Université Dalhousie*

La recherche mathématique aurait-elle enfin la cote? La question se pose…

Depuis quelque temps, les réalisateurs de films (et les grandes vedettes) ont l'air de s'intéresser à la vie des mathématiciens. Dans *Le Destin de Will Hunting*, Matt Damon tient le rôle d'un concierge qui savait résoudre des problèmes d'algèbre combinatoire. En plus, il sortait avec Minnie Driver dans ses temps libres. Ce film nous montre à quel point il est risqué de laisser des problèmes de recherche sur un tableau la nuit.

Dans *Un Homme d'exception*, Russell Crowe tient le rôle de John Nash, le célèbre théoricien des jeux. Hollywood a pris quelques libertés (John Nash a-t-il vraiment édifié la théorie des jeux en songeant à courtiser une femme dans un bar?), mais le résultat montre la recherche mathématique sous un jour attrayant et ludique.

Plus récemment, les oscars Anthony Hopkins et Gwenyth Paltrow partagent la vedette dans le film *Proof*, qui parle de mathématiques, de folie et de famille. (Avez-vous remarqué que les mathématiciens dans ces films se font tous suivre par un psy ou sont en décalage avec la réalité? Sommes-nous vraiment tous si près du gouffre? Des fois je me le demande.)

La télévision s'en mêle également. Dans la série *NUMB3RS*, les mathématiques servent à résoudre des crimes. Texas Instruments est associée au site Web de l'émission (**`http://www.cbs.com/primetime/numb3rs/ti/index.shtml`**). Le télédiffuseur décrit la série en ces termes : « Inspirée de cas réels, cette série montre que les mathématiques aident parfois les policiers à faire des découvertes inattendues et à expliquer l'inexplicable. » (J'aurais bien quelques notions de base à inculquer aux policiers sur l'art d'attraper les automobilistes pressés et le théorème de la valeur moyenne.) Le site propose aussi des activités pratiques et promet d'offrir bientôt un jeu-questionnaire interactif sur les mathématiques.

Lors d'une visite à l'Institut Fields, j'ai eu l'occasion de causer de recherche mathématique avec le dramaturge John Mighton, prix du gouverneur général. John, au cas où vous ne le sauriez pas, ne passe pas tout son temps à travailler sur des problèmes complexes. Il est aussi le fondateur de JUMP (Junior Undiscovered Math Prodigies), un organisme sans but lucratif qui offre des services de tutorat gratuits aux étudiants, même ceux qui ont des troubles d'apprentissage. JUMP reçoit les éloges bien mérités de la presse. John Mighton sait concilier les mathématiques et le théâtre!

Et je suis en train de lire quelques bouquins captivants. *Struck by Lightning*, de Jeffrey Rosenthal (professeur de statistique à l'Université de Toronto) est un texte d'intérêt général sur le calcul des probabilités. *A Mathematician reads the Newspaper*, de John Allen Paulos, aborde une foule de sujets (logique, calcul, statistique, etc.) dans un style simple et familier. Le lecteur est amené à voir le monde non pas avec des lunettes roses, mais avec les yeux d'un mathématicien. Du même auteur, mais plus récent, *A Mathematician Plays the Stock Market* montre que les mathématiciens ne sont pas des dieux et qu'ils peuvent se faire avoir comme tout le monde.

Enfin, je connais plusieurs non-mathématiciens qui se passionnent pour le Sudoku. Qui aurait cru qu'un jeu de chiffres connaîtrait un tel succès en ces temps où la technologie règne sur les loisirs?

J'en viens donc à trouver que les mathématiques et les mathématiciens ont la cote ces temps-ci. On ne nous imagine plus avec des lunettes en écaille des années 50, des pantalons qui nous remontent jusque sous les aisselles et un look de savant insoucieux de son image. On nous présente désormais en tenue sport et en veste de cuir et en élégante compagnie.

N'est-ce pas formidable? Il n'a jamais été facile de « vendre » les mathématiques comme choix de carrière aux étudiants, qui ne voient pas la discipline avec les mêmes yeux que nous. Je crois bien que personne d'entre nous n'a choisi les mathématiques pour faire de l'argent ou du charme (nos groupies sont probablement $o(1)$). Nous avons choisi les mathématiques parce que c'est cool, un point c'est tout.

Les mathématiques jouissent d'une conjoncture ascendante; à nous d'en profiter. Donnez des exposés grand public. Faites des liens entre les mathématiques et le monde qui nous entoure. Au trimestre dernier, il m'arrivait d'apporter ma guitare dans mon cours de calcul pour illustrer mes propos sur les mathématiques, la physique et le son. Mes étudiants ont adoré, et mes « prestations » leur ont fait voir un côté des mathématiques (et de moi) qu'ils n'auraient jamais vu autrement. J'ai constaté dans mes évaluations que cette partie du cours les avait marqués.

Si chacun et chacune d'entre nous se donnait la peine de présenter le côté « cool » des mathématiques à quelques étudiants, cela aiderait grandement notre cause. Que ces étudiants se tournent ou non vers les mathématiques après, ils conserveront, je crois, une belle image de notre discipline et auront eu l'occasion de connaître l'enchantement de la découverte. N'est-ce pas cool, ça?

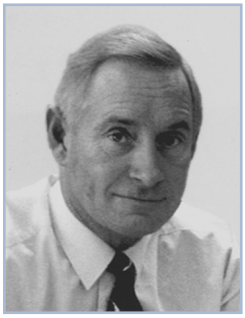
**SOLUTION FOR SAMPLE EXCERCISE (PAGE 10)**

$x \equiv 1982 \equiv 2 (\text{mod } 6)$; $x \equiv 1978 \equiv 4 (\text{mod } 7)$; $x \equiv 32 \ (\text{mod } 42)$.

Therefore $x = 2006$.

*The 2005 reports from the standing committee chairs are in the language provided by the chair. The President's and Advancement of Mathematics Committee as well as the Education, Publications, Research, Student and Women in Mathematics committee reports will appear in the May issue of the CMS Notes.*

*Les rapports sont livrés dans la langue de rédaction d'origine. Les rapports du président, du comité pour l'avancement des mathématiques ainsi que les rapports des comités d'éducation, publications, recherches, étudiants et femmes en mathématiques paraîtront dans le numéro de mai des Notes de la SMC.*



## EXECUTIVE DIRECTOR'S ANNUAL REPORT

### General:

As the activities of the Society continue to expand, effective administration by the staff in Ottawa is particularly important. I would like to thank and acknowledge all of the staff for their help and support in making 2005 a successful and productive year.

In late 2004, the Society entered into an agreement with the Statistical Society of Canada (SSC) to provide membership and related services for the SSC. Although the transition was more complicated than had been anticipated, the Executive Office staff handled the situation very well. With the transitional period over and with a year of experience of handling the required duties, the work-load is now more controlled and systematic. The current arrangements will be reviewed in 2006 prior to a new agreement being negotiated in 2007.

I am happy to report that the campaign to attract new members has been relatively successful. Most new memberships have arisen from the 2 for 1 special offer for those who have never been CMS members. In December 2005, the Board passed a motion that, effective 2006, members who are students or pre-university teachers will receive a subscription to CRUX with MAHYEM as a benefit of membership. This benefit should be very attractive to teachers and students and should help to increase these members.

At the December meeting, the Board of Directors accepted the Report of the Ad-hoc Committee on the CMS Deficit Situation. Some of the recommendations contained in the report for reducing expenditures and for increasing revenues have been implemented already. A proposal for a new pricing model for CMS periodicals is still being investigated and a final recommendation will be submitted to the Board of Directors in June 2006.

The 2005 election of officers and directors went smoothly and I would like to thank the members of the Nominating Committee for their efforts in securing excellent candidates to serve on the Executive Committee and the Board of Directors. As of June 30, 2005, a number of officers and directors ended their term. I wish to acknowledge the valuable leadership and support of Christiane Rousseau during her four-year term on the Executive Committee (President-elect (2001-2002), President (2002-2004) and Past President (2004-2005)). I also wish to thank Jon Thompson (New Brunswick – Fredericton), Steven Boyer (UQAM), Kathryn Hare (Waterloo), and Samuel Shen (Alberta) for their important contributions as members of the Executive Committee from 2003 to 2005. The CMS extends its thanks and gratitude to those directors who ended their four-year terms in June 2005.

### Fund Raising:

One of the most important matters, approved by the Board of Directors in June 2005, was the decision for the Society to develop a professional fund raising section and to establish an agreement with Queen's Advancement External Services to assist in this endeavour.

The position of a full-time Development Coordinator has been established and it is hoped to fill the position in early 2006. Initially it will be a two-year contract position. Further details of the Society's fund raising plans are contained in the President's Report.

The future will see a greater emphasis on fund raising so that the Society can maintain and, where possible, expand the many programs that assist the development of mathematics in Canada.

### Publications and Electronic Services:

In 2005, as has been the case for many years previously, all of the Society's periodicals appeared on-time or well ahead of schedule. This could not be accomplished without the significant efforts of all of the editors-in-chief, the members of the various editorial boards, and particularly the staff of the CMS Publications Office in Winnipeg under the direction of Craig Platt (Manitoba).

Although the production of CMS periodicals has been impressive, more efforts are needed to maintain and increase periodical subscriptions. An analysis of existing subscribers has been performed and a focuses for 2006 will be contacting mathematics departments, agents, and librarians to increase subscriptions to the Canadian Journal of Mathematics, the Canadian Mathematical Bulletin and CRUX with MAYHEM, particularly to encourage combined subscriptions.

Several years ago, the CMS entered into a co-publishing agreement with the American Mathematical Society for the CMS Tracts in Mathematics Series. Since no books were ever published in this series, regretfully, the Publications Committee recommended and the Board of Directors agreed that the series be terminated. The CMS and AMS were disappointed that nothing had come of the series and the AMS agreed to terminate the agreement as of March 2005.

The CMS Book Series with Springer is very successful. By the end of 2005, a total of 24 books have been released with several volumes having sales of over 1000 copies to-date. Four new books appeared in 2005 and 12 books are under contract or in production. Jonathan Borwein (Dalhousie) has been one of the Editors-in-Chief since the CMS Book Series was started and, effective December 31, 2005; he stepped down as an Editor-in-Chief and Keith Taylor (Dalhousie) was appointed to replace him. The considerable success of the CMS Book Series is due to the significant efforts of Jonathan Borwein.

The fifth volume in the ATOM (A Taste of Mathematics) Series, *Combinatorial Explorations*, was published in 2005. The sixth volume, *Problems for Mathematics Leagues – II*, should be published in early 2006 with four more volumes appearing before the end of 2006.

One of the recommendations of the Ad-hoc Committee on the CMS Deficit was to increase publication revenues. I am pleased to report that a number of new publishing initiatives have been instituted.

A new agreement has been signed with A.K. Peters for a new series, the CMS Treatises in Mathematics. The CMS will act at the publisher and be responsible for the production of each volume in the series with A.K. Peters responsible for marketing and promotion. As publisher, the CMS will be signing contracts with prospective authors and for making corresponding royalty payments. The Board of Directors has approved a preliminary version of the agreement between the CMS and authors. The CMS is very pleased that the first Editorial Board for the CMS Treatises in Mathematics consists of James Arthur (Toronto), Ivar Ekeland (UBC), Arvind Gupta (Simon Fraser), Barbara Keyfitz (Fields/Houston), and François Lalonde (Montréal).

The CMS is also entering into a co-publishing agreement with the Mathematical Association of America for a series of books in problem solving. It is expected that the final agreement will be approved by the Board in June 2006. The initial books in this series will feature the wealth of problems posed by Murray Klamkin and some of will feature a collection of some of the ATOM books.

In cooperation with Jonathan Borwein, the CMS Associate Publisher, new publishing initiatives have been instituted which should help bring increased publishing revenues in the future.

With the assistance of Nathalie Blanchard, Alan Kelm and David Rodgers, Chair of the Electronic Services Committee, work has begun on improving and updating the CMS web site. The proposed changes have been enthusiastically received and it is hoped that, to some extent, the new site and some new pages will be released in June 2006.

### Meetings:

The 2005 Canadian School Mathematics Forum, hosted by the Fields Institute, took place from at the University of Toronto from May 6 – 8. There were 183 participants from all sectors connected to education in mathematics and from all the provinces and territories of Canada.

The CMS/CSHPM Summer 2005 Meeting (June 4-6), hosted by the University of Waterloo, featured 23 special sessions and 10 plenary and prize lectures. This was one of the largest meetings in Society history with 541 participants.

The CMS Winter 2005 Meeting (December 10-12), hosted by the University of Victoria, involved 15 special sessions and 8 plenary and prize lectures. This meeting was very successful with 395 participants.

Although the CMS Executive Office is providing a greater level of assistance for our meetings, all of our meetings depend on the support of the host university, the research institutes, and the crucial work done by the meeting directors, the chairs of the local arrangement committees and the many special session organizers. The CMS is very grateful to all those who helped make our 2005 meetings extremely successful.

### Thanks:

The Society's continued success would not be possible with the help and support of the members, particularly those who volunteer on CMS committees and editorial boards. With the support of all of those involved with our many activities, I am sure that 2006 will be another successful year.

## RAPPORT ANNUEL 2005 DU DIRECTEUR ADMINISTRATIF

### Généralités

Plus la Société intensifie ses activités, plus il est important qu'elle puisse compter sur un personnel efficace à son bureau d'Ottawa. J'aimerais remercier tous les membres du personnel du bureau administratif, dont la liste figure à la page YYY, d'avoir contribué à faire de 2005 une année productive et couronnée de succès.

À la fin de 2004, la Société a conclu une entente avec la Société statistique du Canada (SSC) en ce qui concerne les services d'adhésion et autres. Même si la transition a été plus complexe que prévu, le personnel du bureau administratif a très bien su gérer la situation. Maintenant la période de transition terminée et après une année d'expérience, la charge de travail est mieux

structurée et plus facile à gérer. L'entente actuelle sera revue en 2006 avant le renouvellement qui sera négocié en 2007.

À ma grande joie, notre campagne de recrutement produit de bons résultats. La plupart de nos nouvelles adhésions découlent de notre offre « 2 pour 1 » aux personnes qui n'ont jamais été membres de la SMC. En décembre 2005, le conseil d'administration (CA) a résolu qu'à compter de 2006, tous les membres étudiants ou enseignants au niveau préuniversitaire recevront un abonnement au *CRUX with MAHYEM* avec leur adhésion. Cet avantage devrait être particulièrement séduisant pour les enseignants et les étudiants, et devrait contribuer à gonfler le nombre de membres de cette catégorie.

À sa réunion de décembre, le CA a accepté le rapport du comité spécial chargé d'étudier le problème du déficit budgétaire. Les auteurs de ce rapport ont notamment recommandé une réduction des dépenses et une augmentation des revenus, recommandations qui ont déjà été adoptées. Une nouvelle grille de tarification des périodiques de la SMC est également à l'étude, et une recommandation finale à cet effet sera soumise au CA en juin 2006.

En 2005, l'élection des membres du CA et de l'exécutif s'est très bien déroulée. J'aimerais remercier les membres du comité des mises en candidature d'avoir recruté d'excellents candidats pour siéger au comité exécutif et au CA. Plusieurs membres de ces deux entités ont achevé un mandat au 30 juin 2004. J'aimerais remercier en particulier Christiane Rousseau de son leadership et de son appui exceptionnel au cours de ses quatre années au comité exécutif (présidente élue — 2001-2002, présidente — 2002-2004 et présidente sortante — 2004-2005). Merci aussi à Jon Thompson (Nouveau-Brunswick — Fredericton), Steven Boyer (UQAM), Kathryn Hare (Waterloo) et Samuel Shen (Alberta) de leur grande contribution en tant que membres du comité exécutif de 2003 à 2005. La SMC remercie aussi chaleureusement tous ses administrateurs qui ont terminé un mandat de quatre ans en juin 2005.

## Campagne de financement

L'une des décisions les plus importantes prises par le CA en juin 2005 aura été d'embaucher un professionnel du financement, qui recevra l'appui du service d'avancement externe de l'Université Queen's, grâce à une entente conclue avec la SMC.

La SMC a créé le poste de coordonnateur ou coordonnatrice du développement (poste à plein temps), qu'elle espère pourvoir au début de 2006. Pour commencer, le poste sera un contrat de deux ans. Le rapport du président contient de plus amples renseignements sur les projets de financement de la Société.

Au cours des années à venir, la Société consacrera plus d'énergie à son financement afin de pouvoir maintenir ses nombreuses activités et, dans la mesure du possible, enrichir les nombreux programmes qui contribuent à l'essor des mathématiques au Canada.

## Publications et services électroniques

En 2005, comme depuis plusieurs années, tous les périodiques de la Société ont paru à la date prévue ou même bien avant. Une telle promptitude n'aurait pas été possible sans le travail considérable de tous les rédacteurs en chef, des membres des comités de rédaction et, en particulier, du personnel du bureau des publications de la SMC à Winnipeg, sous la direction de Craig Platt (Manitoba).

Bien qu'impressionnante, la production des périodiques de la SMC nécessite de plus amples efforts si nous souhaitons maintenir, voire augmenter le nombre d'abonnements. Après une analyse des abonnés actuels, la SMC communiquera, en 2006, avec les départements de mathématiques, les agents et les bibliothécaires de manière à accroître le nombre d'abonnements au *Journal canadien de mathématiques*, au *Bulletin canadien de mathématiques* et au *CRUX with MAYHEM*, notamment pour encourager les abonnements combinés.

Il y a plusieurs années, la SMC a conclu une entente de publication en partenariat avec l'American Mathematical Society concernant la collection des « Traités de mathématiques de la SMC ». Comme aucun ouvrage n'a été publié dans cette collection, le comité des publications a recommandé, avec regret, l'abolition de cette collection, recommandation qui a été acceptée par le CA. La SMC et l'AMS sont déçus que cette collection n'ait rien produit, et l'AMS a accepté de résilier l'entente en mars 2005.

Par contre, la collection « Ouvrages de mathématiques de la SMC », en collaboration avec Springer, connaît un franc succès. À la fin de 2005, elle comptait 24 ouvrages publiés, dont plusieurs titres vendus à plus de 1000 exemplaires. Quatre nouveaux ouvrages ont paru en 2005, et 12 font l'objet d'un contrat ou sont en cours de production. Jonathan Borwein (Dalhousie), l'un des rédacteurs en chef depuis la création de la collection, a terminé son mandat le 31 décembre 2005 et a été remplacé par Keith Taylor (Dalhousie) à ce poste. Pour le vif succès des « Ouvrages de mathématiques de la SMC », nous sommes largement redevables au travail assidu de Jonathan Borwein.

Le cinquième volume de la collection ATOM (Aime-t-on les mathématiques), intitulé *Combinatorial Explorations*, a aussi paru en 2005. Le sixième volume, *Problems for Mathematics Leagues -- II*, devrait pour sa part paraître au début 2006, et quatre autres titres sont prévus avant la fin de 2006.

L'une des recommandations du comité spécial chargé de la question du déficit était d'accroître les revenus tirés des publications. Or, je suis heureux d'annoncer qu'un certain nombre d'initiatives ont été adoptées à cet effet.

La SMC a signé une nouvelle entente avec A.K. Peters au sujet d'une nouvelle collection, les « Traités mathématiques de la SMC ». La SMC sera l'éditeur de la collection et se chargera de la production de chaque volume, et A.K. Peters s'occupera du marketing et de la promotion. En tant qu'éditeur, la SMC signera des contrats avec des auteurs potentiels et versera les redevances exigées. Le CA a approuvé une version préliminaire de l'entente

entre la SMC et les auteurs. La SMC est ravie de la composition du premier comité de rédaction de cette nouvelle collection : James Arthur (Toronto), Ivar Ekeland (UBC), Arvind Gupta (Simon Fraser), Barbara Keyfitz (Fields/Houston) et François Lalonde (Montréal).

La SMC a également signé une entente de publication en partenariat avec la Mathematical Association of America pour une collection d'ouvrages sur la résolution de problèmes. On s'attend à ce que le CA approuve l'entente finale en juin 2006. Les premiers livres de cette collection porteront sur le grand nombre de problèmes posés par Murray Klamkin, et certains présenteront un regroupement de quelques-uns des ouvrages de la collection ATOM.

En collaboration avec Jonathan Borwein, éditeur associé de la SMC, de nouvelles initiatives de publication ont vu le jour; celles-ci devraient favoriser la croissance des revenus de publication au cours des prochaines années.

Grâce au travail de Nathalie Blanchard, Alan Kelm et David Rodgers (président du comité des services électroniques), l'amélioration et la mise à jour du site Web de la SMC vont bon train. Les changements proposés ont été reçus avec enthousiasme, et le nouveau site devrait être public en juin 2006.

### Réunions

Le Forum canadien sur l'enseignement des mathématiques 2005, tenu à l'Institut Fields, a eu lieu à l'Université de Toronto du 6 au 8 mai. Ce Forum a réuni 183 participants de tous les secteurs liés à l'enseignement des mathématiques et de toutes les provinces et territoires du Canada.

La Réunion d'été SMC/SCHPM 2005 (4-6 juin), tenue à l'Université de Waterloo, présentait 23 sessions spéciales et 10 conférences principales ou de lauréats. Attirant quelque 541 participants, ce congrès aura été l'un des plus courus de l'histoire de la Société.

La Réunion d'hiver 2005 de la SMC (10-12 décembre), tenue à l'Université de Victoria, a accueilli 15 sessions spéciales et 8 conférences principales ou de lauréats. Ce congrès des plus réussis a attiré 395 participants.

Même si le bureau administratif de la SMC a accentué son aide à l'organisation des Réunions, toutes dépendent du soutien de l'établissement hôte, des instituts de recherche, du travail essentiel des directeurs de la Réunion, des présidents du comité de logistique et des nombreux organisateurs de sessions. La SMC doit une fière chandelle à toutes les personnes qui ont contribué à l'immense succès de ses Réunions en 2005.

### Remerciements

Le succès continu de la Société ne serait pas possible sans l'appui de ses membres, en particulier de ceux et celles qui siègent aux divers comités de la SMC et aux comités de rédaction. Compte tenu de l'extraordinaire participation de toutes ces personnes à l'organisation de nos nombreuses activités, je suis certain que 2006 sera une autre année fructueuse.

## ELECTRONIC SERVICES COMMITTEE

*David L. Rodgers (Michigan), Chair*

The Committee thanked Eric Woolgar (Alberta) and Jacques Carette (McMaster) for their service and welcomed Jason Brown (Dalhousie) and David Pike (Memorial). Jacques Carette subsequently accepted a two-year appointment to the Committee as a Consultant with industrial experience.

The Electronic Services Committee (ESC) provides policy oversight for services provided by the Web Services Office (Ottawa) and Publications Office (Manitoba):

### Web Services Office

Operations are guided by a resource allocation scheme for prioritizing and tracking work requests that is working well. Overall statistics for 2005 indicate that allocation targets have been essentially met and the on-going review/tracking process has been successful. A better mechanism for tracking and dealing with small tasks has been implemented. Backlog has been reduced.

Written agreement with Google to crawl the CMS website under terms and conditions that protect CMS interests was reached.

A Grad/Undergrad e-mail list has been developed working with the Student Committee.

Office services requested by the Statistical Society of Canada under an existing contractual arrangement have been integrated into the CMS workflow and go smoothly.

A careful, preliminary investigation and analysis of integrated accounting systems that can better and more reliably support Executive Office requirements has been conducted.

### Publications Office

Production of CMS publications are being produced on time with few problems.

Various approaches to digitizing the backfile (approximately 75,000 pages) for CMS journals were discussed with expectation that some real progress can be made by the Summer 2006 (Calgary) Meeting.

Both Offices are involved in a re-design effort for the CMS website that will produce visible results for the Summer 2006 (Calgary) Meeting. An overall design has been endorsed. A prototype for dynamic generation of CMB and CJM web pages was demonstrated to the Committee at the Winter 2005 (Victoria) Meeting. Overall agreement was reached on a model for providing e-commerce services.

### In addition

Data projectors for use at CMS meetings were evaluated and 2 have been purchased for further evaluation.

Automated e-mails to 515 members produced over 200 membership renewals for 2006.

A careful, preliminary investigation and analysis of integrated accounting systems that can better and more reliably support Executive Office requirements has been conducted.

A new KaBoL linkmaster was identified.

The Committee joined Graham Wright in complimenting the work of both the Ottawa and Winnipeg offices, with special mention of their ability and willingness to juggle multiple tasks.

## ENDOWMENT GRANTS COMMITTEE

*Karl Dilcher (Dalhousie), Chair*

The main task of the Endowment Grants Committee is to adjudicate proposals for projects that are requesting financial support from the CMS Endowment Grants Competition. Projects which are funded must contribute to the goals of the CMS and to the broader good of the mathematical community.

The committee was allocated $10,000 for the 2005 competition. Nine applications were received. Four of these were funded and the total allocated amount was awarded. All applicants have been notified by the CMS Executive Office in Ottawa.

The successful applications were as follows:

- A high-school mathematics contest in Thunder Bay; the Endowment Grant will allow for an expansion to additional schools in Northwestern Ontario.
- Financing a regular mathematics column in the French-language science magazine “Découvrir”.
- Contributing to the costs of a championship of mathematical games which will bring over 100 high school students to the Laval University campus.
- Following an international meeting of francophone mathematicians, a one-day meeting will bring together university mathematicians and mathematics teachers at all levels; an endowment grant will provide partial funding.

Endowment Grants of up to three years duration can be awarded, and several of the applications were for two- or three-year grants. However, given the limited funds available for this competition, only one-year grants were awarded this time. More details on the successful applications can be found on the CMS website: **www.cms.math.ca/Grants/EGC/** Reports on projects funded in the past can also be found at this site.

Although the stock market had somewhat recovered, the overall financial situation of the CMS required a reduced competition for 2005. The CMS Executive decided at its meeting in October, 2005, that a somewhat increased minimum amount of $15,000 be allocated from the Endowment Fund for the 2006 Endowment Grants Competition.

## FINANCE COMMITTEE

*Akbar Rhemtulla (Alberta), Chair*

The Finance Committee advises the Board of Directors of CMS on general financial policies and oversees, in accordance with the policies determined by the Board, the financial activities of the Society including the annual budget, the Restricted Investment Fund, the Endowment Fund, the Mathematical Olympiad Fund and Designated Activities Fund. The Committee includes among its members the Treasurer, the Executive Director, the President and the Past President or the President Elect of CMS. The committee meets twice a year, in April and October, to discuss the budget and make recommendations on financial matters.

As of November 2004, the total amount in the various funds was approximately $1,618,000 Canadian. These are invested in various indexed funds managed by Toronto Dominion Quantitative Capital. The mix of the fund weightings is re-considered from time to time. The present allocations are approximately 50% in global equity funds, 10% in Canadian Equity funds and 40% in Canadian Bonds, a quarter of which is in real return bonds.

The Society is in the process of establishing a true Endowment Fund using a portion of the money presently in the Restricted Investment Fund. The Society is presently on a significant drive to raise money for the Endowment Fund.

Due to several reasons including the fall in revenues from the journal subscription numbers and low interest rate there is less money available for some of the activities funded by proceeds of the Restricted Investment Fund. In particular the amount allocated for the Endowment Grants Competition has been kept at a reduced level for the second year, and we had an operating deficit.

## INTERNATIONAL AFFAIRS COMMITTEE

*Richard Kane (University of Western Ontario), Chair*

The IAC is the liaison committee which serves as the voice of Canadian mathematics within the International Mathematical Union (IMU). It is officially a committee of the National Research Council (NRC). The NRC provides most of the funding used to support the participation of Canadian mathematics within the IMU. All of the following items were arranged during 2005.

1. The agreement between the CMS and the NRC with respect to the IAC was renewed for a five year period effective until 2010. NRC will continue to pay the annual Canadian membership fee to the IMU.

2. The IAC has arranged for NRC to submit the nomination of Nassif Ghoussoub for membership on the IMU Executive Committee. The decision about the makeup of the IMU Executive Committee will be made at the IMU General Assembly which

will take place in Santiago de Compostela, Spain just preceding the International Congress of Mathematicians to be held in Madrid in August 2006.

3. The Canadian delegation to the IMU General Assembly has also been arranged. The delegation will consist of: Jon Borwein (Dalhousie), Donald Dawson (Carleton/McGill), Nassif Ghoussoub (UBC), Richard Kane (Western Ontario), and Christiane Rousseau (Montreal), Jacques Hurtubise (McGill) will serve as the alternative delegate.

## MATHEMATICAL COMPETITIONS COMMITTEE

*George Bluman (UBC), Chair*

### Introduction

The Mathematical Competitions Committee (MCC) 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 the MCC include the Mathematical Olympiad Correspondence Programme (Olymon) and the Esso-CMS National Math Camp.

Most of the work of the MCC is done by its four subcommittees (COMC Committee, CMO Committee, IMO Committee, and Correspondence Coordinator). 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/** and at **www.cms.math.ca/MediaReleases/**.

### The Canadian Mathematical Olympiad:

The 37th Canadian Mathematical Olympiad (CMO) was written on March 30th, 2005. A total of 75 competitors from 49 schools were invited to write the 2005 CMO.

The top winners in the 37th Canadian Mathematical Olympiad were:

FIRST PRIZE and the Sun Life Financial Cup: Peng Shi, Sir John A. MacDonald C.I., Scarborough, ON. SECOND PRIZE: Richard Peng, Vaughan Road Academy, Toronto, ON. THIRD PRIZE: Yufei Zhao, Don Mills C.I., Don Mills, ON. HONORABLE MENTION: Boris Braverman, Sir Winston Churchill H.S., Calgary, AB; Elyot Grant, Cameron Heights C.I., Kitchener, ON; Zheng Guo, Western Canada H.S., Calgary, AB; Oleg Ivrii, Don Mills C.I., Don Mills, ON; Lin Fei, Don Mills C.I., Don Mills, ON; David Rhee, McNally H.S., Edmonton, Alberta; Shaun White, Vincent Massey S.S., Windsor, ON. A detailed report on the 2005 CMO, including the contest paper, solutions to the problems, and graders' reports is available at: **www.cms.math.ca/Competitions/CMO**

### The Asian Pacific Mathematics Olympiad:

The 17th Asian Pacific Mathematics Olympiad (APMO) was written on March 14th, 2005. A total of 41 Canadian students wrote the exam. The award winners were: Peng Shi (Gold); Richard Peng and Elyot Grant (Silver); Kent Huynh, Boris Braverman, Oleg Ivrii, and David Rhee (Bronze); Yufei Zhao, Francis Chung, and William Fu (Honourable Mention). We are grateful to Bill Sands, Naoki Sato and Daryl Tingley for their proposed problems for APMO 2005. Further details regarding the 2005 APMO are available at **www.cms.math.ca/Competitions/APMO/.**

### The International Mathematical Olympiad:

The 46th International Mathematical Olympiad (IMO) took place in Mérida, Mexico from July 8-19, 2005. Competing against students from 90 other countries, the young Canadian Team of six students (five have at least one more year of eligibility) did very well, winning one Gold Medal, two Silver Medals, and two Bronze Medals. The six students who competed for Canada were: Lin Fei, Don Mills C.I., Toronto, ON; Elyot Grant, Cameron Heights C.I., Kitchener, ON; Richard Peng, Vaughan Road Academy, Toronto, ON; David Rhee, McNally H.S., Edmonton, AB; Peng Shi, Sir John A. MacDonald C.I., Scarborough, ON; Yufei Zhao, Don Mills C.I., Toronto, ON.

The team was accompanied by the Team Leader, Dr. Felix Recio (University of Toronto), the Deputy Team Leader, Dr. Dorette Pronk (Dalhousie University), and the Deputy Leader Observer, Mr. Adrian Tang (University of Calgary).

We are grateful to Daniel Brown, Naoki Sato, and Jacob Tsimerman for their proposed problems for IMO 2005.

For more information regarding the 2005 IMO, see the very interesting articles (including the effects of Hurricane Emily) in the December 2005 issue of CMS Notes and **www.cms.math.ca/MediaReleases/2005/imores.html**. Further details about the IMO are available at: **www.cms.math.ca/Competitions/IMO/**.

### IMO Training Seminars:

Two training camps are held each year to prepare students for the annual IMO. The Winter Training Seminar (held at York University, January 4-9, 2005) 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 Summer IMO Training Seminar (held at BIRS and at the University of Calgary, June 25-July 10, 2005) is used for intensive training of the actual IMO team. We are very grateful to PIMS for giving us almost two weeks at BIRS at no charge to CMS (hopefully this will continue in future years!)

### Mathematical Olympiads Correspondence Programme:

This programme (Olymon) is intended for Canadian (or permanent resident) high school students with exceptional mathematical ability who are interested in mathematical problem solving at a high level or have ambitions to compete in Mathematical Olympiads. This year there were ten problem sets: eight were constructed and

marked by Edward Barbeau (University of Toronto), one by Valeria Pandelieva of Ottawa, and one by Lily Yen of Burnaby, BC. The number of respondents for each set was normally in the 10-15 range. All the Olymon problems with their solutions are posted at **www.cms.math.ca/Competions/MOCP/** and also on the website of Ed Barbeau (**www.math.utoronto.ca/barbeau**). It is hoped to increase the participation rate and also recruit someone to supervise a French version of the correspondence programme. Dr. Edward Barbeau has been the Coordinator of the MOCP for many years.

### National and Regional Math Camps

The National Math Camp is designed primarily for younger Canadian students with at least two years remaining in high school and with the potential to compete at the Mathematical Olympiad level. Participation in the camp is by invitation only. It is intended for students in Grades 8-10. The camp was held at John Abbott College in Montreal, July 3-9, 2005 and hosted 17 students: nine from Ontario, five from BC, two from Saskatchewan, and one from Alberta. Five students from Quebec were invited but none attended! Normally, the initial selection is made from the results in the Canadian Open Mathematics Challenge and the remaining students are selected based on their results in the Grade 10 Galois Contest, organized by the University of Waterloo's Centre for Education in Mathematics and Computing (CEMC). Other contest information and recommendations from Regional Math Camp directors are also considered. The 2005 National Math Camp was organized and run by Daniel Gatien (John Abbott College) and Matthieu Dufour (Université du Québec à Montreal) with sessions led by Richard Hoshino, Keigo Kawaji and Anne Fearnley. Overall, the students rated the 2005 camp very favourably and they preferred the geometry sessions well above all others. Further details can be obtained at: **www.cms.math.ca/MathCamps/**.

### The Canadian Open Mathematics Challenge

November 2005 marked the tenth writing of the COMC. It is a collaborative activity between the CMS and CEMC. This Contest has several purposes. First and foremost, it aims to encourage students in their exploration of mathematics and problem solving. Second, the COMC provides an enrichment activity for teachers to use with their students during the Fall term. And third, the COMC is used by the CMS to identify students who will write the Canadian Mathematical Olympiad and who will attend, among other events, the Winter Training Seminar and the National Math Camp.

The 2005 edition of the COMC had a record number of over 6300 participants. The paper had an average mark of 41/80 thus giving some chance of success to every student who wrote the paper, while continuing to provide a challenge for the very best problem solvers in the country. The top five winners were: Farzin Barekat, Sutherland S.S., North Vancouver, BC; Boris Braverman, Sir Winston Churchill H.S., Calgary, AB; David Rhee, McNally H.S., Edmonton, AB; Peng Shi, Sir John A. MacDonald C.I., Scarborough, ON; Allen Zhang, St. George's School, Vancouver, BC. Thanks go to the hard-working Problems Committee who annually ensure that the paper meets its varying goals. Further details are available at: **www.cms.math.ca/Competitions/COMC/** or **www.cemc.uwaterloo.ca/english/contests/open.shtml**.

It is apparent that the Mathematical Competitions Committee (particularly its subcommittees) is very active. I would like to thank all members for their enthusiasm and hard work in making everything run so smoothly. No small measure of thanks is due to the staff at the CMS Executive Office and, in particular to the Executive Director Graham Wright, for their dedication.

## NOMINATING COMMITTEE

*Line Baribeau (Laval), Chair*

The first task of the year for the Nominating committee was to find candidates to the Board of Directors for the elections that were held in the Spring.Then the committee had to find members to fill vacancies in the Advancement of Mathematics, Education, Endowment Grants, Electronic Services, Finance, International Affairs, Publications, Research, and Women in Maths Committees. New chairs were also nominated for the Finance, International Affairs and Research Committees. As of December 2005, the position of Chair of the Women in Maths Committee was still vacant. In looking for committee members, the Nominating Committee tries to keep a regional and gender balance, as well as a good range of mathematical interests. In particular, it is great to recruit people from outside of academia, as we did this year for one committee position.

## COMITÉ DES MISES EN CANDIDATURE

*Line Baribeau (Laval), présidente*

Au début de l'année, le comité a eu la tâche de trouver les candidats au Conseil d'administration en vue des elections du printemps. Puis, il a fallu combler plusieurs postes dans les comités suivants: avancement des mathématiques, éducation, attribution des bourses du fonds de dotation, services électroniques, finances, affaires internationales, publications, recherche et femmes en mathématiques. Nous avons également trouvé de nouveaux présidents pour les comités des affaires internationales, des finances et de la recherche. Au 31 décembre, le poste de président(e) du comité des femmes en mathématiques restait à combler. Rappelons que dans la constitution des comités, nous essayons de maintenir un équilibre géographique, une répartition homes/femmes équitable, ainsi qu'un bon éventail d'intérêts mathématiques. Nous sommes toujours heureux également de recruter en dehors du monde universitaire, comme fut le cas pour un des postes comblés cette année.

Crux Mathematicorum with Mathematical Mayhem

# ONLINE PUBLIC ACCESS TO MAYHEM PROBLEMS

# LES PROBLÈMES DU MAYHEM EN ACCÈS LIBRE SUR INTERNET

Le *Mathematical Mayhem* est une revue de résolution de problèmes lancée en 1988 par des élèves du secondaire. De format semblable à *Crux Mathematicorum*, la revue de renommée internationale de la SMC, le Mayhem a été conçu « par des étudiants, pour les étudiants ».

Dès ses débuts, la revue a été dirigée par quelques-uns des meilleurs étudiants en mathématiques de niveau secondaire et universitaire du pays. Les huit rédacteurs fondateurs et rédacteurs émérites ont représenté le Canada au moins une fois à l'OIM. À eux tous, ils ont remporté trois médailles d'or, sept d'argent, deux de bronze et une mention honorable. Ils ont également occupé à sept reprises le poste de chef d'équipe adjoint, et une fois celui de chef d'équipe. Le but du Mayhem était de susciter l'intérêt des étudiants les plus doués. Au fil des ans, les membres du comité de rédaction ont terminé leur secondaire, et bon nombre d'entre eux ont poursuivi des études de deuxième cycle, ce qui a eu pour effet de relever encore le niveau du contenu mathématique. Vers le milieu des années 1990, le nombre d'abonnés au Mayhem était en baisse, et la revue perdait l'un de ses principaux commanditaires. La fin semblait imminente.

Les rédacteurs de l'époque ont alors sollicité l'aide de la SMC. En 1997, le Mayhem a fusionné avec le Crux, ce qui a donné naissance à une nouvelle publication : *Crux Mathematicorum with Mathematical Mayhem* (*CRUX with MAYHEM* pour faire court). Malgré son statut de « revue dans une revue », le Mayhem n'a pas vraiment changé de contenu. Lorsque les rédacteurs actuels ont pris la relève, ils ont décidé, après consultation avec le rédacteur en chef du CRUX, le directeur administratif de la SMC et les anciens rédacteurs du Mayhem, de ramener la section du Mayhem à un niveau préuniversitaire et préolympiades, de sorte qu'il rejoigne un public plus vaste. Avec le temps, il pourrait aussi aider les étudiants les plus sérieux à faire la transition vers le reste du CRUX.

Au cours des cinq dernières années, l'équipe de rédaction du Mayhem a tranquillement reciblé son contenu vers son nouveau public. Avec ses chroniques régulières (le problème du mois et « Polya's Paragon ») et ses problèmes destinés à un bassin d'étudiants beaucoup plus vaste, le Mayhem est beaucoup mieux adapté à son public cible. Et maintenant que la SMC a décidé de promouvoir les mathématiques auprès d'une nouvelle génération de jeunes mathématiciens, la portion « Mayhem » du *CRUX with MAYHEM* sera offerte gratuitement sur Internet.

Si vous passez sur la page du *CRUX with MAYHEM* du site de la SMC (**www.journals.cms.math.ca/CRUX/**), vous verrez que tout le contenu du Mayhem des onze dernières années est « PUBLIC ». Je vous invite à passer sur le site et à le faire connaître à d'autres, en particulier aux étudiants, pour qu'ils puissent apprécier le Mayhem à sa juste valeur!

Mathematical Mayhem is a problem solving journal started in 1988 by a group of high school students. Similar in format to the CMS internationally recognised journal Crux Mathematicorum, Mayhem was created "for students, by students".

From the early days it was run by some of the top high school and university mathematics students in the country. The eight founding editors and editors emeriti all represented Canada at least once at the IMO and, between them, brought home 3 gold, 7 silver and 2 bronze medals as well as 1 honourable mention. They have also acted as deputy leader of the Canadian team 7 times and leader once. The mathematics was designed to challenge some of the best high school and undergraduate mathematics students. As the years went on and the editorial board left high school and later many entered graduate school, the level of the mathematics continued to rise. By the mid 1990's, the number of subscribers to Mayhem was down and they lost one of their vital sponsors. It looked like the journal would fold.

The editor at the time approached the CMS for help and then, in 1997, Mayhem joined Crux to become Crux Mathematicorum with Mathematical Mayhem (short-form CRUX with MAYHEM). Although Mayhem lived as a journal within a journal inside Crux, the content wasn't all that different. When the current editor took over, in consultation with the Editor-in-Chief of CRUX, the CMS Executive Director and past Mayhem staff, it was decided that the Mayhem section would focus on pre-university and pre-Olympiad material with the idea that Mayhem could reach out to a broader audience. In time it could also help more serious problemists "graduate" to the rest of the material in CRUX.

Over the last five years the Mayhem staff has slowly turned its focus towards its new audience. Now with regular features like "The Problem of the Month" and "Polya's Paragon" and problems aimed at a larger population of pre-university students, Mayhem is much better suited for its intended audience. Now, the CMS, has decided that to promote mathematics to a new generation of mathematicians, the Mathematical Mayhem section of CRUX with MAYHEM will be available free of charge on the internet.

If you proceed to the CMS website and go to the CRUX with MAYHEM page (**www.journals.cms.math.ca/CRUX/**) if you browse any issue of the journal for the last 11 years, you will find all of the Mayhem material is labelled PUBLIC. Please visit the site, show it to others, especially our students and let them enjoy a little Mathematical Mayhem!

**Shawn Godin**
*MAYHEM Editor*
*Rédacteur du MAYHEM*

# CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

## APRIL 2006 AVRIL

**3-7** Workshop on Number Theory and Polynomials, Heilbronn Institute for Mathematical Research (University of Bristol, UK) **www.maths.bris.ac.uk/heilbronn/heilbronn.html**

**6-12** Additive Combinatorics (CRM, Montreal, Quebec) **www.crm.montreal.ca/Number 2005/**

**14-20** 44th International Symposium on Functional Equations* (University of Louisville, Louisville, KY 40292) **romanger@us.edu.pl, thomas.riedel@louisville.edu, sahoo@louisville.edu**

## MAY 2006 MAI

**5-10** Combinatorial and Geometric Group Theory (Vanderbilt University, Nashville, TN) **www.math.vanderbilt.ed/~msapir/cggt/cggt.html**

**7-11** Category Theory and its Applications a conference in memory of Saunders Mac Lane In conjunction with the 2006 Unni Namboordiri Lectures and the Spring 2006 Midwest Topology Seminar (The University of Chicago, Chicago,IL) **www.math.uchicago.edu/~may/MACLANE/**

**10-12** Workshop on Numerical, Mathematical and Modeling Analysis related to Fluid Dynamics in Hydrogen Fuel Cells held at University of Ottawa, Supported by MITACS **www.fields.utoronto.ca/programs/scientific/05-06/fuelcells/**

**12-13** Ottawa-Carleton Discrete Mathematics Workshop (Carleton University, Ottawa, ON) **www.fields.utoronto.ca/programs/scientific/05-06/discrete_math/**

**13-18** Analytical Methods for Diophantine Equations (Banff International Research Station, Banff, AB) **paradis@crm.umontreal.ca**

**14-16** Workshop on Covering Arrays: Constructions, Applications and Generalizations (Carleton University) **www.fields.utoronto.ca/programs/scientific/05-06/covering_arrays/**

**15-17** Workshop on Probabilistic Symmetries and their Applications held at the(University of Ottawa)**www.mathstat.uottawa.ca/~givanoff/workshop.htm**

**15-20** Workshop on Random Walks in Random Environments(Fields Institute, Toronto, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

**17-21** ASL Annual Meeting (Montreal, Quebec) **asl@vassar.edu**

Coxeter Lecture Series: Yair Minsky (Yale) (Fields Institute, Toronto) **www.fields.utoronto.ca/programs/scientific/05-06/**
*date to be determined / date à déterminer*

**23-27** Hyperbolic Geometry (Fields Institute, Toronto) **www.fields.utoronto.ca/programs/scientific/05-06/**

## JUNE 2006 JUIN

**1** Actuarial Research Day (University of Western Ontario, London, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

**1-3** Carleton Applied Probability Workshop (Carleton University, Ottawa, ON) **www.fields.utoronto.ca/programs/scientific/05-06/applied_probability/**

**3-5** **CMS Summer 2006 Meeting / Réunion d'été 2006 de la SMC**
**Westin Hotel, Calgary AB** **www.cms.math.ca/events**
**meetings@cms.math.ca.**

**3-7** Rencontre annuelle 2006 du GCEDM/ CMESG 2006 Annual Meeting (University of Calgary, Calgary, AB)

## JUNE 2006 JUIN

**8-11** Digital Mathematical Performance Workshop (University of Western Ontario, London, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

**10-20** Mathematical Modeling of Infectious Diseases Summer School (York University, North York, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

**12-15** Journées Peter Shalen,a conference on 3-dimensional topology and its role in mathematics, on the occasion of Peter Shalen's sixtieth birthday (CRM in Montreal, Quebec) **www.crm.umontreal.ca/Shalenfest/index_e.html**

**15-20** The Joint CAIMS-MITACS 2006 Annual Meeting (York University, North York, ON)

**19-7 jul.** Computational Number Theory and Applications to Cryptography (University of Wyoming) **http://math.uwyo.edu/RMMC/2006/rmmc06.html**

**21-25** 9th PIMS Graduate Industrial Math Modelling Camp (GIMMC) (Simon Fraser University, Burnaby, BC) **www.pims.math.ca/gimmc**

**25-28** 2006 SIAM Conference on Discrete Mathematics (Victoria, B.C.) **www.siam.org/meetings/calendar.php**

**26-30** 10th PIMS Industrial Problem Solving Workshop (IPSW) (Simon Fraser University, Burnaby, BC) **www.pims.math.ca/ipsw**

**27-Jul 3** International Commission on Mathematical Instruction: Challenging Mathematics in and beyond the Classroom (Trondheim, Norway) **www.amt.canberra.edu/icmis16.html/, barbeau@math.utoronto.ca**

## JULY 2006 JUILLET

**3-14** Conference and mini-courses on Geometric Group Theory (CRM, Montreal, Québec) **www.crm.umontreal.ca/geometric06**

**6-18** **International Mathematical Olympiad / Olympiade International mathématique (Ljubljana, Slovenia)**
**www.cms.math.ca/Competitions www.smc.math.ca/Concours**

**10-14** SIAM Annual Meeting (Boston, MA) **www.siam.org/meetings/calendar.php**

**24-27** MOPTA 06 -- 6th Annual MOPTA Conference Modeling and Optimization: Theory and Applications (University of Waterloo, Waterloo, ON) **www.stats.uwaterloo.ca/stats_navigation/Mopta/index.shtml**

**24-Aug 4** Computational Commutative Algebra Workshop (Fields Institute, Toronto, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

## AUGUST 2006 AOÛT

**2-6** Eighth IMS North American New Researchers Conference (Minneapolis,Minnesota) **galin@stat.umn.edu**

**12-18** Third International Conference of Applied Mathematics (Plovdiv, Bulgaria) **http://math.uctm.edu/conference2006**

**12-20** Methods of Integrable Systems in Geometry: An LMS Durham Research Symposium, Satellite to ICM 2006 (University of Durham, UK) **www.icm2006.org**

**13-19** 10th Prague Topological Symposium, International Conference on General Topology and its Relations to Modern Analysis and Algebra (Prague, Czech Republic) **topology-news@atlas-conferences.com**

# CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

**AUGUST 2006 AOÛT**

**14-16** Canadian Computational Geometry Conference (CCCG)(Queen's University, Kingston, ON) `www.fields.utoronto.ca/programs/scientific/05-06/`

**16-19** Workshop on Geometric Methods in Group Theory (Carleton University, Ottawa, ON) `www.fields.utoronto.ca/programs/scientific/06-07/group_theory/`

**16-19** Trends and Challenges in Calculus of Variations and its Applications, Satellite to ICM 2006 (UCLM, Toledo, Spain) `www.icm2006.org`

**16-19** Algebraic Geometry, Satellite to ICM 2006 (Segovia, Spain) `www.icm2006.org`

**22-30** **International Congress of Mathematicians (Madrid, Spain)** `www.icm2006.org`

**31- Sept.5** Workshop on Geometric and Topological Combinatorics, a satellite conference of ICM 2006 (Universidad de Alcala (UAH), Alcala de Henares, Spain) `francisco.santos@unican.es`

**SEPTEMBER 2006 SEPTEMBER**

**14-17** Conference On Routing And Location 2006 (CORAL 2006), Satellite to ICM 2006 (Puerto de la Cruz, Tenerife) `www.icm2006.org`

**OCTOBER 2006 OCTOBRE**

**2-6** Quantum Cryptography And Computing Workshop (The Fields Institute, Toronto) `www.fields.utoronto.ca/programs/scientific/06-07/crypto/quantum`

**OCTOBER 2006 OCTOBRE**

**30-Nov.3** Computational challenges arising in algorithmic number theory and cryptography (the Fields Institute, Toronto) `www.fields.utoronto.ca/programs/scientific/06-07/crypto/number_theory/`

**NOVEMBER 2006 NOVEMBRE**

**27-Dec.1** Workshop on Cryptography: Underlying Mathematics, Provability and Foundations (the Fields Institute, Toronto) `www.fields.utoronto.ca/programs/scientific/06-07/crypto/crypto_foundations/`

**DECEMBER 2006 DÉCEMBRE**

**9-11** **CMS Winter 2006 Meeting / Réunion d'hiver 2006 de la SMC Toronto, ON** `www.cms.math.ca/events, meetings@cms.math.ca`

**JANUARY 2007 JANVIER**

**4-7** Joint Mathematics Meetings: AMS, MAA, AWM,etc. `www.ams.math.org`

**MAY 2007 MAY**

**20-24** The CAIMS Annual Meeting (Banff Conference Centre)

**JULY 2007 JUILLET**

**16-20** 6th International Congress on Industrial and Applied Mathematics (Zurich, Switzerland) `www.iciam07.ch`

## Tarifs et horaire 2006 Rates and deadlines

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

| Issue date / date de parution | Content deadline / Date limite pour contenu |
|---|---|
| February / février | December 1 / le 1 décembre |
| March / mars | January 14 / le 14 janvier |
| April / avril | February 15 / le 15 février |
| May / mai | March 15 / le 15 mars |
| September / septembre | July 15 / le 15 juillet |
| October / octobre | August 15 / le 15 août |
| November / novembre | September 15 / le 15 septembre |
| December / décembre | October 14 / le 14 octobre |

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

**Subscription to the *CMS Notes* is included with the CMS membership. For non-CMS members, the subscription rate is $60 (CDN) for subscribers with Canadian addresses and $60 (US) for subscribers with non-Canadian addresses.**

**L'adhesion à la SMC comprend l'abonnement aux Notes de la SMC. Le tarif d'abonnement pour les non-membres est de 60 $ (CDN) si l'adresse de l'abonné est au Canada et de 60 $ (US) si l'adresse est à l'étranger.**

# New and Noteworthy from Springer

## Mathematics and the Aesthetic

### New Approaches to an Ancient Affinity

**Nathalie Sinclair**, Michigan State University; **William Higginson**, Queen's University, Ontario, Canada; and **David Pimm**, University of Alberta, Edmonton, Canada (Editors)

The essays in this book focus on the affinity between the mathematical and the aesthetic at a much deeper level, beyond surface similarities to more fundamental connections. The way the aesthetic insinuates itself into mathematical thinking and contributes to the growth and value of mathematical knowledge are examined. The development of mathematical knowledge is reconsidered from both the empirical and theoretical perspectives.

2006, approx. 288 pp. (CMS Books in Mathematics) Hardcover
ISBN 0-387-30526-2 ► **approx. $59.95**

## The Square Root of 2

### A Dialogue Concerning a Number and a Sequence

**David Flannery**, Cork Institute of Technology, Cork, Ireland

Using no more than the most basic algebra and geometry, David Flannery manages to convey not only why irrational numbers are fascinating, but how the whole enterprise of mathematical thinking is imaginative, intriguing, and engaging. A startlingly original and informative dialog, this book is a one-of-a-kind introduction to the pleasure and playful beauty of mathematical thinking.

2006, 260 pp. 31 illus., Hardcover
ISBN 0-387-20220-X ► **$25.00**

## Heavy Tail Phenomena

### Probabilistic and Statistic Modeling

**Sidney I. Resnick**, Cornell University, New York

This comprehensive text blends mathematical, probabilistic and statistical tools used in heavy-tail analysis. In a clear and coherent exposition, balancing theory and actual data, the book examines the broad applicability of heavy tails to such fields as finance, data networks, insurance, and hydrology. Numerous examples and exercises, along with implementation of methodologies in Splus or R statistical languages will benefit researchers and students in applied mathematics, statistics, operations research, electrical engineering, and economics.

2006, approx. 433 pp. 46 illus., (Springer Series in Operations Research and Financial Engineering) Hardcover
ISBN 0-387-24272-4 ► **approx. $59.95**

## Computing the Continuous Discretely

### Integer-point Enumeration in Polyhedra

**Matthias Beck**, San Francisco State University, **Sinai Robins**, Temple University

Illuminating the field of discrete mathematics with examples, theory, and applications of the discrete volume of a polytope, the authors have weaved a unifying thread through basic yet deep ideas in discrete geometry, combinatorics, and number theory. There is no other book that encompasses all of these ideas. Includes 250 exercises and open problems.

2006, 250 pp. 40 illus., (Undergraduate Texts in Mathematics) Hardcover
ISBN 0-387-29139-3 ► **approx. $39.95**

## Introduction to Stochastic Integration

**Hui-Hsiung Kuo**, Louisiana State University

The theory of stochastic integration, also called the Ito calculus, has a large spectrum of applications in virtually every scientific area involving random functions. This introductory textbook on stochastic integration provides a concise introduction to the Ito calculus, and covers the constructions of Brownian motion, stochastic integrals for Brownian motion and martingales, the Ito formula, multiple Wiener-Ito integrals, stochastic differential equations, and applications to finance, filtering theory, and electric circuits.

2006, 279 pp. 2 illus., (Universitext) Softcover
ISBN 0-387-28720-5 ► **$49.95**

## Mathematical Masterpieces

### Further Chronicles by the Explorers

**Art Knoebel**, New Mexico State University; **Reinhard Laubenbacher**, Virginia Bioinformatics Institute; **Jerry Lodder**, New Mexico State University; and **David Pengelley**, New Mexico State University

By looking at original historical sources, the authors introduce advanced undergraduates to the excitement of mathematical discovery. Each chapter contains a different story anchored around a sequence of selected primary sources showcasing a masterpiece of mathematical achievement. There are numerous exercises and historical photographs.

2006, approx. 350 pp., (Undergraduate Texts in Mathematics) Hardcover
ISBN 0-387-33060-7 ► **approx. $79.95**



If undelivered, please return to:
si NON-LIVRÉ, prière de retourner à:
CMS Notes / Notes de la SMC
577 King Edward
Ottawa, Ontario, K1N 6N5, Canada