CMS NOTES de la SMC

IN THIS ISSUE
DANS CE NUMÉRO

MESSAGE FROM THE VICE-PRESIDENT - Ontario

Ram Murty
Queen's University

The next International Congress of Mathematicians will be held in Madrid, Spain from 22 to 30 August, 2006. There is a website which contains the latest information concerning the meeting. For certain categories of participants, some financial support to attend the congress is available and further details can be obtained at **www.colmatelat.ehu.es/FinSupProg.pdf.**

It seems that the AMS has applied to the National Science Foundation for funds to permit partial travel support for US mathematicians to attend the ICM. Application forms can be found at **http://www.ams.org/careers-edu/icmapp.html** and completed forms must be mailed to the AMS by October 31, 2005. I know of no Canadian sources of funds specifically devoted to travel to the ICM aside from the obvious source of NSERC Discovery grants.

There will also be several satellite conferences before or after the date of the congress and details of these events can be found at **www.icm2006.org/satelliteactivities/acceptedapplications.**

It is well-known that the Fields Medals and the Nevanlinna Prize are awarded at this event. In addition to this, ICM2006 will be inaugurating the Gauss Prize. According to the statutes of this prize, it will be awarded for "outstanding contributions that have found significant practical applications outside of mathematics, or achievements that made the application of mathematical methods to areas outside of mathematics possible in an innovative way, for example, via new modeling techniques or the design and implementation of algorithms."

It might be appropriate to highlight a few of the emerging themes in number theory that will receive some attention at the ICM. The selection below naturally has a personal bias.

First and foremost is the recent breakthrough by Goldston, Pintz and Yildirim concerning gaps between consecutive primes. If p_n denotes the n^{th} prime, they showed that

$$\Delta := \liminf_{n\to\infty} \frac{p_{n+1}-p_n}{\log p_n} = 0.$$

Notice that if there are infinitely many twin primes, (that is, primes p_n with $p_{n+1}-p_n = 2$) then this is trivially true. However, it is a famous unsolved problem that there are infinitely many twin primes. The above result on Δ is a significant step towards this conjecture and this is partly the reason that there is so much excitement associated with it. Previously, the best result was that $\Delta \leq 0.2486$ due to Helmut Maier in 1986. It is an easy consequence of the prime number theorem that $\Delta \leq 1$. In a recent paper by Goldston, Motohashi, Pintz and Yildirim, a viable approach is indicated of how to attack the classical twin prime problem. It is interesting that theoretically, this could have been done about thirty years ago, since all the tools used were available then.

In the wider landscape of science, one of the emerging motifs is a vast synthesis of mathematics and physics. It is well-known that disciplines such as differential geometry, ODE and PDE theory, group theory, representation theory, operator algebras, functional analysis, algebraic topology and even algebraic geometry (with the advent of string theory) have found relevant roles in physics of the 20th century. What is surprising is that number theory will be playing a fundamental role in the physics of the 21st century.

To make a long story short, one should perhaps begin with Feynman diagrams. These are essentially "directed graphs" without loops, with finitely many vertices and edges (as well as "half-edges"; that is, the edge is incident with only one vertex of the graph). These diagrams are

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EDITORIAL

by S. Swaminathan
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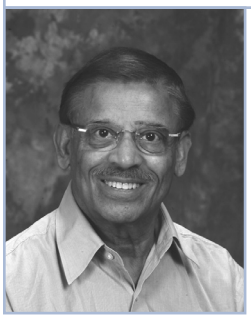

EXAMPLE IS BETTER THAN PRECEPT, *Proverb, early 15th century*

Mention a mathematical statement to a post-graduate student: if (s)he tries to prove it then you have a promising researcher who might produce a good doctoral thesis – on the other hand if (s)he tries to find a counterexample then you have a promising mathematician. This saying emphasizes the importance of examples.

Good and appropriate examples are the backbone of mathematical research. Either they clarify and justify definitions and theorems, or they lead to conjectures and new results.

A famous instance is the Horseshoe example of Stephen Smale that led to Chaos theory. Working on structural stability of dynamical systems in Rio de Janeiro, Smale received a letter from Norman Levinson that brought his attention to a counterexample to a conjecture of his in an earlier paper. He worked hard to resolve the challenge to his beliefs, translated Levinson's analytical arguments into geometrical ones and convinced himself that Levinson was right by constructing the Horseshoe. For the full story refer to "Finding a Horsheshoe on the Beaches of Rio", in *Mathematical Intelligencer*, vol 20, 1998.

Smale worked on problems raised by Hassler Whitney (1907-1989), who was a pioneer in combinatorial and differential topology. In particular Whitney asked if a sphere can be turned inside-out in four space never permitting tears or creases.

This is called an 'eversion' problem. Smale's solution was highly algebraic. A remarkable, step-by-step geometric eversion was found by a mathematician Bernard Morin, who was totally blind from birth and who could 'visualize' examples in four dimensions.

When Whitney was at the Institute for Advanced Study in Princeton, Keith Kendig (a review of whose book on conics will appear later in the *CMS NOTES*) happened to mention Bézout's theorem, which basically says that two curves of degrees m and n intersect in mn points. Replying that he had never heard of it, Whitney moved over to the blackboard saying that he would find a counterexample! After some attempts and some talk about complex line at infinity and counting multiple points of intersection, he asked, "What about two concentric circles?" He argued further with Kendig, found both double points and finally accepted that it is quite a theorem. Kendig learnt how one of the giants does it; he writes "he had taken the theorem to the mat, wrestled it, and the theorem won. I had known the result for at least two years, and I realized that in 15 or 20 minutes, he had gained a deeper appreciation of it than I'd ever had. In retrospect, it represented a turning point for me: I began to think examples, examples." Kending affectionately dedicated his book to Hassler Whitney.

Books such as Gelbaum and Olmsted's *Counterexamples in Analysis*, Steen and Seebach's *Counterexamples in Topology*, and Stoyanov's *Counterexamples in Probability* have a fascination for many students akin to that of "hard" science fiction. The reader – especially the one with a pencil and scratch pad who tests the apparently outrageous claims personally – experiences a sense of wonder akin to Keats' experience reading Homer,

"like some watcher of the skies
When some new planet swims into his ken".

(Or, more prosaically, with Dorothy: "Toto, I don't think we're in Kansas anymore.")

Editors of journals receive often papers that contain either abstract theorems with no illustrative example, or results which can be disproved by trivial examples.

Young researchers should be made aware that such papers are not acceptable for publication. Our graduates should be made to realize that counterexamples provide insight into a problem by showing which hypothesis needs to be strengthened in order to obtain a true result, or by clarifying the need for a particular choice of definition.

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).

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ÉDITORIAL

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LES EXEMPLES VALENT MIEUX QUE LES PRÉCEPTES, *Proverbe, début du XVe siècle*

Posez un énoncé mathématique à un étudiant de deuxième cycle : s'il essaie de le prouver, vous avez là un chercheur prometteur qui rédigera une bonne thèse de doctorat; s'il essaie de trouver un contre-exemple, vous avez là un mathématicien prometteur. Voilà qui illustre bien l'importance des exemples. De bons exemples pertinents sont l'essence même de la recherche mathématique. Ils clarifient et justifient les définitions et théorèmes, ou ils mènent à des conjectures et à de nouveaux résultats.

Un exemple célèbre est celui du « fer à cheval » de Stephen Smale, qui a donné la théorie du chaos. Pendant qu'il travaillait sur la stabilité structurale des systèmes dynamiques à Rio de Janeiro, Smale a reçu une lettre de Norman Levinson, qui portait à son attention un contre-exemple à une des conjectures qu'il avait déjà présentées dans un article. Il a travaillé avec acharnement à résoudre le problème selon ses croyances, il a transposé les arguments analytiques de Levinson en arguments géométriques et s'est lui-même convaincu que Levinson avait raison. L'histoire au complet, « Finding a Horsheshoe on the Beaches of Rio », est racontée dans *Mathematical Intelligencer* (vol. 20, 1998).

Smale s'est attaqué à des problèmes soulevés par Hassler Whitney (1907-1989), pionnier de la topologie combinatoire et différentielle. En particulier, Whitney se demandait s'il était possible de retourner une sphère sur elle-même dans un espace quadridimensionnel sans qu'elle se déchire ni se plisse. C'est ce qu'on appelle un problème d'éversion. La solution de Smale était très algébrique. Un mathématicien du nom de Bernard Morin, qui était aveugle de naissance et ne pouvait « visualiser » des exemples en quatre dimensions, a trouvé une éversion géométrique progressive remarquable.

Durant le séjour de Whitney à l'Institut d'études supérieures de Princeton, Keith Kendig (dont une critique du livre sur les coniques paraîtra plus tard dans les NOTES) lui a parlé du théorème de Bézout, selon lequel deux courbes de degré m et n s'entrecroisent en mn points. Après avoir répondu qu'il n'avait jamais entendu parler de cet exemple, Whitney s'est mis au tableau en disant qu'il trouverait un contre-exemple. Après quelques tentatives et discussions sur la ligne complexe à l'infini et avoir compté de multiples points d'intersection, il a demandé : « Et si c'était deux cercles concentriques? » Il a argumenté encore avec Kendig, il a trouvé les deux points doubles, et il a enfin admis que c'était tout un théorème. Kendig venait d'apprendre comment s'y prenaient les grands : « Whitney a confronté le théorème, il lui a fait une chaude lutte, et c'est le théorème qui a gagné, » raconte-t-il. « Je connaissais le résultat depuis au moins deux ans, mais je venais de constater qu'en 15 ou 20 minutes, il avait mieux compris le problème que mois. En rétrospective, ce fut un point tournant dans ma carrière : j'ai commencé à exploiter les exemples à fond. » Kending a d'ailleurs dédicacé son livre à Hassler Whitney, en des termes très cordiaux.

Des ouvrages comme ceux de Gelbaum et Olmsted (*Counterexamples in Analysis*), de Steen et Seebach (*Counterexamples in Topology*) et de Stoyanov (*Counterexamples in Probability*) fascinent bon nombre d'étudiants, à l'instar de la science-fiction pure. Le lecteur – en particulier celui qui s'arme d'un crayon et d'une feuille pour vérifier personnellement les affirmations qui lui semblent extravagantes – vit un émerveillement semblable à celui de Keats en lisant Homère :

> « Alors, je me suis senti
> comme un veilleur des cieux,
> lorsqu'une nouvelle planète
> surgit à portée de sa vue. »

(Ou, à un autre degré, comme Dorothy dans le Magicien d'Oz : « Mon petit Toto, nous ne sommes plus au Kansas! »)

Les rédacteurs reçoivent souvent des articles portant sur des théorèmes abstraits sans exemples, ou dont les résultats sont réfutables à l'aide d'exemples futiles. Les jeunes chercheurs devraient savoir que de tels articles ne sont pas publiables, et nos diplômés, que les contre-exemples accroissent notre compréhension des problèmes en illustrant les hypothèses qu'il faut renforcer pour obtenir un vrai résultat, ou en clarifiant le choix d'une définition.

AMS CENTENNIAL RESEARCH FELLOWSHIPS

The AMS Centennial Research Fellowship Program makes awards annually to outstanding mathematicians to help further their careers in research. From 1997-2001, the fellowship program was aimed at recent PhDs. Recently, the AMS Council approved changes in the rules for the fellowships. A recipient of the fellowship shall have held his or her doctoral degree for at least three years and not more than twelve years at the inception of the award (that is, received between September 1, 1994 and September 1, 2003). Applications will be accepted from those currently holding a tenured, tenure track, post-doctoral, or comparable (at the discretion of the selection committee) position at an institution in North America.

Application forms can be obtained from

`http://www.ams.org/employment/centflyer.html`

or by mail from: Membership and Programs Department

American Mathematical Society
201 Charles Street
Providence, RI 02904-2294

The stipend for fellowships awarded for 2006-2007 is expected to be US$64,000. The deadline for receipt of applications is **December 1, 2005**.

Women (and Men) In Science: How to Ask The Wrong Questions

A few months ago, Carolyn Gordon and I published an article titled "Women in Academia: Are We Asking the Right Questions?" (*Notices of the American Mathematical Society*, Volume 51 number 7, August 2004, pages 784-786). Carolyn is a professor of mathematics at Dartmouth University and has just finished her term as president of the Association for Women in Mathematics. Our point of departure was a survey showing that, in every field of science, engineering and mathematics, women are not achieving high academic rank at the same rate they are obtaining PhD degrees. (Donna J. Nelson and Diana C. Rogers, A National Analysis of Diversity in Science and Engineering Faculties at Research Universities, Final Report. **www.now.org/issues/diverse/diversity_report**). The question is: Why?

In our article, we urged university faculties and administrations to re-examine the criteria they use in determining whether to grant tenure to a faculty member. We suggested that they need to ask different questions --- about men as well as about women --- when making decisions that will affect faculty composition (and that will affect the way our children and grandchildren experience their university education) for the next several decades.

Recent remarks by Harvard's President, Lawrence Summers, have brought this issue to public attention. His remarks, however they were intended, were heard by many to assert that biological factors, including lifestyle choices unique to women, are the reason that women are failing to make the top ranks in academia.

Summers has since apologized and the issue has since moved to another place: many people believe that President Summers was only calling for the sort of analysis that we urged, and wonder whether a scholarly researcher is again being hounded by the guardians of political correctness for asking the "wrong" question. In intellectual inquiry, can there be such a thing?

If the matter is put that way, the answer is "no". We do not encourage the thought police to monitor the curiosity and research of scholars. But some questions are more productive, more amenable to answers and more likely to move us in the right direction than others. "Why did you leave your shoes in the middle of the floor?" (after I have just tripped over them in the dark) is an example of a question that, however sincerely asked, is unlikely to elicit a useful response. The question of whether biological determinism lies behind women's scoring differences on SAT mathematics tests (as some heard President Summers to say) is the same kind of question. It has been studied many times, and the results are inconclusive. The scoring differences are too slight and the results too culture-dependent to be a convincing measure of biological difference.

But suppose that women do have different abilities in mathematics. Are these distinctive talents inferior or might they instead represent a way for women to contribute uniquely to the advancement of the discipline? In a test designed by men, could there be categories in which women do not perform well, while the qualities that have enabled some women to excel in science and mathematics are simply overlooked by the test? Even for men, as for women, SAT tests are an indifferent predictor of success, and do not even purport to predict outstanding performance in science. In short, more study of whether, or why, girls do not match top-scoring boys on standardized tests is not likely to help us understand gender distribution in university faculties.

Today's society needs an increased supply of scientists, mathematicians and engineers to solve pressing medical problems like cancer and AIDS, to ameliorate environmental problems like global warming and pollution, and to continue the stream of technological innovation needed to improve the quality of life for a growing population. Universities have a unique responsibility in educating the next generation of scientists and in encouraging the research that will solve problems and generate new inventions. No academic questions are "wrong", morally, but, in a world stressed by immediate problems of environmental hazard and disease, some questions are just not worth asking.

Given that so little is known of how to predict a successful career in science, mathematics or engineering, decisions about hiring or giving tenure to university scientists have to be posed in the language of risk-assessment. Risk-averse administrations adopt the conservative strategy of hiring people who look like the people already there. But there are risk factors in hiring men as well as women (women have babies, men may have more health problems in mid life), and predictions of success in men are notoriously inaccurate.

If women's talents are different, then it is possible that there are women who can make unique contributions, at the very highest level, to the scientific enterprise. But we are not going to be able to identify those women unless we ask the right questions. Institutions must develop workable, imaginative strategies to recruit and retain the best minds to address today's research and practical challenges. We need to invite the most talented women in science, at every level from postdoctoral fellow to distinguished professor, to participate in our universities. We need to make visible, to celebrate, models of success in women scientists. We need to observe that they may not have been identified by the usual predictors, and that they may not have achieved success early in life. They may, like men, have been able to combine scientific success with personal fulfillment, or, also like men, they may have struggled with adversity and have been forced to make difficult decisions.

The choice of a career is a difficult and important question for a young person. One can ask if it is easier for men than for women to make the sacrifices required for an outstanding career in science. But that avoids the question of what sacrifices are truly necessary for success. The sad fact is that in the developed world (the G-8 countries, say), the prospect of a career in science or mathematics has become so unappealing to

our young people that we rely on immigration to fill our needs in research and technology. Why are so many of our brightest children not choosing careers in mathematics and science? The current attention to women in science may have the beneficial effect of drawing attention to the amount of encouragement that everyone needs to pursue this rewarding, yet demanding career.

And about those shoes. It is easy to trip each other up, intentionally or inadvertently. The right question is how to recognize each other as members of the same community, using our diverse talents for the common good.

Barbara Lee Keyfitz is Director of The Fields Institute for Research in Mathematical Sciences and Moores Professor of Mathematics at the University of Houston. She is currently President of the Association for Women in Mathematics.

(reprinted from PIMS Magazine, Vol 9, issue 1 Fall 2005.)

Les femmes (et les hommes) et la science : l'art de poser les mauvaises questions

Il y a quelques mois, je cosignais avec Carolyn Gordon un article intitulé « Women in Academia: Are We Asking the Right Questions? » (Notices of the American Mathematical Society, volume 51, numéro 7, août 2004, pages 784-786). Professeure de mathématiques à l'Université Dartmouth, Carolyn vient de terminer son mandat à la présidence de l'Association for Women in Mathematics. Nous sommes parties d'un sondage révélant que dans toutes les disciplines de la science, du génie et des mathématiques, la proportion de femmes atteignant le haut de la hiérarchie universitaire était inférieure à la proportion de femmes qui décrochent un doctorat. (Donna J. Nelson et Diana C. Rogers, A National Analysis of Diversity in Science and Engineering Faculties at Research Universities, Final Report. **http://www.now.org/issues/diverse/diversity_report**). Mais pourquoi?, telle est la question.

Dans notre article, nous exhortons le corps professoral et les dirigeants des universités à revoir les critères d'attribution de la permanence des professeurs. Nous avons suggéré toutes sortes de questions qu'ils devraient se poser – sur les hommes comme sur les femmes – lorsqu'ils prennent des décisions qui toucheront la composition du corps professoral (et aussi l'expérience que vivront nos enfants et nos petits-enfants à l'université) au cours des prochaines décennies.

Ce sont des commentaires formulés récemment par le recteur de l'Université Harvard, Lawrence Summers, qui ont porté cet enjeu sur la place publique. Quelle qu'ait été leur intention, ces remarques ont été interprétées par bien des gens comme une affirmation selon laquelle certains facteurs biologiques, y compris des choix de vie propres aux femmes, expliquent pourquoi les femmes atteignent moins souvent le haut de la hiérarchie universitaire que les hommes.

M. Summers s'est excusé depuis, et la question a pris un autre cours : de nombreuses personnes croient que le recteur ne faisait que demander le type d'analyse que nous réclamions depuis longtemps, tout en se demandant si les défenseurs de la rectitude politique ne s'acharnaient pas encore sur un chercheur qui aurait posé la « mauvaise » question. Mais en recherche, existe-t-il des « mauvaises questions »?

Sous cet angle, la réponse est non. Nous ne voulons certainement pas que la censure entrave la curiosité ou les recherches de nos chercheurs. Toutefois, certaines questions sont plus productives, plus faciles à résoudre et plus susceptibles de nous amener dans la bonne direction que d'autres. Si je dis : « Pourquoi as-tu laissé tes chaussures au beau milieu de la chambre? » (après m'y être accroché les pieds dans la pénombre), même le plus sincèrement du monde, je n'obtiendrai vraisemblablement pas une réponse utile. Une question comme : « L'écart entre les résultats des hommes et ceux des femmes aux tests d'habiletés scolaires (SAT) en mathématiques relève-t-il du déterminisme biologique? » (comme l'aurait apparemment dit le recteur Summers), entre dans la même catégorie. Elle a été étudiée à maintes reprises, et les résultats ne sont pas concluants. D'une part, l'écart est trop mince, d'autre part, les résultats de l'étude sont de nature trop culturelle pour constituer une mesure convaincante de la différence biologique.

Mais supposons que les femmes aient des habiletés mathématiques différentes de celles des hommes. Est-ce à dire que ces habiletés sont inférieures, ou plutôt qu'elles permettent aux femmes de contribuer d'une manière qui leur est propre à l'avancement des mathématiques? Dans un test conçu par des hommes, se pourrait-il que certaines catégories de questions ne conviennent pas aux femmes, et que les qualités qui ont permis à certaines d'exceller en science et en mathématiques ne soient pas mises à profit dans le test? Tant pour les hommes que les femmes, les tests d'habiletés ne sont pas de bons prédicteurs de réussite, ni de bons prédicteurs d'excellence en science. Bref, ce n'est pas en réalisant d'autres études pour expliquer si, ou pourquoi les filles ne réussissent pas aussi bien que les garçons aux tests normalisés que l'on comprendra mieux la répartition hommes-femmes dans les facultés.

Notre société a un besoin criant de spécialistes en sciences, en mathématiques et en génie qui pourront trouver des remèdes au cancer ou au SIDA, trouver des solutions au réchauffement planétaire ou à la pollution, et innover continuellement pour améliorer la qualité de vie d'une population en croissance. Il revient aux universités seules de former la prochaine génération de scientifiques et de soutenir les recherches qui apporteront des solutions à nos problèmes et feront des inventions. En recherche, il n'y a donc pas de « mauvaise

Les femmes (et les hommes) et la science : l'art de poser les mauvaises questions *suite*

question », mais moralement, dans un monde soumis à de vives tensions environnementales ou sanitaires, certaines questions ne valent tout simplement pas la peine d'être posées.

Comme il est pratiquement impossible de prédire une brillante carrière en science, en mathématiques ou en génie, les décisions quant à l'embauche ou à l'attribution de la permanence aux scientifiques se prennent en fonction du degré de risque. Les administrations réfractaires au risque adoptent une stratégie conservatrice et embauchent des gens à l'image des personnes en poste. Toutefois, des risques sont associés tant à l'embauche des hommes qu'à l'embauche des femmes (les femmes ont des enfants, les hommes sont plus souvent malades que les femmes à l'approche de la cinquantaine), et les prédicteurs de réussite chez les hommes sont d'une inefficacité notoire.

Si les femmes ont des talents différents de ceux des hommes, il est donc possible que les femmes fassent des contributions uniques à l'entreprise scientifique, à l'échelon le plus élevé. Il ne sera toutefois pas possible de trouver ces femmes à moins de leur poser les bonnes questions. Les établissements d'enseignement doivent concocter des stratégies pratiques et novatrices pour recruter et retenir les éléments qui pourront le mieux surmonter les obstacles pratiques et scientifiques actuels. Il faut inviter les femmes les plus douées en sciences, des boursières postdoctorales aux professeures éminentes, à jouer un rôle actif dans la vie universitaire. Il faut faire connaître des modèles scientifiques féminins et leur rendre hommage. Il faut reconnaître qu'elles n'ont peut-être pas été détectées à l'aide des prédicteurs habituels et n'ont peut-être pas atteint la notoriété à un jeune âge. Comme les hommes, ces femmes auront réussi à concilier carrière scientifique et vie personnelle ou, aussi comme les hommes, elles auront éprouvé des tiraillements et auront été forcées de prendre des décisions difficiles.

Pour les jeunes, le choix d'une carrière est une décision difficile et importante. Certains se demanderont s'il est plus facile pour les femmes que les hommes de faire les sacrifices nécessaires pour mener une brillante carrière scientifique, sans toutefois se demander QUELS sacrifices sont véritablement nécessaires à la réussite. Ce qui est triste, c'est que la perspective d'une carrière en sciences ou en mathématiques rebute tellement les jeunes des pays développés (disons des pays du G-8), qu'il faut se fier à l'immigration pour répondre à nos besoins en recherche et en technologie. Pourquoi nos jeunes doués sont-ils si peu nombreux à se diriger vers les mathématiques ou les sciences? L'attention que l'on porte en ce moment aux femmes en sciences pourrait avoir comme effet bénéfique d'attirer l'attention sur les encouragements dont chacun a besoin pour mener une telle carrière, à la fois gratifiante et exigeante.

Revenons à nos chaussures. Il est facile de se faire trébucher les uns les autres, intentionnellement ou non. Alors posons-nous la vraie question, tâchons de trouver le moyen de se reconnaître et de s'apprécier les uns les autres en tant que membres d'une même communauté qui mettent à profit leurs talents respectifs dans l'intérêt collectif.

Barbara Lee Keyfitz est directrice de l'Institut Fields de recherche en sciences mathématiques et titulaire de la chaire d'enseignement Moores de l'Université de Houston. Elle est aussi présidente de l'Association for Women in Mathematics.

(ré-impression du PIMS Magazine, Vol 9, issue 1 Fall 2005.)

CMS Winter 2005 Meeting
University of Victoria
Victoria, BC
December 10-12

The most up-to-date information for the Winter 2005 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/winter05/

The Meeting registration form can also be found in the September 2005 issue of the CMS Notes.

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

Réunion d'hiver 2005 de la SMC
Université de Victoria
Victoria (C.-B.)
du 10 au 12 décembre

L'information la plus récente de la Réunion d'été 2005 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/hiver05/

Le formulaire d'enregistrement est aussi publié dans les Notes de la SMC de septembre 2005.

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

NEWS FROM DEPARTMENTS

Université de Montréal

Montréal, Québec

Promotions : Octavian Cornéa (professeur titulaire, juin 2005), Pierre Duchesne (professeur agrégé, juin 2005); Charles Dugas (renouvellement professeur adjoint, juin 2005)

Nouveaux professeurs : Alejandro Murua (professeur agrégé, septembre 2005); Manuel Morales (professeur adjoint, septembre 2005).

Prix/Distinctions : Jiri Patera (doctorat honoris causa de la Czech Technical University); Véronique Hussin (prix en enseignement, juin 2005), Andrew Granville, Prix Jeffery-Williams de la Société mathématique du Canada (juin 2006)

Visiteurs : Babacar Saar (algèbre, août 05-nov. 05); Ramin Mohammadalikhani (géométrie différentielle, sept. 05-août 06), Shengda Hu (géométrie différentielle, sept. 05-août 06) et Alexander Ivrii (géométrie différentielle, sept. 05-août 06); Samuel Lisi (géométrie différentielle et topologie, sept. 05-août 06); Ketty De Renzende (topologie, sept. 05-août06); Pierre Charollois (théorie des nombres, sept. 05-août 06), Habiba Kadiri (théorie des nombres, sept. 03-août 06), Guillaume Ricotta (théorie des nombres, sept. 04-août 06), Harald Helfgott (théorie des nombres, sept. 05-août 06) et Jack Fearnley (théorie des nombres, sept. 05-août 06); Jianjun Chuai (géométrie algébrique, août 05-août 07); Iryna Kashuba (physique mathématique, sept 05-août 06) et Michael Germain (physique mathématique, mai 04-août 06); Libor Snobl (physique mathématique, janv. 04-janv.06); Zhu Chang Zhong (analyse, oct. 05-août 07)

Autre nouvelle : Nouvelle directrice, Véronique Hussin, juin 2005.

ICM 2006
MADRID, SPAIN

The list of the plenary speakers is:

Percy Deift, Courant Institute of Mathematical Sciences, New York University, New York, USA

Jean-Pierre Demailly, Université Joseph Fourier, Grenoble, France

Ronald DeVore, University of South Carolina, Columbia, USA

Yakov Eliashberg, Stanford University, Stanford, USA

Étienne Ghys, École Normale Supérieure de Lyon, Lyon, France

Richard Hamilton, Columbia University, New York, USA

Henryk Iwaniec, Rutgers University, Piscataway, USA

Iain Johnstone, Stanford University, Stanford, USA

Kazuya Kato, Kyoto University, Kyoto, Japan

Robert V. Kohn, Courant Institute of Mathematical Sciences, New York University, New York, USA

Ib Madsen, Aarhus University, Aarhus, Denmark

Arkadi Nemirovski, Technion - Israel Institute of Technology, Haifa, Israel

Sorin Popa, University of California, Los Angeles, USA

Alfio Quarteroni, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

Oded Schramm, Microsoft Corporation, Redmond, USA

Richard P. Stanley, Massachusetts Institute of Technology, Cambridge, USA

Terence Tao, University of California, Los Angeles, USA

Juan Luis Vázquez, Universidad Autónoma de Madrid, Madrid, Spain

Michèle Vergne, École Polytechnique, Palaiseau, France

Avi Wigderson, Institute for Advanced Study, Princeton, USA

The list of the invited Section lecturers can be found on the web site: **www.icm2006.org**

The Music of the Primes
by Marcus du Sautoy
Harper-Collins (2004) 335 pages

This is a book which has interest both for mathematicians and for non-mathematicians and hence it seemed a good idea to have a reviewer from each camp (and a timely one, since all of our earlier joint projects have by now left the building).

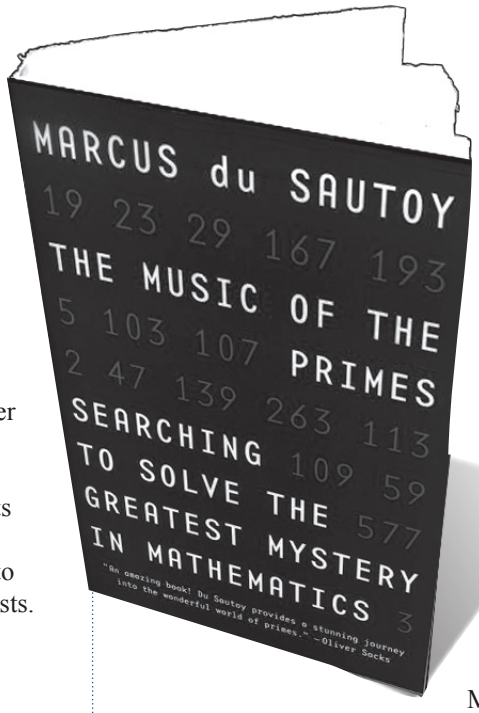
There was a time when mathematics in general and number theory in particular were considered somewhat snobbish pursuits, when leading practitioners like G. H. Hardy boasted about the unworldliness of their own achievements and when Deans told Mathematics Chairmen that they would not consider themselves ill-funded were they only to compare themselves to philosophers rather than to physicists.

The public has always held a place for (mathematicians and) scientists amongst its heroes, although maybe not quite up there with baseball players and with movie stars. If only a greater effort could be made to humanize them and their work! In the past century, perhaps it was only Einstein who achieved this level of public familiarity and whose name became a household word. When Einstein passed away some fifty years ago, the headline in one Toronto newspaper simply read "Albert dies". Obviously, this was not because the public fully appreciated his work.

Mathematics, and especially number theory, have been much slower off the mark than some other academic disciplines but things have indeed changed in recent years. Partly, it may have been the lesson learned from the computer science community, young and brash and very much aware of where their bread is buttered. Partly, it was the example given by cryptographic applications of the simplest (and later the more complicated) number-theoretic constructs which allow application to the safety of our bank accounts and hence are of more immediate concern to most of the public than is the precise location of planets, such as Pluto or Ceres. It also has not hurt that such applications have helped to get jobs for mathematics graduates. Partly, it was the timely solution by Wiles of the Fermat problem, perhaps the most famous of the really old number-theory questions.

In any case, we now see movies such as "Good Will Hunting" and "A Beautiful Mind" devoted to the folklore of mathematics, and more than a few recent books such as those by M. vos Savant, K. Sabbagh and M. du Sautoy.

Du Sautoy's book presents the public with a lively entrance to the lives and thoughts of mathematicians. The author makes a genuine and largely (albeit not completely) successful effort to convey the general feel of the subject and its practitioners in a fashion which is accessible to non-mathematicians.



The book begins with a chapter which bears the title "Who Wants To Be a Millionaire?" and then begins to introduce us to the story of the Riemann Hypothesis and, more generally, the study of the primes, in which that conjecture plays a central role. This study is full of heroes and there is room for a lot of folksy stories. The fact is that there are plenty of funny incidents and interesting people who have contributed to the story of our pursuit of the primes. Maybe there are just as many humorous mathematicans as there are baseball players, who knows? Maybe there are also a certain number of not so nice people as well but hey, nobody says we have to tell the whole story.

In any case, after a brief reference to Hilbert's famous list of problems, we begin in the modern day with the Clay Prizes, the April Fools' joke of Bombieri, who is described by the author as "the Mathematical Aristocrat" and the related story of Alain Connes, painted as "a benign Robespierre of mathematics to Bombieri's Louis XVI". You can tell already this book is going to be a lot of fun, unless perhaps you are personally involved and not flattered by the author's very colourful descriptions. The author seems pretty careful to avoid this danger.

We then step back in time to the pre-Riemann period. As might be expected, the choice of heroes is pretty automatic here: Euclid and Euler and the infinitude of primes, Gauss and Legendre and the "prime number conjecture". There is time for side-trips away from number theory, to Euler's bridges of Königsberg and to a discussion of the nature of mathematical proof, amongst others, but the funny stories from this period are, alas, lost to us with time. Hopefully, they did take place.

Possibly, Dirichlet might have been included here, but the author finds it more convenient to save his story for the following chapter on Riemann, whom he greatly influenced. Suffice it to say that the importance of Dirichlet is not slighted.

We now reach the story of Riemann and of his work on primes. These two chapters are tough sledding mathematically. At various places we read about exponential numbers, reciprocals, infinite sums, and three dimensional shadows of a four dimensional zeta landscape with infinitely many points at sea level each producing a wave like a musical note. The

assumption that the reader is familiar with such terminology does not ruin the book's enjoyment for the non-mathematician but it certainly helps to limit it. Far more helpful to someone who will never try to prove a theorem is the general feel for the subject provided, for example, by the description (on page 78) of mathematics as "an aesthetic discipline where talk of beautiful proofs and elegant solutions is commonplace.... the flash of illumination that mathematicians crave often feels like bashing notes on a piano until suddenly a combination is found which contains an inner harmony marking it out as different."

There follows a brief description of the important work of Chebyshev and a little more than perfunctory bow to the two mathematicians who actually did prove what is still the most important theorem in the subject. We are told that "Hadamard could never have achieved what he did without Riemann's head start." Undoubtedly so, but only after more than a quarter century. And, what about Riemann's debt to Euler and Dirichlet? Duly recorded to be sure, but with a very different tone.

We then cross the century to Hilbert, to Landau and to Hardy and Littlewood. Hardy, the first person to prove that infinitely many of the zeros of Riemann's zeta function lie on the line, is particularly interesting. Even if someone like Hardy had contributed a little less than he actually did to the story of the zeta-function it would be a loss to leave out the exploits of a character who was so very much a character! And then of course we come to Ramanujan, a story also much too interesting to ignore, never mind if his work on the distribution of primes did not have quite the lasting importance of many of his other discoveries.

In fact, the story of the primes is tied to a lot of other central topics, as are many of the leading players. Eventually we are led to the topic of security on the internet, a delight of information for the non-mathematician and one that would not have been understandable without having been placed in context by the previous sections describing the nature of the primes, the fundamental contributions of Gödel to mathematical thought, and the story of Turing and the birth and development of the computer.

The story concludes with introductions to two of the main trends for current attacks on this elusive goal: There are those who, bolstered by the evidence of extensive computer calculations of the zeros, are finding analogies to the theories of random matrices and quantum chaos and hoping that such similarities will provide some clues to the goal. There are others who, noting that there has been some considerable success in dealing with a finite analogue of this infinite problem, namely the theorems of Gauss, Hasse, Weil and Deligne, are hoping to find here the bridge to Riemann's legacy.

In contrast to the books by vos Savant and Sabbagh, this one is written by a mathematician and thus provides a better possibility of conveying to the non-mathematician the idea of just what mathematics is all about. As hinted already, the author succeeds in doing this quite well so long as he is talking in generalities, and this already makes the book far better than the other two. When describing more precisely the specifics of the mathematics, it might seem to the mathematician that the author is sacrificing some precision for the sake of understanding but doing so in a reasonable way. However, that sacrifice is in several instances insufficient to convey what he is trying to convey, at least to most non-mathematicians. Still, to the extent that this is a book about mathematics (as opposed to being about mathematicians) it is much better than the other two.

To the extent that this is a story about mathematicians rather than about mathematics the book by Sabbagh is also very enjoyable but here too the du Sautoy book shines. In this aspect as well there are some inaccuracies and these can no longer be passed off as approximations to the truth in aid of understanding. We doubt, for example, that Selberg could have been pleased to read (if he did) that he had already entered his "nineties" several years ahead of schedule.

Still, there is a great deal of pleasure in reading about Erdös' descent on the young Pomerance, about Weil's near brushes with early extinction, about a bet (concerning the aforementioned zeros) of bottles of wine between an aristocrat and a musketeer, and of many other similar anecdotes which cannot help but increase the readability and enjoyment. Of course, it may be that the reviewers are influenced by the fact the winner of the bet is an old friend. Nevertheless, they recommend the book as a very good read, both for non-mathematicians and for others.

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`.

BOOK REVIEW

NICE BUT NOT HISTORY

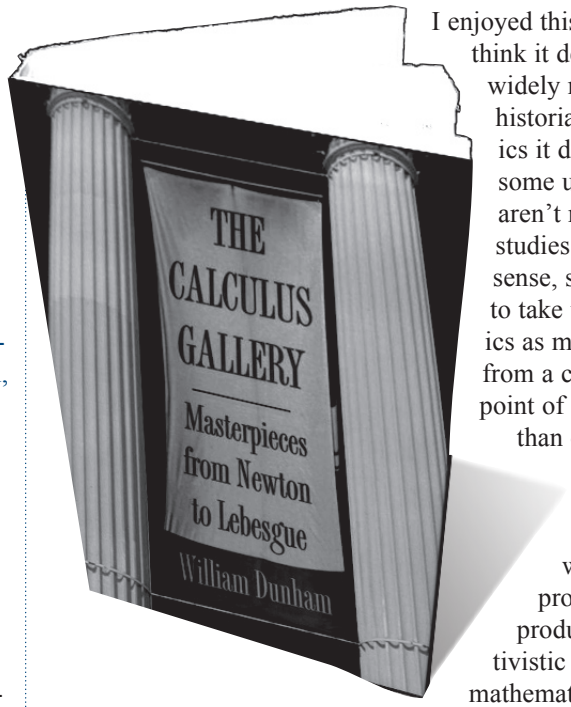
Tom Archibald
Simon Fraser University, Burnaby, BC

The Calculus Gallery: Masterpieces from Newton to Lebesgue

by William Dunham, Princeton: Princeton University Press, 2005.

Bill Dunham is the author of well-known works (*Journey Through Genius, Euler: Master of Us All*) popularizing the history of mathematics for a broad mathematical audience. He is very good at it: those two books are approachable and engaging accounts that can be read with pleasure by anyone from the middle undergraduate years. The present book continues in this vein, providing expositions of various milestones in real analysis (not just calculus, despite the title). Arranged in roughly chronological order, fourteen chapters present aspects of the work of luminaries from the seventeenth to the early twentieth centuries. The subject matter is a little less accessible than that of the earlier books. Dunham himself describes it as "not for the mathematically faint of heart", though in fact I think only about half the book presumes a beginning course in real analysis.

The selection of material is judicious, and includes some material that may be found in many history of mathematics textbooks. Thus we find Newton on inversion of series and the general binomial theorem, Leibniz on "integration by parts", Euler on the gamma function, series summation, and estimating π, Cauchy's mean value theorem, Riemann integration, and Weierstrass' pathological function. These things are treated already in works such as Victor Katz's *A History of Mathematics* or Umberto Bottazzini's more specialized *The Higher Calculus*, but the fact that Dunham is concentrating on vignettes rather than providing a broad picture allows him a leisure of exposition that serves the subject well. The last sixty pages, dealing with Cantor, Volterra, Baire and Lebesgue, are particularly attractive in presenting rather hard material in a way which exposes some of the mathematical issues associated with pathological functions very nicely. The book artfully concludes with Lebesgue's version of the fundamental theorem of calculus, something many undergraduates never see. I think it would be a good idea to assign portions of this work to be read in conjunction with a first analysis course, in order to help students grasp the direction things are going and some of the reasons why they are done as they are.



I enjoyed this book, and I think it deserves to be widely read, but as a historian of mathematics it does cause me some unease. These aren't really historical studies in the usual sense, since they tend to take the mathematics as much as possible from a contemporary point of view, rather than contextualizing it in the debates of the time in which it was produced. This produces a positivistic view of the mathematics of the past as marching step by step in an inexorable way toward the ever-more-perfect present. It's a view with which many mathematicians are entirely too comfortable. As a corollary of this approach, Dunham doesn't feel he really needs the historical literature. Despite a few nods to monuments such as Whiteside's edition of Newton, or to fine standard works like Thomas Hawkins' now-classic book on the history of integration or Jesper Lützen's extraordinary study of Liouville, Dunham produces his own account directly from the sources, at times leaning on other secondary accounts by mathematicians. It makes engaging reading, but as a picture of the past, and what we can learn from studying the past, it is anemic and, to this reader, sometimes troubling.

Despite these reservations, the book will afford lots of pleasure, and should raise many questions which historians of mathematics might be called upon to answer. An example: given that for most of the nineteenth century complex analysis was thought of as the natural arena for research in the field, how is it that real analysis surged to the forefront in the closing years of that century?

BRIEF BOOK REVIEWS

S. Swaminathan
Dalhousie University, Halifax, NS

Martin Gardner's Mathematical Games

The Entire Collection of his Scientific American Columns on one CD-ROM, The Mathematical Association of America, 2005, $54.95.

The famous "Mathematical Games" column of Martin Gardner ran in *Scientific American* from 1956 to 1986. In these columns Gardner introduced his readers to the delights of mathematics and of puzzles and problem solving. Readers learnt about RSA public key cryptography, Mandelbrot's fractals, the Life game of John Conway, Penrose tilings and other interesting mathematical matters. Now all this material, from his fifteen books, has been brought together on one searchable CD. A profile of, and interview with, Martin Gardner is included. The Windows version of Acrobat 6.0.1 is included on the CD.

The Notre Dame Lectures

Lecture Notes in Logic 18

Edited by Peter Cholak, Association for Symbolic Logic, A. K. Peters, 2005, vii + 184 pp.

In Fall 2000 the Notre Dame logic community hosted four logicians as visiting lecturers. Each of them presented a series of expository lectures at the graduate level. Greg Hjorth lectured on countable models and theory of Borel equivalence relations, Rodney G. Downey on some computability-theoretic aspects of reals and randomness, Zoe Chatzidakis on Model theory of difference fields, and Paola D'Aquino on weak fragments of Peano arithmetic. Refinements of these lectures are published in this volume.

Logic Colloquium 2000, Lecture

Lecture Notes in Logic 19

Edited by Rene Cori, Alexander Razborov, Stevo Todorcevic and Carol Wood, Association for Symbolic Logic, A. K. Peters, Wellesley, MA 2005, xi + 408 pp.

Logic Colloquium 2000, the European meeting of the Association for Symbolic Logic, took place at the Sorbonne, Paris in July 2000 on the site of Hilbert's presentation of his famous list of problems in 1900. It was part of the World Mathematical Year and was organized to have special impact on the future of logic in the new millennium. The main themes were: Proof theory and logical foundations of computer science, set theory, model theory, computability and complexity theory, history of 20th century logic, philosophy and applications of logic to cognitive sciences.

This volume contains the tutorials, photographs and articles constituting the proceedings of the Colloquium. A noteworthy article is "Hilbert's Wide Program" by William Ewald.

Logic Colloquium '01,

Lecture Notes in Logic 20

Edited by Matthias Baaz, Sy-David Friedman, and Jan Krajicek, Association for Symbolic Logic A. K. Peters, Wellesley, MA 2005, viii + 486 pp.

The 2001 European Summer Meeting of the Association for Symbolic Logic, Logic Colloquium 2001, was held at the Vienna University of Technology, Vienna in August 2001. It was organized by the International Kurt Gödel Society on the occasion of the 70th anniversary of Gödel's famous publication *Über formal unentscheidbare Sätze der Principia Mathematica und verwandter Systeme I*. Special plenary addresses commemorating this anniversary were given by Georg Kreisel and Gaisi Takeuti.

The present volume contains 19 refereed papers on set theory, model theory, proof theory, computability theory, aleph-compactness, and complexity. G. Takeuti's paper on 'Incompleteness Theorem and its frontier' describes the theorem, its effects and its impact on Hilbert's program.

A First Course in Abstract Algebra, Rings, Groups and Fields,

Second Edition,

by Marlow Anderson and Todd Feil Chapman & Hall/CRC, 2005, xviii + 673 pp.

Which is a better way to begin a course in abstract algebra: start with group theory and then proceed to rings and fields or introduce rings first using the examples of integers and polynomials? Many instructors and authors of texts choose the former. Others take the point of view that student's familiarity with integers and polynomials will help in motivating the role of algebraic operations. The authors of the present book found that the latter approach has worked well for them. After discussing properties of rings and fields, unique factorization, homomorphisms and ideals they introduce groups using symmetries of figures in the plane and space.

The standard material is laid out in 9 sections consisting of 49 chapters. Each chapter includes 'Quick Exercises' which are intended to be done by the student as the text is read to make sure that the topic just covered is understood well. These exercises are typically straightforward, mostly short verifications of facts. The exercises following each chapter begin with the 'Warm-Up Exercises' which are designed to test the fundamental comprehension of the contents of the chapter. Then there are regular exercises which include both computational and supply-the-proof problems. Historical remarks are given in many of the chapters. The 'Hints and Answers' section provides hints to many problems and answers where necessary. The major change in this second edition is the addition of a new section about Galois theory. Familiarity with linear algebra or complex numbers is not assumed; the necessary material concerning these is presented in the text with a chapter on the field of complex numbers and two chapters on vector spaces.

Reality Conditions, Short Mathematical Fiction

by Alex Kasman

MAA, Spectrum Series, 2005, ix + 247 pp.

Many mathematicians and science-fiction authors have written short stories involving mathematical ideas and concepts. In 1958 and 1962 Clifton Fadiman published two anthologies (*Fantasia Mathematica* and *Mathematical Magpie*) of such stories, anecdotes, poems, etc. Alex Kasman maintains a website — **`math.cofc.edu/kasman/MATHFIC/default.html`** — which contains lists of fictional writing that have a strong connection to mathematics. Taking the point of view that fiction with mathematical content is a good way to get people thinking of and talking about mathematics, Alex Kasman teaches an interdisciplinary course called "Mathematics in Fiction" at the College of Charleston, South Carolina.

In the present book Kasman presents 16 mathematical short stories written by himself. Covering different areas of mathematics the stories deal with ideas from geometry, number theory, topology, mathematical physics, Egyptian mathematics etc. Since the fictional nature of the stories blur the line between reality and fiction, an appendix, entitled Author's Notes, is included. It describes which parts of the stories are real and which have been made up. The title of the book is also the title of a story which concerns the quest of a grad student to prove an important theorem and to make a place for himself in mathematical history. The plot and characters are based on the famous Sumerian myth of Gilgamesh. However, instead of real immortality, the hero seeks the sort of immortality that Newton and Gauss achieved through their work and, instead of gods, he interacts with leading mathematicians and physicists.

One doesn't need to be a mathematician to read his book. Anyone can enjoy reading it.

Matrix Mathematics: Theory, Facts, and Formulas with application to Linear Systems Theory

by Dennis S. Bernstein

Princeton University Press 2005, xxxvii + 726 pp.

This is a reference work for users of matrices in engineering, science, and applied mathematics. Each chapter begins with the development of relevant background theory followed by a collection of specialized results. Identities, inequalities, and matrix facts are stated rigorously with cross references, citations to the literature and illuminating remarks. Twelve chapters cover the major topics in matrix theory. A detailed list of symbols, a summary of notation and conventions, an extensive bibliography with author index, and an extensive reference list are provided.

Applied Numerical Analysis

by Matiur Rahman

WIT Press, Billerica, MA, 2005

xiii + 392pp + CD-ROM

This is a textbook primarily intended for one semester engineering and science courses in undergraduate mathematics. Later chapters of the book contain advanced material suitable for senior undergraduate and graduate students. The chapter headings are: Introduction, Ordinary differential equations, Partial differential equations, Nonlinear differential equations and stability, Calculus of variations, and Applications (Stability of subsystems, Ocean waves, nonlinear wave-wave interactions, seismic response of dams, and Green's function method for waves). Solved problems and exercises are included. Hints to some exercises and answers to many exercises are provided.

A First Course in Scientific Computing

Symbolic, Graphic, and Numeric Modeling using Maple, Java, Mathematica, and Fortran90

by Rubin H. Landau, Princeton University Press 2005, xxiv + 481 pp

A computer is used for solving real-world problems that are often too difficult for analytic or human solution, yet workable with a computer. The discipline of computational science is concerned with the mathematical modeling and problem solving techniques of scientific computing. In contrast, computer science, which studies computers for their own intrinsic interest, provides the underpinning for the development of hardware and software tools that computational scientists use.

This book deals with the basics of computation, numerical analysis, and programming from a computational point of view. The reader will acquire some ideas of what is possible with computers, what type of tools there are for it, and how to go about getting all the pieces to work together. The use of Maple or Mathematica in problem solving is discussed in eight chapters in Part 1 of the book. Part 2, consisting of Chapters 9 to 21, is devoted to Java or Fortran90. Part 3 has two chapters on LateX. A CD is provided with the book. It contains Java programs, LateX files, data files, Maple worksheets and various supplementary materials. The book contains enough material for a one- or two semester course. Practical examples are discussed. The book can be used as a learning text or a reference guide for students of mathematics, engineering and science subjects.

EDUCATION NOTES

by Ed Barbeau
University of Toronto

CURRICULUM DOCUMENTS FROM MAA

This month, I will examine three recent publications of the Mathematical Association of America, two from the series on Classroom Resources Material and one from the Spectrum Series. They can be ordered, either online at **www.maa.org** or by telephone at 1-800-331-1622.

As noted last month, increasing attention is being paid to material appropriate for students not pursuing a mathematics-related field, even at the college level. There are various models of courses to promote mathematical literacy. One can focus on basic arithmetic and algebraic skills, or on the use of technology, or on mathematical reasoning and the structure of logical argument. But a consensus is emerging towards "quantitative literacy", the ability to interpret data that might be found in news stories, instructions and advertisements.

The first book is based on a mathematics course given at Hope College, in Holland, MI, as a companion to to general education science courses:

Janet Anderson and Todd Swanson, Understanding our Quantitative World
xii+302 pages; hardbound; 2005
ISBN 0-88385-738-3; Catalogue code: UQW
List price: US$51.50 (member US$40.95)

The unifying theme of this book is functions - their description, manifestations, analysis, interpretation and variety. The treatment is quite informal, but careful enough that students would be able to negotiate it on their own without the help of a teacher. Formulae are given and explained, but not justified mathematially. Each chapter contains review questions to check comprehension and exercises based on news items and advertisements; this material originates in the US.

The first four chapters treat the displaying of data using tables, graphs, histograms and scatterplots. This is followed by a chapter on measures of central tendency and dispersion. After a brief introduction to functions of two variables and contour diagrams, the authors treat in turn the contexts and characteristic properties of linear, exponential, logarithmic, periodic and power functions. The book concludes with two chapters on probability and sampling. There is enough material to support a full university course. Much of it would be excellent in a course for future teachers, even at the elementary level.

When I was a first year undergraduate, the mathematics department put on a very nice semester course half of which was devoted to finite differences. While for some reason, the course did not make it into the permanent syllabus, I though it was an interesting and successful venture. In fact, the topic could have found a natural home in the secondary algebra curriculum. It had a practical flavour and would have set the stage for more advanced ideas in computation, analysis and theory of operators. However, this subject does intervene in the second book on my list:

Al Cuoco, Mathematics Connections: A Companion for Teachers and Others
xix+238 pages; hardbound; 2005
ISBN 0-88385-739-1; Catalogue code: MCO
List price: US$53.95 (member US$41.95)

The book is terrific. Al Cuoco is Senior Scientist and Director of the Center for Mathematics Education at the Education Development Center in Newton, MA. After taking a doctorate in algebraic number theory, he taught high school for many years before devoting his energy at EDC to curriculum development, professional development of teachers and educational policy. The book reflects his belief that curriculum reform must rest on a foundation of solid and significant mathematics that should be taught by teachers with direct experience of doing mathematics. He evidently believes that such mathematics can be made not only accessible but exciting to a wide range of students.

The unusual nature of this book is reflected in the subtitle; it is indeed a "companion", especially for secondary exponents of our discipline. It grew out of work at the EDC on a course for high school seniors who have already completed secondary algebra. From the preface: "In developing [the project], my colleagues and I consulted regularly with high school teachers. Almost all of them told us that much of mathematics in the later years was either new to them or buried deep in their undergraduate backgrounds. Together with these teachers, we came up with the idea for this book: a development of some mathematical topics and ideas, written specifically for practicing or prospective high school teachers." Accordingly, this is neither a teaching guide nor a textbook. Rather it presents a tight complex of topics that illustrate mathematical ways of investigating, thinking and presenting topics. The reader is expected to be actively engaged, to attempt the problems, to carry out investigations, and, particularly, to reflect on their understanding of mathematical concepts, terminology and practice - in short, to be autonomous and adventuresome. Although a solid grip on the existing high school syllabus is necessary, there is no need for a more advanced background. There are wide margins, that contain frequent comments that clarify, anticipate results, challenge the reader and lend historical perspective.

Chapter One treats various strategies for determining polynomials with given values, including the use of finite differences, Mahler bases (consisting of polynomials of the form $\binom{x}{k}$) and Lagrange interpolation. The treatment is leisurely; the reader is invited to study examples for patterns. However, one ends up with a net of interconnections to be savoured. Chapter Two looks at polynomials as objects of study, and explicitly emphasizes the dual character of polynomials as functions and as forms. Not only are the standard theorems that every high school mathematics graduate should (but generally does not)

know covered, but the derivative is introduced algebraically and the difference and differential operators related. The third chapter discusses complex numbers and their geometry, introduces the cosine and sine as real and imaginary parts of unimodular numbers and develops trigonometric relationships from there. The final section of the chapter treats maps on the complex plane, in particular, $z \to z^2 + c$, providing the occasion to introduce Julia sets and the Mandelbrot set.

Chapter Four, "Combinations and locks", changes the scene. The connection with algebra arises from the verification of identities by combinatorial arguments. A major part of the chapter is devoted to the number of ways of setting a combination of a Simplex Lock with n buttons; a sequence of sets of buttons are depressed with each individual button pressed no more than once. This links us back to the first chapter through the result: *For nonnegative integers m and k, the identity*

$$x^m = \sum_{k=0}^{m} \langle m, k \rangle \binom{x}{k}$$

holds, where $\langle m, k \rangle$ is the number of combinations on an m−button Simplex lock that uses all the buttons with a sequence of k pushes. The final chapter gives a highly textured treatment of sums of the first x m^{th} powers.

Algebra has not fared very well in recent curriculum revisions, being seen by its detractors as boring, technical and difficult. However, it is the language in which any student going into a mathematics-related area must be fluent. Teachers who take the trouble to work through this book will surely gain a vision of exciting possibilities for algebra that may inform their own teaching and their recommendations for a suitable syllabus.

The final book of my trio is:

David F. Haynes, Tatiana Shubin (editors),
Mathematical Adventures for Students and Amateurs
xi+291 pages; softcover; 2004
ISBN 0-88385-548-8; Catalogue code: ASM-1
List price: US$38.50 (member US$30.95)

This collection of nineteen essays is based on Bay Area Mathematical Adventure (BAMA) talks for bright middle and secondary students hosted by the universities of Santa Clara and San Jose in California. Many well-known mathematicians participated — Joseph Gallian, Ron Graham, Jean Pedersen, Carol Pomerance, Sherman Stein, Robin Wilson — to speak on mathematics in the areas of number theory, combinatorics and probability, geometry and topology, applications and history, along with others.

Accessible and lively, this book can be read independently by students or tapped into by teachers and lecturers in search of material for talks. Gallian describes how he managed to decode the numbers on drivers' licences, a skill that turned out to be helpful to a cancer researcher. Sheldon Axler demonstrates how the computer and the mathematical mind can collaborate on settling conjectures about odd numbers less than the sums of their proper divisors. Communicating with extra-terrestrials, analyzing the Challenger disaster, juggling and solving puzzles all lead to significant mathematics. Pedersen works around to the problem of determining *how many bounded and how many unbounded regions in space result when the planes of the Platonic solids are extended in space.*

There is a British version of this program that resulted in a book that I reviewed a few years ago in the *Notices of the American Mathematical Society* (49:8 (September, 2002), 905-910):

C.J. Budd, C.J. Sangwin, *Mathematics Galore! Masterclasses, Workshops and Team Projects in Mathematics and its Applications*, Oxford University Press, 2001

All these books illustrate how rich a mathematical world is accessible for students and teachers to explore without having to master a lot of preliminary material. This allows for an alternative model to courses that allows them to emerge out of interesting problems and investigations rather than to plough systematically through a lot of basic material with the promise of interesting stuff to come later. *EJB*

Olympiad problems

The Mathematical Association of America has just published *USA and International Mathematical Olympiads, 2004* continuing its annual series of books on this topic (ISBN 0-88385-819-3; catalogue code US5; list price US$34.95). As usual, it provides problems, hints and solutions for the USAMO, the team selection test and the IMO. Here are the last problems from each of the selection tests:

3. A 2004 ×2004 array of points is drawn. Find the largest integer n such that it is possible to draw a convex n−sided polygon whose vertices lie on the points of the array.

6. Define the function f from the set of nonnegative integers to the rationals by f(0) = 0 and

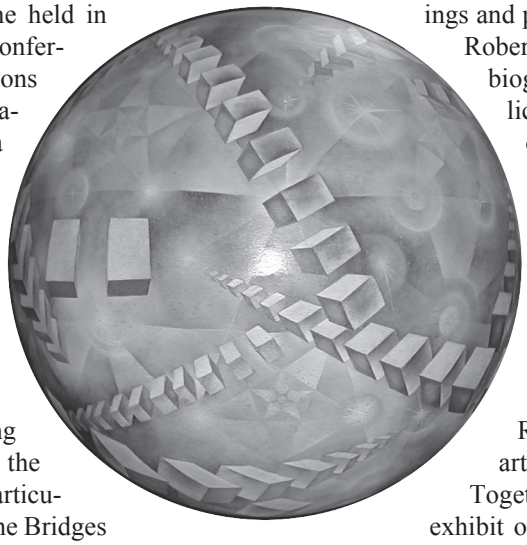
$$f(3n + k) = -\frac{3f(n)}{2} + k$$

for $k = 0, 1, 2$. Prove that f is one-to-one and determine its range.

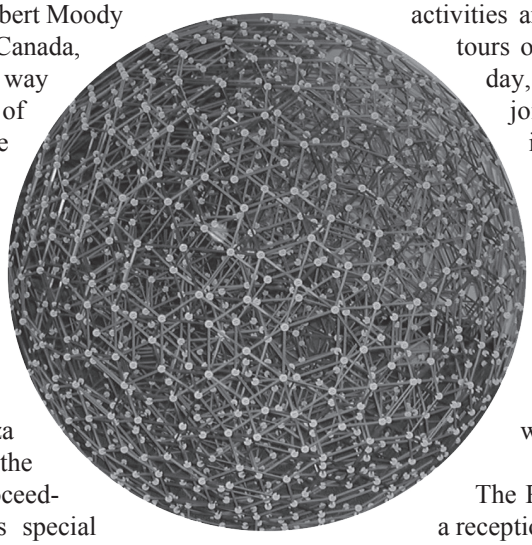
RENAISSANCE BANFF

Christiane Rousseau
Université de Montréal

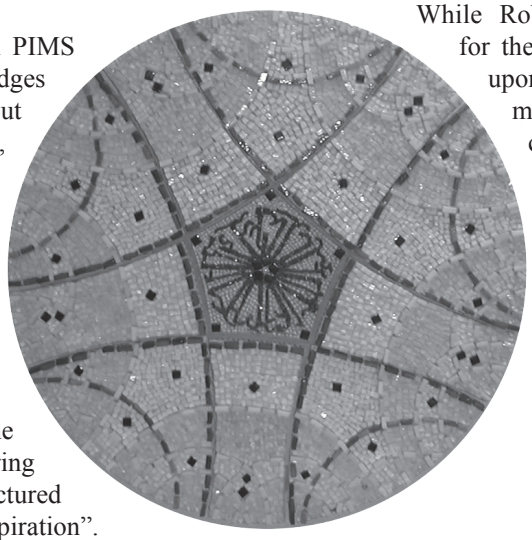
The Renaissance Banff Conference took place at the Banff Centre from July 31 to August 3, 2005. It was the 8th Bridges Conference, and the first one held in association with BIRS. The Bridges Conferences, subtitled "Mathematical Connections in Art, Music and Science" are an international conference series, created by Reza Sarhangi in 1998. More details on the series are available from **www.sckans.edu/~bridges/**.



As those who have been there will know, the Banff Centre, where BIRS is located, is primarily a centre for the arts; mathematicians at BIRS events may find themselves queuing for lunch among musicians, poets, or sculptors. This, and the beautiful mountain scenery, make this a particularly suitable location for a conference in the Bridges series. When he was Director of BIRS, Robert Moody dreamed of bringing this conference to Canada, and in particular to BIRS, as the ideal way to build a bridge between the activities of BIRS and those of the Banff Centre. He worked very hard, together with Reza Sarhangi and the Banff Centre, and his dream became reality last summer. The resulting "Renaissance Banff" event was the first major event to link the "mathematics" theme of BIRS activities with the "arts" theme of the Banff Centre activities. It was my pleasure to express the CMS thanks to Robert Moody and Reza Sarhangi for the splendid organization of the Conference and the publishing of the Proceedings. The CMS also wishes to express special thanks to the scientific organizers of the Coxeter day.



The CMS was honoured to partner with PIMS and the Banff Centre in this event. The Bridges Conferences usually last for three days but Renaissance Banff included a fourth day, the "Coxeter day", to celebrate the contributions and/or outreach of Donald Coxeter in arts, music and science. The Coxeter day started with a speech by Donald's son, Edgar Coxeter, who spoke of his father's passion for mathematics and his way of speaking of the mathematics hidden inside the details of everyday life. Marjorie Senechal gave a lecture on the outreach of Coxeter in science: "Coxetering crystals", while Doris Schattschneider lectured on "Coxeter and the Artists: Two-way inspiration".



The other lectures of the day, including lectures by Robert Dawson and Carlo Sequin, dealt with mathematics of tilings and polytopes and their relation to art. Siobhan Roberts is a writer who is presently working on a biography of Donald Coxeter. She gave a public lecture, "The man who saved geometry", on the life and scientific accomplishments of Donald Coxeter which was attended by many more people than the delegates from Renaissance Banff. A small musical piece composed by Donald Coxeter when he was 15 was played during the evening of the Coxeter day.

More than 150 participants came to Renaissance Banff, with backgrounds in arts, mathematics, and/or computer science. Together with the lectures there was a large art exhibit of exceptional quality. There were plenary activities and parallel smaller presentations. Guided tours of the Banff Centre were organized every day, with invitation to the delegates for further joint projects. All texts of lectures, including the lectures of the Coxeter day, are published in the Proceedings. The CMS is distributing the Proceedings in the Eastern part of the country. The book of 540 pages is a useful source of inspiration for any teacher or professor. It comes with a CD on which one finds both the lectures and an art gallery. It can be ordered at a very low price on the CMS website: **www.cms.math.ca**.

The Renaissance Banff Conference ended with a reception to acknowledge the accomplishments of Robert Moody as the first Scientific Director of BIRS. While Robert Moody was officially responsible for the Scientific Program of BIRS, he took it upon himself to get involved in setting up many other aspects of the Institute, and can take much of the credit for the warm and hospitable atmosphere that visitors find there today. The whole Canadian mathematical community is grateful to Robert Moody for his tremendous work in the establishment of BIRS, as well as for his scientific accomplishments and for his life commitment to the community.

EMPLOYMENT OPPORTUNITIES

UNIVERSITY OF VICTORIA - DEPARTMENT OF MATHEMATICS AND STATISTICS
Tenure-track position in Mathematics

The Department of Mathematics and Statistics at the University of Victoria invites applications for a tenure-track position in Mathematics, at the Assistant Professor level, to commence on 1 July, 2006.

Applicants must have a Ph.D. in Mathematics or a related discipline and have an outstanding research record. Excellence, or the demonstrated potential for excellence, in teaching mathematics is required. The successful applicant must also be able to supervise undergraduate students, graduate students and post-docs, and be prepared to be involved with activities of the Department.

Our highest priority fields of interest are algebra (including, but not limited to, algebraic combinatorics, combinatorial algebra, numerical linear algebra, and symbolic algebra), geometry (including, but not limited to, differential geometry, discrete geometry, and stochastic geometry), and probability (including, but not limited to, applied probability, probabilistic combinatorics, and probabilistic financial modelling). If a suitable candidate in one of these areas can not be found, then excellent candidates in other areas may be considered.

Information about the Department, including descriptions of courses offered and research areas of faculty, can be found at the website: **www.math.uvic.ca.**

Applicants should submit curriculum vitae, a teaching dossier or equivalent documentation that outlines their teaching experience and effectiveness, and arrange for three confidential letters of reference to be sent. Applications should be directed to:

Chair, Department of Mathematics and Statistics
University of Victoria
PO Box 3045 STN CSC
Victoria, B.C. V8W 3P4 CANADA
Telephone: (250) 721-7436 FAX: (250) 721-8962
E-mail: **mathcomp@math.uvic.ca**

The closing date for applications is **January 3, 2006**.

The University of Victoria is an equity employer and encourages applications from women, persons with disabilities, visible minorities, aboriginal peoples, people of all sexual orientations and genders, and others who may contribute to the further diversification of the University.

All qualified candidates are encouraged to apply; however, in accordance with Canadian immigration requirements, Canadians and permanent residents will be given priority.

UNIVERSITY OF VICTORIA - DEPARTMENT OF MATHEMATICS AND STATISTICS
Tenure-track position in Mathematics

The Department of Mathematics and Statistics at the University of Victoria invites applications for a tenure-track position in the area of Mathematical Biology or Bioinformatics, at the Assistant Professor level, to commence on 1 July, 2006.

Applicants must have a Ph.D. in Applied Mathematics, or a related discipline, and have an outstanding research record. Excellence, or the demonstrated potential for excellence, in teaching mathematics is required. The successful applicant must be able to interact in a research capacity with the Applied Mathematics Group and other interdisciplinary groups throughout the university. S/he must be able to supervise undergraduate students, graduate students and post-docs, and be prepared to be involved with activities of the Department.

Information about the Department, including descriptions of courses offered and research areas of the Applied Mathematics Group, can be found at the website: www.math.uvic.ca.

Applicants should submit curriculum vitae, a teaching dossier or equivalent documentation that outlines their teaching experience and effectiveness, and arrange for three confidential letters of reference to be sent. Applications should be directed to:

Chair, Department of Mathematics and Statistics
University of Victoria
PO Box 3045 STN CSC
Victoria, B.C. V8W 3P4, CANADA
Telephone: (250) 721-7436 FAX: (250) 721-8962
E-mail: **biolcomp@math.uvic.ca**

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usually drawn in $\mathbb{R}^4$, and are meant to depict interactions between atomic particles. To each such diagram, Feynman associated an integral (often divergent) and attempts to make these converge are called "renormalizations".

In his fascinating book, *Knots and Feynman Diagrams*, Dirk Kreimer connects Hopf algebras to this renormalization procedure. What emerges is a surprising connection to number theory. To be precise, the multiple zeta values

$$\zeta(k_1, ..., k_r) := \sum_{n_1 > n_2 > \ldots > n_r \geq 1} \frac{1}{n_1^{k_1} n_2^{k_2} \ldots n_r^{k_r}},$$

with $k_1 > 1$ and $k_2, ..., k_r \geq 1$, turn out to be the connecting link. The study of these values is a new chapter in mathematics and involves algebraic geometry and number theory. It may shed light on the folklore conjecture that the special values of the Riemann zeta function, $\zeta(3)$, $\zeta(5)$, $\zeta(7)$, ... are transcendental and algebraically independent.

Mathematicians may profit by reading the survey article by Pierre Cartier entitled, "A mad day's work: from Grothendieck to Connes and Kontsevich. The evolution of concepts of space and symmetry" (in the *Bulletin of the American Math. Society*, 38 (2001), no.4, 389-408 or in the original French version "Grothendieck et les motifs", *IHES Report*, 2000), where he conjectures the existence of a "cosmic Galois group".

There are many other themes related to number theory such as random matrix theory, mirror symmetry and its connections to modular forms, class field theory and the role of the motivic Galois group in modern physics that we have not been able to indicate even briefly. No doubt, these topics will be amplified at the ICM2006.

CRUX with MAYHEM - EDITORIAL BOARD / CRUX with MAYHEM - CONSEIL DE RÉDACTION

Individuals interested in serving on the Editorial Board for Crux Mathematicorum with Mathematical Mayhem should contact the Editor-in-chief (coordinates below) by **November 30, 2005**. The appointments are for three years beginning **January 1, 2006**.

Le conseil de rédaction du CRUX Mathematicorum with Mathematical Mayhem est à la recherche de nouveaux membres. Les mandats sont de trois ans et débuteront le **1 janvier 2006**. Si vous êtes interessé, veuillez communiquer avec l'éditeur-en-chef (coordonées ci-dessous) avant le **30 novembre 2005.**

Current members of the Editorial Board
Membres en cours de mandat au conseil de rédaction

Robert Bilinski - Collège Montmorency	Skoliad Editor	to	31/12/2009
Iliya Bluskov - UNBC	Problems Editor	to	31/12/2009
Richard Brewster - Cariboo	Problems Editor	to	31/12/2007
R. Bruce Crofoot - Thompson Rivers	Associate Editor	to	31/12/2007
J. Chris Fisher - Regina	Problems Editor	to	31/12/2008
Bruce C. Gilligan - Regina	Articles	to	31/12/2007
Shawn Godin - Ottawa-Carleton District School Board	Mayhem Editor	to	31/12/2006
John F. Grant McLoughlin - UNB	Book Reviews	to	31/12/2006
John F. Grant McLoughlin - UNB	Mayhem Assistant Editor	to	31/12/2005
Bruce L.R. Shawyer - MUN	Editor at Large	to	31/12/2008
Edward T.H. Wang - Wilfrid Laurier	Problems Editor	to	31/12/2005
Robert E. Woodrow - Calgary	Olympiad Editor	to	31/12/2005
Graham P. Wright - Ottawa	Managing Editor	to	30/06/2007

Jim Totten, Editor-in-Chief, Crux Mathematicorum with Mathematical Mayhem
Department of Mathematics & Statistics, Thompson Rivers University
900 McGill Road, Kamloops, BC M3J 1P3, totten@cariboo.bc.ca

YORK UNIVERSITY - Atkinson Faculty of Liberal Arts and Professional Studies
Mathematics/Statistics contractually limited position

The Mathematics/Statistics Program invites applications for a one-year contractually limited appointment in the area of Statistics and/or Number Theory. Applicants must have a PhD in Mathematics and/or Statistics, and show excellence or promise of excellence in research, and evidence of potential for superior teaching. Preference will be given to candidates who can strengthen existing areas of present and ongoing research activity.

This position, to commence July 1, 2006, is subject to budgetary approval.

York University is an Affirmative Action Employer. The Affirmative Action Program can be found on York's website at www.yorku.ca/acadjobs or a copy can be obtained by calling the affirmative action office at 416-736-5713. All qualified candidates are encouraged to apply; however, Canadian citizens and Permanent Residents will be given priority. Temporary entry for citizens of the U.S.A. and Mexico may apply per the provisions of the North American Free Trade Agreement (NAFTA).

Applicants should submit a letter of application with a current curriculum vitae, including the names and addresses of three referees and identifying areas of teaching and research interest, and arrange to have the letters of reference (at least one of which should address the applicant's teaching) sent directly, by ***December 1, 2005****, to:*

Professor Paul Szeptycki
Co-ordinator, Mathematics Program/
SASIT - Atkinson Faculty of Liberal and Professional Studies
2064 TEL Building/York University
4700 Keele Street
Toronto, ON, Canada, M3J 1P3
E-mail: szeptyck@yorku.ca

MESSAGE DU VICE-PRÉSIDENT - Ontario

Ram Murty
L'université Queen's

Le prochain Congrès international des mathématiciens (CIM) se tiendra à Madrid, en Espagne, du 22 au 30 août 2006. Consultez le site Web au : **www.icm2006.org**

Vous y trouverez les renseignements les plus à jour sur le congrès. Certaines catégories de participants ont droit à du financement. Vous trouverez de l'information à ce sujet au **www.colmatelat.ehu.es/FinSupProg.pdf**.

Il semble que l'AMS ait demandé des fonds de la National Science Foundation pour financer une partie des déplacements des mathématiciens des É-U au CIM. Formulaires : **www.ams.org/careers-edu/icmapp.html**

Envoyez les formulaires remplis à l'AMS au plus tard le 31 octobre 2005. Je ne connais pas de source de financement canadienne destinée précisément à couvrir les déplacements au CIM, à part, les Subventions à la découverte du CRSNG. Des congrès satellites se tiendront également avant et après le CIM. Détails : **www.icm2006.org/satelliteactivities/acceptedapplications**.

Vous savez sans doute que la médaille Fields et le prix Nevanlinna sont décernés à l'occasion de l'ICM. Cette année, on remettra en outre à l'ICM2006 le premier prix Gauss. Ce prix vise à « souligner la contribution de scientifiques dont la recherche en mathématiques a engendré des applications pratiques à l'extérieur du milieu des mathématiques ou des réalisations qui ont rendu possible l'application innovatrice de méthodes mathématiques à l'extérieur du milieu des mathématiques, par exemple à l'aide de nouvelles techniques de modélisation, ou encore la création ou l'application d'algorithmes ». Il me paraît approprié de mettre en lumière quelques-uns des nouveaux thèmes en théorie des nombres qui retiendront l'attention au CIM. Les choix ci-dessous témoignent bien sûr de mes intérêts personnels. Il faut mentionner avant tout la dernière percée effectuée par Goldston, Pintz et Yildirim à propos des écarts entre les nombres premiers consécutifs. Si p_n représente le $n$ième nombre premier, ils ont montré que :

$$\Delta := \liminf_{n\to\infty} \frac{p_{n+1} - p_n}{\log p_n} = 0.$$

Remarquez que s'il existe un nombre infini de nombres premiers jumeaux (nombres premiers p_n où $p_{n+1}-p_n = 2$), alors cela est pratiquement vrai. Toutefois, l'existence d'un nombre infini de nombres premiers jumeaux est un problème célèbre toujours non résolu. Le résultat ci-dessus représente une percée importante vers cette conjecture, ce qui explique en partie l'engouement qu'elle suscite. Le meilleur résultat obtenu à ce jour ($\Delta \leq 0.2486$) était attribué à Helmut Maier en 1986. Le fait que $\Delta \leq 1$ est une conséquence simple du théorème des nombres premiers. Dans un article paru récemment, Goldston, Motohashi, Pintz et Yildirim proposent une méthode viable d'attaquer le problème classique des nombres premiers jumeaux. Fait intéressant, il aurait été théoriquement possible d'obtenir un tel résultat il y a trente ans puisque tous les outils existaient déjà.

Dans le milieu scientifique plus étendu, l'un des nouveaux motifs est une vaste synthèse des mathématiques et de la physique. Il est bien connu que des disciplines comme la géométrie différentielle, [ODE and PDE theory], la théorie des groupes, la théorie des représentations, l'algèbre des opérateurs, l'analyse fonctionnelle, la topologie algébrique et même la géométrie algébrique (avec la création de la théorie des cordes) ont joué des rôles importants en physique au 20e siècle. Ce qui est surprenant, c'est que la théorie des nombres jouera un rôle fondamental dans la physique du 21e siècle.

Pour faire une longue histoire courte, il faudrait peut-être commencer par les diagrammes de Feynman. Il s'agit essentiellement de « graphes orientés » sans boucle, avec un nombre fini de sommets et de côtés (et de « demi-côtés », un demi-côté étant le côté qui est incident with un seul sommet du graphe). On dessine généralement ces diagrammes en $\mathbb{R}^4$, et ils servent à illustrer des interactions entre les particules atomiques. À chaque diagramme de la sorte, Feynman a associé une intégrale (souvent divergente); ces tentatives de convergence sont appelées « renormalisations ».

Dans un ouvrage fascinant intitulé Knots and Feynman Diagrams, Dirk Kreimer établit des rapports entre l'algèbre de Hopf et ce processus de renormalisation. Il en ressort un lien étonnant avec la théorie des nombres. Plus précisément, les valeurs zêta multiples

$$\zeta(k_1, ..., k_r) := \sum_{n_1 > n_2 > \ldots > n_r \geq 1} \frac{1}{n_1^{k_1} n_2^{k_2} \ldots n_r^{k_r}},$$

où $k_1 > 1$ et $k_2, ..., k_r \geq 1$, constituent le lien entre les deux. L'étude de ces valeurs ouvre un nouveau chapitre des mathématiques qui implique la géométrie algébrique et la théorie des nombres. Voilà qui pourrait éclairer la conjecture populaire selon laquelle les valeurs spéciales de la fonction zêta de Riemann, $\zeta(3)$, $\zeta(5)$, $\zeta(7)$, ... sont transcendantes et algébriquement indépendantes.

À ce sujet, je vous suggère un article de Pierre Cartier intitulé « A mad day's work: from Grothendieck to Connes and Kontsevich. The evolution of concepts of space and symmetry » (publié dans le *bulletin de l'American Mathematical Society*, 38 (2001), no 4, 389-408, ou en version originale française, « Grothendieck et les motifs », *IHES Report*, (2000), où l'auteur conjecture l'existence d'un « groupe de Galois cosmique ».

Bien d'autres thèmes liés à la théorie des nombres comme la théorie des matrices aléatoires, la symétrie bilatérale et ses liens avec les formes modulaires, la [class field theory] et le rôle du groupe de Galois motivique dans la physique moderne, que nous n'avons même pas eu le temps d'aborder, même brièvement. Il ne fait aucun doute que ces sujets seront traités plus à fond au CIM 2006.

CALL FOR NOMINATIONS - 2006 DOCTORAL PRIZE
APPEL DE MISES EN CANDIDATURE - PRIX DE DOCTORAT 2006

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

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

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

Candidatures
Les candidats doivent être nommés par leur université; la personne qui propose un candidat doit se charger de regrouper les documents décrits aux paragraphes suivants et de faire parvenir la candidature à l'adresse ci-dessous. Aucune université ne peut nommer plus d'un candidat. Les candidatures doivent parvenir à la SMC au plus tard le **31 janvier 2006**.

Le dossier sera constitué des documents suivants :

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

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

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

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

Nominations
Candidates must be nominated by their university and the nominator is responsible for preparing the documentation described below, and submitting the nomination to the address below.
No university may nominate more than one candidate and the deadline for the receipt of nominations is **January 31, 2006**.

The documentation shall consist of:

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

Président du Comité de sélection du Prix de doctorat
Chair, Doctoral Prize Selection Committee
Société mathématique du Canada / Canadian Mathematical Society
577 King Edward
Ottawa, Ontario Canada K1N 6N5

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

Call for Sessions - Propositions de sessions

Additional self-supported sessions play an important role in the success of our meetings. The CMS welcomes and invites proposals for self-supported sessions for this meeting (December 9-11, 2006) at the Sheraton Centre, Toronto. Proposals should include a brief description of the focus and purpose of the session, a tentative list of speakers, as well as the organizer's name, complete address, telephone number, e-mail address, etc. These additional sessions will be incorporated with the other sessions in time blocks allocated by the Meeting Director. All sessions will be advertised in the *CMS Notes*, on the web sites and, if possible, in the Notices of the AMS and in publications of other societies. Speakers in these additional sessions will be requested to submit abstracts which will be published on the web site and in the meeting programme. Those wishing to organize a session should send a proposal to the Meeting Director by the deadline below.

Les sessions complémentaires autonomes jouent un rôle important dans le succès de nos Réunions. La SMC vous invite à proposer des sessions autonomes pour son congrès qui se tiendra au Sheraton Centre, Toronto (du 9 au 11 décembre 2006). Toute proposition doit inclure une brève description de l'orientation et des objectifs de la session, une liste des conférenciers possibles ainsi que le nom, l'adresse complète, le numéro de téléphone, le courriel et autres coordonnées de l'organisateur. Ces sessions complémentaires seront intégrées aux autres sessions du programme, dans des cases horaires prévues à cet effet par le directeur de la Réunion. Toutes les sessions seront annoncées dans les *Notes de la SMC*, sur le site web et, si possible, dans le bulletin de l'AMS et les publications d'autres sociétés. Les conférenciers de ces sessions complémentaires devront présenter un résumé qui sera publié sur le site web et dans le programme de la Réunion. Toute personne qui souhaiterait organiser une session est priée de faire parvenir une proposition au directeur de la Réunion avant la date limite ci-dessous.

In addition to various plenary and prize lectures, the following sessions will be taking place:
Aux différentes conférences plénières et de prix s'ajouteront les sessions suivantes:

Calabi-Yau Varieties and Mirror Symmetry
Variétés de Calabi-Yau et symétrie miroir
Org: James Lewis (Alberta), Noriko Yui (Queen's)

Commutative Algebra and Algebraic Geometry
Algèbre commutative et géométrie algébrique
Org: Ragnar Buchweitz (Toronto), Graham Lueschke (Syracuse), Greg Smith (Queen's)

Complexity and Computability in Analysis, Geometry, and Dynamics
Complexité et calculabilité en analyse, géométrie et dynamique
Org: Alex Nabutovsky, Michael Yampolsky (Toronto)

Differentiable Dynamics and Smooth Ergodic Theory
Dynamique différentiable et théorie ergodique lisse
Org: Giovanni Forni, Konstantin Khanin (Toronto)

Nonlinear Schrödinger Equations
Équations de Schrödinger non linéaires
Org: James Colliander, Robert Jerrard (Toronto)

Poisson Geometry and Mathematical Physics
Géométrie de Poisson et physique mathématique
Org: Eckhard Meinrenken (Toronto)

Probability Theory and Operator Algebras
Théorie des probabilités et algèbres d'opérateurs
Org: Matthias Neufang (Carleton), Balint Virag (Toronto)

Deadline: December 21, 2005
Date limite : 21 décembre 2005

Meeting Director / Directeur de la réunion:
Ian Graham
CMS Winter 2006 Meeting
Department of Mathematics - University of Toronto
40 St. George Street, Toronto, ON M5S 2E4
graham@math.toronto.edu

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

EMPLOYMENT OPPORTUNITIES

UNIVERSITY OF TORONTO - DEPARTMENT OF MATHEMATICS
Tenure Stream Assistant Professorships

The department anticipates having a number of tenure-stream Assistant Professorships over the next several years. Applicants must demonstrate excellent accomplishments and outstanding promise in research and strong commitment to graduate and undergraduate teaching. Preference will be given to researchers in the areas of Analysis (Code: ANA), Algebra (Code: ALG), Geometric Analysis (Code: GAN), and Applied Mathematics (Code: AM). However, exceptional candidates in all fields of pure or applied mathematics are encouraged to apply (Code: OTHER).

Application material must include the candidate's Curriculum Vitae and list of publications. Applicants must arrange to have four letters of reference, of which at least one letter primarily addresses the candidate's teaching, sent directly to the appointments committee. Candidates are encouraged to send a cover letter specifying the code of the most relevant of the above areas and specifying whether the candidate is a Canadian citizen/permanent resident. Candidates are also encouraged to send a research statement, a teaching statement, and the AMS cover sheet. Application material should be sent to the **Appointments Committee, Department of Mathematics, University of Toronto, 40 St.George Street Room 6290, Toronto Ontario M5S 2E4, Canada**. Preference will be given to applications received by **November 15, 2005**.

The University of Toronto offers the opportunity to teach, conduct research, and live in one of the most diverse cities in the world. The University of Toronto is strongly committed to diversity within its community and especially welcomes applicants from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversification of ideas.

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

UNIVERSITY OF TORONTO - DEPARTMENT OF MATHEMATICS
Ted Mossman Chair in Mathematics

Thanks to a generous gift from James Mossman, the Department of Mathematics, University of Toronto, is proud to announce a search for the Ted Mossman Chair in Mathematics. The appointment is at the level of Professor with tenure, and the Chair holder is expected to be an outstanding mathematician, whose research and teaching will make a major contribution to the quality and stature of the department. The appointment is effective July 1, 2006.

Applicants should send a complete Curriculum Vitae and a short statement about their research program and arrange to have four letters of reference sent to the **Ted Mossman Search Committee, Department of Mathematics, University of Toronto, 40 St. George Street Room 6290, Toronto, Ontario M5S 2E4, Canada**. Preference will be given to applications received by **January 1, 2006**.

The University of Toronto offers the opportunity to teach, conduct research, and live in one of the most diverse cities in the world, and is strongly committed to diversity within its community. The University especially welcomes applications from minority candidates and others who may add to the further diversification of ideas.

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

UNIVERSITY OF TORONTO - DEPARTMENT OF MATHEMATICS
Limited Term Assistant Professorships

The department invites applications for Limited Term Assistant Professorships (non tenure stream) at the St.George and Mississauga campuses. Applicants must demonstrate strength in teaching and significant research promise. Application material must include the candidate's Curriculum Vitae and list of publications. Applicants must arrange to have four letters of reference, of which at least one letter primarily addresses the candidate's teaching, sent directly to the appointments committee. Candidates are encouraged to send a cover letter specifying that they are applying for a CLTA position and specifying whether the candidate is a Canadian citizen/permanent resident. Candidates are also encouraged to send a research statement, a teaching statement, and the AMS cover sheet. Application material should be sent to the **Appointments Committee, Department of Mathematics, University of Toronto, 40 St.George Street Room 6290, Toronto Ontario M5S 2E4, Canada**. Preference will be given to applications received by December 15, 2005.

The University of Toronto offers the opportunity to teach, conduct research, and live in one of the most diverse cities in the world. The University of Toronto is strongly committed to diversity within its community and especially welcomes applicants from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversification of ideas.

The appointments are effective July 1, 2006 and are contractually-limited term appointments for a term of three years. All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

EMPLOYMENT OPPORTUNITIES

MCMASTER UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS Britton Postdoctoral Fellowships

Applications are invited for the Britton Postdoctoral Fellowship in the Department of Mathematics and Statistics at McMaster University named after our former colleague Dr. Ronald F. Britton. This fellowship provides an opportunity to spend up to three years engaged in research, with a limited amount of teaching, and are particularly suitable for talented young mathematicians who have recently completed the Ph.D. To learn more about the department, please visit **www.math.mcmaster.ca.**

The Fellowship is open to candidates of any nationality and selection will be based upon the candidate's research potential. Research areas of particular interest include Geometry and Topology of Manifolds, Gauge Theory, and Group Actions. The fellowship normally starts July 1, 2006 and the annual stipend is $42,000 plus a $5,000 grant for research expenses.

Candidates are required to apply for these fellowships by using the MathJobs website by **January 3, 2006**. See our application at **www.mathjobs.org/**...

Applicants should provide at least three letters of recommendation. At least one of these letters should report on the candidate's teaching abilities. Preferably these letters will be submitted through the MathJobs website (see above); they may also be sent directly to either **Dr. Bradd Hart, Chair, or Dr. Ian Hambleton, Britton Professor of Mathematics, c/o Britton Postdoctoral Fellowship Applications, Department of Mathematics and Statistics, McMaster University, Hamilton, ON L8S 4K1, Canada**.

We appreciate all replies to this advertisement but applications will not be acknowledged. McMaster is committed to Employment Equity and encourages applications from all qualified candidates, including aboriginal peoples, persons with disabilities, members of visible minorities and women.

MCMASTER UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS Canada Research Chair Postdoctoral Fellowship

Applications are invited for the Canada Research Chair Postdoctoral Fellowship in the Department of Mathematics and Statistics at McMaster University. This fellowship provides opportunities to spend up to three years engaged in research, with a limited amount of teaching, and is particularly suitable for talented young mathematicians who have recently completed the Ph.D. To learn more about the department, please visit **www.math.mcmaster.ca**

The Fellowship is open to candidates of any nationality and selection will be based upon the candidate's research potential. Fellowship holders will work under the supervision of Dr. Walter Craig, a holder of a Canada Research Chair in Mathematics at McMaster University.

Research areas of particular interest include analysis, partial differential equations, Hamiltonian dynamical systems and applied mathematics. The fellowship normally starts July 1, 2006 and the annual stipend is $42,000 plus a $5,000 grant for research expenses.

Candidates are required to apply for these fellowships by using the MathJobs website by **January 3, 2006**. See our application at **www.mathjobs.org/**...

Applicants should provide at least three letters of recommendation. At least one of these letters should report on the candidate's teaching abilities. Preferably these letters will be submitted through the MathJobs website (see above); they may also be sent directly to either **Dr. Bradd Hart, Chair, or Dr. Walter Craig, c/o CRC Postdoctoral Fellowship Applications, Department of Mathematics and Statistics, McMaster University, Hamilton, ON L8S 4K1, Canada**.

We appreciate all replies to this advertisement but applications will not be acknowledged. McMaster is committed to Employment Equity and encourages applications from all qualified candidates, including aboriginal peoples, persons with disabilities, members of visible minorities and women.

EMPLOYMENT OPPORTUNITIES

MCMASTER UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS
Postdoctoral Fellowship

Applications are invited for postdoctoral fellowship positions in the Department of Mathematics and Statistics at McMaster University. These fellowships provide an opportunity to spend either two or three years engaged in research, depending on funding and the needs of different research groups, with a limited amount of teaching. These positions are particularly suitable for talented young mathematicians who have recently completed the Ph.D. degree. To learn more about the department, please visit **www.math.mcmaster.ca**.

The fellowships are open to candidates of any nationality and selection will be based upon the candidate's research potential. The fellowship normally starts July 1, 2006 and the annual stipend is $40,000 plus a $2,000 grant for research expenses.

Candidates are required to apply for these fellowships by using the MathJobs website by **January 3, 2006**. See our application at **www.mathjobs.org/**...

Applicants should provide at least three letters of recommendation. At least one of these letters should report on the candidate's teaching abilities. Preferably these letters will be submitted through the MathJobs website (see above); they may also be sent directly to **Dr. Bradd Hart, Chair, c/o Postdoctoral Fellowship Applications, Department of Mathematics and Statistics, McMaster University, Hamilton, ON L8S 4K1, Canada**.

We appreciate all replies to this advertisement but applications will not be acknowledged. McMaster is committed to Employment Equity and encourages applications from all qualified candidates, including aboriginal peoples, persons with disabilities, members of visible minorities and women.

QUEEN'S UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS
Tenure-track position in Mathematics and Engineering

The Department of Mathematics and Statistics invites applications for a **tenure-track position** in **Mathematics and Engineering** to commence July 1, 2006. The appointment will be at the Assistant Professor level, but exceptional candidates may be appointed at the Associate Professor level. Salary will be commensurate with qualifications.

Mathematics and Engineering is an interdisciplinary applied mathematics program. The Department has strong research groups in communications and information theory, and in control, dynamics and mechanics, and we plan to expand the faculty complement in these areas. The Department also has interests in other areas including partial or applied differential equations, large scale scientific computation, computer security, and statistical data analysis. Candidates must have a strong research record and the ability to develop an independent research programme.

Candidates must have a Ph.D. in applied mathematics, electrical, mechanical or chemical engineering, computer science, statistics or a closely related field. Membership or eligibility for membership in a Canadian professional engineering association is required, which normally requires an undergraduate engineering degree. Candidates should offer evidence of ability to provide first-rate instruction in a range of applied mathematics or statistics courses and supervise graduate students. Decisions will be made on the basis of demonstrated research and teaching excellence, complementarily of research interests with existing strengths, and potential for collegial service. To quickly establish the research programme, the Department normally offers some teaching release in the first year of the appointment.

Interested candidates should send a curriculum vitae, descriptions of teaching and research interests, at least four letters of recommendation, and copies of their three most significant publications, to the address below, before **December 15, 2005**. At least one letter should comment on the candidate's teaching. More details are available at **www.mast.queensu.ca/positions/**

Dr. Leslie G. Roberts, Associate Head
Department of Mathematics and Statistics
Queen's University
Kingston, Ontario K7L 3N6
fax: (613)533-2964
e-mail: **position@mast.queensu.ca**
www.mast.queensu.ca

All qualified candidates are encouraged to apply; however Canadians and permanent residents will be given priority. The University invites applications from all qualified individuals. Queen's is committed to employment equity and diversity in the workplace and welcomes applications from women, visible minorities, aboriginal people, persons with disabilities and persons of any sexual orientation or gender identity. The academic staff at Queen's University are governed by a collective agreement, the details of which are posted at **www.queensu.ca/qufa.**

EMPLOYMENT OPPORTUNITIES

UNIVERSITY OF VICTORIA - DEPARTMENT OF MATHEMATICS AND STATISTICS
Tenure-track position in Mathematics

The Department of Mathematics and Statistics at the University of Victoria invites applications for a tenure-track position in the area of Applied Mathematics, at the Assistant Professor level, to commence on 1 July, 2006.

Applicants must have a Ph.D. in Applied Mathematics, or a related discipline, and have an outstanding research record. Excellence, or the demonstrated potential for excellence, in teaching mathematics is required. The successful applicant must be able to interact in a research capacity with the Applied Mathematics Group and other interdisciplinary groups throughout the university. S/he must be able to supervise undergraduate students, graduate students and post-docs, and be prepared to be involved with activities of the Department.

We are interested in candidates whose main are of research is one of the following: Differential Equations, Mathematics of Finance, Numerical Analysis and Scientific Computing, Optimization and Operations Research, Stochastic Processes, Stochastic Financial Modelling and Actuarial Science.

Information about the Department, including descriptions of courses offered and research areas of the Applied Mathematics Group, can be found at the website: **http://www.math.uvic.ca/**

Applicants should submit curriculum vitae, a teaching dossier or equivalent documentation that outlines their teaching experience and effectiveness, and arrange for three confidential letters of reference to be sent. Applications should be directed to:

Chair, Department of Mathematics and Statistics
University of Victoria
PO Box 3045 STN CSC
Victoria, B.C. V8W 3P4 CANADA
Telephone: (250) 721-7436 FAX: (250) 721-8962
E-mail: **apldcomp@math.uvic.ca**

The closing date for applications is **January 3, 2006**.

The University of Victoria is an equity employer and encourages applications from women, persons with disabilities, visible minorities, aboriginal peoples, people of all sexual orientations and genders, and others who may contribute to the further diversification of the University.

All qualified candidates are encouraged to apply; however, in accordance with Canadian immigration requirements, Canadians and permanent residents will be given priority.

UNIVERSITY OF VICTORIA - DEPARTMENT OF MATHEMATICS AND STATISTICS
Tenure-track position in Mathematics

The Department of Mathematics and Statistics at the University of Victoria invites applications for a tenure-track position in the area of Pure Mathematics, at the Assistant Professor level, to commence on 1 July, 2006.

Applicants must have a Ph.D. in Mathematics and have an outstanding research record. Excellence, or the demonstrated potential for excellence, in teaching mathematics is required. The successful applicant must also be able to supervise undergraduate students, graduate students and post-docs, and be prepared to be involved with activities of the Department.

Excellent candidates in all areas of Pure Mathematics are strongly encouraged to apply. We are particularly interested in candidates whose main area of research is algebra, geometry, number theory or topology.

Information about the Department, including descriptions of courses offered and research areas of the Pure Mathematics Group, can be found at the website: http://www.math.uvic.ca/

Applicants should submit curriculum vitae, a teaching dossier or equivalent documentation that outlines their teaching experience and effectiveness, and arrange for three confidential letters of reference to be sent. Applications should be directed to:

Chair, Department of Mathematics and Statistics
University of Victoria
PO Box 3045 STN CSC
Victoria, B.C. V8W 3P4, CANADA
Telephone: (250) 721-7436 FAX: (250) 721-8962
E-mail: **purecomp@math.uvic.ca**

The closing date for applications is **January 3, 2006**.

The University of Victoria is an equity employer and encourages applications from women, persons with disabilities, visible minorities, aboriginal peoples, people of all sexual orientations and genders, and others who may contribute to the further diversification of the University.
All qualified candidates are encouraged to apply; however, in accordance with Canadian immigration requirements, Canadians and permanent residents will be given priority.

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

NOVEMBER 2005 NOVEMBRE

3-7 2nd Workshop on Tutte Polynomials and Applications, Centre de Recerca Matematica, (Bellaterra, Spain) **www.crm.es/**

4-6 Geometric and Probabilistic Methods in Group Theory and Dynamical Systems (Texas A&M University, College Station, TX)
www.math.tmu.edu/~sunik/05tamu

4-6 Atelier sur l<analyse des dur/es de vie, Workshop on Survival Analysis (Centre de recherches mathématiques, Montréal, Québec)
activites@crm.umontreal.ca

7-9 19th Midwest Conference on Combinatorics, Crytography and Computing (Rochester Institute of Technology, Rochester, NY)
www.math.rit.edu/~cvlsma/MCCCC/

14-15 Prarie Analysis Seminar 2005 (Kansas State University, Manhatten, KS)
www.math.ksu.edu/pas/2005/prarie05-index.html

17-21 Nonlinear parabolic Problems (Helsinki, Finland)
www.math.helsinki.fi/research/FMSvisitor0506

18-20 Conférence sur la théorie de l'homotopie soulignant le 60e anniversaire de Joe Neisendorfer, Homotopy Theory conference in honor of Joe Neisendorfer's 60th birthday (Centre de recherches mathématiques, Montréal, Québec)
www.crm.umontreal.ca/homotopy05

18-22 Renormalization and Universality in Mathematical Physics (Fields Institute, Toronto)
www.fields.utoronto.ca/programs/scientific/05-06/

29-30 Opening Conference, Heilbronn Institute for Mathematical Research (University of Bristol, UK)
www.maths.bris.ac.uk/heilbronn/heilbronn.html

28-Dec.3 International Conference on Operator Algebras and their Connections to Mathematical Physics (University Hassan I, Settat, Morocco)
www.math.uni-muenster.de/math/inst/reine/cuntz/icoamp/

29-Dec.3 Renormalization in Dynamical Systems (Fields Institute, Toronto)
www.fields.utoronto.ca/programs/scientific/05-06/

DECEMBER 2005 DÉCEMBRE

10-12 **CMS Winter 2005 Meeting / Réunion d'hiver 2005 de la SMC (Victoria Conference Centre)** **www.cms.math.ca/Events**

12-15 Second International Conference on Technology, Knowledge and Society (Hyderabad, India) **www.technology-conference.com**

12-16 Atelier sur l'intersection arithmetique de cycles et formes modulaires, Workshop on Arithmetic Intersection of Cycles and Modular Forms (Centre de recherches mathematiques, Montréal, Québec)
www.crm.umontreal.ca/Intersection05

14-18 First Joint International Meeting between AMS and the Taiwanese Mathematical Society, Tung-Hai University (Taichung, Taiwan)
www.ams.org/amsmtgs/internmtgs.html

16-18 8th WSEAS Conference on Applied Mathematics (Tenerife, Spain)
www.wseas.org/

JANUARY 2006 JANVIER

3-7 Moduli spaces of knots - AIM Research Conference Center (Palo Alto, CA)
www.aimath.org/ARCC/workshops/spaceofknots.html

5-9 Partially Hyperbolic Dynamics, Laminations, & Teichmuller Flow (Fields Institute, Toronto)
www.fields.utoronto.ca/programs/scientific/05-06/

JANUARY 2006 JANVIER

9-11 Distinguished Lecture Series: Gregory Margulis (Yale) (Fields Institute, Toronto)
www.fields.utoronto.ca/programs/scientific/05-06/

13-15 2006 Workshop on Combinatorial Inverse Systems
www.fields.utoronto.ca/programs/scientific/05-06/coin-variants/

12-15 Joint Mathematical Meetings, AMS, AWM. SIAM etc, Henry B. Gonzalez Center (San Antonio, Texas) **www.ams.org/amsmtgs/sectional.html**

22-24 ACM-SIAM Symposium on Discrete Algorithms (Miami, Florida)
www.siam.org/meetings/calendar.php

30-Feb.3 Mathematics-in-Study Group 2005 (Massey University, Auckland, New Zealand)
http://misg2006.massey.ac.nz/

30-Feb.3 The Cacetta-Haggkvist conjecture in Graph Theory - AIM Research Conference Center (Palo Alto, CA)
www.aimath.org/ARCC/workshops/cacetta.html

FEBRUARY 2006 FÉVRIER

13-18 L-functions and Related Themes (CRM, Montreal, Quebec)
www.crm.umontreal.ca/Number2005/

20-24 p-Adic Representations, Modularity, and beyond
AIM Research Conference Center (Palo Alto, CA)
www.aimath.org/ARCC/workshops/padicmodularity.html

MARCH 2006 MARS

7-11 Holomorphic Dynamics, in Celebration of John Milnor's 75th Birthday (Fields Institute, Toronto)
www.fields.utoronto.ca/programs/scientific/05-06/

13-17 Anatomy of Integers (CRM, Montreal, Quebec)
www.crm.umontreal.ca/Number2005/

13-17 International Congress on the Applications of Mathematics (in co-operation with SIAM) (Santiago, Chile) **www.siam.org/meetings/calendar.php**

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/

MAY 2006 MAI

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

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

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/

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

JUNE	2006	JUIN
3-5	**CMS Summer 2006 Meeting - Réunion d'été 2006 de la SMC Westin Hotel, Calgary AB www.cms.math.ca/events**	
25-28	2006 SIAM Conference on Discrete Mathematics (Victoria, B.C.) www.siam.org/meetings/calendar.php	
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
10-14	SIAM Annual Meeting (Boston, MA) www.siam.org/meetings/calendar.php	

AUGUST	2006	AOÛT
2-6	Eighth IMS North American New Researchers Conference (Minneapolis,Minnesota) galin@stat.umn.edu	
12-20	Methods of Integrable Systems in Geometry: An LMS Durham Research Symposium, Satellite to ICM 2006 (University of Durham, UK) www.icm2006.org	

AUGUST	2006	AOÛT
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	
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	

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	

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**	

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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

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Full page / page complète	245.00	460.00	615.00
3/4 page	225.00	425.00	565.00
1/2 page	150.00	280.00	375.00
1/4 page	90.00	170.00	260.00
Back cover	310.00	580.00	225.00
Inserts	185.00	345.00	460.00

For more than 4 pages, or for the printing and inserting of camera ready material, please send a sample to the CMS Notes for a quote. Surcharges apply for prime locations - contact notes-ads@cms.math.ca Subscription to the Notes is included with the CMS membership. For non-CMS members, the subscription rate is $50 (CDN) for subscribers with Canadian addresses and $50 (US) for subscribers with non-Canadian addresses.

Pour plus de 4 pages, ou pour l'impression et l'inclusion d'une copie prête à la reproduction, veuillez envoyer un exemple aux Notes de la SMC afin d'obtenir un estimé. Des suppléments sont applicables pour des places de choix - communiquer avec notes-ads@cms.math.ca. L'adhesion à la SMC comprend l'abonnement aux Notes de la SMC. Le tarif d'abonnement pour les non-membres est de 50 $ (CDN) si l'adresse de l'abonné est au Canada et de 50 $ (US) si l'adresse est à l'étranger.

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