CMS NOTES de la SMC

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MESSAGE FROM THE PRESIDENT-ELECT

Dr. Tom Salisbury
The Fields Institute

This is my first column for the *CMS Notes* as President-elect of the CMS, becoming President in July 2006. As the body that represents and works for mathematicians across the country and speaks for mathematics to government and the public, the CMS is an important organization for all of us. July will also be when I end my term as deputy-director of the Fields Institute, another organization that has become important to mathematicians in Canada. So I thought I would take this opportunity to discuss the changes the three Canadian mathematics institutes have made to the way mathematics is done in Canada.

The three principal Canadian mathematics institutes are le Centre de recherches mathématiques (CRM), in Montreal; the Fields Institute in Toronto; and the Pacific Institute for the Mathematical Sciences (PIMS), distributed across British Columbia, Alberta, and Washington State but with headquarters in Vancouver. They are part of an international phenomenon, namely the rise of national institutes where mathematicians gather for limited periods of time to work intensively on common problems. Such institutes have grown up in many countries over the last 20 years and now form a loose confederation (for lists, google IMSI - International Mathematical Sciences Institutes). This success is made even more striking by its uniqueness: mathematics is the only discipline in which this model has been so universally adopted, and even the closest analogues lie in very mathematical disciplines such as statistics (eg SAMSI) and theoretical physics (eg CITA). Much more common in other disciplines is the model of an institute with permanent research faculty and a smaller number of visitors. Those institutes have a long and distinguished history in mathematics as well - IAS in Princeton being one famous example. But many institutes now adhere to an increasingly familiar pattern of visitors and postdocs in residence during periods of concentration on specific themes. There are of course many variations on this pattern, and indeed, each of the three Canadian mathematics institutes structures its programs in unique ways. Mathematicians may be keenly aware of the differences, but people outside the discipline are most struck by what they have in common.

To what do we owe this development? Even a casual look at *Mathematical Reviews* will show how much more collaborative mathematics is now than 40 years ago. Far from the stereotype of the solitary mathematician working alone in a corner, multi-authored papers are now the norm. In large part this is because TeX and the internet have made long-distance collaboration vastly simpler. But the institutes contribute too, by providing points of focus and intensity around which many of these collaborations start and blossom. The increasingly collaborative nature of mathematics is one reason the institutes have flourished. Another is the mobility of mathematicians - the discipline does not routinely tie its researchers to labs or clinics or even specific locations, leaving many of us free to visit institutes running programs central to our work. By bringing a critical mass of researchers together and shining a bright light on well chosen areas of mathematics, the institutes attempt to move particular fields forward by quantum leaps. At the same time, they expose local mathematicians to the leaders in a field, and vice versa. Their extensive postdoc programs are now an important source of training for young researchers. The networks of researchers they create will continue to collaborate long after they leave

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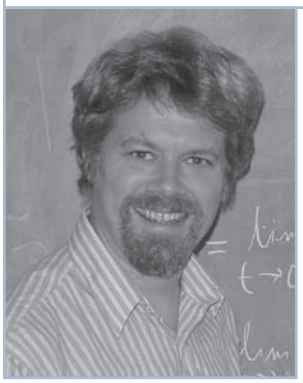
EDITORIAL

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



SPECULATIONS, AFTER KATRINA

This August, the world watched in shock as Hurricane Katrina hit the American Gulf Coast, devastating many communities. In New Orleans, in particular, the already almost unimaginable damage of a Category 4 hurricane became a disaster of historical proportions when the levees and pumping systems failed, putting most of the city under water, and leading to shortages of food, drinking water, and medicine, and a near-breakdown of civil order. Our thoughts are with those who lost loved ones, homes, livelihood, and possessions in this catastrophe.

Many CMS members will remember New Orleans as a popular site for conferences. It is safe to say that it will be many years before it is again the city of those memories; indeed, it does not seem clear whether or not the New Orleans of a month ago will ever be rebuilt. And it seems clear that the effects will spread wider yet.

In the days after the disaster, it was widely noted in the media that a 2001 article in *Scientific American* ("Drowning New Orleans" by Mark Fischetti) had predicted the nature and scale of the disaster with uncanny accuracy. Climate change, destruction of wetlands, building in vulnerable areas: all played a part. The location of vital infrastructures such as oil refineries in the same vulnerable areas ensured repercussions spread across a continent. Perhaps, in retrospect, this will be seen as the week when it became widely understood that the effects of human activity on the environment cannot be ignored and that governments must take such issues seriously - including theoretical predictions.

If so, the twenty-first century may be a period of organized attempts to repair the damage done in the twentieth. Travel might be more expensive and less common; while we would not expect to see the national or international conference disappear as a part of academic life, it is possible that travel on such a scale might require more thought. Perhaps fewer but longer events would become the norm.

In an extreme situation, we might see long-distance travel becoming as rare as it was during the nineteenth century, and public transportation predominating at the local scale. The first of these eventualities could cause serious geographical constraints on research universities, making research more difficult at small and isolated institutions. The second might force some teaching institutions to provide accessible residences or lose students.

Any major social goal is likely to affect the funding of research, and even the employment of researchers. One need only read the biography of any mathematician (or other scientist) working during the Second World War to realize how military needs drove the research scene during those years. However, we are speculating now about a much longer time scale, a struggle measured in decades or generations. Over such a period of time, it would be foolhardy to neglect pure research, even if certain areas of applied research could make a strong claim to first consideration for support. One of the tasks of the mathematical community would be to ensure that this would not be forgotten.

This is not an attempt at prediction. No doubt there are many other possibilities, each with their own implications for both the mathematical community and humanity as a whole. But one lesson we can surely learn from the recent events: change is inevitable, intelligent response essential.

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ÉDITORIAL

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SPÉCULATIONS POST-KATRINA

En août dernier, le monde a assisté en direct aux effets de l'ouragan Katrina, qui a dévasté une partie de la côte américaine du golfe du Mexique. À La Nouvelle Orléans, en particulier, les dégâts quasi inimaginables causés par un ouragan de catégorie 4 ont pris les proportions d'un désastre historique après la rupture des digues et la défaillance du système de pompage qui la protégeaient. Une grande partie de la ville a été inondée, ce qui a causé une pénurie de nourriture, d'eau potable et de médicaments, et entraîné pillages et émeutes dans la ville. Nos pensées accompagnent ceux et celles qui ont perdu des êtres chers, leur maison, leur gagne-pain ou des biens personnels dans cette catastrophe.

Pour bien des membres de la SMC, La Nouvelle-Orléans était une ville de congrès populaire. Je ne crois pas me tromper en affirmant qu'il faudra de nombreuses années avant qu'elle ne regagne sa popularité à cet égard. En effet, personne ne sait vraiment si La Nouvelle-Orléans d'avant sera reconstruite, et il semble clair que les répercussions du désastre se feront sentir encore plus loin qu'on ne le croyait.

Dans les jours qui ont suivi la catastrophe, les médias ont fait grand état d'un article paru en 2001 dans *Scientific American* (« Drowning New Orleans »), dans lequel Mark Fischetti prédisait la nature et l'ampleur du désastre avec une exactitude troublante : changements climatiques, destruction des zones humides, construction dans des zones à risque… Tout y était. L'emplacement d'infrastructures de haute importance, notamment les raffineries de pétrole, dans ces zones vulnérables a fait en sorte que les répercussions s'étalent à l'ensemble du continent. En rétrospective, peut-être que cette semaine-là marquera le début d'une prise de conscience comme quoi il ne faut pas badiner avec les effets de l'activité humaine sur l'environnement, et que les gouvernements doivent prendre ces effets au sérieux, y compris les prévisions théoriques.

Le cas échéant, le XXIe siècle pourrait être une période où l'on tentera au mieux de réparer les dégâts que nous avons causés au siècle précédent. Les déplacements seront peut-être plus chers et moins fréquents. Les congrès nationaux et internationaux, qui ne disparaîtront certainement pas, seront peut-être moins fréquentés et nécessiteront peut-être une réflexion plus approfondie. Les congrès plus longs et moins fréquents deviendront peut-être la norme.

À l'extrême, qui sait si les longs déplacements ne seront pas aussi rares qu'au XIXe siècle, et si les transports publics ne prédomineront pas à l'échelle locale? La première de ces éventualités pourrait imposer de lourdes contraintes géographiques aux universités de recherche, ce qui rendra la recherche plus difficile dans les établissements de petite taille ou éloignés. La seconde éventualité pourrait forcer certains établissements d'enseignement à offrir des résidences abordables sous peine de perdre des étudiants.

Tout objectif social d'envergure pourrait avoir une grande incidence sur le financement de la recherche et même sur l'embauche des chercheurs. Il suffit de lire la biographie d'un mathématicien (ou de tout autre scientifique) qui a travaillé durant la Seconde Guerre mondiale pour s'apercevoir que les besoins militaires ont orienté la recherche durant ces années. Toutefois, nous parlons ici d'une échéance beaucoup plus longue, d'une lutte qui se mesurera en décennies ou en générations. Sur une si longue période, il serait téméraire de négliger la recherche pure, même si certains domaines de la recherche appliquée pourraient attirer une grande partie du financement. L'une des tâches de la communauté mathématique sera de veiller à ce que les bailleurs de fonds n'oublient pas cela.

Toutefois, nous nous gardons bien de faire des prédictions. Les possibilités sont évidemment nombreuses, chacune ayant une incidence différente sur la communauté mathématique et l'humanité tout entière. S'il est une leçon que nous pouvons tirer de cette dernière catastrophe naturelle, c'est que le changement est inévitable et qu'il faut y réagir intelligemment.

NEWS FROM INSTITUTES/SOCIETIES

ASSOCIATION MATHÉMATIQUE DU QUÉBEC

15th of October 2005

48th annual AMQ conference
Montreal, Quebec
Collège Jean-De-Brébeuf

From the 27th to the 31st of May 2006

EMF 2006
(Espace Mathématique Francophone)
Sherbrooke, Quebec
Sherbrooke University

On June 1st 2006

The EMF 2006 is followed by the
49th annual AMQ conference
Sherbrooke, Quebec
Sherbrooke University

`www.mlink.net/~amq/AMQ/`

Three great advantages to being a mathematician:

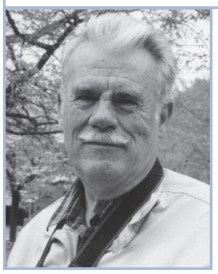
(1) You don't have to be able to spell.

(2) You don't have to be able to add.

(3) You don't have to be able to write legibly.

[from Bluff Your Way in Math by Robert Ainsley]

HELP SUPPORT YOUR SOCIETY!



Arthur Sherk
Treasurer
Trésorier

Graham Wright
Executive Director
Directeur administratif

We welcome this opportunity to comment on new initiatives in the CMS that address financial matters. These initiatives arise in response to a growing concern that our traditional sources of revenue are no longer sufficient to cover the wide array of CMS activities. All of our activities enjoy substantial support from our members and we believe that cutting them is the least desirable option open to us.

In simpler days, the revenue associated with subscriptions to our research journals (the *Canadian Journal of Mathematics* and the *Canadian Mathematical Bulletin*) together with the foreign exchange income associated with such subscriptions, has been sufficient to subsidize other activities not fully supported by fees or grants. In many years, there was even a modest surplus after these needs were taken care of, and this surplus was put into the Endowment Fund.

Recent Operations Budgets, however, have suffered substantial deficits. This was particularly true for the 2004 Budget. Part of the loss in 2004 was unforeseen (we lost about $35,000 in subscription revenue and foreign exchange because of the bankruptcy of one of our periodicals subscription agents). But the more serious problem was foreign exchange losses incurred because of the steady appreciation of the Canadian dollar. Subscription charges for all our periodicals sold outside Canada are in US dollars. The smaller exchange rate has resulted in more than a 20% decrease in the revenues from our research publications. The significantly higher value of the Canadian dollar is likely to continue into the future.

Consideration has been given to other methods of collecting subscription funds and to other currencies. Raising subscriptions and membership fees (which we are doing to some extent) is not sufficient to restore fiscal health. An Ad-hoc Budget Review Committee has been formed and is examining ways in which the 2006 budget can be balanced. "Obvious" solutions, such as reducing programs that run deficits, are under consideration. The better solution, of course, is to somehow find new sources of revenue.

The Ad Hoc Committee has found some savings in a number of Society activities that can be made without seriously damaging the programs involved. These are being implemented as soon as feasible. In themselves, however, these will not be sufficient to solve the problem.

Turning to the possible generation of new revenue, we have the Fund Raising Drive which was approved by the Board of Directors in June and which is under the direction of the President, Eddy Campbell. This campaign will not address all of the budget concerns and such a campaign will take time to implement and for revenues to be realized. Nevertheless, the campaign will seek funds for a number of activities which are currently paid for from operating funds. It is hoped that eventually the campaign will generate some endowed funds for the Education and Research initiatives (like the Jeffrey-Williams Prize, for example).

In combination, the work of the Ad Hoc Committee and the fund-raising campaign is expected to return the Society to financial good health without a substantial reduction of our activities.

We are also appealing to all members to help support the CMS. Some members already make annual donations over and above their fees, as part of their own personal charitable contributions. (Such donations receive a receipt for income tax purposes.) This is a crucial point. Individual member contributions, however small in themselves, are a very important part of any Society's successful appeal to the public for funding. Thus your gifts to the CMS have two positive effects: they support our operations and they strengthen our appeal.

We strongly encourage individual members to adopt a regular annual giving program to the Society.

SUPPORTEZ VOTRE SOCIÉTÉ !

Nous profitons de ces quelques lignes pour commenter les nouvelles mesures prises par la SMC pour remédier à ses difficultés financières. Ces mesures sont devenues nécessaires en raison du manque à gagner entre nos sources de revenu traditionnelles et le large éventail d'activités qu'organise la SMC. Étant donné que nos membres apprécient toutes nos activités, nous estimons qu'une réduction des activités serait la solution la moins souhaitable.

Il fut un temps où les recettes tirées des abonnements à nos revues (le *Journal canadien de mathématiques* et le *Bulletin canadien de mathématiques*) et le taux de change avantageux tiré de la vente d'abonnements à l'étranger suffisaient à financer nos autres activités non payantes ou non subventionnées. Pendant de nombreuses années, il nous restait même un petit surplus une fois ces besoins comblés, et ce surplus a servi à constituer un fonds de dotation.

SUPPORTEZ VOTRE SOCIÉTÉ ! *suite*

Toutefois, les budgets des dernières années ont affiché d'imposants déficits, en particulier le budget de 2004.

Une partie des pertes subies en 2004 était imprévue (nous avons perdu environ 35 000 $ en revenu d'abonnement et en recettes découlant du taux de change suite à la faillite d'une de nos agences d'abonnement). Toutefois, les pertes qui nous ont fait le plus mal sont attribuables à la hausse constante du dollar canadien, qui s'est traduite par une perte de recettes en taux de change. Précisons que les tarifs d'abonnement à l'étranger de tous nos périodiques sont établis en dollars américains. La baisse du taux de change s'est traduite par une chute de plus de 20 % de nos revenus de vente de publications scientifiques. Et l'on s'attend à ce que le dollar canadien demeure fort encore un bon moment.

Nous avons songé à d'autres façons de hausser nos revenus d'abonnement et à la possibilité d'utiliser d'autres devises. Une hausse des tarifs s'abonnement et des droits d'adhésion (que nous appliquons tout de même modérément) ne suffira pas à sortir la Société de son marasme financier. La Société a donc formé un comité spécial d'examen du budget qui étudie justement des façons d'équilibrer le budget de 2006. Les solutions « évidentes », par exemple la réduction des programmes déficitaires, sont à l'étude. La meilleure solution, bien sûr, consiste cependant à trouver de nouvelles sources de revenus.

Le comité spécial a trouvé des façons de réduire les dépenses de certaines activités de la Société sans pour autant les mettre en péril. Ces mesures entreront en vigueur le plus rapidement possible, mais elles ne suffiront pas à résoudre le problème.

Quant à la hausse des recettes, nous comptons notamment sur la campagne de financement, approuvée par le conseil d'administration en juin dernier et sous la direction de notre président, Eddy Campbell. Cette campagne ne réglera pas non plus à elle seule toutes nos difficultés financières. Il faudra en outre un certain temps pour la mettre en branle et pour qu'elle porte ses fruits. Néanmoins, cette campagne rapportera du financement pour un certain nombre d'activités qui, pour l'instant, sont financées à même le budget de fonctionnement. Nous espérons qu'à plus long terme, cette campagne produira des fonds que nous pourrons verser dans un fonds de dotation destiné à l'éducation et à la recherche (pour le prix Jeffrey-Williams par exemple).

Nous espérons que les travaux du comité spécial et la campagne de financement redonneront à la Société sa solidité financière sans qu'il soit nécessaire de réduire nos activités.

Nous incitons également tous nos membres à soutenir la SMC. Outre leurs droits d'adhésion, quelques membres font déjà un don annuel leur donnant droit à un reçu officiel. C'est là un élément important. Les dons de nos membres, malgré leur petite taille en soi, jouent un rôle déterminant lorsque vient le temps de solliciter du financement public. Vos dons à la Société ont donc deux effets positifs : ils financent nos activités et renforcent notre capacité d'obtenir du financement externe.

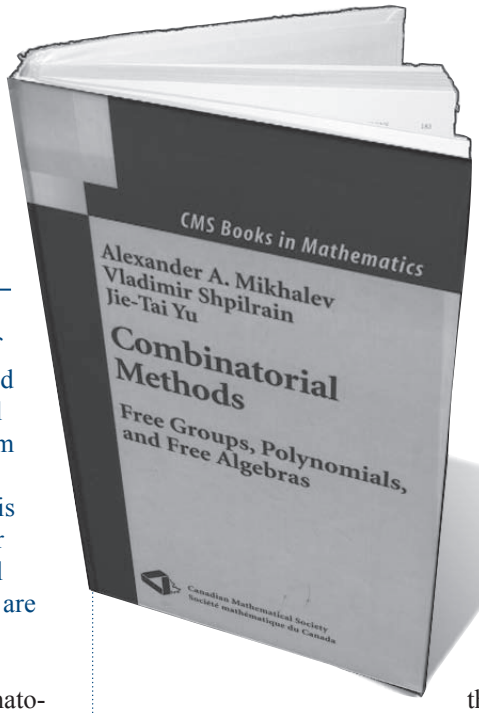
Nous incitons donc tous nos membres à adhérer à un programme de don annuel à la Société.

BOOK REVIEW An Excellent Read

by Kanta Gupta
University of Manitoba

Combinatorial Methods: Free Groups, Polynomials, and Free Algebras

by Alexander A. Mikhalev, Vladimir Shpilrain, and Jie-Tai Yu
CMS Books in Mathematics 19
Springer 2004 xii + 315 pages



This book covers a very wide range of applications of combinatorial methods to algebras and groups. It is divided into three main parts, as the subtitle indicates. The general plan is to begin by introducing problems and methods from combinatorial group theory and later to investigate analogous concepts for various rings and algebras. The emphasis throughout is on combinatorial as opposed to geometric or topological arguments. In the second part there are several references to concepts from algebraic geometry, but these are fully explained.

Part I begins with a relatively brief introduction to combinatorial group theory as applied to free groups, essentially focusing on those tools useful in questions involving automorphisms. Thus, for instance, Whitehead's algorithm for deciding if two elements of a free group are automorphic images of each other is discussed in some detail. Also, free differential calculus is introduced and used for similar applications. Tests for determining if an endomorphism is an automorphism are considered. Test elements (those which if mapped to themselves under an endomorphism signify that the map is an automorphism) are discussed in some detail. (An early example is due to Nielsen: $[x,y]$ in the free group generated by x and y.) Several examples are given as well as an algorithm by Comerford for recognising test elements in free groups. The Jacobian matrix test due to Birman is also discussed. Part 1 ends with a discussion of orbits associated with the actions of the automorphisms of free groups and of various simplifications of Whitehead's algorithm to reduce its running time.

With the notable exception of varieties of groups, which are not mentioned, analogues of many of the above concepts are generalized in Part III to free associative algebras.

The second part, on polynomial algebras, concentrates on six problems or conjectures, with a chapter devoted to each. The first of these, the Jacobian conjecture, considers the consequences of the invertibility of the Jacobian matrix corresponding to two polynomials. This is shown to be equivalent to a "weaker" conjecture, that if the Jacobian matrix corresponding to polynomials p,q in $K[x,y]$ is invertible, then $K[p,q]$ is a retract of $K[x,y]$.

The next problem is Zariski's cancellation conjecture, that if R is a commutative algebra over a field of characteristic 0 and $R[x]$ is isomorphic to $K[x_1,\dots,x_{n+1}]$, then R is isomorphic to $K[x_1,\dots,x_n]$. A proof that this is true for $n = 2,3$ is given. Various spin-offs of the conjecture are considered, and using an example due to Danielewski, varieties V_1, V_2 are constructed which are not isomorphic, but $V_1 \times \mathbb{K}$ and $V_2 \times \mathbb{K}$ are equivalent in $\mathbb{K}$, where $\mathbb{K}$ is the field of complex numbers.

The third problem is that of deciding if all automorphisms of polynomial algebras are tame or stably tame, and, in particular, if an automorphism suggested by Nagata is tame. A recent, as yet unpublished, proof by Shestakov and Umirbaev that it is wild (i.e. not tame) is given. Gröbner bases are also introduced with applications to testing for automorphisms. The chapter concludes with the problem of lifting automorphisms and, in particular, the Nagata automorphism, to a free associative algebra $K\{X\}$. A construction by M. Smith yielding that the Nagata automorphism is stably tame is described. While the problem of lifting the Nagata automorphism in general is open, the authors construct a partial solution.

The fourth problem, the embedding problem, is concerned with the problem of deciding if two isomorphic algebraic varieties in affine space are equivalent under an automorphism of the space. A special case is the embedding conjecture of Abhyankar and Sathaye that if for p in $K[X]$, the dimension of $K[X]/p$ is one less than that of $K[X]$, then p is a coordinate.They begin by constructing a criterion to decide when two polynomials in $C[x,y]$ are connected by an automorphism of $C[x,y]$. Also, a criterion is given for deciding when two polynomial algebras are isomorphic. As an application of their method they construct an irreducible algebraic curve with, for any k, at least k inequivalent embeddings in the 2-dimensional complex plane.

They next give their attention to deciding if two algebraic varieties are isomorphic or equivalent, and give a procedure for constructing isomorphic but inequivalent varieties. Also, they construct an efficient criterion for distinguishing isomorphic but inequivalent hypersurfaces. The chapter concludes with examples of negative solutions to the embedding problem for free associative polynomial algebras of degrees $n > 3$ and a proof that the conjecture is true for $n=2$.

Throughout the preceding chapters detailed and easy to follow explanations for the many connections to algebraic geometry are given. Also, there are numerous examples to

illustrate the various concepts. Although there are many references to geometry, the proofs are mostly algebraic.

They next turn their attention to the problem of recognising coordinate polynomials in $K[x,y]$, that is, polynomials which are part of a basis for $K[x,y]$. An important tool here is the concept of outer rank of a polynomial, that is, the minimal number of generators on which an automorphic image can depend. For the polynomial x, for instance, this is 1. Clearly, a necessary condition for a polynomial to be a coordinate is having outer rank 1. Using Gröbner bases an algorithm is given for deciding if a polynomial p is a coordinate in $K[x,y]$, which also finds q with $K[x,y]=K[p,q]$. For the free associative algebra of rank 2 they construct an algorithm, based on the preceding one, for detecting primitives. Among other necessary conditions they show that primitive elements are palindromic.

The final section of this chapter deals with $K[z]$ automorphisms and coordinates of $K[z][x,y]$, over a field of characteristic 0. A polynomial $p(x,y)$ is a coordinate of $K[z][x,y]$ if x and p are connected with an automorphism and is a tame coordinate if the automorphism is tame. It is shown that p is a tame coordinate if using the Euclidean algorithm, 1 can be obtained from the partial derivatives of p with respect to x and y, and, if this is possible, an algorithm is constructed to produce the corresponding automorphism taking x to p. Also, an algorithm is constructed to determine coordinate polynomials $p(x,y)$ which are not necessarily tame. The automorphism of Nagata considered as an automorphism of $K[z][x,y]$ is shown to be wild, and, more generally, a class of wild automorphisms is constructed.

In the final chapter in this part test elements for $K\{X\}$, the free associative algebra and $K[X]$, the polynomial algebra over a field K of characteristic 0 are constructed. The chapter ends with a list of 10 open problems on test elements.

The title of the third and final part of the book, Free Nielsen-Schreier Algebras, is a bit misleading, since it actually is about free Schreier varieties of algebras (varieties in which subalgebras of relatively free algebras are free) and Nielsen varieties (varieties in which reduced subsets of algebras are independent sets). Most of the topics investigated in this part have their analogues in topics introduced in Part 1 for groups. Almost all the results here are taken from publications of the authors. It begins with a list of the main properties of Schreier varieties. This is followed by analogues of Schreier's techniques and formulas for the ranks of subgroups of free groups, applied to finding the ranks of subalgebras of free associative algebras and Lie algebras. The role of Fox's free differencial calculus to find ranks of subalgebras of free associative algebras is also demonstrated. Algorithms based on Jacobian matrices are constructed for determining if a system of elements is primitive (i.e. can be included in a basis) for free associative algebras and free Lie superalgebras.

This is followed by a chapter on three generalisations of primitive elements, Δ-primitive elements in the sense of Shpilrain, almost primitive elements in the sense of Rosenberger, generic elements in the sense of Stallings. An element of a free group is a Δ-primitive element if its Fox derivatives generate the augmentation ideal as a right ideal in the free group ring. It is shown that if an endomorphism of a free group maps a Δ-primitive element to another, it is an automorphism. An element of a free group is almost primitive if it is not primitive but primitive in any proper subgroup containing it. For any group G and a variety V, an element g in $V(G)$, the verbal subgroup in G defined by V, is V-generic if for any group H and a homomorphism of H to G, the map is surjective if g is the image of an element in $V(G)$. Each of these under certain conditions is shown to yield test elements, and the various connections between these are investigated. In addition, there are examples for all three.

In the following chapter automorphic orbits and properties of primitive elements in free algebras of Schreier varieties are considered. After establishing basic properties of partial derivatives these are applied to the problems of elimination of variables, that is, finding conditions so that a polynomial in n variables can be mapped by an automorphism to one involving fewer variables and to developing an algorithm to determine the rank of a system of elements, that is, among all automorphic images, the minimal number of generators necessary to define the elements. A further application is to construct an algorithm to determine if a system of elements is primitive, that is, can be included in a set of free generators.

An endomorphism α is a retraction if $\alpha^2 = \alpha$, and a retract is the image of a retraction. Turner has shown for groups that test elements are precisely those elements not contained in any proper retract. A proof of the exact analogue for free algebras is next presented. This leads to a test that determines if a subgroup is a retract and to algorithms that determine test elements of free associative algebras and free Lie algebras of rank 2. The chapter ends with several examples of almost primitive elements of free algebras of Schreier varieties and of various free Lie algebras and with a construction for a series of generic elements for free Lie algebras. There is also a characterization of the Δ-primitive elements of free Lie algebras.

The final chapter is on free Leibniz algebras. These are like Lie algebras but with the condition $[x,x]=0$ removed. Varieties of free Leibniz algebras are not Schreier varieties but share some properties. It is shown that the Jacobian test is positive for free Leibniz algebras for deciding that an endomorphism is an automorphism. Also, it is proved that free Leibniz algebras are residually finite. Also, if the ground field of a free Leibniz algebra is constructive, an algorithm is constructed to recognize tame and wild automorphisms.Finally, a wild automorphism of free Leibniz algebra is explicitly exhibited.

continued page 8

BOOK REVIEW Painless Mathematics

S. Swaminathan
Dalhousie University, Halifax, NS

Euclid in the Rainforest, Discovering Universal Truth in Logic and Math

by Joseph Mazur

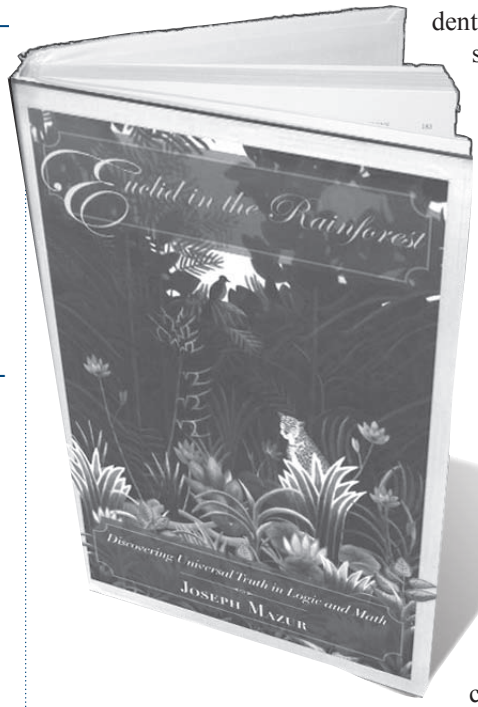
Pi Press, New York 2005 xv + 316 pp.

Mathematics has the reputation of being esoteric -- how often do we hear people say 'math was my worst subject at high school'? Ever since the appearance of Lancelot Hogben's Mathematics for the Million and Courant & Robbins' What is Mathematics, mathematicians who believe not only in the practical importance but also the aesthetic beauty of the subject, and who have the gift of good expression, have written books accessible to the layman. The book under review is one such work.

The author received as gifts for his seventeenth birthday from Barry Mazur, his older brother, two books – Dostoyevsky's *Crime and Punishment* and a textbook on modern algebra. He says that he read the novel in one continuous stretch and expected the second book to be 'as riveting as the first'. But a sentence in the second page that began with the word 'Clearly,' stalled his progress for hours. Working through the book and solving problems he wondered about the relevance of mathematical abstractions to life itself. He found mathematics to be a range of mountains to climb. "Challenges of ascending through the thin air of abstraction only made vistas from the summits more magnificent. With a firm proven foothold on one peak, I could see others beckoning me higher from above misty clouds covering valley paths through the forests of flowering ideas."

Since then, having become a teacher of mathematics and gaining experience over thirty years of teaching, he collected stories of extraordinary students and fellow mathematicians 'trying to reach peaks from the steepest faces. These are stories of excitement and discovery and the confidence of feeling certain about mathematical proofs. 'They are human stories,' he writes, 'ultimately not so removed from the excitement of a Russian novel. I begin to see my brother's inadvertent point.'

In this well-written book Joseph Mazur introduces various topics in mathematics and logic in casual conversational settings which arise naturally during his travels through Venezuelan rainforests, through Mediterranean islands, Greece, Turkey etc. Then, back in New York, following a random group of summer school students of Columbia University, he delves into the subject of probability through discussions with an old professor in a Greenwich Village café. The many characters in the book are persons with whom he interacted in mathematical discussions. He pays tribute to Roger Godement who patiently spent many hours with him on several occasions at the Café Luxembourg in Paris clarifying proofs that he could not understand in modern algebra classes.



With clear exposition Joe Mazur discusses mathematical theorems and their proofs. A beginning student reader of this book will find that he is learning mathematics painlessly as if he is reading a book of stories. Part 1 on Logic contains five chapters which deal with the Pythagorean theorem, Camille Jordan's attempts to prove the simple and obvious truth about a continuous closed curve, logic & its loopholes and the strange worlds of non-Euclidean geometry. Part 2, entitled Infinity, deals with counting, finiteness and infinity, Zeno's paradoxes, irrational numbers, induction and set theory. Part 3, entitled Reality discusses how mathematics reflects the real world, probability, prediction, laws of large numbers, tests for truth, plausible reasoning in science and mathematics.

The book deserves to be assigned as supplementary reading to all undergraduates taking science courses.

BOOK REVIEWS *continued from page 5*

Combinatorial Methods: Free Groups, Polynomials, and Free Algebras

In my personal opinion, the book makes an excellent read. The authors have made a very good effort to making the book quite readable and reasonably self-contained, which should make it generally accessible. The scope of the material also makes it valuable as a reference source. Examples appear throughout as do suggestions for further research in the form of open problems. I can highly recommend it to any student of algebra and, in fact, to anyone doing research in algebra. The extensive bibliography contains 419 entries.

BRIEF BOOK REVIEWS

Peter Fillmore
Dalhousie University, Halifax, NS

The Curious Life of Robert Hooke: The Man Who Measured London

by Lisa Jardine, Harper Collins 2004 ix + 422 pages

Hooke's law is known to all, and his quarrel with Newton over the inverse square law to many, but few of us could say much more about him. Lisa Jardine's account of Robert Hooke's eventful life (1635-1703), "the man who, in the helter-skelter race to make the fundamental discoveries of modern science and technology, always took second place", is an absorbing account of his life and times.

A close contemporary and friend of Robert Boyle, Christopher Wren and Samuel Pepys, Hooke negotiated the shoals of orphanhood, religion and royal preference, to become a skilled experimentalist, architect and surveyer. Indeed, together with Wren, he played a leading role in the reconstruction of London after the great fire of 1666. He was a founding member of the Royal Society (1660) and for many years, as "curator of experiments", was responsible for the design and execution of experiments to investigate questions proposed by the circle of gentlemen who made up the Society. (It is interesting to note that they were preoccupied with the two problems that haunt our own society: money and relevance.) And yet, in spite of these and many other splendid achievements, he died in obscurity, alone and virtually friendless, in misery and ill-health, wealthy and a miser.

Representations of Algebras and Related Topics

Ragnar-Olaf Buchweitz and Helmut Lenzing, editors
Fields Institute Communications 45
AMS 2005 xvii + 396 pages

This volume is the Proceedings of the Tenth International Conference on Representations of Algebras and Related Topics, which took place at the Fields Institute in July and August of 2002 and was dedicated to Vlastamil Dlab to mark his 70th birthday. In addition to the 27 research and survey articles, the editors have provided an appreciation of "Vlasta's" work and an excellent photograph. A companion volume (to be reviewed in these *CMS Notes* at at a later date), containing materials from the instructional and specialized workshops at the conference, appeared as volume 40 in this series (2004).

Experimental Mathematics with Maple

by Franco Vivaldi
Chapman & Hall/CRC Mathematics 2001 xi + 223 pages

This paperback, based on a course offered by the author at the University of London for five years, "contains sufficient material for a one-semester course in experimental mathematics for first-year students in mathematics or computer science". It aims to introduce "the foundations of discrete mathematics while developing basic computational skills. No previous knowledge of computing is assumed." The treatment proceeds from computer experimentation to abstraction, under such topic headings as integers and rationals, sets and functions, sequences, real and complex numbers, polynomials and rational functions, elements of programming, vector spaces and modular arithmetic, with a final 3-page chapter which gives the axioms for a few of the commonest mathematical systems.

Topology for Computing

by Afra J. Zomorodian
Cambridge Monographs on Applied and Computational Mathematics 16
Cambridge 2005 xiii + 243 pages

The author's goal is to enable computer scientists "to grasp and participate in current research in computational topology". His motivation is the usefulness of topological concepts in solving problems in computer science, in such areas as computational geometry, graphics, robotics, structural biology and chemistry. The book is based on his dissertation (2001, supervised by Herbert Edelsbrunner) and incorporates materials from courses offered subsequently to graduate students at Stanford and the Max-Planck-Institut für Informatik. A ten-page overview is followed by five chapters on mathematics (spaces, groups, homology, Morse theory), four on algorithms, and three on applications. There are numerous figures, a bibliography of more than 100 items, and an index.

Real Analysis: Measure Theory, Integration, and Hilbert Spaces

by Elias M. Stein and Rami Shakarchi
Princeton 2005 xix + 402 pages USD59.95

This is the third volume of a series of four textbooks—the Princeton Lectures in Analysis—designed to present in a unified manner the core areas of analysis. (The earlier volumes dealt with Fourier analysis and complex analysis; still to come is a volume on functional analysis.) Each of these books is based on an intensive (48 lecture hours) one-semester course at Princeton. In the first three books there is enough overlap that prerequisites are minimal: limits, series, differentiable functions, and Riemann integration, together with some linear algebra. The exercises play an important part in this treatment; For example, Chapter 1 presents Lebesgue integration in 37 pages, followed by 9 pages of exercises and two further pages of "problems"–these are more challenging and in some cases go beyond the material presented in the book. Subsequent chapters cover differentiation and integration, Hilbert spaces, abstract measure and integration, and Hausdorff measure and fractals.

EDUCATION NOTES

by Ed Barbeau
University of Toronto

CURRICULUM DOCUMENTS FROM MAA

These are challenging times for mathematics departments. At the same time as we are seeing a decline in mathematics specialists, our field is playing an ever-increasing role in almost every area of scientific, technological and socialogical endeavour. This has produced a need for an enormous number of students in higher education to obtain a mathematical background that they can apply in their chosen career. For many of these, the traditional calculus and linear algebra sequence does not fill the bill. While many institutions are introducing new courses and programs, and while pedagogical and curricular issues are being energetically discussed within the profession, there are still many disaffected students and colleagues who complain that we are not adequately responding to the situation.

For over fifty years, the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America has been issuing recommendations. While many of them have dealt with internal issues in mathematical education, those recently produced in 2004 have deliberately focussed on the needs of client disciplines and what sort of education a population generally competent in mathematics should have. All of the MAA publications can be ordered from The Mathematical Association of America, PO Box 91112, Washington, DC 20090-1112. The website is **www.maa.org**; orders by phone can be made at 301-617-7800 and by fax at 301-206-9789.

A good place to start is

Achieving Quantitative Literacy: An Urgent Challenge for Higher Education, by Lynn Steen
MAA Notes #62, MAA, 2004; 124 pp. paperbound
ISBN 0-88385-816-9; List price US$27.95;
Catalogue code NTE-62

Steen argues that quantitative literacy, the ability to understand tables and graphs, and to judge and analyze material involving numbers and diagrams, is an attribute equally important to the ability of modern citizens to engage in democratic discourse as the traditional literacy of being able to read and write. In the United States, the National Council of Education and the Disciplines initiated a national examination of issues surrounding quantitative literacy, especially in the context of school and college studies. It published *Mathematics and Democracy: The Case for Quantitative Literacy*. The Mathematical Sciences Education Board followed up with a national forum, whose proceedings were published under the title *Quantitative Literacy: Why numeracy matters for schools and colleges*. The book under review provides an overview of the issues emerging from these initiatives. Steen finds that educational policy and practice has not kept up with the changing data-oriented needs of society. This creates a gap between the capacities of our citizens that can threaten democratic culture. This is more than a matter of "basic skills" and will need to involve the higher levels of our education system as well as the elementary. Steen asks us to see the acquisition of quantitative literacy as the outcome of a demanding college-level learning experience that cuts across the entire undergraduate curriculum.

Steen indicates that there are difficult issues to resolve regarding quantitative literacy. To what extent should it be part of the core mathematical program and part of the curriculum outside of the mathematics class? How does it coexist with the standard heirarchical mathematics sequence? This useful book will foment and structure discussion within our community. The latter part of the book is particularly helpful with an insider-outsider dialogue touching on school and college mathematics, technology and statistics. One chapter provides examples of questions and tasks used to test quantitative literacy and includes excerpts from newspaper accounts to analyze. Finally, there is a brief discussion of initiatives taken by Dartmouth College, Hollins University, Macalester College, Trinity College in Connecticut, the University of Nevada (Reno) and the Washington Center for Improving the Quality of Undergraduate Education. Dartmouth College's Center for Mathematics Education has mounted materials on its website **www.math.dartmouth.edu/~ matc/.**

The second book I wish to discuss is

Curriculum Foundation Project: Voices of the Partner Disciplines, ed. by Susan Ganter & W. Barker
150 pp., Paperbound, 2004
ISBN 0-88385-813-4; List price
US$23.95; Catalogue Code CFO

This consists of a series of reports from eleven disciplinary workshops organized between November 1999 and February 2001 by the *Curriculum Renewal Across the First Two Years (CRAFTY)* subcommittee of the MAA *Committee for the Undergraduate Program in Mathematics (CUPM)*. There were 20-35 participants in each workshop and a final summation conference in November 2001. In each workshop, there was a dialogue among the representatives of the partner disciplines, with mathematicians present to listen and serve as resources. The areas involved were (1) biology and chemistry; (2) business and management; (3) computer science and physics; (4) chemical, civil, electrical and mechanical engineering; (5) life sciences; (6) interdisciplinary core mathematics; (7) statistics; (8) teacher preparations; (9) technical mathematics.

Basically, the problem is that, while 95% of mathematics students major in other disciplines, many mathematics courses do not lead to mathematical competence in partner disciplines. The major recommendations ("A Collective Vision") call for an emphasis on conceptual understanding, problem-solving skills, mathematical modelling, communication skills and balance of perspective; a reworking of priorities for topics and courses to favour depth over breadth, non-calculus-based statistics and data management in the first two college years, discrete mathematics and reasoning, while continuing to require calculus and linear

algebra as appropriate; and the use of a variety of instructional techniques and technology. Business education journals, in particular, maintain an active debate on pedagogical issues.

The volume includes an address by William Wulf, then president of the National Academy of Engineering on the *Urgency of Engineering Education Reform*.

These two books provide a backdrop to the latest round of MAA recommendations covering the *entire* college-level curriculum:

Undergraduate Programs & Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004
A report by the Committee on the Undergraduate Program in Mathematics
124 pp., paperbound, 2004
ISBN 0-88385-824-2; List price US$23.95; Catalogue Code CGU
www.maa.org/cupm/

There are six fundamental recommendations:

1. Mathematics departments should be aware of the characteristics, abilities and goals of students in their courses and align courses to meet their needs;
2. Every course should incorporate activities to promote analytical, communication, problem-posing and problem-solving skills.
3. Every course should try to present key ideas from various perspectives, employ a broad range of examples and applications, make connections to other subjects and introduce contemporary topics.
4. Departments of the mathematical sciences should encourage faculty collaboration with colleagues in other departments in the creation of courses and programs.
5. Courses should incorporate activities to help students learn to use technology.
6. Administrators should encourage and reward faculty efforts to improve the efficacy of teaching and strengthen curricula.

Part I of the report provides recommendations for departments, programs and courses in the mathematical sciences, while Part II treats specific student audiences: those in general education and introductory college courses, those majoring in other disciplines, those majoring in the mathematical sciences and mathematics majors with specific career goals, such as teaching or entering the nonacademic workforce. The website **www.maa.org/cupm/** provides a wealth of illustrated resources.

Ontario Secondary School Mathematics Bulletin

Clearing out my effects in preparation for a departmental move, I came across a half dozen issues of the *Ontario Secondary School Mathematics Bulletin* from the years 1966, 1967 and 1971. This journal was published thrice annually by the mathematics faculty at the University of Waterloo, with an annual subscription price of one dollar. The editor was Kenneth D. Fryer and the problems (an important ingredient in the publication) were edited by Ross Honsberger. One member of the editorial board was R.G. Dunkley, at first head of the mathematics department at St. Mary's Collegiate Institute in Ontario and later assistant to the dean of mathematics.

Appearing at a time when some of the warts on the New Math were becoming apparent and the province was doing away with the Grade 13 Departmental examinations, the journals contained a lively debate of the issues, involving such principals as Ralph Stanton, John Coleman and Andrew Gleason, who wrote to clarify his comments made on a panel at an AMS-MAA symposium on the New Mathematics. In a letter to the editor, Andrew Gleason stated that, at a Rutgers symposium on the New Mathematics sponsored by the AMS and MAA, he "praised the general state of affairs in quite general terms. because I am very pleased with program as a whole and have a feeling of general satisfaction", while at the same time took issue with specific points where mistakes had been made. The symposium, reported on by Ralph Staal, also featured Ed Begle. While the editors of the *OSSMB* looked askance at what they felt was a severe weakening of the curriculum and sometimes expressed themselves pungently, there were many responses from teachers that put matters in perspective and it is fair to say that there was a general willingness to wrestle with the difficulties of the new mathematics while wanting to retain its positive features. Readers today will recognize the same issues about skill development, retention and conceptual understanding. Topics of debate particular to the time included the teaching of sets, functions, numbers to other bases. John Coleman, of Queen's University, defended the teaching of sets, which "cannot possibly be eliminated from the curriculum", a judicious use of the number-numeral distinction as "there are some topics in which it is of extreme importance, as for example, in the introduction to rational numbers". Responding to the criticism against functions as ordered pairs, Coleman "would be strongly opposed to their [students'] being tied down by insistance on a single definition, to a single and hence impoverished concept of function". As for presenting numbers to other bases, this was helpful in appreciating the ingenuity of the decimal system, although the treatment "need not be very extensive and certainly need not involve extensive computation in these other systems".

A letter to the editor from Gordon Rogers of East York Collegiate Institute was a *cri de coeur* about the political environment in which teachers had to operate: "What secondary school staff has not been plagued with conflicts between teachers of academic subjects, on the one hand, and administration on the other, over whether students known to be incompetent shall nevertheless be thrust into a higher grade level to flounder even more hopelessly? This is known as `doing something for the student' rather than `doing something to the student'. The cry goes up `but he needs the credit' and our voices, attempting to say `he needs the mathematics' are too often lost in a gale of kindly

compassion emitted by those who wish to help each student by concealing from him the unpleasant fact that lack of exertion or lack of adequate foundation can prevent success in mathematics. What does it matter if he stays away from class when it suits his fancy, or that, attending regularly, he literally does not know (in Grade 13) that 1.2 and 12/10 are synonymous, or that [1.2/10] does not reduce to [7/5]?" The letter concludes with the observation, "Too often our protests are met with that gem of Administration wisdom `Well, construct a course they can succeed in'."

Those whose education was perceived to have been weakened by the mathematical reforms of the sixties might now be among those who now look askance at the failings of the current crop of students.

A brief letter to the editor from Victor Linus, of the University of Ottawa, tried to put matters in their proper place: "Thanks for the copy of the *OSSM Bulletin*. It contains interesting material which among other things includes some polemical chaff. However, the purpose of my note is mathematics (pure) not polemics (applied)." He went on to point out that a problem involving the harmonic series could be solved without the use of Bertrand's conjecture by a simple argument of Vinogradov.

Indeed, the *OSSMB* can be regarded as a precursor of *Crux Mathematicorum* without the sly wit of Leo Sauvé. Articles report on a recent Grade XIII geometry examination, discuss the use of complex numbers in getting trigonometric formulae, treat coaxial circles, solve the postage stamp problem, introduce projective coordinates, survey Egyptian mathematics, "draw attention to some curious and far-reaching results in probability theory that can be obtained by simple combinatorial and algebraic arguments within the grasp of high school students", look at linear transformations from the "alias and alibi points of view", report on developments in functional equations, consider the construction using straightedge and compasses of an equilateral triangle with a vertex on each of three parallel lines, provide a 1909 proof of Morley's Theorem by Naraniengar (the adjacent pairs of the trisectors of the angles of a triangle always meet at the vertices of an equilateral triangle), and discuss the ballot problem (find the probability that at every stage in the counting of votes, one of two candidates is always ahead) and its dual.

There are announcements and reports on a number of events, including a conference held at the University of Toronto on May 26-29, 1967 at the invitation of the Canadian Mathematical Congress (now the CMS). It was organized by Israel Halperin and Warwick Sawyer, with talks given by Tom Hull and Ken May and dinner at *Ed's Warehouse* in the Toronto theatre district. About thirty teachers and professors attended and one of the topics under discussion was programs available at universities and colleges of education for future secondary teachers of mathematics. We are told that a regular meeting of the Institute of Mathematics and its Applications took place in London, England, on April 27, 1967, where the speaker, Dr. J.M. Hammersley, FIMA, of Trinity College Oxford, expounded on the topic, "The enfeeblement of mathematical skills by 'modern mathematics' and similar soft intellectual trash in schools and universities." (Take that!)

In honour of Canada's centennial, students at Preston High School tackled the project of expressing all the numbers from 1 to 100 using the digits 1, 9, 6, 7, the four arithmetic operations and the square root sign. When unfillable gaps in the list appeared, they were permitted to use factorials and merging of digits (e.g. 1 and 9 to form 19), and eventually the floor function and decimal points. The OSSMB provided the complete list. There was an extensive discussion of the following problem from the Ontario 1966 Problems Paper: Show that the spiral whose equation in polar coordinates is $p^2 = a^2/\theta$ where a is constant, has a horizontal asymptote, and find its equation. Make a suitable sketch of the curve, showing its behaviour for small and large values of p. Speaking of asymptotes, the markers of a grade XIII paper discovered over sixty renditions of this word, including "aphotil", "psyhimtote" and "atomic rope".

The glory of the journal was its problem section. Many were geometrical and some were quite formidable, but there were some lighter ones as well: *Professor Adams wrote on the blackboard a polynomial, f(x), with integral coefficients and said, "Today is my son's birthday, and when we substitute his age A for x, then f(A) = A. You will also note that f(0) = p, and that p is a prime number greater than A." How old is Professor Adam's son?* Or this: *"If two of my children are selected at random, likely as not, they will be of the same sex," said the Sultan to the Caliph. "What are the chances that both will be girls?" asked the Caliph. "Equal to the chance that one child selected at random will be a boy," replied the Sultan. How many children did he have?*

While the *OSSMB* is no more, it is important that such a rich contribution to communication between teachers of the secondary and tertiary levels and to the fostering of the learning of mathematics and solving problems among teachers be not lost to our collective memories.

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

an institute, giving each program a persistent impact on the field. These are all direct reasons why the Canadian institutes play an increasingly important part in the life of Canadian mathematics.

But there are indirect effects as well. The infrastructure and staff assembled for institute programs have helped stimulate specialized conference activity throughout the country. Institutes help fund these topical meetings. They also help support the national meetings of the CMS (also CAIMS and the SSC), that have been increasingly successful in attracting a broad segment of the mathematical community. The resources and leadership found at the institutes (either separately or in collaboration) have enabled the Canadian mathematical sciences community to launch and move rapidly forward with initiatives such as MITACS, BIRS, NPCDS, and stable funding for AARMS – all of which are important additions to the mathematical or statistical landscape in Canada, and all of which share many of the institutes' goals and impacts. Applied mathematics is advanced through networks that actively involve people from both mathematics departments and industry. Likewise, mathematics education benefits when mathematicians meet and work with teachers. In both areas, the institutes have emerged as natural sites at which mathematicians from many universities can work together at building such networks and connections.

The institutes have enriched and intensified Canadian mathematics, despite their significant under-funding (eg relative to U.S. institutes such as MSRI and IMA). The international presence they have built is something Canadian mathematicians can be proud of. In collaboration with each other, and with the CMS and other organizations, they continue to work to improve the mathematical research environment in Canada. I urge you to involve yourself in the workings of an institute near you. Participating in or organizing an institute program can be a rewarding and exciting experience, one you won't regret.

CALL FOR NOMINATIONS - CANADIAN JOURNAL OF MATHEMATICS - EDITORS-IN-CHIEF
APPEL DE MISES EN CANDIDATURE - JOURNAL CANADIEN DE MATHÉMATIQUE - ÉDITEURS-EN-CHEF

The term of office of the present Editors-in-Chief of the Canadian Journal of Mathematics will end December 31, 2006. The Publications Committee of the CMS invites nominations for the next Editors-in-Chief to serve for a five year term.

Applications should consist of a formal letter of application and include the following:

- **A curriculum vitae**
- **An expression of views of the publication indicating if any changes in direction or policy are contemplated**
- **Since editorial responsibilities often necessitate a lessening of responsabilities in an individual's normal work, applicants should indicate that they have the support of their university department and, in particular, of their head of department.**

Any input from the mathematical community concerning this important selection process is welcome. Applications (with supporting material) and/or comments should be sent to the address below. The deadline for the receipt of applications is November 30, 2005.

Le mandat des rédacteurs-en-chef actuels du Journal canadien de mathématique prendra fin le 31 décembre 2006. Le Comité des publications de la SMC sollicite des mises en candidatures pour les prochains rédacteurs-en-chef pour un mandate de cinq ans.

Les mises en candidature doivent inclure une lettre formelle et les éléments suivants:

- **Un curriculum vitae**
- **L'expression de votre opinion sur la publication indiquant si des changements de directions ou de politiques sont envisagés**
- **Puisque les responsabilités de rédaction nécessitent souvent une réduction dans la charge normale de travail, les candidats devraient indiquer qu'ils(elles) ont l'appui de leur département et en particulier, de leur chef de département.**

Les commentaires de la communauté mathématique au sujet de cette importante sélection sont bienvenus. Les mises en candidatures (avec matérial à l'appui) et/ou commentaires devraient être acheminés à l'adresse ci-dessous. L'échéance pour la réception des mises en candidature est le 30 novembre 2005.

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Address for Nominations / Addresse de mise en candidatures:

Juris Steprans
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CMS Publications Committee
Comité des publications de la SMC
Department of Mathematics
York University
N520 Ross, 4700 Keale Street
Toronto, Ontario M3J 1P3
chair-pubc@cms.math.ca

MESSAGE DU PRÉSIDENT-ÉLU

Dr. Tom Salisbury
L'institut Fields

Je signe aujourd'hui ma première contribution aux Notes en tant que président élu de la SMC, puisque mon mandat à la présidence commencera en juillet 2006. En tant qu'organisme qui représente les mathématiciens de tout le pays et fait valoir les mathématiques auprès des gouvernements et du public, la SMC joue un rôle important pour nous tous. C'est aussi en juillet que prendra fin mon mandat de directeur adjoint à l'Institut Fields, un autre organisme qui joue un rôle important pour la communauté mathématique canadienne. J'aimerais donc profiter de l'occasion pour vous parler de l'incidence des trois instituts mathématiques du Canada sur la communauté mathématique canadienne.

Les trois principaux instituts mathématiques du Canada sont le Centre de recherches mathématiques (CRM), à Montréal, l'Institut Fields, à Toronto, et l'Institut du Pacifique pour les sciences mathématiques (PIMS), qui a des antennes un peu partout en Colombie-Britannique, en Alberta et dans l'État de Washington, mais dont le siège social est à Vancouver. Ils sont le produit d'un phénomène mondial, soit l'essor d'instituts nationaux où les mathématiciens se réunissent pendant une période prédéterminée pour travailler intensément sur des problèmes communs. De tels instituts ont vu le jour dans de nombreux pays au cours des 20 dernières années et forment maintenant un regroupement informel (pour obtenir une liste, entrez « IMSI » - International Mathematical Sciences Institutes dans Google). Le succès de ces instituts est d'autant plus frappant qu'il est unique : les mathématiques sont la seule discipline où ce modèle a été adopté si universellement, et les cas qui s'en rapprochent le plus sont dans des disciplines très mathématiques comme la statistique (le SAMSI, par ex.) et la physique théorique (CITA). Ce que l'on voit beaucoup plus souvent, dans d'autres disciplines, c'est un institut où travaillent des chercheurs permanents, et qui accueille un petit nombre de visiteurs. Les mathématiques occupent aussi une place importante depuis longtemps dans ces instituts (l'IAS de Princeton étant un exemple bien connu). Toutefois, de nombreux instituts adhèrent maintenant à un modèle de plus en plus courant, soit la présence de visiteurs et de chercheurs postdoctoraux en résidence pendant des périodes définies sur des thèmes particuliers. Il existe bien sûr de nombreuses variations sur ce thème, et, bien sûr, chacun des trois instituts mathématiques du Canada structure ses programmes à sa manière. Si les mathématiciens saisissent généralement très bien les différences, les gens de l'extérieur sont étonnés des similitudes.

À quoi devons-nous ce développement? Il suffit de jeter coup d'œil rapide aux Mathematical Reviews pour voir à quel point la collaboration s'est intensifiée en mathématiques depuis 40 ans. Le stéréotype du mathématicien solitaire a fait place à des équipes de travail et aux articles rédigés en collaboration. Il faut dire que le langage TeX et Internet ont grandement facilité la collaboration à distance. Les instituts ont eux aussi contribué à cette nouvelle image en proposant aux chercheurs des centres d'intérêt qui donnent naissance à un grand nombre de ces collaborations. La nature de plus en plus collaborative des mathématiques explique en partie l'essor des instituts. Une autre partie de l'explication tient à la mobilité des mathématiciens. Les mathématiciens ne sont pas confinés à un laboratoire, à une clinique ou même à un endroit particulier; ils ont donc tout le loisir de visiter des instituts qui dirigent des programmes clés pour leurs travaux. En réunissant une masse critique de chercheurs et en ciblant des sujets très pointus, les instituts mathématiques accélèrent considérablement les développements dans certains domaines. Ils mettent en outre leurs mathématiciens en contact avec des sommités d'un domaine et vice versa. Leurs programmes postdoctoraux exhaustifs constituent désormais d'importantes sources de formation pour les jeunes chercheurs. Comme les réseaux de chercheurs qu'ils créent poursuivent leur collaboration longtemps après avoir quitté l'institut, chaque programme a des retombées durables sur le domaine. Ce sont toutes là des raisons directes qui expliquent pourquoi les instituts canadiens jouent un rôle de plus en plus important dans la communauté mathématique du Canada.

Mais il y aussi a des retombées indirectes. L'infrastructure et le personnel rassemblés autour des programmes des instituts favorisent la tenue de conférences et de congrès spécialisés à la grandeur du pays. Les instituts contribuent au financement de ces congrès. Ils appuient aussi les Réunions nationales de la SMC (et celles de la SCMAI et de la SSC), qui attirent un éventail de plus en plus large de membres de la communauté mathématique. Les ressources et la direction que fournissent les instituts (seuls ou en collaboration) ont aidé la communauté mathématique canadienne à lancer de nouvelles initiatives et à les réaliser beaucoup plus rapidement – le réseau MITACS, la station internationale de Banff, le Programme national sur les structures de données complexes (PNSDC), financement stable pour l'AARMA –, initiatives qui sont toutes d'importants ajouts au paysage mathématique ou statistique du Canada, et qui partagent un grand nombre des objectifs des instituts. Les mathématiques appliquées progressent grâce à des réseaux auxquels participent des gens à la fois des universités et de l'industrie. De même, l'enseignement des mathématiques ressort gagnant lorsque les mathématiciens se réunissent pour travailler avec les enseignants. Dans ces deux domaines, les instituts sont devenus tout naturellement des lieux où les mathématiciens de nombreuses universités se retrouvent pour travailler ensemble à l'établissement de tels réseaux.

Les instituts ont enrichi et stimulé la communauté mathématique canadienne, et ce, malgré leur sous-financement (par comparaison avec les instituts américains comme le MSRI et l'IMA). Les mathématiciens canadiens ont de quoi être fiers de la présence internationale que nos instituts ont établie. En collaborant entre eux et avec la SMC ou d'autres associations, ils continuent de travailler à l'essor de la recherche mathématique au Canada. Je vous incite donc fortement à prendre part aux travaux d'un institut près de chez vous. La participation au programme d'un institut ou à son organisation est une expérience stimulante et enrichissante que vous ne regretterez sûrement pas.

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

Dalhousie University Halifax, NS

Appointments: Alan Coley (University Professor, Relativity, July 1 2005 to June 30, 2010); Peter Selinger (Associate Professor, Algebra, July 2005); Joanna Mills Flemming (Assistant Professor, Statistics, July 2005); Sara Faridi (Assistant Professor, Algebra, July 2005); Theodore Kolokolnikov (Assistant Professor, Applied Mathematics, January 2006); Dr. Sara Faridi is a UFA.

Promotions: Bruce Smith (Professor, Statistics, July 2005); Dorette Pronk (Associate Professor with tenure, Mathematics, July 2005).

Retirements: Chris Field, Kevin Moriarty and Dick Sutherland retired on June 30, 2005. Drs. Field and Sutherland had served in the department for 30 years, and Dr. Moriarty for 22 years.

Other News: The Department hosted the 2005 Summer School of the Atlantic Association for Research in the Mathematical Sciences, and will host the 2006 and 2007 events. Forty students, from seven countries, took part this year in the School, which was directed by Drs. Tony Thompson and Renzo Piccinini.

Laurentian University Sudbury, ON

Retirement: Len Todd (Professor, July 2005, after 36 years of service).

Appointment: Fabrice Fleurot (Assistant Professor, July 2005).

Other News: Patrice Sawyer, Professor of Mathematics, assumed the duties of Chair effective July 1st, 2005.

Ryerson University Toronto, ON

News: The former Department of Mathematics, Physics and Computer Science has split into three distinct departments. There is now a Mathematics Department at Ryerson.

Memorial University of Newfoundland, St.John's, NF

Appointments: Chris Radford (Professor and Head of Department, Applied Mathematics, August 25, 2005); J. Concepcion Loredo-Osti (Assistant Professor, Statistics, September 1, 2005); Zhaozhi Fan (Assistant Professor, Statistics, September 1, 2005).

Promotions: Serpil Kocabiyik (Professor, September 2005); Xiaoqiang Zhao (Professor, September 2005); Jie Xiao (Associate Professor, September 2005).

Visitors: Ivan Graham (U.K., March 17-April 3, 2005); Perre Magal (France, April 16-23, 2005); Jianlong Chen (P.R.China, Feb. 2 - April 2, 2005); Peter Nickolas (Australia, Sept. 3-30, 2005); Pedro Asentio (Spain, Sept. 6-12, 2005); Tom Osbourne (Manitoba, Sept. 6-13, 2004); Georgi Karadzhov (Bulgaria, Sept. 1-Dec. 31, 2004); Xiang Liang (P.R. China, Sept. 1, 2004 - Jan. 31, 2005); Sjur Dikrik Flam (Norway, Sept-December, 2004); Mingshu Peng (P.R. China, May 17, 2005 - April 30, 2006); JongJin Kim (South Korea, July 2005 - January 2007); Andrey Trifonov (Russia, September 2005); Shengfan Zhou (P.R. China, June 22 - August 31, 2005); Shiwang Ma (P.R. China, June 15 - August 31, 2005); Zhong Yi (P.R. China, July 1 - December 31, 2005); Peixuan Weng (P.R. China, July 27 - October 27, 2005); Tsiu-Kwen Lee (Taiwan, July 14-31, 2005); Stefano Maset (Italy, August 1-20, 2005); Gennady Bocharov (Sept. 15-22, 2005).

Other News: A third edition of "Discrete Mathematics with Graph Theory", by Edgar Goodaire and Michael Parmenter, a popular text for discrete math and graph theory courses, was released July 2005.

Queen's University Kingston, Ontario

Promotion and Tenure: Troy Day, Associate Professor, CRC, Mathematical Biology

Appointments: David Steinsaltz, Associate Professor, July 1, 05, Statistics, Demography. Abdol-Reza Mansouri, Assistant Professor, Sept. 1, 05, Control Theory. Julia Brettschneider, Assistant Professor, July 1, 05, Statistics, Microarray Analysis (joint with Community Health and Epidemiology). Ram Murty, Professor, Cross appointed to the Department of Philosophy, Queen's University. Leo Jonker, Professor, Queen's University Chair in Teaching and Learning.

Adjunct Appointments (2005-2008): Norman Beaulieu, University of Alberta, Canada Research Chair in Broadband Wireless Communications. Pietro-Luciano Buono, UOIT, Dynamical Systems Claude Tardif, Royal Military College, Combinatorics

Retirements: Grace Orzech, Associate Professor, July 1, 2005. David Pollack, Associate Professor, July 1, 2005.

Resignation: Shawn Kraut, July 1, 2005.

Deaths: M.T. Wasan, Emeritus Professor, May 2005

Awards: Morris Orzech, Associate Professor, The Chancellor A. Charles Baillie Teaching Award, Queen's University.

University of Western Ontario, London, ON

Appointment : Ajneet Dhillon, (Assistant Professor, Algebraic Geometry, July 2005).

Promotion : Masoud Khalkhali, (Professor, July 1, 2005).

Retirement: Allan Heinicke, (Professor, June 30, 2005).

Saunders Mac Lane 1909-2005

Saunders Mac Lane was one of the most influential mathematicians of the 20th century and was, together with Samuel Eilenberg, a co-creator of Category Theory. Details of this achievement together with much other information about his career is well described in his new book "Saunders Mac Lane, A Mathematical Autobiography", A.K. Peters, Ltd., 2005.

However, in this article, I will present my personal point of view since Saunders MacLane was my thesis advisor, mentor and lifetime friend. Much of this article appears in the August-September issue of the MAA publication FOCUS. However, the next few paragraphs emphasize a few of his Canadian connections known to me. There are undoubtedly many others.

It is probably not so well known that Saunders organized a large informal off the record series of talks on category theory in Vancouver at the time of the International Congress of Mathematicians in Vancouver in 1974. He went to many meetings in Canada during his career. One of the most recent was the International Conference on Category Theory held in Vancouver in 1997.

Saunders was closely connected with many Canadian mathematicians. At least two of his students are at Canadian universities, namely Peter Zvengrowski at the University of Calgary, and myself at the University of British Columbia. He also had very close connections to students of Samuel Eilenberg such as Miles Tierney and William Lawvere who have spent much time in Canada as well as Michael Barr, a Harrison student and a well known and influential mathematician from McGill.

Irving Kaplansky was the first student of Mac Lane, receiving his Ph.D. at Harvard in 1941. Kaplansky came to Harvard from the University of Toronto on the first Putnam fellowship. Kaplansky himself has had a tremendous influence on American mathematics.

I first met Saunders as a graduate student in Chicago in 1961 when I took a course with him in category theory and around that time probably first came to his attention when I pointed out a slight error in one of the exercises in his book with Birkhoff on Modern Algebra.

Saunders' influence on me did, in fact, extend much further back in time to September 1956 when I took a course in algebra at Harvard from Andrew Gleason using the same book just mentioned. This course resulted in my changing majors from physics to mathematics since it convinced me that mathematics had the richness and mystery that I wished to explore further!

In his later years when he had passed from his role of advisor and mentor to friend I was constantly amazed by his tenacity and independence. To give an example, when he was in Coimbra, Portugal, at the category meetings in 1999 after the lectures one day everyone was urging him to take a cab back to the hotel because of the steep walk from the university to the town. But, no, he wanted to walk back and I ended up walking back with him. This was difficult for him, but he was very determined.

He showed the same tenacity and at the same time a great attention to detail when acting as a thesis advisor. When I had something written up and thought it was fine, Saunders would read it through, make corrections and usually suggest some other lemma or theorem that needed proving.

My most important interactions with Saunders, in fact, took place this way when I was a graduate student. He insisted on weekly meetings as well as insisting on a report on progress from the previous week. It was not enough to have read something - he wanted evidence of some thought applied to the research problem at hand. In this way he was very serious and not nearly as light and easygoing as he seemed with some visitors.

At this time in the early 60s there was indeed a whirl of categorical ideas evolving with visits to Chicago from Eilenberg, Freyd, Lawvere, Beck and Linton. Tom Hungerford was also writing a thesis with Mac Lane at the same time and John Thompson and Jonathan Alperin could be heard in the halls discussing exciting new developments in group theory. Max Kelly and John Gray came up frequently for the Midwest Category Seminar. In the meantime Saunders kept producing all these books, neatly typed chapter after chapter. "Homology" was the first one. I was directly involved in the proofreading of each chapter as it was typed and used to delight in finding misprints when Saunders would say I had an "eagle eye". He liked to have his students read original source material and had me read early papers by Hopf, his papers with Eilenberg on $K(\pi,n)$ spaces, Lawvere's thesis as well as Freyd's, at that time new, book on abelian categories.

Now this is not intended to be a chronological or balanced view of Saunder's life but rather an impressionistic view of a person with a very rational and orderly view of the world. Please see the autobiography mentioned above for a more complete story.

At Oberwohlfach he climbed through the hills with his special walking stick. In the 1970s there were many category meetings and many impassioned discussions amongst the participants especially with the new developments in topos theory. There were discussions during the day and in the evening and arguments often with both Eilenberg and Mac Lane present. Freyd, Lawvere, Johnstone, Kock, Tholen, Rosicky, Isbell, Barr and Tierney and many others were involved. Eilenberg's students, in particular, were always part of the inner circle. Jon Beck's work, in particular, continues to command the highest respect.

I remember Saunder's first wife Dorothy quite vividly from the 1974 International Conference in Vancouver when I had many categorists at my house. I met Saunder's second wife Osa at MSRI in 1993 and have a much treasured photo of Osa, Saunders and my wife standing around my son Ian, then 18 months old. I saw her later at notable events like the celebration in Coimbra, Portugal, in 1999 and kept in touch with her up and through the time of Saunders' memorial service at MSRI on May 4, 2005.

As he used to say at the time of someone's passing - Hail and Farewell!

John MacDonald, Vancouver, B.C. August 14, 2005

George E. Hay 1914-2005

George E. Hay, professor emeritus of mathematics, Univesity of Michigan, Ann Arbor, MI, died on 12 January 2005. He was born in 1914 in Durham, Ontario. He received three degrees in Mathematics from the University of Toronto, culminating with his doctorate in 1939. In 1940 he joined the Department of Mathematics at the University of Michigan as an instructor.

He steadily rose through the ranks, becoming professor in 1956. Hay specialized in Applied Mathematics specifically in the theory of elasticity and mechanics, publishing a book on Vector and Tensor Analysis in 1954. He was chairman of the department from 1957-67, and is remembered as giving quiet and capable leadership through the difficult 10 years when financial pressures and a strong demand for highly trained mathematicians seriously threatened mathematics at the University. He was a straightforward, honest and kind person who influenced many colleagues within and outside mathematics.

[From London Mathematical Society Newsletter No. 340, September 2005; slightly edited].

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.**

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MATHEMATICS AND STATISTICS, QUEEN'S UNIVERSITY

The Department of Mathematics and Statistics invites applications for a **renewable (tenure-track) appointment** at the **Assistant Professor level** to begin July 2006. Exceptionally qualified candidates may be appointed at the rank of Associate Professor. Salary will be commensurate with qualifications and experience. Candidates must have a Ph.D. in pure or applied mathematics, statistics or a related area.

The successful applicant must have a strong research record and have demonstrated the potential for research leadership. Candidates must have the capacity and desire to contribute to a strong graduate program and a commitment to excellence in undergraduate teaching. Applicants' research will be assessed on the way it will enhance the overall research profile of the Department. The research interests of the Department can be obtained from its website at **www.mast.queensu.ca/**

Interested candidates should arrange for a curriculum vitae, a description of research interests, up to five publications or preprints, a statement on teaching or a teaching dossier, and at least four letters of reference, one of which should comment on the candidate's teaching, to be sent to the address below by **November 30, 2005**. Applications will be considered until the position is filled.

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.**

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

OCTOBER 2005 OCTOBRE

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

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

18-22 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

NOVEMBER 2005 NOVEMBRE

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

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**

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

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/

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

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

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

JANUARY 2006 JANVIER

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/

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/

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**

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

AUGUST 2006 AOÛT

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

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

AUGUST	2006	AOÛT
12-20	Methods of Integrable Systems in Geometry: An LMS Durham Research Symposium, Satellite to ICM 2006 (University of Durham, UK) `www.icm2006.org`	
13-19	10th Prague Topological Symposium,International Conference on General Topology and its Relations to Modern Analysis and Algebra (Prague, Czech Republic) `topology-news@atlas-conferences.com`	
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)** `http://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 Toronto, ON** `www.cms.math.ca/events, meetings@cms.math.ca`	

JANUARY	2007	JANVIER
4-7	Joint Mathematical Meetings, AMS, MAA, AWM. SIAM etc, New Orleans Marriott and Sheraton New Orleans Hotel (New Orleans, Louisiana) `www.ams.org/amsmtgs/sectional.html`	

JANUARY	2008	JANVIER
6-9	Joint Mathematical Meetings, AMS, MAA, AWM. SIAM etc, San Diego Convention Center (San Diego, California) `www.ams.org/amsmtgs/sectional.html`	

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October / octobre	August 15 / le 15 août
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