CMS NOTES de la SMC

Volume 34 No. 8 December / Décembre 2002

In this issue / Dans ce numéro

Editorial **2**

Book Review: 17 Lectures on Fermat Numbers **3**

Report on Reallocation..... **5**

Minutes of the Annual General Meeting **9**

Revue - Reading the Principia **12**

Education Notes..... **13**

NSERC Awardee – Eric Muller **20**

From the Institutes **21**

Obituary / Avis de décés Ron Scoins **22**

Obituary / Avis de décés Bruno Forte..... **23**

Calendar of events / Calendrier des événements..... **26**

Rates and Deadlines / Tarifs et Échéances **27**

FROM THE EXECUTIVE DIRECTOR'S DESK

Graham Wright

Finances and Publishing

The Society's £nances are divided into two parts. The Operations Fund, which records the revenues and expenditures for the various activities, and Restricted (Investment) Funds. The Operations Fund has four divisions - General, Education, Research and Publishing - while the Restricted Funds are comprised of the Endowment Fund, the Mathematical Olympiad Fund, and the Designated Activities Fund.

Since March 1997, the Society's Restricted Funds have been invested with TD Asset Management Incorporated and are "passively managed". In particular, the funds are invested in three index funds - a Canadian Bond Index (40%), an S&P/TSX Composite Index (10%) and a Global Index (50%). Although these index funds have not been performing well recently, it is regarded as a sound investment strategy in the long term.

In June 2002, the Board of Directors unanimously passed two motions with regard to the Restricted Funds. One *"That the Society clarify the use of the Restricted funds, separating out a Contingency Fund and a true Endowment Fund portion."* and a second *"That the Society undertake a major drive to grow the Endowment Fund, to fund in perpetuity major projects and prizes of interest to the Society"*. If successful, some activities that are currently £nanced by revenues in the Operations Fund would move to be £nanced from endowed funds. It is hoped to develop the Terms of Reference for a true Endowment Fund in the near future and then start a major fund raising drive to greatly increase the amount in this Endowment Fund. If any member would like to provide any comments or suggestions please contact the Treasurer (Arthur Sherk - treasurer@cms.math.ca) or myself (director@cms.math.ca).

The Finance Committee is charged with overseeing the Society's £nancial operations and meets twice yearly (October and April). At each meeting the Committee meets with representatives of TD Asset Management to review the performance of the restricted investments.

(see EXEC–page 17)

CMS NOTES
NOTES DE LA SMC

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

Editors-in-Chief
Peter Fillmore; S. Swaminathan
notes-editors@cms.math.ca

Managing Editor
Graham P. Wright

Contributing Editors
Education: Edward Barbeau; Harry White
notes-education@cms.math.ca
Meetings: Monique Bouchard
notes-meetings@cms.math.ca
Research: Noriko Yui
notes-research@cms.math.ca

Editorial Assistant
Victoria L. Howe

The Editors welcome articles, letters and announcements, which should be sent to the *CMS Notes* at:
Canadian Mathematical Society
577 King Edward
P.O. Box 450, Station A
Ottawa, Ontario, Canada K1N 6N5
Telephone: (613) 562-5702
Facsimile: (613) 565-1539
E-mail: notes-articles@cms.math.ca
Website: www.cms.math.ca

No responsibility for views expressed by authors is assumed by the *Notes*, the editors or the CMS. The style £les used in the production of this volume are a modi£ed version of the style £les produced by Waterloo Maple Software, ©1994, 1995.

ISSN: 1193-9273 (Print); 1496-4295 (Online)

©Canadian Mathematical Society 2002

EDITORIAL

Peter Fillmore

At ICM 1998 in Berlin, as a result of overtures from the CMS, the Canadian Embassy provided the venue for a reception in honour of the newly minted Fields medallists. This was done again in Beijing, and this time the leadership of the CMS tried to get the Canadian Government to take a more serious interest in the matter by proposing that a high-level of£cial take part in the award ceremony and, especially, that an endowment be created to fund a suitable cash prize to accompany the medal. This is seen by many as a necessity if, among the ever increasing number of prestigious and valuable new prizes, the Fields medal is to hold its own as the "Nobel Prize for mathematics". Others may see it as an unfortunate intrusion of the things of Mammon into our community.

Be that as it may, the indifference of our government is in striking contrast to that of some others. Norway has created an international prize in mathematics, the Abel Prize, with an endowment of 200 million Norwegian Kroner (about CAD 40 million), evidently putting it in the same league as the Nobel Prizes. The detailed announcement was made by the Minister of Finance at the Abel Conference this past summer, which was itself opened by King Harald V. The objectives are to honour outstanding work in mathematics and to raise the status of mathematics in society, as well as to commemorate Abel. The Norwegian Academy of Science and Letters will administer the prize, to be awarded annually from 2003. Is anyone in Ottawa paying attention?

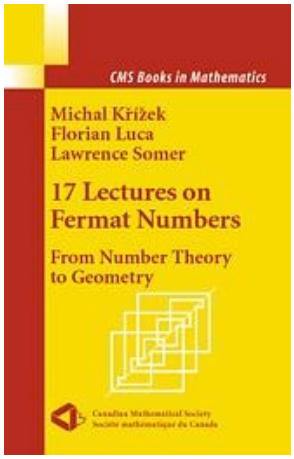
Au Congrés international des mathématiciens de 1998 tenu á Berlin, á la suite d'une proposition de la SMC, l'ambassade canadienne avait tenu une réception en l'honneur des nouveaux lauréats de la médaille Fields. La même chose s'est produite á Beijing, et la SMC a tenté cette fois de solliciter davantage la participation du gouvernement du Canada dans le dossier en proposant qu'un haut fonctionnaire prenne part á la cérémonie de remise des médailles et surtout, que l'on crée un fonds de dotation pour accompagner les médailles d'un prix substantiel en argent. De nombreuses personnes considérent cette initiative comme une priorité si, étant donné le nombre toujours croissant de nouveaux prix d'envergure et prestigieux qui sont créés, on souhaite que la médaille Fields conserve sa réputation de ≪prix Nobel des mathématiques≫. D'autres considérent plutôt qu'ils est malheureux que la communauté mathématique ait de telles préoccupations £nancié res.

Mais quoi qu'il en soit, l'indifférence de notre gouvernement contraste vivement avec l'attitude d'autres administrations. La Norvége, par exemple, a créé le Prix Abel, un prix international de mathématiques, avec un fonds de dotation de 200 millions de couronnes norvégiennes (environ 40 millions de $ CAN). De toute évidence, cette initiative classe le prix dans la catégorie des Nobel. L'annonce détaillée a été faite par le ministre des Finances á la conférence Abel l'été dernier, elle-même ouverte par le roi Harald V. Ces prix ont pour objectif de rendre hommage á des travaux exceptionnels en mathématiques, d'élever la place des mathématiques dans la société ainsi que de rendre hommage á Abel. L'Académie norvégienne des sciences et des lettres administrera le prix, qui sera décerné annuellement á partir de 2003. Mais sur la Colline, qui s'en soucie?

All About Fermat Numbers, With Shortcomings

Book Review by Karl Dilcher, Dalhousie University

17 Lectures on Fermat Numbers
From Number Theory to Geometry
by Michal Křížek, Florian Luca, and Lawrence Somer
CMS Books in Mathematics
Springer-Verlag, New York, 2001
xxiv+257 pp



Most mathematics books restrict themselves to some well-de£ned area of mathematics and serve either as introduction on a certain level, or as monograph with various degrees of completeness. Occasionally, however, a book picks up a very speci£c topic and treats it from a variety of angles, often touching on different £elds of mathematics. The book under review, "17 Lectures on Fermat Numbers: From Number Theory to Geometry" belongs to this second category. Even within this category it is quite unique in that the subject matter is narrower than in most other books. This approach may not always be successful, but in this case it does work, at least in principle.

It is certainly satisfying for the reader to have almost everything that is known on a particular subject collected in one place. Also, it contributes to a sense of mathematics as a uni£ed subject to see several different areas enter, often in unexpected ways. While the authors of "17 Lectures" made good use of the advantages of such an approach, they also fell victim to some of its dangers. In particular, if a very narrow subject is treated to such a degree of completeness then, almost by necessity, the book will contain parts that might better have been left out.

All these are general remarks; I will now turn to the subject matter, and how it is treated in this book. The *Fermat numbers* $F_m = 2^{2^m} + 1$, for $m = 0, 1, 2, \ldots$, are among the best known special number sequences. The reason for the double exponent 2^m lies in the fact that the polynomial x^n+1 always factors when $n > 1$ is an odd integer; therefore 2^n+1 cannot possibly be a prime unless it has the form of F_m. In this connection, Fermat observed that the £rst £ve numbers in this sequence, namely $3, 5, 17, 257$, and $65\,537$, are indeed prime, and he conjectured that all the F_m are prime. However, in 1732 Euler found that $F_5 = 641 \cdot 6\,700\,417$, and thus disproved Fermat's conjecture. To this date no other *Fermat prime* has been found, the smallest one in doubt being F_{31}. More than two hundred Fermat numbers are now known to be composite. All this would be no more than a mathematical curiosity were it not for the well-known connection between Fermat numbers and the construction of regular polygons with straightedge and compass, £rst found by Gauss. It is an important contribution of "17 Lectures" to show that there is more to Fermat numbers than the obvious connection with primality testing and factoring and with regular polygons, although the £rst chapter gives a brief historical account of just these topics. The book actually opens with a foreword by Alena Šolcová, a Czech historian of science; this is an interesting 11-page essay on the life and work of Fermat. All this is followed by a chapter on the fundamentals of number theory, a very nice introduction to those topics from elementary number theory, up to quadratic reciprocity, that are needed to understand much of the material in the rest of the book. An interesting feature of this chapter are the geometric interpretations of many of the concepts and results; the many historical remarks are also quite useful.

The next two chapters contain, with proofs, the most basic properties (mainly recurrence relations and congruences) and what the authors call "the most beautiful theorems" on Fermat numbers. Of course, beauty in mathematics, as anywhere, is rather subjective, but some of the results are indeed both important and striking, such as Gauss's theorem mentioned above, and the theorem of Euler and Lucas on the shape of the factors of Fermat numbers.

Chapters 5–7 contain almost everything that is known on primality and factoring in connection with Fermat numbers. In particular, these chapters contain proofs and discussions on some general primality tests, Pepin's famous test, the theorem of Lucas, Proth's theorem, and various related results. This is probably the strongest and most useful part of the book. In fact, up to this point this book is excellent in many respects.

The results in Chapters 8 and 9 are more isolated and probably less important. Some of the proofs are quite sophisticated and lengthy, and this is where the reader may begin to get tired. A typical result states that a Fermat number is never perfect or part of an amicable pair.

The next chapter, on the irrationality of sums of certain reciprocals, is again very interesting; it contains a variety of

results that are not restricted to Fermat numbers. However, Chapter 11, devoted entirely to a very special Diophantine equation, should in my opinion not have been included in a book of this character. The proof of this one result takes up 12 pages, and detracts from, rather than adds to, the value of the book. The ups and downs continue in the next chapter, where an interesting and useful discussion on pseudoprimes and Carmichael numbers is followed by 6 heavy pages on superpseudoprimes, a concept that, according to MathSciNet, has not appeared in print before. Chapter 13, on generalized Fermat numbers and Cullen numbers, is once again useful as a reference for anyone interested in the subject or working in this area.

Several applications of Fermat numbers are given in Chapter 15; it contains the Fermat number transform (a variant of the discrete Fourier transform) and other related transforms. Other topics include pseudorandom number generators, minimal perfect hashing schemes, and even an excursion into chaos theory. This is once again a fascinating chapter with some unexpected results and connections to other parts of mathematics. The £nal two chapters contain a proof of Gauss's theorem and a construction of the regular 17-gon; all of this is quite appropriate for this book.

A £rst appendix contains various useful tables of Fermat numbers and their factors, with just the right degree of completeness; later I will mention the other two appendices. The bibliography, with more than 350 entries, is very complete and contributes to the value of the book as a reference, as do the extensive name and subject indexes.

Altogether, this could have been a great book, were it not for two points that diminished its enjoyment. I have already hinted at my £rst point: Regardless of the value of the authors' own very recent research, most of it should not have been included in a book of this nature. This research should £rst be disseminated by other means (most of it has been, or is being, published in journals), picked up by others, expanded on, changed, applied, etc., before it is ready for inclusion in an expository and historical text that this book wants to be and is best at.

My main criticism, however, is of a different nature, and begins with the title of the book. "17 Lectures" is clearly a variation on Paulo Ribenboim's classic "13 Lectures on Fermat's Last Theorem". The only reason for having 17 lectures (why *lectures*?) is the fact that 17 is a Fermat number. This in itself wouldn't be so bad; however, it dictates the entire structure of the book. The book would have pro£ted from a more standard "Chapter - Section" structure. For instance, why are Gauss's theorem and the construction of the 17-gon in different chapters? And why are Mersenne numbers in an appendix, instead of a chapter? But that's not all: Chapter 14 contains 17 open problems, and the otherwise very useful list of internet addresses has 17 entries. And why is the chapter on open problems not at the end? I hope that I am wrong, but could it be that it's Chapter 14 because F_{14} is the smallest composite Fermat number without any known prime factor? The worst offense, in the same numerological vein, concerns the page count. Immediately upon opening the book I had noticed that the print size was smaller than usual, and strangely out of proportion (in contrast to the usually very well-proportioned Springer-Verlag look). The reason: The book ends with page 257, i.e., F_3!

The criticism in the last two paragraphs comes from my disappointment at seeing a potentially excellent book spoiled so needlessly. I can still recommend it to number-theorists and other mathematicians alike; everybody will £nd useful and interesting information in it. In the classroom, this book might be suitable for undergraduate projects or supplementary readings in a number theory, algebra, or history of mathematics course. It will also be accessible to bright high school students and interested amateurs. In fact, Fermat's name in the title may attract such readers, and they will £nd a well written, interesting, and mathematically sound book, in spite of its shortcomings.

CMS MEMBERSHIP

The 2003 Membership Notices have been mailed. Please renew your membership now. To renew electronically, please visit our website at www.cms.math.ca

ADHÉSION Á LA SMC

Les avis d'adhésion 2003 ont été postés. Veuillez renouveller votre adhésion maintenant. Vous pouvez aussi renouveller au site web www.smc.math.ca

Report of the Steering Committee for Pure and Applied Mathematics

The CMS Notes is publishing this report in four instalments, the £rst three of which appeared in September, October and November. This instalment contains the balance of the Report.

Part 6: Highly Quali£ed Personnel

Mathematical training of HQP in Canada shows two noticeable trends: interdisciplinary training and training of PDFs.

Interdisciplinary Training

The most signi£cant development over the past 4 years has been the growth in infrastructure for interdisciplinary training. Interdisciplinary training in mathematics is undergoing rapid evolution at many Canadian universities. Successful Masters programs in Financial Mathematics have been initiated at Alberta, Calgary, Toronto, UBC, and Waterloo; McMaster plans one. Masters programs in Industrial Mathematics have been developed at Ottawa/Carleton (high technology), Manitoba, Memorial (computational science), Montreal, and Toronto; McMaster plans one also.

A great deal of interdisciplinary graduate training in mathematics departments is now carried on by utilizing the resources of the various labs and centres described in previous sections. In particular, these labs and centres have enabled certain departments to enrich considerably their interdisciplinary offerings for graduate students. For example, the IAM at UBC, with 69 faculty members from 13 different departments currently supervises 30 graduate students from the Department of Mathematics. Since 1997, Giref at Laval has graduated 49 Masters, 33 PhDs, and 22 PDFs in engineering and mathematics; it is currently training 35 Masters, 47 PhDs, and 4 PDFs. The establishment of CACR at Waterloo has given a new focus in Canada to training in cryptography. Since it was founded in 1998, the CACR at Waterloo has trained 20 PDFs and over 30 graduate students. The SFU CECM has trained more than 40 PDFs and Research Associates since its inception in 1993.

A recent survey gave the following employment patterns for graduates between 1997 and 2001:

– Of 219 PhDs, 139 accepted academic positions (40 PDFs; 68 tenure-track, 23 limited term, and 8 college appointments), 56 entered the private/public sector (15 in £nance, 36 in high tech industry, and 5 in government), 15 retrained, and 9 are unknown.

– Of 333 Masters students, 125 pursued a PhD in mathematics, 113 entered the private/public sector (29 in £nance, 64 in high tech industry, and 16 in government), 26 retrained, and 29 are unknown.

Future expansion in Canadian mathematical graduate training will support a growing number of mathematical students who are being employed in the £nancial/industrial world. The 1995 SIAM Report on Mathematics in Industry cites the fact that industrial managers repeatedly commented on the importance of mathematicians for their analytical thinking skills and expertise for formulating and solving problems in different contexts.

Interdisciplinary research and training has broad needs and, as a result, is more expensive than are other areas of mathematical training.

One obvious requirement is large-scale computing facilities. As well, there is a need to provide students with continuous exposure to innovative research that arises from other disciplines and the industrial sector. This requires face-to-face contact with other scientists and representatives from industry. The major Institutes and MITACS, with their extensive contacts and experience, have played a major role in providing forums for such interactions.

Postdoctoral Fellows

Training of PDFs is a major success story in Canadian mathematics. In the past decade, there has been a striking rise in the numbers of PDFs trained. Data from the 1996 Review of Canadian Mathematics shows 370 PDFs trained in Canadian mathematics departments during the 5-year period 1991-1996, and a recent survey shows that GSC 336/337 grantees (representing 80% of mathematicians with grants) alone trained 560 PDFs during the 5-year period 1997-2002. This very impressive 50% increase is clearly an index of increased mathematical activity and of a strengthened discipline.

The increase in PDF training is also linked to the importance of new funding sources. In GSC 336/337, even the larger grants are not suf£cient to support a PDF fully, so that additional funding has been required to complement research grants. In particular, the 3 Institutes and MITACS are providing such partial funding: each year, on average, the Institutes provide $860K to support 60 PDFs and MITACS provides $1.4M to fund 100 PDFs from a variety of disciplines. Moreover, much of the extra funding provided to highly active researchers in the last Reallocation Exercise was leveraged into funding packages for the support of PDFs.

As these statistics illustrate, recruitment of PDFs is a priority in Canadian mathematics. PDFs play a crucial role in mathematical research; in particular, a critical mass of PDFs is a crucial factor in the creation of highly effective research teams, as indicated by the examples given in Part 3. As potential new faculty, the large international pool of talented PDFs in Canada also provides an important resource for Canadian universities. For example, 4 of the faculty in the Vancouver number theory group (see Part 3) were hired from PDF positions in Canada.

Part 7: Further Considerations on Funding Proposals

This section provides further comment on funding proposals A, B, and C presented in Part 2.

New Applicants

In this section, we explain how NSERC data supports a projection of 25 new grantees per year in GSCs 336/337 during the period 2003-2007. Before providing this explanation, we repeat the observation, made in Part 2, that this prediction is at variance with empirical data, which suggests a pattern of at least 35 new grantees each year. NSERC data predicts that 2000 researchers in the Natural Sciences will be hired by Canadian universities over the next 5 years (BP, New Applicant Survey), and that 1 out of 7 of these researchers will be hired by mathematics and statistics departments (BP, Figure 7). Current patterns lead one to expect that 2 out of 3 of those hired will be mathematicians(as opposed to statisticians) and that 80% of these will apply to GSCs 336/337. Finally, a success rate of 85% among new applicants in GSCs 336/337 leads to the £gure of at least 25 new grantees per year. The consequences of no increase in funding of our proposals for GSCs 336/337 will be severely detrimental to Canadian Mathematics. We £rst want to emphasize that the goals of these funding proposals cannot be realized unless funding is provided by the Reallocation Exercise. There are no other funds available in the GSC budget unless continuing grantees in GSCs 336/337 are to be deprived of needed funds.

Attrition

NSERC data indicates that, during the period 2003-2007, the funds made available by projected attrition will almost exactly balance the amount that Mathematics GSCs will contribute to the Reallocation Exercise. Thus, any money made available by attrition over the next 4 years is effectively gone and will be returned only through funding of our proposals.

If the pattern of attrition for the period 1997-2001 (BP, Table 6) is superimposed onto the current grantee population (BP, Table 3), one predicts that 94 grantees will not reapply during the period 2003-2007. According to Table 6 of BP, those who withdrew in the years 1997-2001 had an average grant of $10,340. Thus the departure of 94 grantees in the period 2003-2007 is predicted to provide GSC 336/337 with roughly $970,000.

Notably, there will be little attrition associated with large grants during the period 2003-2007. One indication of the longevity of the top researchers (the 59 grantees in Mathematics with grants of at least $30K) is that only one has taken early retirement and only two will reach retirement age before 2007. The funding needs of these top researchers will certainly not diminish. Indeed, the argument of Proposal A is that many of these researchers are already under-funded.

Consequence of No Funding

If Proposals A and B are not funded, then these initiatives would be deferred, many opportunities for innovation in Canadian mathematics would be lost, and resources for leaders and emerging leaders would remain inadequate. If Proposal C is not funded or is funded at a low level, then GSCs 336/337 will have an overwhelming problem in dealing with new applicants, many outstanding researchers will be under-funded, and the momentum achieved to date will be lost.

Additional Note

Our funding proposals re¤ect priorities for Canadian mathematics over the next 4 years. We have made an effort to balance innovation and continuity while pursuing these priorities. We believe that a balanced funding of all our proposals would maintain maximal ¤exibility for GSCs 336/337 and best preserve both the health of our discipline and its continued growth and enhancement.

Appendix: Details on the 3 Mathematical Institutes

Centre de Recherches Mathématiques

Founded in 1969, the CRM has been a leader in mathematical innovation in Canada for the last 20 years. CRM developed the national institute model for research in the mathematical sciences, with a solid core program in mathematics, a strong international pro£le, and a wide network of collaborators in other disciplines and in industry. It currently receives $874K in NSERC funding and has a total budget of $3M per year. It is based at the University of Montreal, with principal partners the Montreal universities, and af£liations with nearby universities, such as Ottawa, Queens, and Laval.

At the heart of the CRM's activities lies a thematic program, chosen each year for its quality, timeliness, and pertinence to the development of mathematics in Canada. We give highlights from two examples. Last year's program on Mathematical Methods in Biology and Medicine focused both on the intricate and sophisticated modelling issues for various physiological processes, and on the dif£cult mathematical and statistical problems of inference posed by genomics. There were 11 workshops, a summer school, 2 large international meetings, 6 courses and seminar series, and Aisenstadt lectures by two of the most eminent specialists in the area, A. Winfree and M. Waterman. This program illustrates the interdisciplinary ¤avour of many of the CRM's programs, as it brought in > 1500 participants from mathematics and other areas, such as physiology, neurology, genetics, physics, and computer science. The current program lies in the core subject of Groups and Geometry. A 3-week program on low-dimensional topology in the summer attracted > 100 par-

ticipants for each week, including many students. A similar program, on the Geometric Langlands program, has attracted many of the world leaders in the area (including R. Langlands, who will deliver 8 hours of lectures on his latest ideas in the subject).

The CRM's general program covers a wide range of short programs and workshops (some off-site), as well as the joint CRM-FI-PIMS National program, prizes, a colloquium, and a joint PDF program with the local community. The CRM has been heavily involved in structuring this community, in particular by the creation of sub-disciplinary laboratories in the Montreal area, which assist the integration of the CRM's international breadth with the activities of Canadian researchers. Last year, the CRM hosted over 100 research visitors, outside of the 41 international conferences, workshops, schools, or short courses of its various programs.

In its interdisciplinary and industrial programs, the CRM is the lead institution for the Montreal-based Network for Computing and Mathematical Modelling (NCM_2), which has had some remarkable successes in the construction of large-scale partnerships, detailed below. The NCM_2 will also be organizing two joint workshops and a PDF exchange this year with Minnesota's Institute for Math and its Applications (IMA), in addition to its usual lectures and small workshops. It has also developed ties with NRC's Industrial Research Assistance Program. Another success for the CRM has been the constitution of a research network in brain imaging in Quebec. A CRM-piloted application for funding personnel is pending; it will complement large CFI initiatives for imaging equipment in which the CRM is a partner; one of these has been awarded $23M. The imaging program led to a CRM spin-off, Zeugma Technologies, which was recently awarded $20K £rst prize in the Odyssée Entrepreneurship competition.

The CRM places great emphasis on training; part of this is through the integration of short courses into most of its scienti£c activities, and part through specialized activities, such as summer school (1 per year). The other important impact is through sponsoring PDFs: over the last 3 years, it has co-£nanced an average of 15 PDFs per year, and has been host to 7 more externally funded PDFs per year.

The CRM fully endorses the vision for the discipline presented in these pages, and indeed has anticipated certain of its aspects. The CRM emphasizes both training and disciplinary outreach in its programs, and it has been enthusiastically integrating new researchers into its programs and helping them in a rapid development of their careers.

The Fields Institute

The Fields Institute has been remarkably effective in developing links among mathematicians, other mathematical scientists, and the user community, in areas from biology to physics to £nance. It has an extremely broad scope of activity, not just in its support of mathematical research through its scienti£c programs, but also in math education and in commercial and industrial development of mathematical research. The Institute is there to help the mathematical community cross discipline boundaries and to reach out to the rest of the world. Its activities mesh extremely well with the current goals of the Mathematics GSCs.

The central scienti£c activities of the Fields Institute are based on thematic semesters and years. These programs bring together top researchers from around the world to participate for an extended period in a supportive research environment. Programs focus on areas with exciting current activity, and seek to juxtapose researchers with related interests across the spectrum from pure to the applied. A good example was the recent year-long program in Probability and Applications (to physics, communications, £nance, and biology) which brought together mathematicians and statisticians with researchers applying these methods in diverse areas. The 1999-2000 program in Graph Theory and Combinatorial Optimization attracted mathematicians and computer scientists from both academia and industry. These programs attract the best and brightest of the Canadian mathematical community as both organizers and participants. It is usual to build a program around Canadian strengths, and many top senior and junior mathematicians have been involved. Long-term programs give a signi£cant boost to research efforts, and foster training of new researchers through advanced graduate courses, seminars, and PDF support. Many individuals identi£ed as emerging leaders in this report, and in the report 4 years ago, have been involved in these programs.

Today's mathematicians collaborate extensively. They require the opportunity to get together and exchange ideas. The Fields Institute can provide the infrastructure, logistical support, and supportive environment that is ideal for nurturing this kind of research. Fields is also in a position to react quickly to the latest developments and to mount activity to capitalize on it through workshops, seminars, short courses, and lecture series. Summer schools are a new avenue that is highly effective for trainees to learn about cutting edge research, and plans are in place to expand this program. A very successful summer school in Quantum Information Processing was held last year, with a highlight Distinguished Lecture Series by P. Shor (Bell Labs), winner of the 1999 Godel prize. An upcoming summer school in Automorphic Forms and the Trace Formula will be taught by J. Arthur, and be funded in part by the Clay Institute.

The Fields Institute has a tremendous breadth of activity that goes well beyond the scienti£c programs funded by its NSERC grant. The 3 Institutes founded the National Centre of Excellence, MITACS, which now funds over 20 projects in the mathematical sciences across Canada. Many of the more applied mathematicians involved in groups have taken

advantage of this remarkable new program; it has enabled groups to develop at many centres. In addition, Fields runs an incubator program for commercial projects. Two successful start-ups involved K. Murty and L. Seco, both leading Canadian mathematicians. The latter has led to a joint major ORDCF proposal in Energy Finance with 4 Ontario universities.

On the other side, Fields is one of the few mathematics research institutes in the world that is also concerned with mathematics education below the university level. Its Math. Ed. Forum has been the basis of a number of projects including curriculum development in Ontario. A national effort focused on the use of technology in the teaching of mathematics is currently applying to SSHRC's Initiative on the New Economy program for funding.

The Fields Institute is working to develop programs and interaction in a timely way over the whole range of mathematical sciences. The raw material for this interaction is the very strong and vibrant Canadian mathematical community. Working together, we can do a lot of exciting science, strengthen connections between branches of pure and applied mathematics, and reach out to the broader scienti£c community.

The Paci£c Institute for the Mathematical Sciences

PIMS was created in 1996 and has evolved into a unique bi-national scienti£c partnership, involving all of the major universities in Alberta, BC, and Washington. This appendix describes PIMS pioneering efforts in creating domestic and international partnerships. The PIMS independent submission deals with the Institute's distinctive scienti£c programs and its industrial and educational initiatives. In the last 3 years, PIMS undertook a series of bold national and international actions MITACS, the Banff Research Station, the Paci£c Northwest Partnership, and the Paci£c Rim Initiative that have markedly raised the visibility of our community. These initiatives have also multiplied the opportunities for the mathematical science community in Canada and the world and attracted substantial funding from industrial, provincial, federal, and foreign sources in support of Canadian-led research. By sharing resources among its participant universities, maintaining a ¤exible program structure, and empowering its membership, PIMS has achieved a much higher level of activity, innovation, and opportunity than would be possible otherwise. NSERC's support for PIMS is doubly matched by its partner universities and by the governments of Alberta and BC. PIMS receives (free of overhead) substantial research infrastructure support from its participant universities, including two fully-equipped facilities (each 5,000 sq.ft) at UBC and SFU. Therefore, PIMS is in a strong position to concentrate its resources on research and training. The investment by PIMS in 30 PDFs is matched equally by its industrial partners and af£liated departments. Students from across Canada have access to at least 6 annual PIMS summer schools and training camps in industrial and emerging areas of the mathematical sciences. With its US partners, PIMS developed the Banff International Research Station. In addition to the support of PIMS and of the Berkeley-based MSRI, this unique Canada-US joint venture has received funding from NSF, the Alberta Science Research Authority and from NSERC's MFA program. This new facility will greatly multiply the opportunities, as more than 1700 Canadian and international scientists from across the spectrum of mathematical disciplines are expected to participate in BIRS activities every year. The initial ventures of the Paci£c Northwest Partnership are the 12 PIMS and NSF sponsored Paci£c Northwest (PNW) seminars that help to sustain the collaborative effort throughout Western Canada and the US. Beginning in 2003, the PNW segment of the PIMS industrial program will be developed in collaboration with the Minnesota-based IMA.

PIMS is also looking forward to more partnerships with NSF on a number of Pan-American Advanced Studies Institutes.

Together with its Paci£c Rim partners, PIMS and its sister institutes in China, Taiwan and Japan, are developing the Paci£c Rim Initiative. Jointly, they organize major Paci£c Rim events (Hong Kong '98, Taipei '01, Vancouver '04) promoting scienti£c links throughout the region. The annual PIMS program on Frontiers in Mathematical Physics is a joint initiative with the Perimeter Institute (Waterloo), and the Asia Paci£c Center for Theoretical Physics (Korea).

The PIMS industrial problem-solving workshops and its industrial collaborative program continue to be key building blocks for the MITACS network. In the last 2 years, 53 PIMS industrial partners contributed to the institute's collaborative research program, including 11 out of the 23 MITACS projects. In partnership with the Institute for Computing, Information, and Cognitive Systems and the New Media Innovation Centre (NewMIC), PIMS is developing a 3-year interdisciplinary program on Mathematics and Multimedia to bring mathematicians and statisticians together with their colleagues in computer science and engineering. With its participating K-12 schools, PIMS researchers annually organize dozens of math evenings and math fairs across Western Canada and Washington State. PIMS publishes and distributes Pi in the Sky, a magazine for math educators and students. The Women and Mathematics poster campaign followed the highly acclaimed Year 2000 Mathematics is Everywhere posters on buses and in classrooms. PIMS is also a pioneer in web-casting major events to the world scienti£c community; lectures by PIMS distinguished scientists (e.g., A. Huxley, H.S.M. Coxeter, and others) are made available over the internet using streaming video.

MINUTES OF THE ANNUAL GENERAL MEETING

Room 2708, Pavillon Adrien Pouliot, Université Laval
Québec, Québec
June 16, 2002

DRAFT Pending approval

The meeting opened at 12:30 p.m. with 44 members in attendance.

1. Adoption of the agenda

The agenda was accepted with the addition of the following items:

1. By-Law No. 11 will be discussed after the Executive Director and Secretary's Report.
2. Under Committees, there was a slight change in the order of the reports.

2. Minutes of the previous meeting

G–02–1 MOTION (Piché/Williams)
That the minutes of the previous Annual General Meeting, held on June 3, 2001 be accepted.
Carried Unanimously

3. Matters Arising

There were no matters arising.

4. President's Report

Borwein began by expressing his thanks to the Université Laval, and especially to Claude Levesque, Meeting Director, for the phenomenal work done on the scienti£c programme and local arrangements for the 2002 Summer Meeting. The Meeting Committee is to be congratulated for attracting so many participants to the conference. Thanks also went to the three national research institutes for their £nancial support.
The CMS Executive Of£ce is developed several initiatives to recognize the CMS members. New membership cards are being made available during this meeting and can be picked up at the CMS exhibit booth.
Borwein noted that the CMS as a whole, including all its committees and editorial boards, continue to work tirelessly for the development of their very important programmes. The Society is enormously more complex than it was even a few short years ago, and, although we face several important developmental issues, including expanding membership and maintaining our primarily revenue stream, the CMS is on a sound footing.
He noted that the Innovation Agenda will have profound and widespread effect on the mathematics community. He urged members to look at the reports available on the web and to become engaged in the process.
He thanked the members again for their support during his presidency and expressed con£dence in the abilities and enthusiasm of Christiane Rousseau as she takes over the post of President.
In July, Graham Wright takes on the Executive Director position on a full-time contract basis. All arrangements are in place with the University of Ottawa. This is a two-year appointment and the Society is already considering the future of the position after this two-year term. Part of those discussions include the required quali£cations for the CMS Executive Director, more speci£cally whether the post should be £lled by an academic with a research mathematics background.
Taylor reported that he had attended a recent meeting regarding HQP: highly quali£ed personnel. There will be a number of meetings across the country in the next few months and participation is urged, as the mathematics community has a serious role to play. As always, participation can take many forms, from participation in meetings when possible to writing letters to participants or members of parliament.

5. Treasurer's Report

Sherk presented the Audited Statements and Treasurer's Report. He noted that, although we had budgeted a surplus of approximately $20,000 The year ended with a de£cit of approximately $30,000. This was due to a number of factors, including the increase in the number of staff at the Executive Of£ce and a disappointing result in our fund raising efforts.
Sherk thanked all the editorial and other of£ces of the Canadian Mathematical Society, along with the committees, for keeping their expenses under budget.
Borwein thanked the Executive Of£ce for handling the £nances so well during the last two years, during which time the CMS had to let two £nancial staff go. The £nances are now in the hands of Diane Ellis, the new full-time Accountant.

5.1 Audited Statement

G–02–2 MOTION (Board of Directors)
That the Audited Statement for the period ending December 31, 2001 be accepted. *Carried Unanimously*

5.2 Treasurer's Financial Report

G–02–3 MOTION (Board of Directors)
That the Treasurer's Report for the period ending December 31, 2001 be accepted. *Carried Unanimously*

5.3 Appointment of auditors

G–02–4 MOTION (Board of Directors)
That the £rm of Raymond Chabot Grant Thornton be reappointed as auditor of the Canadian Mathematical Society for the period ending December 31, 2002.
Carried Unanimously

6. 2001 Annual Report to the Members

G–02–5 MOTION (Board of Directors)
That the 2001 Annual Report to the Members be accepted. *Carried Unanimously*

7. Executive Director and Secretary's Report

Caroline Baskerville left the Society just one week ago and Vickie Howe has joined the staff as Assistant to the Executive Director.
Wright noted that we are implementing new strategies to attract and retain paid membership.
He expressed his sincere thanks and appreciation to Jonathan Borwein. By-law No. 11 has been accepted by the Executive Committee and the Board of Directors. This by-law will regularize the starting date (July 1) and end-of -term date June 30) for the of£cers and directors.

G–02–6 MOTION (Board of Directors)
That the Special Resolution of the Members By-law No. 11, dated November 15, 2001 be accepted.
Carried Unanimously

8. Reports from Committees

Women in Mathematics: Malgorzata Dubiel reported that discussions have begun with the Student Committee regarding a Conference for women graduate students in mathematics. Subject to funding, this conference will be held the two days prior to the Summer 2003 in Edmonton.
Students: Daniel Piché reported that the committee needs enthusiastic undergraduate students. He also reported that the latest issue of the Student Communicator has been released. The Committee hopes to publish 2 issues per year. A new web master has been appointed and more content is to come. They would be happy to post information on special projects and invited input from all departments. They also have some funding for special events for students.
The Committee has requested that all future CUMC should be announced in the *CMS Notes*. It can be announced in the calendar of events and a more extensive announcement can be submitted for publication.
Piché is stepping down as Chair and the meeting expressed its thanks and congratulations to him and to the entire Committee for its increasing contribution to the development of the CMS.
Research: Doug Stinson reported that the pool of candidates for the CMS research prizes could be bigger and he encouraged more nominations. He reported an increasing reluctance on behalf of colleagues to organize sessions. This may be an anomaly but the Committee encourages people to organize sessions.
Speci£cally, Eric Woolgar, on behalf of YanPing Lin, the Meeting Director for Summer 2003, encouraged members to organize sessions at the Edmonton meeting.
Borwein noted we may need to look at what other activities we could add to the overall programme of our semi-annual meetings.
Publications: Keith Taylor reported that subscription levels are fairly healthy with a slight decrease in the number of subscriptions. CRUX with MAYHEM subscriptions levels are going up. It was noted that a special project had almost been completed. When completed, a database of approximately 2,000 problems will be available on the web.
Thanks were given to Bruce Shawyer who will soon be stepping down as Editor-in-Chief. Thanks also went to Memorial University for its constant and generous support of the CRUX with Mayhem Editorial Of£ce during Shawyer's mandate.
Jim Totten will be taking over the Editorship and the Committee expressed its best wishes to the new Editor-in-Chief.
It has been agreed that issues of CJM and CMB will be made public after £ve years. CRUX with MAYHEM will not become public because the shelf-life of the problems is longer. How the journals will be affected by the new publishing consortiums is not clear but the Committee will be keeping an eye on the situation.
The selection process for the G. de B. Robinson Award has begun.
Nominating: Jonathan Borwein reported for Anthony Lau. The Committee has begun its work on the 2003 election and the initial slate of candidate should appear on schedule.
Two new private sector members of the Board have now been appointed. Suggestions for private sector members for the Board or Committees is welcome.
Mathematical Competitions: Daryl Tingley reported on the COMC. The CMO is running well and will have a new chair this year. The IMO team was just announced.
Canada is now the Senior Organizing Country for the APMO. Unfortunately, this year's results were nulli£ed, a result of having the problems published on the web. This was a repeat of last year's incident. Bill Sands is the Chair of the Committee and they will be discussing this problem at an upcoming meeting in the hopes of resolving it.

Math Camps are in their fourth year. Tingley encouraged members to organize one. Although they do involve a great deal of effort on behalf of organizers, they are undoubtedly very satisfying and an extremely good way to meet very talented students.
The meeting once again expressed its thanks to Tingley for his energy over the last six years.
International Affairs: Cameron Stewart reported that the CMS is co-sponsoring a reception at the Canadian Embassy in Beijing during the ICM for Fields Medalists.
As a top level member of IMU, Canada is allowed to send £ve representatives to the General Assembly. This year, these representatives will be Christianne Rousseau, Jacques Hurtubise, Nassif Ghoussoub, Cameron Stewart, and Ken Davidson. George Elliott is the alternate.
Canada has no one on the Executive of the IMO but John Friedlander has been nominated.
Finance: There were no items to report which had not been covered under other items.
Endowment Grants: Kathryn Hare reported that, last year, nine projects had received a total of $60,000. This year, the Finance Committee has committed $45,000 but this will be reevaluated in October. She encouraged applications.
Electronic Services: Jason Brown reported on some new features of the web site, including the introduction of xml for the next meeting's abstracts section, the APuRL project, password caching and continuing work towards a better £lter for spam.
Alan Kelm reported on some changes as well. The membership form is ready to be auto-£lled, using a CMS ID and last name. It is now possible to get a department membership list. A comment button button has also been added to the bottom of every page.
The journal website is being reworked. We hope to introduce secure credit card access, add more math-ml, and have book reviews available.
Borwein noted that almost all registrations and abstracts now come through the website.
Education: Ed Barbeau suggested that problems be available for students and teaching on the website. A publication series for education is being considered and members are encouraged to make proposals.
The Committee is suggesting the creation of a Canadian sub-Committee to ICMI and is hopeful.
Nominations were sought for the next Adrien Pouliot Award. Barbeau also reminded members that grants were available for provincial competitions and/or events.
As the Contributing Editor for the *CMS Notes*, he is soliciting news, ideas, events, and reactions to previous columns.
Advancement of Mathematics: Jonathan Borwein reported that the agenda for this new Committee seems in£nite. The Committee is currently focusing on creative ways to retain and increase membership, developing a major endowment drive, and accreditation in mathematics, including a possible fellowship in the mathematics society.

9. Other Business

9.1 Transfer of power to the New President

Borwein invited Rousseau to address the general membership. She began by recalling the 57 years which Canadian mathematicians have dedicated to the development of the Society. With that as a solid foundation, the future looks promising.
While the Society faces some challenges and, perhaps even some real threats, the discipline itself is in a much better position than ever before. With more opportunities for grad students and a sound infrastructure for new and established mathematicians, we have more and better ways of defending ourselves in front of granting agencies. Also, we can play a real leadership role in education issues and establish better and more widespread links with industry, these in turn creating more opportunity for grad students.
Rousseau expressed her sincere thanks to Jonathan Borwein for the extraordinary work he has done during his tenure. With his energy, his open mind and his skill, he has helped the Society make strides in many different areas. Rousseau expressed her commitments to continue in this forward direction.

10. Adjournment

The meeting adjourned at 1:30 p.m.

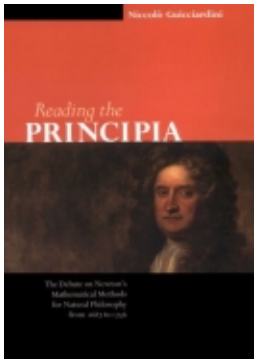
Call for Nominations

The deadline for nominations for the 2002 Canadian Mathematical Society Doctoral Prize is **January 31, 2003**. Further information can be found in the CMS Notes (November 2002, page 25) or at www.cms.math.ca/Prizes.

Appreciating Newton's Principia Mathematica

Revue par Yves André, CNRS Paris

Reading the Principia
by NiccoloÁGuicciardini
Cambridge University Press, 1999
285 pp



Les *Philosophiae Naturalis Principia Mathematica* de Newton sont un livre illustre mais dif£cile. Dif£cile surtout en raison de ces ≪principes mathématiques≫ beaucoup moins bien connus que la ≪philosophie naturelle≫ qu'ils sont censés sous-tendre. Ce sont ces principes mathématiques que N. Guicciardini se propose d'éclairer, en confrontant les lectures qu'en ont faites les contemporains et en démêlant les débats passionnés qu'ils ont provoqués jusqu'áEuler.

Les *Principia* sont un ouvrage de maturité de Newton (1687), bien postérieur aux ≪anni mirabiles≫ (1664-70) qui virent éclore sa ≪méthode analytique des ¤uxions≫ (méthode qui resta largement con£dentielle). Entre-temps, Newton avait pris ses distances avec ses théories de jeunesse: il lut les Anciens, se convainquit de la supériorité de leur science, en vint même áconsidérer son œuvre propre comme la redécouverte d'un savoir perdu. Suivant cette évolution philosophique, il délaissa dans ses publications sa méthode analytique au pro£t d'une ≪méthode synthétique des ¤uxions≫ rappelant Archimède, et s'attacha ádonner ála multiplicité des méthodes mathématiques mises en œuvre dans ses *Principia* la façade géométrique unie des traités d'Appolonius et Pappus.

La premiáre partie de *Reading the Principia* est consacrée aux méthodes mathématiques de Newton : exposé de ses théories des séries, ¤uxions et ¤uentes, et de leurs avatars géométriques, suivi d'une analyse approfondie des méthodes des *Principia*, au cours de laquelle le lecteur mathématicien moderne, guidé de main de maître, apprend véritablement á lire et apprécier les arguments de Newton dans le texte. C'est fascinant.

Reading the Principia nous relate ensuite la façon dont les démonstrations du grand-œuvre de Newton furent lues et reçues.

L'auteur nous présente trois lecteurs. D'abord Newton lui-même: ses manœuvres compliquées lors de la querelle de priorité entre newtoniens et leibniziens-bernoulliens sur l'invention du ≪nouveau calcul≫ — Newton prétendant que les résultats des *Principia* avaient été établis au moyen de ≪la nouvelle analyse≫ avant d'être publiés, suivant l'antique tradition, sous forme ≪synthétique≫. Puis Huygens, dont le célábre *Horologium oscillatorium* avait impressionné Newton: il admira la virtuosité géométrique de Newton tout en critiquant ses écarts de la théorie des proportions d'Eudoxe (et en contestant ses prémisses physiques). En£n le grand rival, Leibniz. Comme pour le calcul des ¤uxions, l'auteur présente une analyse aussi passionnante de la genáse du calcul in£nitésimal leibnizien (*Nova methodus*, 1684).

Les méthodes des *Principia* £rent naître dans l'Europe savante, sur fond de querelle de priorité, un débat complexe dont le cercle newtonien britannique et l'école de Bâle furent les principaux protagonistes; problème de la traductibilité des arguments géométriques des *Principia* en langage symbolique leibnizien, controverses sur le contenu représentatif des symboles...

Lá le tableau s'élargit considérablement: l'auteur peint une époque scienti£que en effervescence oùle problème fondamental de la voie ásuivre pour la mathématisation de la philosophie naturelle était ouvert: géométrisation dans la tradition de Galilée-Huygens, ou algorithmisation ála Leibniz? On sait que le calcul in£nitésimal sous la forme algorithmique que lui donna Euler — basée sur le concept de fonction absent chez Newton et Leibniz — £nit par triompher átravers ses applications et reléguer au passé les méthodes géométriques des *Principia* (*Mechanica*, 1736).

En terminant une seconde lecture de ce livre, j'éprouve le même enthousiasme qu'ála premiáre. L'architecture de l'ouvrage est si nette que jamais sa richesse et son érudition ne donnent l'impression de lourdeur ni de foisonnement. J'ai déjásouligné le talent pédagogique de l'auteur, qui amáne le lecteur mathématicien moderne álire Newton, Leibniz et J. Bernoulli, mieux: áentrer dans leur monde. On a l'impression d'y descendre par cercles successifs, avec émerveillement.

L'ouvrage brille par la rigueur et la clarté de ses analyses. Soin du détail: dans les £gures, les citations reproduites en langue originale en note de bas de page, l'abondante bibliographie. Le style est trás soutenu, évite l'anecdote mais aussi l'austérité par l'élégance souriante du ton. Un livre splendide.

This review is reprinted from the January 2002 issue of "Gazette des Mathématiciens", published by the Société Mathématique de France.

EDUCATION NOTES

Ed Barbeau and Harry White, Column Editors

Formation of elementary teachers

On Saturday, September 21, the Mathematics Education Forum at the Fields Institute heard presentations on the professional development of elementary teachers. As these were particularly £ne, I asked the presenters to prepare summaries for these *Notes*. I was very pleased that George Gadanidis was able to comply with this request. Also present was Sheine Mankovsky, a trustee for the Toronto District School Board, who said some important things, and I felt that it would be useful to relay her comments to a wider audience. Both interventions are reproduced below.

Mathematics Romance and the Professional Development of Elementary Mathematics Teachers

George Gadanidis
Faculty of Eduction, University of Western Ontario
ggadanid@uwo.ca

Abstract: What elementary mathematics teachers need most of all in professional development sessions are: (1) romantic experiences with mathematics, where they fall in love with mathematical thinking; (2) the incentive to try similar experiences for their students; and (3) opportunities to meet and discuss their experiences with other teachers.

Issues in elementary mathematics education

The following key issues need to be addressed in professional development sessions for elementary mathematics teachers (*McGowen & Davis*, 2001a, 2001g; *Stipek et al, 2001)*:

• It is not uncommon for elementary teachers to have negative aesthetic associations with mathematics. Many openly and sometimes proudly admit that they do not like mathematics.

• Despite recent curriculum and assessment reform, many elementary teachers conceive mathematics as learning procedures and getting right answers. Curriculum documents are like inkblots where teachers see their personal conceptions of mathematics.

• Many elementary teachers do not have a background in mathematics and do not feel con£dent about their own mathematical ability.

Teachers need critical experiences

The above issues relate to deep-seated beliefs about mathematics. Changes can occur only through critical professional development experiences. These may be de£ned as those experiences of epiphany that cause us to re¤ect on our knowledge and beliefs and see mathematics and mathematics teaching in a new light (*Gadanidis, Hoogland & Hill*, 2002b). When such moments occur for teachers, mathematics and education artifacts – such as curriculum documents, classroom experiences, ideas from professional development workshops, journal articles and so forth – may cause their perspectives to shift so that something new is seen, something that was not apparent before. As one teacher in one of our studies commented, "I feel like [this experience] has cleaned my spectacles." Similar £ndings are reported by McGowen & Davis (2001) where teachers noted that course experiences "opened [my] eyes to a new outlook on mathematics" (p. 444).

I believe that the core component of a critical experience is a romantic mathematical experience – an intellectually romantic experience. I also believe that teachers are drawn to such experiences.

In one of our research projects, we looked at pre-service elementary teachers' reactions to interviews with mathematicians, where mathematicians express affection towards mathematics (*Labelle*, 2000; *Sinclair*, 2000; *Yeats*, 1999). It is interesting that almost all of the teachers in the study – most of whom entered the faculty of education experience with very negative attitudes towards mathematics – expressed positive aesthetic reactions to the mathematicians' views of mathematics and they shared personal examples of mathematical experiences that they found aesthetically pleasing, as re¤ected in the two excerpts below.

My initial response to the question regarding the beauty of mathematics was one of disbelief! I honestly never considered such an adjective as applicable to the subject of math. Yet with a little instrospection I can remember . . .

After reading the interviews with the mathematicians, particularly Nathalie Sinclair's, I felt a creeping desire to tackle math again. The language she used to describe her love of math was inspirational, as well as poetic, appealing to my senses, and the possibility of actually loving math again . . . Maybe it is possible, after all, to enjoy math again. We'll see . . .

Romantic experiences with mathematics - an example

The typical view of numbers and operations with numbers focuses on students solving questions to get answers. For example, the following is a typical math question:

$$1. \quad 4 + 6 = _____$$

But what would happen if we turned this around so that stu-

dents were given answers and they have to make up the questions? We can reverse the ¤ow of the above question as follows:

$$2. \quad ____ + ____ = 10$$

In terms of practising addition, both the £rst and second questions provide this. However, I have found that both teachers and students enjoy solving the second question much more than the £rst (Gadanidis 2002).

The second question has a number of advantages:

• It has many solutions.

• It allows students to £nd creative ways of making ten.

• It allows students to engage at a level that is appropriate to their mathematical knowledge and ability.

The second question also leads to more mathematics.

For example, students could explore patterns and in fact use patterning to generate solutions, as shown in the following table:

First number	Second number
1	9
2	8
3	7
4	6
5	5
6	4
7	3
8	2
9	1
10	0

We could also consider extending the pattern. What would happen, for example, if we extended the pattern in the £rst column using the numbers 11, 12, 13, and so forth? What numbers do we need in the second column so that we still get a sum of ten? Young students already know about thermometers and have little dif£culty extending the pattern in the second column using negative numbers.

We could also see the pairs of numbers as ordered pairs and graph them on a grid.

Isn't that interesting? The points form a line.

I wonder whether we would also get a similar pattern for a question like $___ + ___ = 5$? How could we control the direction of the line?

It is interesting that teachers who have positive attitudes towards mathematics often have had open-ended mathematics experiences like the one above. As one teacher commented, "I LOVE math. I always have. I, like many of you, had many problem-solving car trips. I still get excited when I see a licence plate that I can make ten with (using any means)." Note the teacher's verbal expression of delight and use of capital letters to convey her emphasis. If this had been a face-to-face dialogue, the teacher might have smiled or raised her voice pleasurably. The example shared by this teacher involves the open-ended mathematical problem of "making ten" using "any means" which contrasts sharply with the more traditional problem of £nding the answer to, say, $5 + 5$. The person "making ten" has the opportunity to use her imagination and to £nd personal, creative ways of looking at mathematically-combined digits on licence plates (Gadanidis & Hoogland, 2002a, 2002b).

Professional development

In my four years as math coordinator for the Durham District School Board, we structured all our mathematics professional development using a 'sandwich' approach:

• Session 1: Mathematics-based experiences for teachers. Ideas to try out in the classroom.

• Between sessions: Teachers tried ideas from Session 1 in their classroom. They collect samples of student work. They re¤ect on their teaching.

• Session 2: Sharing of experiences. Analysis/comparison of teaching experiences and samples of student work. More ideas to try out in the classroom (from presenters and from participants).

This structure offered teachers the oportunity and the incentive to try out their ideas in their classrooms, to re¤ect on them and to talk to other teachers about them.

A last word

The focus of mathematics professional development for elementary teachers has to be on mathematics (it often isn't). In the £rst few mathematics experiences I provide for the teachers in professional development sessions and in education courses I teach, I ensure that the starting point is mathematics that they teach. I also ensure that they experience this mathematics in new ways, where they have opportunities to explore, to wonder, to notice the beauty of mathematics and mathematical thinking.

Note

If you see the example discussed here as having to do with linear functions, you may wonder where it would £t into the elementary curriculum. I was recently invited by two grade four teachers to do a lesson on algebra in their classrooms. The topic was £nding missing values in simple equations. I started the lesson by giving each student a die that they rolled to £nd the £rst missing number in $___ + ___ = 10$. Then they calculated the second missing

number. They kept going until they exhausted all of the possibilities. Students recorded results in a table of values, plotted them and were surprised that they lined up. So we tried a few more, with different sums ... and the mathematical romance continued. This gave them practice £nding missing values, but unlike typical classroom problems, the equations were related. Most teachers and students see algebra as the study where you develop skills for £nding the 'unknown'. Is this algebra? It is a very small part of what is algebra. Mainly algebra is the study of relationships among quantities that vary. The foregoing activity is a good starting point for teachers and young students to experience the beauty of algebra.

References

Gadanidis, G. (2002), *Becoming a Mathematics Teacher: A Mathematical Romance*. London, ON: MathMania Publications.

Gadanidis, G. & Hoogland, C., Mathematics as story. *The Canadian Journal of Science, Mathematics and Technology Education* (to appear)

Gadanidis, G., Hoogland, C. & Hill, B. (2002a), Mathematical romance: Elementary teachers' aesthetic online experiences. *The 26th Conference of the International Group for the Psychology of Mathematics Education*, University of East Anglia.

Gadanidis, G., Hoogland, C. & Hill, B. (2002b), Critical experiences for elementary mathematics teachers. *Proceedings of the XXIV Annual Meeting, North American Chapter of the International Group for the Psychology of Mathematics Education*, Athens, GA (to appear)

Hoogland, C. & Gadanidis, G.. Math as art. *The Journal of the Imagination in Language Learning and Teaching* (to appear)

Labelle, G. (2000), Interview with Gilbert Labelle. *MathMania 5 (4), 10-11*.

McGowen, M.A. & Davis, G.E. (2001a), What mathematics knowledge do pre-service elementary teachers value and remember? In R. Speiser, C.A. Maher & C.N. Walter (eds,), *Proceedings of the XXIII Annual Meeting, North American Chapter of International Group for the Psychology of Mathematics Education* (pp. 875-884), Snowbird, UT.

McGowen, M.A. & Davis, G.E. (2001b), Changing pre-service elementary teachers' attitudes to algebra. In H. Chick, K. Stacey, J. Vincent & J. Vincent (eds.), *Proceedings of the 12th ICMI Study Conference: The future of the teaching and learning of algebra* (pp.438-445), Melbourne, Australia: University of Melbourne, 2002.

Sinclair, N. (2000), The joy of mathematics. *MathMania* 5 (3), 4.

Stipek, J.S. et al (2001), Teachers' beliefs and practices related to mathematics instruction. *Teaching and Teaching Education* 17, 213-226.

Yeats, K.A. (1999), Interview with a mathematician. *MathMania* 4 (1), 6.

A school trustee responds

Sheine Mankovsky
(Trustee, Ward 5, York Centre, Toronto District School Board)
sheine.mankovsky2@tdsb.on.ca

A short time ago George Gadanidis invited me to attend a Saturday seminar sponsored by the Fields Institute for Mathematical Research. Its purpose was to provide a forum for teachers of mathematics to share experience and ideas with respect to math curriculum, and to provide them with support to continue to develop their expertise. Now, I am not particularly math-inclined—not by aptitude, and not by choice. But as a trustee on the Toronto District School Board I am hugely interested in the subject. Until recently, with 21 colleagues I shared responsibility for the education of about 300,000 of our community's children, including my own.

I was impressed by the profound and sincere commitment of these folks to the education of children, and I was impressed with their interest in doing a better job of teaching them mathematics. But as I sat and listened to the discussion, I became more and more concerned because, from my experience as a student, parent, long-time employee in large bureaucracies, and trustee, I had little con£dence that they were going to reach their objectives. I'd like to share some thoughts on why.

First, the public education system is structured as any other conventional, hierarchical bureaucratic institution in our society. The purpose of a bureaucracy is to provide a vehicle for carrying out some purpose in a uniform, stable, and predictable way. Form drives function. Uniform outcomes are an important measure of success. In fact, bureaucrats often write superb manuals to ensure that happens. And the really good ones are so good that there is no need to think. Therefore, and this isn't an original thought at all, change is not a hallmark of such organizations. In fact, stability and predictability require just that-repeat the actions, don't change them. Don't think about changing them. Don't think.

Bureaucracies aren't known for encouraging democracy, initiative, responsibility, transparency or accountability. It's not that there isn't an effort by the people running the shop. It's not that the folks aren't doing their darndest, and

then some. The fatal ¤aw is structural: structure drives function.

So, with respect to public education, the public is left trusting an institution that is structurally set up to fall far short of our expectations. Educators are bureaucrats, and teachers are curriculum administrators, administrating the manuals that we prefer to call curriculum.

In the hierarchical education bureaucracy, like all others, to progress in one's personal career, one must ultimately leave the classroom-and the kids-behind. Scaling the pyramid brings various rewards to successful climbers. But it takes them ever further from the kids. The very people who went into education as a calling, ironically, de£ne their personal success in terms of obtaining senior administrative positions in the organization. For some, the pinnacle is a position in the Ministry of Education. And some will £nd theirs in faculties of education. Bottom line, the classroom is not the place you want to be at the end of your career, not really. In a large school board such as the Toronto District School Board this adds up ineffectiveness and, in my own view, failure to live up to our common responsibility for the best interests of all of our community's children, including our own.

Bureaucratic structures belong to the industrial age. Training skilled workers to be productive in the industrial economy is a primary purpose of education bureaucracy. Again, not an original thought. When I heard teachers talking in terms of "training trainers", I was shocked. Even the vocabulary of pedagogy wasn't there! Where did it go? Why did it go?

As parents, I believe our fundamental concern is our children's safety. It's not much fancier than that. We want to know that when we aren't around, they will be able to fend for themselves, and, let's not kid ourselves, just plain stay alive. The world is not always a friendly, nurturing place. Every day people get killed out there! Even lots of people. So, we become very protective, and we expect the people to whom we give over our children every day when they enter a school building will above all, keep them safe. Not only will they keep them safe, but they will also tell them how to stay safe for the rest of their lives. Do it this way, and you'll be £ne.

To fend for themselves we know our kids are going to have to be able to earn their living, or, otherwise stated, their loaf of bread. And, as the world becomes more and more unpredictable, at least, from our adult point of view, our impulse to shelter our children grows stronger. With such a mindset, are we really going to support risk-taking? Are we really going to support educational activities that don't make us feel more secure about our kids' futures? You bet we're not, and just to make sure, we will test the kids, on a regular basis. We will administer standardized tests not so much because we need to know that they are learning, but we are just plain scared that they're not.

Our fear for our children's safety impedes their learning. We know that risk-taking is vital to real and qualitative learning. We know that interacting with the world at large is what leads to knowledge creation. We know that creativity and prosperity are closely linked. The knowledge isn't in the book. It certainly isn't in the manual! To promote our children's future security we need to support learning, not teaching, risk, not rote, and yes, failure, not success.

So, where do we go from here? What solution do I propose? Think about it: I trust that you will create some pretty good ones.

How people get educated

Readers of the October, 2002 issue of *University Affairs*, published by the Association of Universities and Colleges of Canada, will have noticed on pages 26-27 an interesting interview by Clare Demerse with Professor David Livingstone, who heads the Centre for the Study of Education and Work at the Ontario Institute for Studies in Education at the University of Toronto. In his 1999 book, *The Education-Jobs Gap*, he argues that many workers in the industrial nations are underemployed. He was surprised to discover that, on average, Canadians spend 15 hours a week in informal learning activities, that is, learning outside of any system of education and certi£cation. In overlooking this fact, educational institutions and employers are "missing some of the major and most passionate kinds of learning experiences that Canadian adults are involved in".

Many of us who have had the occasion to interact with older students or students who suddenly discover that they really need to get on top of some piece of mathematics may have noted how robust the learning of such individuals can be when the motivation is there. There is no doubt that a late start can be disadvantageous to most people in reaching higher levels of mathematics, but often mature students seem to be able to counteract this to a degree with a greater sense of focus, a desire for understanding rather than low competence, and greater persistence and industry, so that they can master basic material more rapidly and ef£ciently.

Livingstone's observations suggest that the reason for a lot of the expense and nonproductivity of modern education may be that we have not understood how learning can be best paced for a signi£cant part of the population. This may be so in part because of the bureaucratization mentioned in the previous piece. As a society, we emphasize the utility of schooling both for individual career prospects and for na-

tional competitiveness to the extent that many students seem to be going through the motions on material that, apart from the needs of certi£cation, does not appear to be particularly compelling. Our emphasis on the nuts and bolts of knowledge, combined with the universality of modern education, have combined to produce a syllabus that is mundane and dispiriting for many pupils and a teaching corps with many individuals who have never gained or have lost a higher vision of their disciplines.

If we consider the implications of this line of thinking, we should be envisaging an education system with the broader goals of opening up to students a host of options for living life to the fullest. This involves a rich extracurricular program and an approach to the academic subjects that nourishes the amateur as well as the professional. Our philosophy of education should be framed by the two answers given in the Psalms to the question "What is man?" In the eighth Psalm, we are told that he is "but little lower than the angels to be crowned with glory and honour" and in the 144th, that his days are like a shadow that passes away. Thus, our schools, colleges and universities should speak to the preciousness of human life, celebrating the great achievements of the past and present, and relegating material needs to a contingency, even if important, status that supports a quest for the deeper ful£lment in life that Dr. Livingstone observed in many of his self-taught subjects.

In mathematics, we have a great story to tell. Over the ages, men and women, both great and small, have bequeathed to us an inheritance of great problems, mathematical structures of incomparable beauty and canons of symbolism and reasoning that are astonishingly powerful. A syllabus that uses this as its guiding light can be both challenging and capable of touching a broad mass of the people. Those who want to take up studies in mathematics or areas where it has importance will of course need a strong technical background and the discipline to acquire it. But the same is true of sports and music, both of which have points of access for almost anybody. If we provide students with the ideological scaffolding that sees mathematics in human and structural terms as a sculpturing of ideas, then the technical aspects of the subject can be embraced with more ef£ciency as the working out of a coherent whole.

In a way, we have recognized this in the reforms of the last twenty years, but we lack both the structures, societal respect for the artifacts of the mind and spirit, and the teaching strength to implement a more humane curriculum in a comprehensive way. So we have wound up with two education systems. There is a palliative one where we try to keep our heads enough above water to get high school students to a level of literacy and numeracy that might have been expected of a grade eight student earlier in the century, and our university graduates to be able to take advantage of career opportunities open to a high school graduate of an earlier era. And, in a haphazard way, depending on individual initiatives, lucky conjunctions of forces, idiosyncratic availability of resources, a second system in which some children have access to knowledge and experiences that were unheard of £fty years ago. These are the students who compete in contests, enter science fairs, participate in summer programs, devour the abundant mathematical literature open to them, bag research assistantships and mentoring, and in some cases, even in high school, operate at a level that might do credit to a graduate student. As praiseworthy as some of this might be, somewhere along the way, we have lost the ideal of our nineteenth century forebears of a universal education system that enriches, ennobles and enables citizens from all stations in life to be full participants in society.

(From the Executive Director's Desk–continued from page 1)

In October,the meeting is also concerned with a review of the Budget Proposal for the next year, while in April, the Committee examines the Audited Statement. Recommendations are transmitted to the Executive Committee and to the Board of Directors for approval.

The budget process very much involves our committee chairs and editors. The Executive Of£ce staff coordinates a wealth of £nancial data into the Budget Proposal subsequently submitted to the Finance Committee. The scope of the CMS has increased considerably in recent years and it is very apparent that the Society is £nding it more and more dif£cult to £nance its current range of activities. Therefore, it must very carefully consider the £nancial impact of any new programs or initiatives.

In 2001, the Operations Fund de£cit was just over $30,000 and for 2002, it is estimated the de£cit will be close to $40,000. The 2003 Budget Proposal that has been endorsed by the Finance and Executive Committees and will be presented to the Board of Directors in December for approval, projects a very small surplus for 2003—approximately $3,500. Although the CMS is fortunate and grateful to our sponsors and members for their support, and to the many members who volunteer their time to help is many ways, the future health of the Society is dependent on signi£cantly increasing revenues or reducing expenditures. In 2002, expenditures in the Operations Fund were very well controlled ($1,415,514 budgeted and $1,400,340 now projected for the year-end). The situation is not the same as regards revenues ($1,405,023 budgeted and $1,360,504 the year-end projection).

As with many similar societies, the surplus in the Pub-

lishing Division ($307,138 in 2001) provides the resources to almost offset the de£cits in the other three divisions (General - de£cit $82,691, Education - de£cit $131,333, and Research - de£cit $123,541). The very small surplus projected for 2003 could easily become a de£cit with slight decreases in exchange revenues, membership and registration fees, subscription income, royalties, etc. It is not desirable for the margin to be so close and efforts are underway to obtain more sponsors for our educational and research activities, to make our meetings more attractive to more delegates, and to widen the scope of our publishing activities. The editors-in-chief (both past and present) have contributed to making our journals and books internationally respected and, therefore, £nancially successful. Since 1990, a crucial component in the Society's publishing activities has been the TEX Of£ce at the University of Manitoba. Michael Doob has been the CMS TEX Editor for the past thirteen years and, under his direction, the TEX Of£ce has been vital to the success of our publications. In 2003, some major changes to our publishing operations will take place.

The CMS TEX Of£ce will become the CMS Publications Of£ce with Craig Platt (Manitoba) as the Technical Editor. I wish to thank the University of Manitoba and the Department of Mathematics for its past and future support of the Society's publishing operations. Although Michael will be stepping down as the TEX Editor, I am delighted to report that he will be staying on as the Technical Consultant. All of the existing support staff will be part of the Publications Of£ce and I am sure it will be a very smooth transition. Bruce Shawyer (Memorial) will be ending his seven-year term as the Editor-in-Chief of CRUX with MAYHEM and the new Editor-in-Chief will be Jim Totten (University College of the Cariboo). Loki Jörgensen has been the Digital Editor since 1998 and his term is also ending in 2002.

I wish to express my personal gratitude and that of the Society to Michael, Bruce, and Loki for their efforts and important contribution to the Society's publications program. In addition to the support from the University of Manitoba mentioned above, I also wish to acknowledge the support received from Memorial University of Newfoundland and the Department of Mathematics and Statistics, and Simon Fraser University, including the Department of Mathematics and the Centre for Experimental and Constructive Mathematics.

RAPPORT DU DIRECTEUR ADMINISTRATIF

Graham Wright

Finances et publications

Les £nances de la Société sont réparties en deux : le budget de fonctionnement, oÁ l'on enregistre les recettes et les dépenses liées aÁ nos activités, et les fonds d'investissement. Le premier compte quatre divisions (fonctionnement général, éducation, recherche et publications), tandis que les seconds comprennent le fonds de dotation, le fonds pour les olympiades mathématiques et le fonds pour activités réservées.

Depuis mars 1997, les fonds d'investissement de la SMC sont con£és aÁ la société Gestion de Placements TD inc. et font l'objet d'une ≪gestion passive≫. En particulier, l'argent est investi dans trois fonds indiciels : l'Indice des obligations du Canada (40 %), l'indice composé S&P/TSX (10 %) et un indice mondial (50 %). Même si ces fonds n'ont pas fourni un rendement élevé dernieÁrement, on consideÁre qu'ils constituent un bonne stratégie d'investissement aÁ long terme.

En juin 2002, le Conseil d'administration a adopté, aÁ l'unanimité, deux propositions concernant le fonds d'investissement. La premieÁre : ≪que la Société clari£e l'usage des fonds d'investissement en créant d'une part un fonds de prévoyance et d'autre part un fonds de dotation≫; et la seconde : ≪que la Société lance une imposante campagne de £nancement pour grossir le fonds de dotation et £nancer aÁ perpétuité des projets et des prix de grande envergure et d'un grand intérêt pour la Société≫. Si ces propositions sont acceptées, certaines des activités actuellement £nancées par des recettes du budget de fonctionnement deviendraient £nancées par un fonds de dotation. On espeÁre déÁnir les parameÁtres d'un véritable fonds de dotation prochainement, puis amorcer une importante campagne de £nancement pour accroître considérablement ce fonds de dotation. Les membres qui auraient des commentaires ou des suggestions aÁ ce sujet sont priés de communiquer avec le trésorier (Arthur Sherk - tresorier@smc.math.ca) ou moi-même (directeur@smc.math.ca).

Le Comité des £nances est responsable de la supervision des activités £nancieÁres de la Société et se réunit deux fois l'an (octobre et avril). AÁ chacune de ses réunions, le comité rencontre des représentants de Gestion et Placements TD pour examiner le rendement de ses fonds d'investissement. En octobre, le comité doit aussi étudier le projet de budget de l'année suivante et en avril, il revoit les états £nanciers véri£és. Il transmet ensuite ses recommandations au Comité exécutif et au Conseil d'administration aÁ des £ns d'approbation.

L'établissement du budget se fait avec la collaboration active de nos présidents de comités et de nos équipes de rédaction. Le personnel du bureau administratif rassemble une masse de données £nancieÁres en un projet de budget, qui est ensuite présenté au Comité des £nances. Comme la SMC

a grandement élargi son champ d'intervention au cours des dernières années, elle a de plus en plus de mal à £nancer l'ensemble de ses activités actuelles. Elle doit donc étudier avec grand soin les répercussions £nancières de tout nouveau programme ou projet.

En 2001, le budget de fonctionnement af£chait un dé£cit d'un peu plus de 30 000 $, et l'on estime que le dé£cit avoisinera les 40 000 $ en 2002. Dans le projet de budget de 2003 approuvé par le Comité des £nances et le Comité exécutif et qui sera présenté au Conseil d'administration en décembre, on prévoit un très petit surplus de quelque 3 500 $. Même si la SMC est choyée de l'appui de ses commanditaires et de ses membres, ainsi que de la participation bénévole d'un grand nombre de ses membres à une foule d'activités, elle devra, pour assurer sa prospérité à long terme, soit accroître considérablement ses recettes, soit réduire grandement ses dépenses. En 2002, les dépenses au budget de fonctionnement ont été très bien maîtrisées (1 415 514 $ au budget, et 1 400 340 $ selon les prévisions actuelles de £n d'exercice). Pour ce qui est des recettes, la situation est assez différente (1 405 023 $ au budget, et 1 360 504 $ selon les prévisions actuelles de £n d'exercice).

À l'instar de nombreuses autres sociétés, le surplus enregistré au poste des publications (307 138 $ en 2001) £nance la quasi totalité des dé£cits des trois autres postes (fonctionnement général - dé£cit de 82 691 $, éducation - dé£cit de 131 333 $, recherche - dé£cit de 123 541 $). Le très petit surplus prévu pour 2003 pourrait facilement se transformer en dé£cit. Il suf£rait d'une légère baisse des taux de change, du nombre d'adhésions, des droits d'inscription, des recettes d'abonnement, des redevances, etc. Puisqu'une si faible marge de manoeuvre est nettement insuf£sante, nous faisons en ce moment des démarches a£n de trouver un plus grand nombre de commanditaires pour nos activités éducatives et de recherche, de rendre nos Réunions plus attrayantes pourattirer un plus grand nombre de participants et d'intensi£er nos activités de publication.

Nos rédacteurs en chef (actuels et anciens) ont contribué et contribuent encore à faire de nos revues et de nos ouvrages des publications de renommée internationale et, par le fait même, pro£tables. Depuis 1990, le Centre de rédaction TeX de l'Université du Manitoba est l'un des éléments clés des activités de publication de la Société. Michael Doob en est le rédacteur TeX depuis 13 ans et, sous son égide, le centre a joué un rôle crucial dans la réussite de nos activités de publication. En 2003, ces activités connaîtront d'importants changements.

En effet, le centre de rédaction TEX de la SMC deviendra le Bureau des publications de la SMC, dont Craig Platt (Manitoba) deviendra le rédacteur technique. Je tiens à remercier l'Université du Manitoba et son Département de mathématiques de leur appui - actuel et passé - aux activités de publication de la SMC. Même si Michael quittera son poste de rédacteur TEX je suis très heureux de vous apprendre qu'il demeurera notre conseiller technique. Tout le personnel de soutien actuel restera au service du Bureau des publications, et je suis certain que la transition se fera tout en douceur. En outre, Bruce Shawyer (Memorial) terminera son mandat de sept ans comme rédacteur en chef du CRUX with MAYHEM et sera remplacé à ce poste par Jim Totten (University College of the Cariboo). Loki Jörgensen, responsable des publications électroniques depuis 1998, termine aussi son mandat en 2002.

Au nom de la Société et en mon nom, je tiens à remercier Michael, Bruce et Loki de leur travail et de leur importante contribution aux activités de publication de la Société. Outre l'appui de l'Université du Manitoba souligné précédemment, je tiens aussi à remercier de leur soutien l'Université Memorial de Terre-Neuve et son Département de mathématiques et de statistique, ainsi que le Département de mathématiques et le Centre de mathématiques expérimentales et constructives de l'Université Simon Fraser.

Math in Moscow

The Canadian Mathematical Society and the Natural Sciences and Engineering Research Council are pleased to announce that the recipient of the £rst NSERC-CMS Math in Moscow Scholarship is Mr. Jonathan Kavanagh from Memorial University of Newfoundland. Mr. Kavanagh will be attending the 2003 Winter semester at the Moscow Independent University.

Two scholarships will be awarded in the Spring competition and the deadline is **April 15, 2003**. Further information on the NSERC-CMS Math in Moscow scholarships can be found at: www.cms.math.ca/bulletins/Moscow_web.html

Math au Moscou

La Société mathématique du Canada et le Conseil de recherches en sciences naturelles et en génie du Canada sont heureux d'annoncer que le récipiendaire de la première bourse CRSNG-SMC Math á Moscou est M. Jonathan Kavanagh de l'Université Memorial á Terre-Neuve. M. Kavanagh passera le trimestre d'hiver 2003 á l'Université Indépendante de Moscou.

Deux bourses CRSNG-SMC Math á Moscou seront attribuées lors du concours de printemps. La date d'échéance pour soumettre sa candidature est **le 15 avril 2003**. Toute l'information sur le programme de bourses CRSNG-SMC Math á Moscou se trouve : www.smc.math.ca/bulletins/Moscou_web.html

Eric Muller Wins NSERC's Michael Smith Award

A long-time Brock University Mathematics Professor with a ¤air for inspiring students to learn math and science in unique ways is being honoured by the federal government for his outstanding contribution to the promotion of science in Canada.

Professor Eric Muller, who is Chair of the Department of Mathematics and Director of the Bachelor of Science/Bachelor of Education program at Brock, is one of £ve winners of the 2002 Michael Smith Awards. The awards are named after Canadian Michael Smith, who won a Nobel Prize in 1993 for his breakthrough contribution to genetic research. The award recipients were announced this week by the Natural Sciences and Engineering Research Council of Canada (NSERC).

"The 2002 winners of the Michael Smith Award are each contributing to making Canada a more innovative nation," said Industry Minister Alan Rock. "That will help us achieve our goal of making Canada one of the top £ve countries in the world for research and development."

Muller, who joined Brock in 1967 and is one of the University's longest-serving professors, has been a mathematics and science educator for more than 30 years. Through hands-on learning at camps, fairs, and workshops, schoolteachers, students, and youths have had the opportunity to learn and become intrigued by science and mathematics. Through creative innovations such as the Math Trails booklets and the Canadian Virtual Math Trail, students use math to explore the history and unique features of Canadian landscapes. Muller has also created games such as Brock Bugs and Brock Bees that promote mathematical thinking and develop a sense of logic and foresight.

These activities are in addition to his decades of teaching and mentoring at Brock, for which he has received numerous awards. Muller was also recently appointed a Fellow of the Fields Institute for Research in Mathematical Sciences.

"Dr. Muller is extremely deserving of this award, and the University is pleased to see him receive this national recognition," said Jack Miller, Associate Vice-President, Research, and Dean of Graduate Studies. "Dr. Muller has a special ability to inspire students to learn about math and science in innovative ways."

NSERC is a key federal agency investing in people, discovery and innovation. The Council supports both basic university research through research grants, and project research through partnerships among universities, governments and the private sector, as well as the advanced training of highly quali£ed people.

The winners of the Michael-Smith Award for 2002 are: (left to right) Patrick Fernet (Projet ISPAJES), Tara Ryan (Evergreen Theatre Society), Lisa Anderson (Discover Engineering), Eric R. Muller (Professor of Mathematics, Brock University) with Dr. Thomas Brzustowski, President of NSERC – Anthony Scullion Photography, Ottawa.

CMS Summer Meeting 2003
June 14 - 16, 2003

University of Alberta
Edmonton, Alberta

We are happy to announce the provisional outline for the Canadian Mathematical Society Summer Meeting 2003. Look for the First Announcement in the February 2003 issue of the *CMS Notes* or at http://www.cms.math.ca/Events/summer03/

HOST : Department of Mathematical and Statistical Sciences, University of Alberta

PUBLIC LECTURE : **Robert Moody** (University of Alberta).

PLENARY SPEAKERS : **Ingrid Daubechies** (Princeton University), **Roland Glowinski** (University of Houston), **Gerhard Huisken** (Tuebingen/Albert Einstein Institute), **James Lepowsky** (Rutgers University), **Dennis Shasha**, (Courant Institute).

PRIZES : **Jeffery-Williams Lecture**: **Ram Murty** (Queen's University), **Krieger-Nelson Lecture**: **Leah Keshet** (University of British Columbia).

SYMPOSIA : **Applied Harmonic Analysis**, Org: RongQing Jia (Alberta) and Bin Han (Alberta); **Combinatorics/Design Theory/Coding Theory**, Org: John van Rees (Manitoba); **Computational and Analytical Techniques in Modern Applications**, Org: Peter Minev (Alberta) and Tony Ware (Calgary); **Computational and Mathematical Finance**, Org: T. Choulli (Alberta); **Conformal Field Theory**, Org: Terry Gannon (Alberta) and Mark Walton (Lethbridge); **Discrete Mathematics**, Org: Vazz Linek (Winnipeg); **Dynamical Systems**, Org: Michael A. Radin (Rochester Institute of Technology); **Geometry and Physics**, Org: Maung Min-Oo (McMaster) and Eric Woolgar (Alberta); **Industrial Mathematics**, Org: B. Huang, Y. Lin and S. Liu (Alberta); **In£nite Dimensional Dynamical Systems**, Org: XiaoQiang Zhao (Memorial) and Thomas Hillen (Alberta); **New and Successful Courses and Programmes in Mathematics**, Org: Ted Lewis (Alberta); **Real Analysis**, Org: Erik Talvila (Alberta).
Contributed Papers, Org: to be announced.

MEETING DIRECTOR : YanPing Lin (Alberta).

LOCAL ARRANGEMENTS : Eric Woolgar (Alberta).

FROM THE INSTITUTES

POSTDOCTORAL FELLOWSHIPS AT THE FIELDS INSTITUTE

Applications are invited for postdoctoral fellowship positions for the 2003-2004 academic year. The Thematic Program on Partial Differential Equations will be offered at the Institute from August 2003-June 2004. **www.£elds.utoronto.ca/programs/scienti£c/03-04/pde/** Quali£ed candidates who have recently completed a PhD in the mathematical sciences are encouraged to apply. These fellowships provide for a period of at least one year engaged in research and participating in the activities of the Institute. One or more positions may involve teaching at a cooperating university or carrying out collaborative research with business or industrial partners.

Applicants seeking postdoctoral fellowships funded by other agencies (such as NSERC and international fellowships) are encouraged to request the Fields Institute as their proposed location of tenure, and should apply to the address below for a letter of invitation.

In addition to regular postdoctoral support, the Jerrold E. Marsden Postdoctoral Fellowship will be awarded. It pays a stipend of $40,000 (Cdn) and provides for a twelve-month period at the Institute for research and participation in the activities of the core program. No teaching is required. In addition to the stipend, a $2000 (Cdn) research grant will be available during the tenure of the award. Standard NSERC guidelines will apply to this grant.

Postdoctoral applications should reach the Institute by January 1, 2003. Applicants should submit a curriculum vitae and a statement of research interests and achievements and should arrange for three (3) letters of reference to be sent to: **Postdoctoral Fellowships**
c/o Director, The Fields Institute
222 College Street, Toronto, On M5T 3J1 Canada
Phone (416) 348-9710 Fax: (416) 348-9714
Email: programs@£elds.utoronto.ca Applications are encouraged from all quali£ed candidates, including aboriginal peoples, persons with disabilities, members of visible minorities and women.

OBITUARY / AVIS DE DÉCÉS

Ron Scoins 1939-2002

Ron Scoins died on October 13th after a long £ght with cancer.

Ron was 63 years of age at the time of his death. He is survived by his wife Mayda, his daughters Sandra and Nancy (and their spouses) and his son Steve. Ron also had four grandchildren of whom he was immensely proud.

Ron started his teaching career at the University of Waterloo in 1973 where he continued until his retirement in 2001. Before that, Ron taught for 13 years in the secondary school system in Kitchener-Waterloo.

During his tenure at the University of Waterloo, Ron was an integral member of the Canadian Mathematics Competition and served in many capacities within this organization. In addition, Ron served as the Associate Dean of External Relations at the University during his last £ve years at the University.

Ron was known by all as an excellent teacher who loved both his subject content and the students that he taught. He received a University of Waterloo Distinguished Teaching Award in 1999 and OCUFA's Teaching Award in 2000.

The awards do not, by themselves, do justice to what Ron gave to teaching. Ron gave of himself. He always provided extra help, encouragement and caring and never missed an opportunity to help a young person. Ron exempli£ed all that is good in teaching.

When Ron learned that he was ill, he faced his illness in the same way he faced other challenges - with courage and optimism. He truly represented the maxim of, 'grace under £re'. Ron was a real gentleman who will be missed by all those with whom he came in contact. He was a man who cared.

***

Remembering Ron Scoins
by Richard Hoshino

Ron Scoins was a mentor and an inspiration to all those who knew him. After a long battle with cancer, Ron passed away on October 13, 2002.

I £rst met Ron in 1993, at an annual seminar for math contest winners at Waterloo. Ron's energy and passion for teaching (as well as his terrible sense of humour) inspired all of us. When I entered the Math Teaching Option at Waterloo several years later, Ron became a mentor to me, both as a teacher, and more importantly, as a person.

Even though he had so many responsibilities, he always made the time to talk to his students, and provide words of encouragement. He challenged his students in the Teaching Option to £nd ways to improve our teaching, to never feel that our learning was complete.

Despite all of his professional accolades, Ron never stopped learning. I vividly recall the last conversation I had with him in March, when he said, "you know Richard, I'm 62 years old. I've been teaching for over forty years, and there's still not a day that goes by that I don't learn something new". This commitment to excellence made him one of the most well-respected mathematics educators in Canada.

During his long battle with cancer, Ron's incredible optimism and faith touched all those who knew him. Despite intensive chemotherapy sessions, Ron still found the strength to teach a course, in the Fall of 2000. How appropriate that at his funeral, the pastor read 2 Timothy 4:7: "I have fought the good £ght; I have £nished the race, I have kept the faith". Ron, you lived 2 Timothy 4:7 better than anyone I have ever met. You challenged us, motivated us, and inspired us. We were so privileged to know you. May you rest in peace.

Appel de candidatures

La date limite pour les mises en candidatures pour le Prix doctorat 2003 de la Société mathématique du Canada est **le 31 janvier, 2003**. Pour plus amples renseignments, veuillez véri£er les Notes de la SMC (novembre, page 25) ou au www.smc.math.ca/Prix

Memories of Bruno Forte

by John Baker, University of Waterloo

Bruno Forte 1928-2002

My dear friend Bruno Forte died in his sleep in Pisa on the autumnal equinox of 2002. Born in Firenze on the summer solstice of 1928, he was proud of his Tuscan heritage but preferred to live out his life in his adopted Canada.

I £rst met Bruno at a meeting in Waterloo in the late 60's. He was attracted there by the Janos Aczél school of Functional Equations - the topic of the meeting. A year or so later, he vacated his Chair of Rational Mechanics at the University of Pavia (founded in the 15th century) to come to Waterloo as a visiting professor and a year later was appointed to University of Waterloo's Applied Mathematics Department which he later chaired for several years.

Bruno loved the wilderness. He was an avid £sherman and hunter. As a youngster, he had excelled in mountaineering and cross country skiing. Peter Hoffman credits Bruno with showing him how to 'snow plow'. I recall attending a meeting in the Italian Dolomites in 1970 at which Bruno led an inexperienced international expedition on a scary ascent of a famous peak with a name sounding something like "Peetzbooee". Included in the party were C.T. Ng (presently in the Pure Math Dept., UW), Mike McKiernan (lately of Applied Math, UW), H. Kairies (Germany) and myself.

Bruno had patience in Mathematics and other endeavours. I remember camping with Bruno and my family at Gogama (near Timmons, Ontario) around 1980. He patiently scoured the forest ¤oor for the better part of a day in search of mushrooms. At nightfall, he carefully laid his bounty out to dry on a picnic table. Unfortunately, an overnight rain spoiled his harvest. I was amazed that he took this misfortune so calmly and proceeded to resume the hunt. Maybe the joy was largely in the pursuit.

Around the same time, Bruno and I attended a meeting on the French coast west of Nantes. One evening he asked me if I would like to accompany him to the shore in hopes of sighting the "green ray". This is a ¤ash of green light which, on rare occasions, can be seen at the instant the sun dips into the western sea. Bruno had looked for it, without success, on numerous occasions. He told me that it is mentioned in the works of Jules Verne, a native of that region. I had not heard of it and told him that, anyway, this was not relevant in Saskatchewan. Well, we saw it! He was delighted and I was dumb lucky!

Bruno coached the Putnam Team at Waterloo for many years. He devoted boundless energy to this endeavour and was proud of the many brilliant youngsters who consistently did so well, often placing £rst in North America, in this prestigious mathematical competition. For most of his career at Waterloo, he had a strangle hold on the special section of First Year Calculus - his main recruiting ground for the Putnam (during this period, I got to teach it once while he was on sabbatical). Although he didn't like to acknowledge it, these activities tended to attract most of the brightest of these youngsters to Pure Mathematics.

Bruno's wife, Maria, and their daughters, Sylvia, Sandra, Claudia, Paula and Laura eventually returned to Italy in the 70's. I visited him frequently at his home in Waterloo and he often came to ours in Elmira. We constantly teased, challenged and insulted each other. I remember an arm wrestling match with him in Elmira which resulted in the demolition of a coffee table. He claimed my longer arm had the advantage; I claimed his shorter one did. My daughter, Laurel, recalls that as small child, in the midst of a heated exchange of insults, she retreated to her bedroom in tears, heart broken that Bruno was picking on her daddy. I considered it my duty to continually remind him that Professors are not really as important as they were then considered to be in Europe. He would sometimes hint at my cultural deprivation and constantly razz me about the futility of Pure Mathematics (which he himself cultivated and secretly admired).

Bruno adored his Siberian Husky Niki but was loath to discipline him. He'd yell at Niki but never lay on a hand. The only time I saw Bruno cry was when Niki died - revealing a small crack in tough armour. He vowed never to have another dog as it would be impossible to replace Niki. A year or so later, he brought my attention to an ad in the newspaper for a Siberian Husky pup. I said "Let's go and look." He said, "No, there can't be another dog like Niki." This scene was repeated over the course of a few weeks when I £nally said "Look, let's just go and see it; you don't have to take him". So we did. On the way, he said, "If that dog has blue eyes, I'm done." Well it did - a beautiful puppy, starved for affection. So it was love at £rst sight. Donna and I bought "Bandit" in celebration of Bruno's 60th birthday. He turned out to be as unruly and loved as Niki.

In 1970, Donna and I went to Europe for six weeks with our then 1 1/2 year old son, Sean, to attend

meetings. We picked up a Renault 4 in Paris and drove to Oberwolfach, in the Black Forest, the scene of the £rst conference. Bruno was there with Maria and some of their daughters. When they discovered that we had no plans for the few weeks leading up to the next meeting, they invited us to be their guests in Italy. I managed to keep my little Renault close behind Bruno's Alfa Romeo sedan through Switzerland, Austria and over the Stelvia Pass. When we reached the Autostrada, Bruno stopped, brought me a map, pointed and said "I'll meet you there." That was the last I saw of the Alfa for several hours. It appeared that his driving personality suddenly shifted into overdrive when he regained a tire hold on Italian asphalt. We fondly remember the warmth of the Forte home in Barga and the fuss Maria and Île raggazze made over our bambino.

Bruno retired from University of Waterloo in 1993 and returned to Italy where he taught in Lecce and Verona. He frequently returned to Canada and to his farm on the Saugeen River near Port Elgin. This is where he wished to spend his last days. However, Parkinsons disease did not permit him to live alone so far from his family. He had planned to come to Canada in July, but suddenly took a turn for the worse a couple of days before his planned ¤ight.

A couple of decades ago, while in the midst of a debilitating depression that would eventually hospitalize me, I would go to Bruno's of£ce daily to confess my irrational and obsessive feelings of guilt, worthlessness and despair. He would patiently listen and try to correct my thinking and I would leave feeling somewhat better only to return the next day just as confused and as miserable as before but to be received with the same empathy. During a couple of my hospital stays, Bruno was a regular visitor and one who gave comfort and support to my family. I couldn't have asked for a more loyal friend.

Addio Bruno, je me souviens.

Réunion d'été 2003 de la SMC du 14 au 16 juin 2003

Université de l'Alberta Edmonton (Alberta)

Voici le programme provisoire de la Réunion d'été 2003 de la Société mathématique du Canada. La premiÁre annonce paraîtra dans le numéro de février 2003 des*Notes de la CMS* ou au site web http://www.smc.math.ca/Reunions/ete03/.

HÔTE : Département des sciences mathématiques et statistiques, Université de l'Alberta

CONFÉRENCE PUBLIQUE : **Robert Moody** (Université de l'Alberta).

CONFÉRENCIERS PRINCIPAUX : **Ingrid Daubechies** (Université Princeton), **Roland Glowinski** (Université de Houston), **Gerhard Huisken** (Tuebingen/Institut Albert Einstein), **James Lepowsky** (Université Rutgers), **Dennis Shasha**, (Institut Courant).

PRIX : **Conférence Jeffery-Williams**: **Ram Murty** (Université Queen's), **Conférence Krieger-Nelson**: **Leah Keshet** (Université de la Colombie-Britannique).

SYMPOSIUMS : **Analyse harmonique appliquée**, Org: RongQing Jia (Alberta) et Bin Han (Alberta); **Combinatoire/Théorie du désign/Théorie des codes**, Org: John van Rees (Manitoba); **Techniques numériques et analytiques dans les applications modernes**, Org: Peter Minev (Alberta) et Tony Ware (Calgary); **L'analyse numérique dans les mathématiques £nanciÁres**, Org: T. Choulli (Alberta); **Théorie des champs conformes**, Org: Terry Gannon (Alberta) et Mark Walton (Lethbridge); **Mathématiques discrÁtes**, Org: Vazz Linek (Winnipeg); **SystÁmes dynamiques**, Org: Michael A. Radin (Rochester Institute of Technology); **Géométrie et physique**, Org: Maung Min-Oo (McMaster) et Eric Woolgar (Alberta); **Mathématiques industrielles**, Org: B. Huang, Y. Lin et S. Liu (Alberta); **SystÁmes dynamiques en dimensions in£nies**, Org: XiaoQiang Zhao (Memorial) et Thomas Hillen (Alberta); **Nouveaux programmes de mathématiques et programmes a succes**, Org: Ted Lewis (Alberta) ; **Analyze réel**, Org: Erick Talvila (Alberta). **Communications courtes**, Org: áconf£rmer.

DIRECTEUR DE RÉUNION : YanPing Lin (Alberta).

LOGISTIQUE LOCALE : Eric Woolgar (Alberta).

McMASTER UNIVERSITY–HAMILTON, ONTARIO
DEPARTMENT OF MATHEMATICS AND STATISTICS

SHARCNET Chair in Scienti£c Computation

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

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

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

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

Applicants should also arrange for at least three letters of recommendation to be sent to the Chair. These letters should address the applicant's research accomplishments and supply evidence that the applicant can communicate articulately and teach effectively.

Applications will be considered until the position has been £lled.

Applications, including a curriculum vitae and a letter of application should be sent to the following address:

M. Valeriote, Chair
Department of Mathematics & Statistics
McMaster University
Hamilton, Ontario Canada L8S 4K1

UNIVERSITY OF TORONTO–TORONTO, ONTARIO
DEPARTMENT OF MATHEMATICS AND STATISTICS

Canada Research Chair in Mathematics and Statistics at UTSC

The University of Toronto at Scarborough solicits applications for a tenured or tenure-track position in the Department of Mathematical Sciences, to begin July 1, 2003. The graduate appointment will be jointly to the Department of Mathematics and the Department of Statistics at the University of Toronto. Rank and salary will be commensurate with quali£cations. The main areas of research interest are Mathematical Statistics, Mathematical Finance, or Probability; however, exceptional candidates in other areas relevant to both Mathematics and Statistics are encouraged to apply. It is intended that the successful applicants will be nominated for a junior Canada Research Chair (Tier II). Accordingly, candidates are expected to be outstanding researchers, whose scholarship and teaching will make major contributions to the quality and stature of the university. Applicants should send their complete C.V. including a list of publications, a short statement describing their research programme, and all appropriate material about their teaching. They should also arrange to have at least four letters of reference sent directly to:

Search Committee UTSC
Department of Mathematics, University of Toronto
100 St. George Street, Room 4072
Toronto, Ontario Canada M5S 3G3

Additional information is available at the Web page: **www.math.toronto.edu/jobs.**

Priority will be given to applications received by **December 31, 2002.** Applications after this date will be considered until the position has been £lled. The University of Toronto is strongly committed to diversity within its community and especially welcomes applications from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversi£cation of ideas.

Any inquiries about the application should be sent to **ida@math.toronto.edu** or **laura@utstat.toronto.edu**

QUEEN'S UNIVERSITY–KINGSTON, ONTARIO
DEPARTMENT OF MATHEMATICS AND STATISTICS

Faculty Positions

The Department of Mathematics and Statistics invites applications for positions in Mathematics and Engineering, an interdisciplinary applied mathematics program in the Faculty of Applied Science. We are interested in candidates for up to three post-doctoral positions, up to three tenure track faculty positions, and candidates for a Tier II Canada Research Chair in Communications or Computer Security. 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 scienti£c 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 £eld. 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 teach a range of applied mathematics or statistics courses to some of the most talented engineering students at Queen's, and supervise graduate students. To quickly establish a research programme, the Department normally offers teaching release in the £rst 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 signi£cant publications, to the address below, before January 1, 2003. At least one letter should comment on the candidate's teaching. More details are available at **http://www.mast.queensu.ca/jobs/**

James A. Mingo, Associate Head
Department of Mathematics and Statistics
Queen's University,
Kingston Ontario K7L 3N6
fax: (613)533-2964
e-mail: position@mast.queensu.ca
http://www.mast.queensu.ca

Canadian citizens and permanent residents will be considered £rst for this position. Queen's University is committed to employment equity and welcomes applications from all quali£ed women and men, including visible minorities, aboriginal people, persons with disabilities, gay men and lesbians.

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

JANUARY 2003 **JANVIER 2003**

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

6-19 Pan-American Summer Institute(PASI) on PDE, Inverse Problems and Non-linear Analysis, Centro de Modalamiento Matemático(CMM), Universidad de Chile. *sandy@pims.math.ca*

FEBRUARY 2003 **FÉVRIER 2003**

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

MAY 2003 **MAI 2003**

11–16 International Conference on General Control Problems and Applications (GCP2003) : Dedicated to the 100th anniversary of A. N. Kolmogorov (Tambov Sate University, Tambov, Russia) *www.opu2003.narod.ru/*

16-18 Canadian School Mathematics Forum 2003 / Forum canadian sur l'enseignement des mathématiques 2003 (Montréal, Québec)
www.cms.math.ca/Events/CSMF2003/
www.smc.math.ca/Reunions/FCEM2003/

JUNE 2003 **JUIN 2003**

14–16 CMS Summer Meeting / Réunion d'été de la SMC (University of Alberta, Edmonton, Alberta)
www.cms.math.ca/Events/
www.smc.math.ca/Reunions/

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

18–21 First Joint Meeting between AMS and Real Sociedad Matematica Espanola (Seville, Spain)
www.us.es/rsme/-ams/

JULY 2003 JUILLET 2003

7–11 Fifth International Congress in Industrial and Applied Mathematics (Sydney, Australia)
www.iciam.org

17–19 44th International Mathematical Olympiad / 44e Olympiade internationale mathématique (Tokyo, Japan)

21–Aug. 15 Second Annual AARMS Summer School for Graduate Students (St. John's, Newfoundland)
www.math.mun.ca/ aarms/summerschools

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

DECEMBER 2003 DÉCEMBRE 2003

6–8 CMS Winter Meeting / Réunion d'hiver de la SMC (Simon Fraser University, Harbour Centre, Vancouver, British Columbia)
Monique Bouchard: meetings@cms.math.ca

SUMMER 2004 ÉTÉ 2004

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

JUNE 2004 JUIN 2004

27 June–2 July European Congress of Mathematics, Stockholm

JULY 2004 JUILLET 2004

12–15 Toulouse 2004 Toulouse 2004 - First Joint Canada-France meeting of the mathematical sciences / Premier congrés Canada-France des sciences mathématiques, (Toulouse, France)
www.cms.math.ca/Events/Toulouse2004/
www.smc.math.ca/Reunions/Toulouse2004/

DECEMBER 2004 DÉCEMBRE 2004

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

RATES AND DEADLINES 2002 / 2002 TARIFS ET ÉCHÉANCES

Net rates/Tarifs nets	Institutional Members Membres institutionels	Corporate Members Membres organisationnels	Others Autres
Full Page	$ 225	$ 420	$ 560
3/4 Page	$ 205	$ 385	$ 510
1/2 Page	$ 135	$ 255	$ 340
1/4 Page	$ 80	$ 150	$ 200
Inserts: maximum 4 pages	$ 180	$ 340	$ 450
Surcharges apply for prime locations - contact notes-ads@cms.math.ca Des suppléments sont applicables pour des places de choix - communiquer avec notes-ads@smc.math.ca			

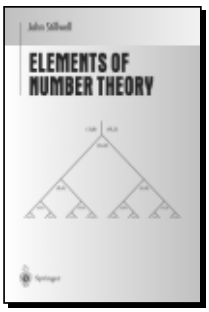
Issue/Numéro:	Deadline/Date limite:
February/février	December 1 décembre
March/mars	January 15 janvier
April/avril	February 15 février
May/mai	March 15 mars
September/septembre	July 1 juillet
October/octobre	August 15 août
November/novembre	September 15 septembre
December/décembre	October 15 octobre
Max. page size/Taille max. des pages: Back page/4e de couverture: 7.5 x 8.5 in/pouces Inside page/page intérieure: 7.5 x 10 in/pouces	

The CMS Notes is mailed in the £rst week of the issue month. Subscription to the Notes is included with the CMS membership. For non-CMS members, the subscription rate is $48 (CDN) for subscribers with Canadian addresses and $48 (US) for subscribers with non-Canadian addresses.

Les Notes de la SMC sont postées la premiÉre semaine du mois de parution. L'adhésion á la SMC comprend l'abonnement aux Notes de la SMC. Le tarif d'abonnement pour les non-membres est de 48 $ CAN si l'adresse de l'abonné est au Canada et de 48 $ US autrement.

SPRINGER FOR MATHEMATICS

ELEMENTS OF NUMBER THEORY



JOHN STILLWELL, Monash University, Clayton, Australia

This book is a concise introduction to number theory and some related algebra, with an emphasis on solving equations in integers. Finding integer solutions led to two fundamental ideas of number theory in ancient times—the Euclidean algorithm and unique prime factorization; and in modern times to two fundamental ideas of algebra—rings and ideals. The development of these ideas, and the transition from ancient to modern, is the main theme of the book. The historical development has been followed where it helps to motivate the introduction of new concepts, but modern proofs have been used where they are simpler, more natural, or more interesting. These include some that have not yet appeared in textbooks, such as a treatment of the Pell equation using Conway's theory of quadratic forms. Also, this is the only elementary number theory book that includes significant applications of ideal theory. It is clearly written, well illustrated, and supplied with carefully designed exercises, making it a pleasure to use as an undergraduate textbook or for independent study.

2002/254 PP., 35 ILLUS./HARDCOVER/$49.95
ISBN 0-387-95587-9
UNDERGRADUATE TEXTS IN MATHEMATICS

RECENT ADVANCES IN ALGORITHMS AND COMBINATORICS

BRUCE REED, Université Paris 6, Cedex, France; and **CLAUDIA LINHARES-SALES,** Universidade Federale do Ceara, Foratela, Brazil (Eds.)

Combinatorics is one of the fastest growing fields of mathematics. One reason for this is because many practical problems can be modeled and then efficiently solved using combinatorial theory. This real world motivation for studying algorithmic combinatorics has led not only to the development of many software packages but also to some beautiful mathematics which have no direct application to applied problems. This book highlights a few of the exciting recent developments in algorithmic combinatorics, including the search for patterns in DNA and protein sequences and the theory of semi-definite programming and its role in combinatorial optimization.

2002/368 PP., 51 ILLUS./HARDCOVER/$89.95
ISBN 0-387-95434-1
CMS BOOKS IN MATHEMATICS, VOL. 11

ORDER TODAY!

- **WEB:** www.springer-ny.com
- **CALL:** toll free 1-800-SPRINGER 8:30 am – 5:30 pm ET.
- **FAX:** your order to (201) 348-4505
- **WRITE:** Springer-Verlag New York, Inc., Dept. S408, P.O. Box 2485, Secaucus, NJ 07096-2485
- **VISIT** your local scientific/technical bookstore
- **E-MAIL** orders@springer-ny.com
- **INSTRUCTORS** Call or write for info on textbook examination copies.

Remember ...your 30-day return privilege is always guaranteed!

12/02 *Promotion #S408*

A SINGULAR INTRODUCTION TO COMMUTATIVE ALGEBRA

GERT-MARTIN GREUEL and **GERHARD PFISTER,** both, University of Kaiserslautern, Germany

This book can be understood as a model for teaching commutative algebra, taking into account modern developments such as algorithmic and computational aspects. As soon as a new concept is introduced, readers are shown how to handle it on the computer. The computations are exemplified with the computer algebra system *Singular* developed by the authors. *Singular* is a special system for polynomial computation with many features for global as well as for local commutative algebra and algebraic geometry. The book includes a CD with a version of *Singular* for various platforms (Unix/Linux, Windows, Macintosh), including all examples and procedures explained in the book. The book can be used for courses and seminars, and as a basis for studying research papers in commutative algebra, computer algebra and algebraic geometry.

2002/588 PP./SOFTCOVER WITH CD-ROM/$44.95
ISBN 3-540-42897-6

M.C. ESCHER'S LEGACY

A Centennial Celebration

MICHELE EMMER, University of Rome "La Sapienza," Rome, Italy; and **DORIS SCHATTSCHNEIDER,** Moravian College, Bethlehem, PA (Eds.)

As one of the most popular artists of the 20th century, M.C. Escher left a rich legacy. The centennial celebration of his birth, held in Rome and Ravello in 1998, gave testimony to the keen interest and new insight into his work, and showcased a number of contemporary artists and scientists whose work is directly inspired by that of Escher. This book contains 40 of their articles, richly illustrated with original art works, in addition to well-known and little-known works by Escher. A CD-ROM complements the articles, containing color illustrations of work by contemporary artists, movies, animations, and other demonstrations.

2002/450 PP., 520 ILLUS.
HARDCOVER WITH CD-ROM/$99.00
ISBN 3-540-42458-X

MATHEMATICS AND MUSIC

A Diderot Mathematical Forum

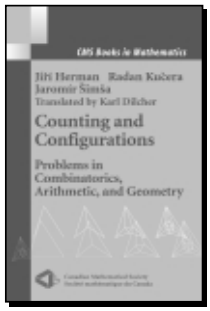
GERARD ASSAYAG, ICRAM, Paris, France; **HANS G. FEICHTINGER,** University of Vienna, Austria; and **JOSE FRANCISCO RODRIGUES,** University of Lisbon, Portugal (Eds.)

Mathematical models can be found for almost all levels of musical activities from composition to sound production by traditional instruments or by digital means. Modern music theory has been incorporating more and more mathematical content during the last decades. This book offers a journey into recent work relating music and mathematics. It contains a large variety of articles covering the historical aspects, the influence of logic and mathematical thought in composition, perception and understanding of music, and the computational aspects of musical sound processing.

2002/288 PP./HARDCOVER/$79.95
ISBN 3-540-43727-4

COUNTING AND CONFIGURATIONS

Problems in Combinatorics, Arithmetic and Geometry



JIŘÍ HERMAN, Gymnazium Brno; **RADAN KUČERA,** Masaryk University; **JAROMIR ŠIMŠA,** Academy of Sciences of the Czech Republic, all, Brno, Czech Republic; Translated by **KARL DILCHER,** Dalhousie University, Halifax, Canada

This book presents methods of solving problems in three areas of elementary combinatorial mathematics: classical combinatorics, combinatorial arithmetic, and combinatorial geometry. In each topic, brief theoretical discussions are immediately followed by carefully worked-out examples of increasing degrees of difficulty, and by exercises that range from routine to rather challenging. While this book emphasizes some methods that are not usually covered in beginning university courses, it nevertheless teaches techniques and skills that are useful not only in the specific topics covered here. There are approximately 310 examples and 650 exercises.

2002/400 PP., 111 ILLUS./HARDCOVER/$69.95
ISBN 0-387-95552-6
CMS BOOKS IN MATHEMATICS, VOL. 12

COLLECTED PAPERS

GORO SHIMURA, Princeton University, Princeton, NJ

In 1996, the AMS awarded Goro Shimura the Steele Prize for Lifetime Achievement for his "important and extensive work on arithmetical geometry and automorphic forms." His seminal work has resulted in the "many notations in number theory that carry his name and that have long been familiar to workers in the field." These four volumes contain 103 of his most important papers, beginning in 1954 and continuing up through the present.

VOLUME I: 1954-1966
2002/808 PP./HARDCOVER/$149.00
ISBN 0-387-95406-6

VOLUME II: 1967-1977
2002/848 PP./HARDCOVER/$149.00
ISBN 0-387-95416-3

VOLUME III: 1978-1988
2002/APPROX. 651 PP./HARDCOVER/$159.00
ISBN 0-387-95417-1

VOLUME IV: 1989-2001
2002/APPROX. 776 PP./HARDCOVER/$149.00
ISBN 0-387-95418X

Springer
www.springer-ny.com