CMS NOTES de la SMC

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MESSAGE DE LA PRÉSIDENTE SORTANTE

Christiane Rousseau
Université de Montéal

English page 16

L'année 2003-2004 s'est terminée en feu d'artifice. Après le grand congrès conjoint d'Halifax de juin dernier dont Eddy Campbell a fait état, nous nous sommes retrouvés à Toulouse en juillet pour le premier congrès Canada-France réunissant les communautés canadienne et française de mathématiques, statistique, mathématiques appliquées et industrielles. Les congressistes ont pu admirer la Ville rose et assister aux feux d'artifice sur la Garonne sans avoir à subir de canicule. La réception donnée par la Mairie de Toulouse leur a permis d'admirer la magnifique Salle des Illustres. Le congrès a été un grand succès avec pas moins de 430 participants, dont un nombre important d'étudiants et de stagiaires postdoctoraux qui ont donné une conférence, une session, ou encore, fait une présentation par affiche.

Le congrès s'est ouvert sur la conférence plénière de Laurent Lafforgue (IHES). Les autres conférenciers pléniers ont été Grégoire Allaire (École Polytechnique), Maïtine Bergounioux (Orléans), Jonathan Borwein (Dalhousie), David Brillinger (Berkeley), Walter Craig (McMaster), Henri Darmon (McGill), Emmanuel Giroux (ENS-Lyon), Gabor Lugosi (Barcelona), Mikhail Lyubich (Toronto), Christophe Reutenauer (UQAM), Alain-Sol Sznitman (ETH Zürich), Murad Taqqu (Boston) et Henry Wolkowicz (Waterloo). Côté éducation, Michèle Artigue (Jussieu) s'est adressée au problème de la transition secondaire/supérieur. En plus de ces 15 conférences plénières le congrès a aussi compté 15 sessions spéciales : Algèbres d'opérateurs, Topologie et géométrie symplectique, Théorie des nombres, Équations aux dérivées partielles, Systèmes dynamiques, Équations différentielles et commande, Analyse variationnelle et optimisation, Analyse stochastique, Processus multifractals et à longue mémoire, L'interface entre les probabilités et la statistique, Analyse statistique des données fonctionnelles, Analyse numérique, Topologie de petite dimension et théorie géométrique des groupes, Biologie mathématique, Systèmes dynamiques complexes. Une table ronde organisée par Eric Muller a porté sur la popularisation des mathématiques.

Un nombre important d'exposés ont été donnés en français. Certains conférenciers ont privilégié un mode de présentation bilingue en parlant en français avec des transparents anglais ou le contraire. Les communautés canadiennes et françaises ont été heureuses de se retrouver et le congrès s'est déroulé dans un climat chaleureux. Suite au succès de ce congrès, des discussions ont été entamées pour organiser un deuxième congrès Canada-France en été 2008 dans le cadre d'une réunion d'été élargie de la SMC simultanément à une réunion de MITACS. En effet, l'initiative canadienne de rapprochement avec les industries dans le cadre de

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NOTES DE LA SMC

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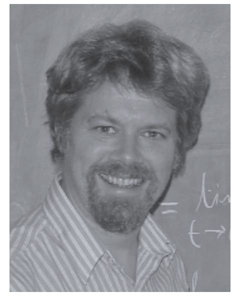
EDITORIAL

The Golden Ratio

S. Swaminathan



Robert J. MacG. Dawson

In recent months, the Fibonacci sequence and the Golden Ratio ϕ; (as it's popularly known, though mathematicians tend to use τ instead) have been thrust into the public eye in a way that perhaps they never have been before. Dan Brown's best-selling book *The Da Vinci Code* uses both, as key elements in a plot of great complexity that also drags in secret societies, esoteric theories about the origins of Christianity, the Grail myth, and much more. The book is a fine piece of light summer reading: the characterization and dialogue are clumsy, but the action ricochets along from surprise to twist to cliffhanger. The momentum of the book is such that it even survives the multitude of minilectures in which one character explains to another (and to the reader) about the Priory of Sion, Newton's alchemy, hidden symbols in Leonardo's paintings, early Christianity or... the Golden Ratio.

However, this is a work of fiction; and much (by no means all) of the esoterica that is thrown around like beads at Mardi Gras is a figment, if not of the author's imagination, then those of an active community of mystics and conspiracy theorists. Religious groups have been quick to point out that much of the material dealing with the early history of the Church is easily debunked; and, sadly, not all of the mathematics is quite what it ought to be either. The value of ϕ is not 1.618 as claimed (though that is a good approximation); and while some of the properties ascribed to it are valid, others are not. It is hard to read this book unless one deliberately removes the batteries from one's crackpot detector first.

As with the Grail theories, Brown did not invent the pseudoscience himself; real occurrences of ϕ in nature and art have rubbed shoulders uncomfortably with crackpot theories for decades. For instance, a news item appeared recently on television describing how a baker has introduced a new type of bread in which he mixed the ingredients using the "golden ratio, 1.6." The reporter and the baker referred to the importance of the ratio in art and architecture. The baker claimed that his "golden" bread covntained proteins, carbohydrates etc nutrients in the right proportions for a healthy diet. It is probably tasty and nutritious; but no doubt if he had used the ratio 1.5 instead the bread would have been just as good.

In some cases fact and fiction are harder to distinguish. Did Le Corbusier deliberately use the Golden Ratio in his works? Very definitely, and he published books explaining why he did so. Did the designers of the Parthenon? It's possible, but there are many rectangles in its design, only a few near-golden. Did the builders of the Pyramids? Almost certainly not. Measure your credit card, health card, or driver's licence: the proportions are within 2% of the Golden Ratio. Design or coincidence, who knows?

Again, what about appearances in nature? Observations show that for many plants the angles between successive leaves on a stem involve Fibonacci numbers, as do the spirals on pine cones, pineapples, and many other fruits; and simple mechanisms have been proposed to explain this. On the other hand, don't bother looking for a theory to explain why the ratio between a person's height and the height of his or her navel is exactly ϕ (as one of Brown's characters claims.) It just isn't.

Measurements made on real objects can only be approximations which are sometimes taken as if they are exact numbers. Many "fool's golden" ratios arise in this way: a ratio is measured as 1.6 or 1.7, and it's assumed that the real value must be ϕ. Again, as Martin Gardner wrote some years ago, there are fewer small numbers than there are tasks for them to perform. Let the numbers 5 and 8 turn up in some context and the amateur Fibonaccist decides that here we must have another application of his favorite sequence.

These examples of nonrigorous inductive logic are easy to see through. But perfect rigor leads to perfect unreadability (consider Whitehead and Russell's *Principia Mathematica*.) As a result, mathematical literature does contain errors, misconceptions, imperfect proofs, inconsistent definitions and defective conclusions. It is well known that some authors of the seventeenth and eighteenth centuries were not careful about convergence of infinite series – though the results obtained were often correct. Infinitesimals were used for centuries before being placed on a rigorous footing. And, of course, Gödel's Incompleteness Theorem has put certain limits on what we can ever hope for in terms of rigor.

There is, of course, a time for nonrigorous thinking even in mathematics. During the early stages of a new result, both public and private conjecture play a large role. Sometimes a missing step becomes so important that people study what would follow if it were true – the Riemann Hypothesis and "P=NP", are good examples. Recently, also, we have seen a rise in "experimental" research in mathematics, in which computers are used to amass evidence for a proposition, which may not lead to a formal proof at all. Indeed, Chaitin has shown that many mathematical facts have no proof other than a listing of the evidence for them! Nonetheless, it is still the general goal of mathematics to find proofs that are "as rigorous as necessary" whenever possible. The referee system, introduced in the last century, is one of the chief safeguards.

Fiction may suffer if the author is too casual with the facts, and we may regret that the Golden Ratio's fifteen minutes of fame were not better handled. Nonetheless, without some lapse in rigor there would be no fiction. In mathematics, rigor is far more important; but it is still important to let the imagination wander freely. Two articles of interest in this connection are: *Ten Misconceptions about Mathematics* by Michael Crowe, in Minnesota Studies in the Philosophy of Science, Vol. XI, University of Minnesota Press, 1988, 260-277, and *Fidelity in Mathematical Discourse: Is One and One Really Two?* by Philip J. Davis, American Mathematical Monthly, 79 (1972), 252-263.

CALL FOR NOMINATIONS / APPEL DE MISES EN CANDIDATURE

Editors-in-chief, Canadian Mathematical Bulletin / Éditeurs-en-chef, Bulletin Canadien de mathématiques

The term of office of the present Editors-in-chief of the Canadian Mathematical Bulletin will end December 31, 2005.

The publication committee of the CMS now invites nominations for the next Editors-in-Chief to serve a five year term.

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

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

The Pulications Committee will communicate its recommendation to the Executive Committee of the CMS in April 2005. Any input from the mathematical commiunity concerning this important selection process is welcome.

Applications, along with supporting documents, and/or comments should be sent to the address below no later than **November 30, 2004**.

Le mandat des rédacteurs-en-chef actuels du Bulletin canadien de mathématique prendra fin le 31 décembre 2005.

Le comité des publications de la SMC sollicite des mises en candidature pour les prochains rédacteurs-en-chef pour un mandat de cinq ans.

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

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

Le Comité des publications transmettra ses recommandations au Comité exécutif de la SMC en avril 2005. Les commentaires de la communauté mathématique au sujet de cette importante sélection sont bienvenus.

Les mises en candidature, incluant matériel d'appui, et/ou commentaires devraient être acheminés à l'addresse qui suit avant le **30 novembre 2004**.

Prof. Dana Schlomiuk
Chair Publications Committee / Présidente du Comité de publications
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Mathematics, Physics and *A Hard Day's Night*

Jason I. Brown, Dalhousie University

Abstract

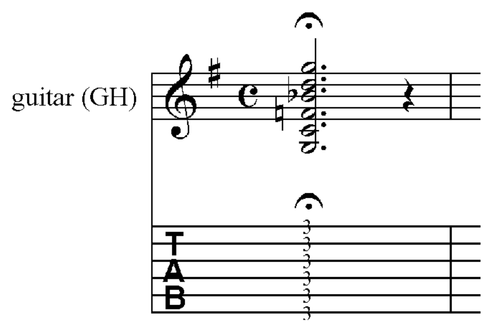
In this article we shall use mathematics and the physics of sound to unravel one of the mysteries of rock 'n' roll – how did the Beatles play the opening chord of *A Hard Day's Night*? The song may never sound the same to you again.

1 Introduction

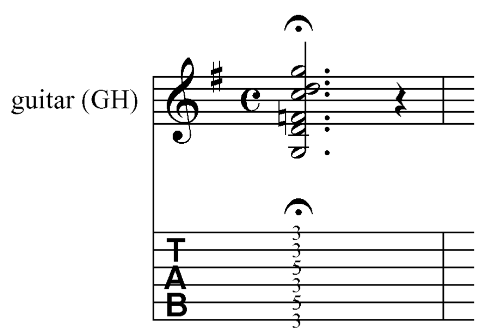
It was forty years ago that the Beatles ushered in a new era in pop music with the opening of *A Hard Day's Night*. The importance of the opening chord was clearly apparent to the Beatles. In *The Complete Beatles Recording Sessions* [3], author Mark Lewisohn quotes the Beatles' producer, George Martin, "We knew it would open both the film and the soundtrack LP, so we wanted a particularly strong and effective beginning. The strident guitar chord was the perfect match." This seemed to close the discussion about the origin of the chord but should it have?

Many a guitarist (whether professional or amateur) has tried to reproduce the chord, but the voicing of the chord has remained a subject of much discussion over the past 40 years. If you browse musical transcriptions for the chord, you will come across three common ones (note that guitar parts are scored as usual an octave up from where they sound):

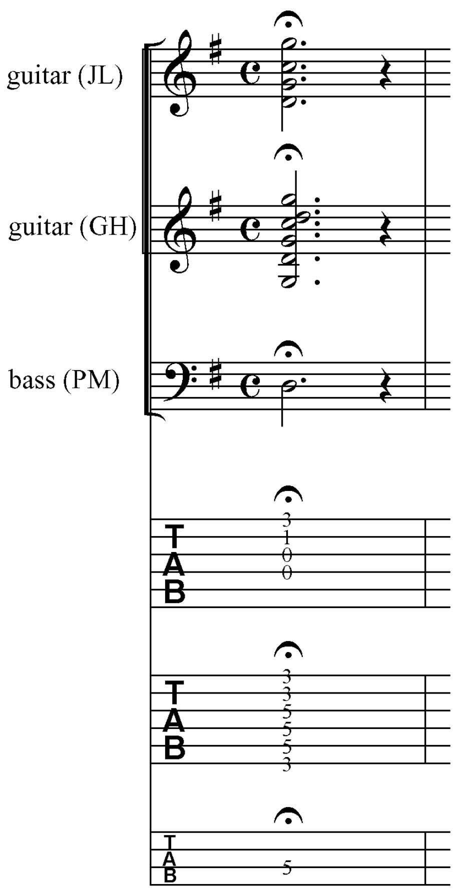
- Version 1: G C F Bb D G (a favorite by its ease of play; just play a barre chord at the third fret).



- Version 2: G D F C D G (another favorite, and one that often appears on Internet sites as the "one" that George Harrison (GH) played).



- Version 3: This one has George, John Lennon (JL) and Paul McCartney (PM) playing, with George (on his twelve string electric) playing G D G C D G, slightly different than in version 2, while John plays D G C G and Paul plays D on his bass (this is the transcription from [1]).



Is there any way to tell which of these three versions is the right one? Mathematics will help direct us to the answer.

2 Musical Forensics

We need to discuss briefly the physics and mathematics of sound (see [5, 2] for more details). Pure tones have a frequency, which corresponds to its pitch, and an amplitude, which corresponds roughly (but not exactly) to the loudness of the tone, and are modelled mathematically by sine and cosine functions. All sounds are made up of pure tones, which add together to give you complex tones and chords (that is, the functions of the latter are linear combinations of the functions for the pure tones). A single note sounded on an instrument is made up of a fundamental (main) pure tone plus other tones, called harmonics, whose frequencies are multiples of the fundamental tone's frequency. All of the amplitudes are added together in this "mix" that we hear. When a sound is digitized for a CD, the amplitude is sampled 44,100 times every second. What is hidden in the process of recording music are the individual frequencies, and how they were played. Fourier Transforms can be used to dissassemble the sampled amplitudes into the original frequencies.

After the song *A Hard Day's Night* was opened in a sound editing program on a computer, a segment of approximately one second was selected in the middle of the chord. The sound was saved as a file, and using some Mathematica subroutines from [2, chapter 14] a Fourier Transform was run on the list of data. There were 29,375 frequencies present, which included not only the notes being struck, but also harmonics, as well as any other frequencies that might have arisen during the recording.

We are after the loudest notes, as these correspond to the fundamental notes being struck (though there will probably be some of the louder harmonics present, along with possibly some other loud rattles). A threshhold was chosen which kept the sound faithful to the original. The table shows the the 48 frequencies with amplitude 0.02 or larger.

Freq. (Hz)	Ampl.	Freq. (Hz)	Ampl.	Freq. (Hz)	Ampl.	Freq. (Hz)	Ampl.
110.34	0.0600967	299.494	0.0298296	1050.86	0.0687151	2368.93	0.0221358
145.619	0.025485	392.57	0.0309716	1185.97	0.0372155	2371.19	0.0212846
148.621	0.0264278	438.358	0.0286329	1286.55	0.0231789	2371.94	0.0436633
149.372	0.0656018	524.678	0.0680974	1314.32	0.03819	2372.69	0.036042
150.123	0.175149	587.73	0.020613	1320.33	0.0223535	2637.65	0.0261839
174.142	0.0275547	588.48	0.0310337	1321.08	0.0494908	2638.4	0.0237794
174.893	0.0380282	589.231	0.0231753	1488.47	0.0241328	2754.	0.020001
175.643	0.0407103	785.141	0.0323532	1632.58	0.0205742	2763.76	0.0493617
195.159	0.0405164	786.642	0.0251928	1750.43	0.0234704	3083.52	0.0332062
218.428	0.0448308	787.393	0.0268553	2359.93	0.0366079	3147.32	0.0293723
261.964	0.0302402	960.784	0.0228509	2367.43	0.0267098	3148.07	0.0418507
262.714	0.0234502	981.801	0.02242	2368.18	0.0755327	3158.58	0.0285631

The frequencies need to be converted to notes, so choosing the reference note A 220 Hz, the frequencies were converted to the number of semitones above or below A 220 (by applying the function $f(x) = 12\log_2(x/220)$). Here is the list of semitones (we see that some of the instruments could have been better tuned as not all of the numbers are close to their nearest integer):

-11.9466, -7.14367, -6.79035, -6.70313, -6.61635, -4.04686, -3.97239, -3.89825, -2.07421, -0.124124, 3.02237, 3.07191, 5.34031, 10.0254, 11.9353, 15.0472, 17.0118, 17.0339, 17.056, 22.0254, 22.0584, 22.075, 25.5205, 25.8951, 27.0719, 29.1659, 30.5752, 30.9449, 31.0238, 31.0337, 33.099, 34.699, 35.9056, 41.078, 41.133, 41.1385, 41.1439, 41.1604, 41.1659, 41.1714, 43.0042, 43.0091, 43.7514, 43.8127, 45.708, 46.0626, 46.0667, 46.1244

In musical circles, middle C is written as C4, with the second number indicating the octave, so A 220 Hz is written as A2. Here are the frequencies above rounded to the nearest semitones:

A2, D3, D3, D3, D3, F3, F3, F3, G3, A3, C4, C4, D4, G4, A4, C5, D5, D5, D5, G5, G5, G5, B5, B5, C6, D6, E6, E6, E6, E6, F#6, G#6, A6, D7, D7, D7, D7, D7, D7, D7, E7, E7, F7, F7, G7, G7, G7, G7

Many of the notes appear in the various versions of "the chord". But to argue what was played and how the notes were played we'll need to make some deductions.

Some of the notes (especially in the higher range) must be harmonics, as they are well beyond what instruments can play. In fact, the range of a guitar is from E2 to about E6 and the bass guitar from E1 to about D4. Notes could have arisen on either George Harrison's or John Lennon's guitar or Paul's bass. The analysis now shows why the three well known transcriptions of the opening chord must all be wrong: each has a low G2 being played, but this note is definitely missing.

It is well known that for the album *A Hard Day's Night*, George used a 12 string guitar and its sound can definitely be heard on the solo in *A Hard Day's Night*. Thus it seems safe to assume George used this guitar on the opening chord as well. The twelve string guitar has each string doubled, with the bottom four in octaves, so the strings are, from lowest to highest, E2 E3 A2 A3 D3 D4 G3 G4 B4 B4 E5 E5. It seems reasonable that notes on strings of roughly the same thickness struck on one instrument would be roughly of the same amplitude. Looking back at the frequencies and their amplitudes, we see that one D3 is extra loud, with an amplitude of 0.175. This is taken as a bass note from Paul's Hofner bass (no other single frequency is nearly as loud).

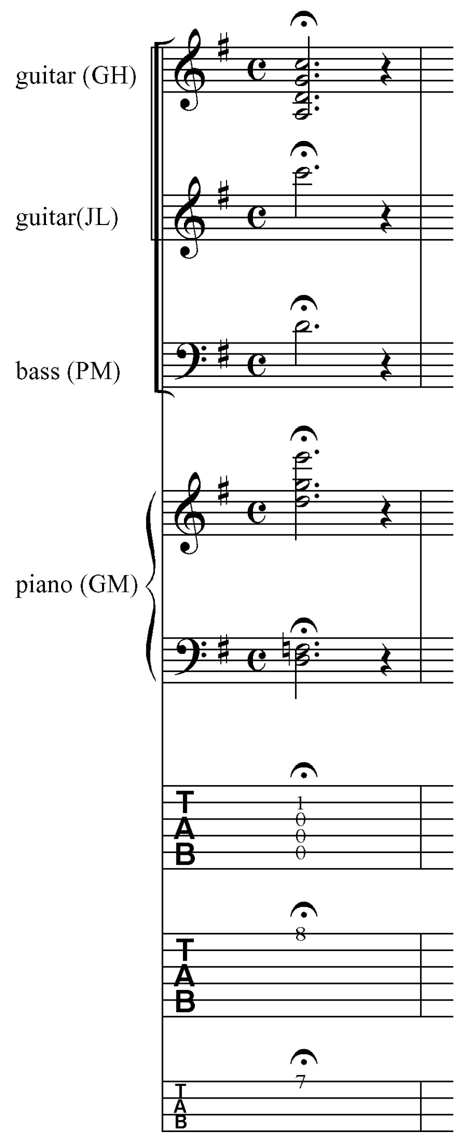
Now A2 and A3 can be paired off, both likely coming from George's 12 string (a nice open pair of strings). But even with one of the D3's accounted for on Paul's bass, what about the other three D3's?

Only one can come from George's 12 string, and even if John played another one on his six string, there's still another to account for. There is no evidence that any guitar was multitracked, at least on this opening chord. The two F3s create a much bigger problem. For no matter how George plays an F3 on his 12 string, an F4 should be heard as well, and there is no F4 at all present!

A hidden assumption came to the fore. Beatles' record producer, George Martin, is known to have doubled on piano George Harrison's solo on the track. Could "the chord" be part piano? Pianos have three strings for every note; a hammer strikes all three at the same time to produce a sound. That solved the problem of the three F3's: all could have come from a piano playing F3. Note that the frequencies of the three F3s were slightly different, but each string on a piano is individually tuned and is likely to be slightly off from one another in the "triple."

But what about the three left over D3's? If all belonged to a single piano note, then where would the single D4 come from? Not from George Harrison's guitar (as a D3 or another D4 would be present) and not from George Martin's piano (as otherwise there would be three D4's present). However, the bottom ten pitches on a piano are single strings which change to pairs of strings, and around C3 they change to the usual triples of strings. But indeed there are some grand pianos (of medium length) for which the break occurs right after D3. This implied that two of the D3s were played on the piano.

What George Harrison played on his 12 string was nothing like any of the transcriptions: he played A2 A3 D3 D4 G3 G4 C4 C4, most likely on string sets 2 through 5 – eight strings with six open strings in total (for a great chiming effect). George Martin (GM) played D3 F3 D5 G5 E6 on the piano. The other notes are fairly high and could be attributed to harmonics of these notes, except that there is a loud C5, which could have been played by John high up on his six string. There is also one extra E6 unaccounted for, which is taken as a harmonic.



3 The End

The notes played on the piano interweave well with the notes on the 12 string, starting a bit higher (at

D3) from the lowest note played on the guitar and ending higher (at E6). The amplitudes show why the piano is so well hidden; it is mixed perfectly, with amplitudes almost identical to those of the higher strings played on Harrison's guitar.

In *All You Need is Ears* [4], George Martin makes a point of saying "it shouldn't be expected that people are necessarily doing what they appear to be doing on records" and likens recording to filmmaking, where all sorts of effects are carried out in the background in order to create illusions. We see that sometimes mathematics can unravel the best mysteries.

Acknowledgements

This article was partially supported by a grant from the Natural Sciences and Engineering Research Council of Canada.

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[1] T. Fujita, Y. Hagino, H. Kubo and G. Sato, *The Beatles Complete Scores*, Hal Leonard, Milwaukee, 1993.

[2] T.W. Gray and J. Glynn, *Exploring Mathematics with Mathematica*, Addison Wesley, New York, 1991.

[3] M. Lewisohn, *The Complete Beatles Recording Sessions*, Doubleday, Toronto, 1988.

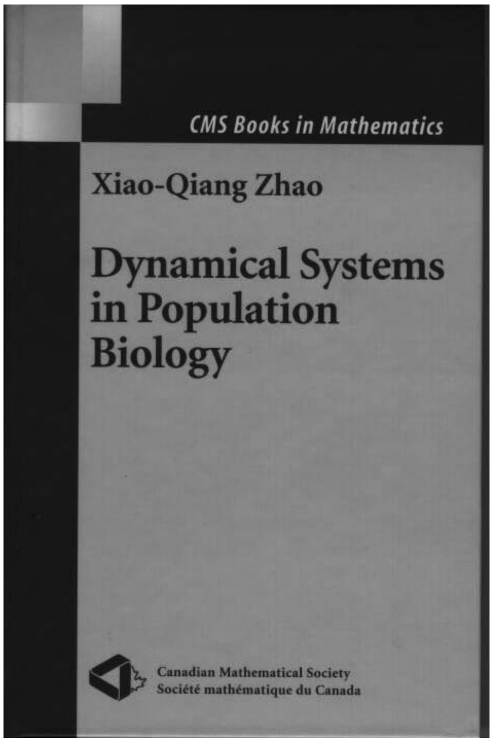
[4] G. Martin, *All You Need Is Ears*, St. Martins' Press, New York, 1979.

[5] J.S. Rigden, *Physics and the Sound of Music*, Wiley, New York, 1977, pg. 71.

MODELLING POPULATION DYNAMICS

Book review by Shigui Ruan, University of Miami

DYNAMICAL SYSTEMS IN POPULATION BIOLOGY
by Xiao-Qiang Zhao
CMS Books in Mathematics Vol. 16.
Springer-Verlag, New York, 2003, xiv+276 pp.



The classical Lotka-Volterra models in population dynamics were proposed under certain assumptions: that all species are in a constant environment, at the same location, and all individuals are identical; that is, under the assumptions of temporal, spatial, and demographic homogeneity. If the environment is not temporally constant (e.g., because of seasonal effects of weather, food supplies, mating habits, etc.), then the parameters become time dependent. If a deterministic version of a random variation in the environment is used, then almost periodicity arises. If the population as a whole disperses according to the irregular motion of each individual, then this microscopic irregular movement results in a diffusion process. If differences among individuals and their vital characteristics (birth rates, mortality rates, etc.) are taken into account, structured population models are needed. In the last 30 years, great efforts have been made to modify the classical deterministic population models in order to relax one or more of these oversimplified assumptions.

The author of this book provides an introduction to the theory of periodic semiflows on metric spaces and its applications to population dynamics. He develops dynamical systems approaches to various evolutionary models including difference, delay, ordinary, and partial differential equations, with special attention given to periodic and almost periodic phenomena. In the first three chapters the underlying abstract mathematical concepts are introduced, comprising abstract discrete dynamical systems on metric spaces, global dynamics in certain types of monotone discrete dynamical systems on ordered Banach spaces, and periodic semiflows and Poincaré maps. The topics covered include chain transitivity, strong repellers, dissipative systems, persistence, monotone systems, global attractivity and convergence, Poincaré maps, asymptotically periodic semiflows, and skew-product semiflows. In the next 5 chapters, the results are then applied to continuous-time periodic population models, as in N-species competition in a periodic chemostat, almost periodic competitive systems, and 3-species parabolic systems. Chapter 9 focuses on the global dynamics in an autonomous nonlocal delayed predator-prey model. The book concludes with a chapter on traveling waves in a periodic reaction-diffusion system with bistable nonlinearilities.

The book is well-organized and reader-friendly. It will be a valuable reference for mathematicians who are interested in infinite dimensional dynamical systems and their applications to population dynamics.

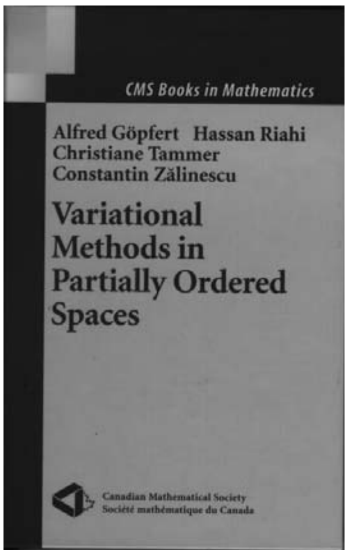
As we go to press with this issue, we have received the sad news of the passing away of Professor Murray Klamkin (Professor at the University of Alberta) on August 6, 2004.

An obituary will be published in the November 2004 issue of the *CMS Notes*.

OPTIMIZING VECTOR VALUED FUNCTIONS

Book review by G.Isac, RMC, Kingston

VARIATIONAL METHODS IN PARTIALLY ORDERED SPACES
by Alfred Göpfert, Hassan Riahi,
Christiane Tammer, Constantine Zalinescu
CMS Books in Mathematics, Vol. 17
Springer-Verlag, New York, 2003, 350 pages



Optimization is a very popular and well-known domain in applied mathematics. The optimization of vector valued functions is a topic of current interest. In many practical problems related to industrial systems, logistics, management science, operations research and optimal control, optimization involving several objective functions is often necessary. Multiobjective optimization is also known under the name of "Pareto Optimization" [Vilfredo Pareto (1848-1923)]. His graduation thesis was an essay on mechanical equilibrium: "The fundamental Principles of Equilibrium in Solid Bodies" (1870). The economist Maffeo Pantoleani attracted him to the study of equilibrium of economic systems. It is important to cite one of his principles.

"Principeremo col definire un termine di cui è comodo fare uso per scansare lungaggini. Diremo che i componenti di una collectività godono, in una certa posizione, del Massimo di ofelimita, quando è impossiblile allontanarsi pochissimo da quella posizione giovando, o nuocenso, a tutti i componenti collectività; ogni piccolissimo spostamento da quella posizione avendo necessarimente per effetto di giovare a parte dei componenti la collectività e di nuocere ad altri:." [V. Pareto (1906)][1]

In multiobjective optimization we have to study several types of optimality with respect to an ordering defined on a vector space by a closed pointed convex cone. This ordering is total only when the space is the real field $\mathbb{R}$, ordered by $\mathbb{R}_+$. Therefore, in Pareto Optimization, the notions of "minima" or "maxima" are replaced by the notion of "efficiency", defined by a convex cone. Consequently, in this case there exist several kinds of optimality conditions. They are different than the optimality conditions used in optimization of real-valued functions.

The fundamental mathematical tool in Pareto Optimization is the theory of cones in topological vector spaces. Because interest in multiobjective problems is growing the necessity to have a good book related to variational methods in partially ordered spaces is quite real.

Concerning the notion of "efficiency" in Pareto Optimization, the reader is referred also to the recent book of the reviewer, V.A. Bulavsky and V.V. Kalashnikov: *Complementarity, Equilibrium Efficiency and Economics*, Kluwer Academic Publishers (2002). This book and the present book may be considered as complementary. The present book is the result of the cooperation of four authors known for their work in this domain. They have published several joint papers on the optimization of vector-valued functions. The reader will find in this book the most important notions and results necessary to work in Pareto Optimization. The structure of the book is the following:

Chapter 1: Examples: In this chapter the authors present several simple examples that illustrate the kind of problems that can be handled with the methods presented in this book. We find mathematical models for the following practical problems: equilibrium problems, location problems in town planning, multicriteria control problems, multicriteria fractional programming problems and stochastic efficiency in a set.

Chapter 2: Functional Analysis over Cones: In this chapter are presented the mathematical tools based on ordering, necessary for Pareto Optimization. The sections of this chapter are the following:

(1) Order structures;
(2) Functional Analysis and Convexity;
(3) Separation theorems for not necessarily convex sets;
(4) Convexity notions for sets and multifunctions;
(5) Continuity notions for multifunctions;
(6) Continuity properties of multifunctions under convexity assumptions; and
(7) Tangent cones and differentiability of multifunctions.

Chapter 3: Optimization in Partially Ordered Spaces: This chapter is the most important chapter of this book and it is dedicated to several

1 *Roughly: "... We say that the members of a collectivity enjoy maximum satisfaction in a given position if it is impossible, by a small change of posi tion, to help or hurt all the members; any small change helps some and hurts others"* [Ed.]

new results concerning the theory of multicriterial optimization and equilibrium problems. The main sections of this chapter are the following:

(1) Solution concepts;
(2) Existence results for efficient points;
(3) Continuity properties with respect to a scalarization parameter;
(4) Well-posedness of vector optimization problems;
(5) Continuity properties;
(6) Sensitivity of vector optimization problems;
(7) Duality;
(8) Vector equilibrium problems and related topics;
(9) Existence by scalarization of vector equilibrium problems;
(10) Mixed vector equilibrium problems;
(11) Applications to vector variational inequalities;
(12) Minimal point theorems in product spaces and corresponding variational principles; and
(13) Optimality conditions.

Chapter 4: Applications: This last chapter is dedicated to some applications, as for example:

(1) Approximation problems;
(2) Solution procedures;
(3) Location problems;
(4) Multicriteria fractional programming;
(5) Multicriteria control problems; and
(6) Stochastic efficiency in a set.

In this chapter are also presented some numerical algorithms, as for example: proximal-point algorithms and geometric algorithms based on duality assertions, among other solutions procedures.

The book is well presented and it has a long list of references.

Specialists working in Pareto Optimization and other specialists interested in applications of multicriteria optimization now have a nice book on variational methods in partially ordered spaces. This book is also an invitation to the study of topological vector spaces.

We recommend strongly this book to graduate students in mathematics, to graduate students in economics, in engineering and to researchers working in pure and applied mathematics.

BRIEF BOOK REVIEWS

by Peter Fillmore, Dalhousie University

VERTEX OPERATOR ALGEBRAS IN MATHEMATICS AND PHYSICS

Stephen Berman, Yuly Billig, Yi-Zhi Huang and James Lepowsky, editors
Fields Institute Communications 39, AMS 2003 ix + 249 pages

This book presents the proceedings of a workshop held at the Fields Institute in October 2000, within the program "Infinite Dimensional Lie Theory and Its Applications". The workshop followed up on the work of a conference on vertex operators at MSRI Berkeley in 1983. The intervening years saw many deep and exciting developments in areas of mathematics and physics related to vertex operators, including the "monstrous moonshine" conjecture, the theory of quantum groups, two-dimensional quantum field theory, and string theory.

QUANTUM CONTROL: MATHEMATICAL AND NUMERICAL CHALLENGES

André D. Bandrauk, Michel C. Delfour and Claude Le Bris, editors
CRM Proceedings and Lecture Notes 33, AMS 2003 xii + 211 pages

From the cover: "An entirely new branch of science now known as *Laser Control of Molecular Processes* is steadily making an impact on the experimental and technological worlds. In parallel, mathematicians from control theory and numerical simulation are getting progressively involved and making their contributions to this scientific endeavour. This volume presents the proceedings of a workshop held at the CRM in October 2002. The workshop concentrated on advanced numerical methods and new mathematical control and optimization approaches and tools for the quantum control of matter at the molecular level using current laser technology. It brought together mathematicians, theoretical chemists, and physicists working in the area of control and optimization of systems to address the outstanding numerical and mathematical problems."

THE GEOMETRY OF TOTAL CURVATURE ON COMPLETE OPEN SURFACES

by K.Shiohama, T.Shioya and M.Tanaka
Cambridge Tracts in Mathematics 159
Cambridge University Press 2003 ix + 284 pages

The Gauss-Bonnet Theorem states that the total curvature of a compact Riemannian 2-manifold is a topological invariant. For noncompact complete Riemannian 2-manifolds the total curvature is not topologically invariant but depends on the choice of the Riemannian metric. Thus in this case the total curvature may be considered to encode certain geometric properties of the manifold, and the purpose of this book is to study this situation.

The treatment is self-contained and should be suitable for beginning graduate students, as well as for non-specialists looking for an introduction to this area of differential geometry.

SHERLOCK HOLMES IN BABYLON AND OTHER TALES OF MATHEMATICAL HISTORY

Marlow Anderson, Victor Katz, and Robin Wilson, editors
Spectrum Series, MAA 2004 + 387 pages

This delightful selection of historical articles appeared originally in the journals of the MAA (Monthly, Mathematics Magazine, College Mathematics Journal), as far back as 1913 and as recently as 2002, with the great majority from the past 25 years. There are some 40 articles in all, arranged in chronological sections: Ancient, Medieval and Renaissance, Seventeenth Century, and Eighteenth Century. Each section is provided with a forward, giving brief descriptions of the selections, and an afterword with suggestions for further reading.

In the title article, R.C.Buck leads the reader through the deciphering of several cuneiform tablets, 3700 years old, including multiplication tables and the fascinating Plimpton 322. The last six articles deal with various aspects of Euler's legacy: an overview of his life and work, followed by discussions of the number *e*, his view of infinitesimals, and his contribution to the fundamental theorem of algebra and quadratic reciprocity. Between these "bookends" the reader will find a wealth of information that will both entertain and serve to inform one's teaching.

GAUSS: TITAN OF SCIENCE

by G. Waldo Dunnington, with additional material by Jeremy Gray
Spectrum Series, MAA xxix + 537 pages.

Dunnington's book was published in 1955, the first comprehensive biography of Gauss and the product of some 30 years' work on substantially all known sources. Dunnington was an American professor of German, inspired to pursue this project at the age of twelve when he learned from his teacher in Missouri, a great granddaughter of Gauss, that no full biography existed. Since that time at least five others have appeared, but as Jeremy Gray says in his admirable introduction, "Dunnington's book remains the core of any attempt to understand Gauss and his work." It is notable for the wealth of information contained in its nine appendices, including Gauss's will, genealogy, a chronology of his life, books borrowed while a student at Göttingen, courses taught, and an extensive bibliography. The careful placing of his account in the German political and intellectual scene of the day has also been praised.

But as Gray notes, the book has significant limitations. It does not give a "warts and all" portrait of Gauss; and although Dunnington did take some mathematics courses, the reader is likely to feel that "he does not always explain the mathematics with sufficient clarity." Gray, a well-known British mathematical historian, has taken steps to remedy this by including, in addition to his general introduction, an introduction to Gauss's mathematical diary (which he began in 1796 at age 18 and kept sporadically until 1814) and a commentary on it, as well as an annotated bibliography. In all, these valuable additions amount to some 65 pages.

CMS Excellence in Teaching Award

for post-secondary undergraduate teaching in Mathematics

Prix d'exellence en enseignement de la SMC

pour l'enseignement collégial et de premier cycle universitaire en mathématiques

Recognizing sustained and distinguished contributions in teaching. Full-time university, college, two-year college, or CEGEP teachers in Canada with at least five years teaching experience at their current institution can be nominated.

For details regarding nomination procedure, please visit *www.cms.math.ca/Prizes* or *http://hed.nelson.com*

Deadline for nomination is: November 15, 2004

Ce prix récompense des contributions exceptionnelles et soutenues en enseignement. Il s'addresse aux professeures et professeurs d'université, de collège ou de cégep au Canada ayant au moins cinq ans d'expérience dans leur institution présente.

Pour les détails sur la procédure de mise en nomination voir *www.smc.math.ca/Prix* ou *http://hed.nelson.com*

Date limite pour soumettre une candidature : 15 novembre 2004

Nelson & Brooks/Cole, Thomson Businesses are proud sponsors of this award.

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DU BUREAU DE LA PRÉSIDENTE SORTANTE *suite*

MITACS a suscité beaucoup d'intérêt du côté français et on prévoira sûrement une partie de la réunion sur les mathématiques industrielles.

Au nom de tous les participants du congrès je voudrais remercier Francis Clarke, directeur scientifique, et tous les membres du comité scientifique pour un très beau programme. Comme la réunion de Toulouse s'est déroulée sur le sol français c'est la partie française du congrès qui s'est chargée de la plus grande partie de l'organisation et nous nous joignons à nos collègues français pour remercier Jean-Pierre Ramis, président du comité local d'organisation, Marie-Line Chemin qui a assuré l'intendance du congrès de main de maître, et tous les collègues de l'Institut de Mathématiques de Toulouse qui ont mis la main à la pâte : Serge Cohen, Laure Coutin-Laporte, Anne Cumenge, Thierry Delmotte, Fabrice Gamboa, Jean-Baptiste Hiriart-Urruty, Michel Ledoux, Marcel Mongeau, Bertrand Monthubert, Marc Reversat et Jean-Marc Schlenker. Du côté canadien, Alan Kelm a assumé la responsabilité du site Internet.

Cet automne je continuerai d'assumer le suivi dans la préparation de la candidature de Montréal pour le Congrès international des mathématiciens de 2010. Cette candidature sera présentée en partenariat par toute la communauté mathématique canadienne avec les Instituts et MITACS.

Le renouvellement de MITACS pour les 7 prochaines années est une très grande nouvelle pour notre communauté et plus particulièrement pour nos étudiants de doctorat et stagiaires postdoctoraux pour qui la présence de MITACS permet d'espérer des postes en recherche et développement dans des compagnies de haute technologie.

Pendant mon mandat à la présidence j'ai travaillé en étroite collaboration avec le bureau de la SMC et je veux tous les remercier : Nathalie Blanchard, Monique Bouchard, Gertrud Jeewanjee, Alan Kelm, Suzanne Lalonde, Yvette Roberts, Liliane Sousa. Je veux remercier plus particulièrement Graham Wright qui depuis plus de vingt ans se dévoue corps et âme à la SMC et dont l'aide a été particulièrement précieuse pendant mon mandat. Je salue aussi l'aide précieuse d'Arthur Sherk et de tous les vice-présidents.

Ces dernières années la communauté mathématique canadienne a renforcé son influence scientifique et son image et elle a de beaux projets d'avenir. Elle est en plein recrutement de nombreux jeunes collègues qui pourront continuer et pousser plus loin le travail entrepris. Au premier juillet, Eddy Campbell est devenu président de la SMC. Eddy a une très bonne connaissance de la SMC et une vision d'avenir et la SMC est entre de très bonnes mains.

EDUCATION NOTES

By Ed Barbeau, University of Toronto

Call for contributions

This is my annual call for contributions from the readers on matters educational. This can be news of what is going on at your university or of awards received. Or it can be discussion of problems and assignments that some pedagogical significance, or your views on issues of the day, particularly if you have experience that inform them. Please send contibutions to Ed Barbeau at ***barbeau@math.utoronto.ca***. Articles in either French or English are welcome.

In particular, there were many Canadian delegates to the tenth International Congress on Mathematical Education, held in Copenhagen, Denmark from July 4 to July 11, 2004. I would be delighted to receive impressions and reports from any of them.

ICMI Study 16

The International Commission on Mathematical Instruction (ICMI) has commissioned a study on **Challenging Mathematics In and Beyond the Classroom**, whose main event will be a Study Conference from June 27 to July 3, 2006 at Trondheim, Norway with invited participants. The scope of this study will be wide. It will look at, for instance, the impact of mathematical challenges both inside and outside of the classroom, the role of mathematical challengies in supporting the curriculum for students of all levels of ability, vehicles for propagating mathematical challenges and assessment of their effectiveness.

A discussion document has been prepared by an international committee chaired by Ed Barbeau of the University of Toronto (***barbeau@math.utoronto.ca***) and Peter Taylor of the University of Canberra in Australia who is the executive-director of the Australian Mathematical Trust (***pjt@olympiad.org***, not *our* Peter Taylor!). This document defines terms, describes issues, provides sample situations, and poses questions for discussion. Finally, it indicates how to become involved in the Study Conference. Would-be participants will be asked to submit a brief curriculum vita and a 6-10 page document addressing matters relevant to the study no later than August 31, 2005. The committee plans to send out invitations by January 31, 2006. The Conference will be followed by a publication.

For more information, visit the websites ***www.amt.canberra.edu*** or ***www.mathunion.org/ICMI/***, or contact either of the chairs.

KappAbel: A Nordic Competition

The delegates to the International Congress on Mathematics Education in Copenhagen had the pleasure of watching the finals of the KappAbel competition. One team of students from each of the five Nordic countries, Denmark, Iceland, Finland, Norway and Sweden, participated over two evenings. In the first, they presented their projects on Mathematics and music and in the second, solved problems.

The competition is named after the great Norwegian mathematicianm Niels Henrik Abel, who died at Frolands Verk in Norway on April 6, 1829. In 1998, while preparing for a celebration of the 200th anniversary of Abel's birth in 1800, Ivar Salvesen, a teacher at the lower secondary school in Froland arranged a contest in his honour for local school classes. The name of the contest derives from kapp which is part of a Norwegian word meaning "compete", *kapabel* which means "capable" and the name Abel of the great mathematician; its current headquarters is in the house where Abel died. The first national contest occurred in Trondheim, Norway in 2000 as part of the Norwegian celebration of the International Year of Mathematics. The following year drew in competitors from Iceland, and this year, for the first time, all five Nordic countries took part with students from 175 classes. The main partners in operating the contest are the Norwegian University of Science and Technology in Trondheim and the Norwegian Centre for Mathematics education.

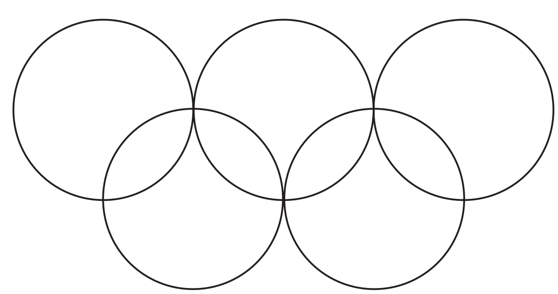
In each country, two introductory rounds were held through the Internet. Classes who made it to the national semifinals were asked to prepare a project, and then on the day after the semi-finals, the top three teams squared off in the finals. The classes, represented in the semifinals by two boys and two girls, are from the ninth grade in Norway and Iceland, and the eighth grade in Denmark, Sweden and Finland.

To give you a flavour of the finals, here are three problems that were used in Copenhagen. Each class was given five minutes to work together on the problem and write up a solution to be considered by the judges. The problem was also presented to members of the audience to test their prowess. While the judges were marking the solutions, a progress report was presented to the audience by one of the schools. The mistress-of-ceremonies then presented the official solution, after which the judges gave a grade out of 5 for each team along with a brief justification for their evaluation.

1. *In the diagram below, the five circles mark out five regions. Place the digits 1, 2, $\cdots$, 9 into these regions so that the sum of the numbers in each circle is the same.*

2. *(a) Show how to cut a square into three congruent parts.*

   (b) Show how to cut a square into three similar parts, just two of which are congruent.



EDUCATION NOTES *Continued*

A third part was considered but not used by the contest committee, namely to cut a square into three similar parts with no two congruent.

3. *Suppose the dots in a 3 ×3 square array are connected by a chain of line segments, each connecting two of the dots, in such a way that each dot is visited exactly once by the chain and the segments do not cross. What is the configuration that will produce the longest such chain?*

The website is ***www.kappabel.com***.

The Mathematikum in Giessen

One of the most interesting talks at the recent International Congress on Mathematics Education was given by Albrecht Beutelspacher of Giessen, Germany. (In particular, he is a member of the committee for ICMI Study 16, described above.) He was a prime mover in bringing into existence the Giessen *Mathematikum*, a mathematical science centre in an old customs building that has been open to the public since November, 2002. Its mission is to make mathematics available to the general public, especially its younger members. There are about 100 interactive exhibits in an exhibition space of about 1000 square meters. Visitors can play with soap bubbles, build bridges, experiment with mirrors and solve puzzles, for example. The exhibits mainly treat geometry, numbers, randomness and calculus. There is a room devoted to π. Open every day, except for December 24, 25 and 31, the facility also includes a cafeteria and a shop.

While the City of Giessen and the Land (province) of Hessen contributed a large amount of money to set up the museum, it requires no outside support for operating expenses. Visitors are charged an entrance fee (6 Euros for adults, and 12 Euros for a family).

The centre plays an important educational role. On weekday mornings, the centre is open for school visits and on weekends, the emphasis is on families and groups of adults. Sessions are available to help teachers make the best use of a visit; questions are provided that will encourage children to spend at least 10 minutes at each exhibit; follow-up material is available. Beutelspacher observed that schools tend to ask the question "What did they learn?" while the centre is more interested in asking "What did they start? What made them start?" Engagement is the goal. Other events include guided tours, weekly presentation of individual exhibits, lectures for children, art exhibits, science weekends and *Mathematik auf dem Sofa*, a kind of mathematical chat. The centre attracted 135000 people in its first year with about 20 per cent more in its second. Visitors generally stay for at least two hours and many will not leave until the building closes. The website for the *Mathematikum* is ***www.mathematikum.de.***

THE UNIVERSITY OF TORONTO
Department of Mathematics

The department anticipates having a number of open positions over the next several years, subject to budgetary approval.

- Full professorships (tenured). Successful candidates will be nominated for a Canada Research Chair. Applicants must be outstanding mathematicians who are leaders in their field. (Code: CRC)

- Assistant Professorships (tenure-stream). Applicants must demonstrate excellent accomplishments and outstanding promise in research and strong commitment to graduate and undergraduate teaching. Preference will be given to researchers in areas of Analysis (Code: ANA), Algebra (Code: ALG), and Geometric analysis (Code: GAN). However, exceptional candidates in all fields of pure or applied mathematics are encouraged to apply (Code: OTHER).

- Limited Term Assistant Professorships, for a period of one to three years. Applicants must demonstrate strength in teaching and significant research promise. (Code: CLTA)

- Post-doctoral positions, for a period of one to two years. Applicants must demonstrate strength in teaching and research. Applicants must directly contact faculty members who may support them from their grants. For a list of faculty members and their research interests, see ***http://www.math.toronto.edu/dept/dirfac.html***. (Code: PDF)

Applicants are asked to specify the code of the most relevant positions and to include the standard AMS Cover Sheet. Applicant material must include the candidate's Curriculum Vitae, list of publications, and four letters of recommendation, of which at least one letter primarily addresses the candidate's teaching. All application material should be sent to the Search Committee by Email (text, postscript, or PDF only) to ***mathjobs@math.utoronto.ca***, or by fax to 416-978-4107, or by post to the Department of Mathematics, University of Toronto, 100 St. George Street, Room 4072, Toronto, Ontario, Canada M5S 3G3. Preference will be given to applications received by December 1, 2004.

The University of Toronto offers the opportunity to teach, conduct research, and live in one of the most diverse cities in the world. See ***http://www.toronto.ca*** and ***http://www.toronto.com.***

The University of Toronto is strongly committed to diversity within its community and especially welcomes applicants from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversification of ideas.

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

MESSAGE FROM THE PAST PRESIDENT

Christiane Rousseau, Université de Montréal

The 2003-2004 year ended with a bang. Scarcely had we wrapped up the joint meeting in Halifax last June, about which Eddy Campbell has brought us up to date, than we found ourselves in Toulouse in July for the first joint Canada-France meeting, bringing together the Canadian and French communities of experts in mathematics, statistics, and applied and industrial mathematics. Conference participants enjoyed the charm of "la Ville rose" and the spectacle of fireworks over the Garonne with the added perk of balmy weather. The reception, organized by the City of Toulouse, was held in the magnificent "Salle des Illustres." The conference was an enormous success, attracting over 430 participants. An impressive number of grad students and postdocs were in attendance, some of whom presented contributed papers and hosted poster sessions.

The congress began with a plenary conference by Laurent Lafforgue (IHES). The other plenary speakers were Grégoire Allaire (École Polytechnique) , Maïtine Bergounioux (Orléans), Jonathan Borwein (Dalhousie), David Brillinger (Berkeley), Walter Craig (McMaster), Henri Darmon (McGill), Emmanuel Giroux (ENS-Lyon), Gabor Lugosi (Barcelona), Mikhail Lyubich (Toronto), Christophe Reutenauer (UQAM), Alain-Sol Sznitman (ETH Zürich), Murad Taqqu (Boston) and Henry Wolkowicz (Waterloo). Turning to education, Michèle Artigue (Jussieu) addressed the issue of the high school-university transition. Besides the plenary sessions, there were 15 sessions covering a range of topics: operator algebras, symplectic topology and geometry, number theory, partial differential equations, dynamical systems, differential equations and control, variational analysis and optimization, stochastic analysis, multifractals and long memory processes, the probability/statistics interface, statistical analysis of functional data, numerical analysis, low dimensional topology and geometrical group theory, mathematical biology and complex dynamical systems. A round table organized by Eric Muller explored the popularization of mathematics.

A significant number of papers were presented in French. Some speakers opted for a bilingual presentation model, talking in French with English overheads or vice versa. The Canadian and French contingents got along famously and the entire meeting ran smoothly. In fact, the meeting's success has precipitated discussions about a second Canada-France meeting in 2008 as part of the CMS Summer Meeting, which will be held jointly with MITACS. In fact, the Canadian initiative to forge stronger ties with industry through MITACS generated considerable interest among the French, and at least part of the meeting will focus on industrial mathematics.

On behalf of all congress participants, I would like to thank Scientific Director Francis Clark and all the members of the Scientific Committee for an excellent program. As the Toulouse meeting took place on French soil, our French hosts took on the lion's share of organizational duties, and we join with our French colleagues in thanking Jean-Pierre Ramis, chairman of the local organizing committee, and Marie-Line Chemin, who guided the proceedings with a master's touch, as well as all members of the Toulouse Institut de Mathématiques who lent a helping hand: Serge Cohen, Laure Coutin-Laporte, Anne Cumenge, Thierry Delmotte, Fabrice Gamboa, Jean-Baptiste Hiriart-Urruty, Michel Ledoux, Marcel Mongeau, Bertrand Monthubert, Marc Reversat and Jean-Marc Schlenker. On the Canadian side, Alan Kelm looked after the Internet site.

This fall, I will continue to work on preparing Montreal's bid for the International Congress of Mathematicians in 2010. The proposal will be presented on behalf of the entire Canadian mathematics community, including the Institutes and MITACS. The renewal of MITACS for the next seven years is extremely good news for our community and particularly for our doctoral students and postdocs, for whom the participation of MITACS opens up research and development opportunities in the high-tech industry.

During my term as president, I worked closely with the CMS office staff and I would like to thank them all: Nathalie Blanchard, Monique Bouchard, Gertrud Jeewanjee, Alan Kelm, Suzanne Lalonde, Yvette Roberts, and Liliane Sousa. I would like to offer a special thank you to Graham Wright, who has devoted himself heart and soul to the CMS for more than 20 years and whose help has been particularly helpful. Finally, I would like to acknowledge the invaluable assistance I received from Arthur Sherk and all the vice-presidents.

Over the past few years, the Canadian mathematics community has succeeded in solidifying its scientific reputation and burnishing its image, and some exciting new projects are in store. It is in the process of recruiting many young people who will continue our work and take it to new heights. On July 1, Eddy Campbell became CMS President. Eddy has an excellent knowledge of the CMS and an exciting vision for the future. Our organization is in very good hands.

CMS Winter 2005 Meeting - Victoria, BC / Réunion d'hiver 2005 de la SMC - Victoria, C.-B.
Call for sessions / Appel de propositions de sessions

The deadline for the Call for Sessions is **December 15, 2004**. A full call will appear in the November issue of the *Notes*. Please visit ***www.cms.math.ca/events/winter05/*** for additional information.

La date limite de l'appel de sessions est le **15 décembre 2004**. Un appel détaillé sera publié dans les *Notes* de novembre. Visitez ***www.cms.math.ca/Reunions/hiver05/*** pour plus d'information.

APPEL DE CANDIDATURES PRIX DE DOCTORAT 2005 DE LA SMC

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

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

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

Candidatures

Les candidats doivent être nommés par leur université; la personne qui propose un candidat doit se charger de regrouper les documents décrits aux paragraphes suivants et de faire parvenir la candidature à l'adresse ci-dessous. Aucune université ne peut nommer plus d'un candidat. Les candidatures doivent parvenir à la SMC au plus tard le **31 janvier 2005**.

Le dossier sera constitué des documents suivants :

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

Président, Comité de sélection du Prix de doctorat
Bureau administratif de la SMC
577 avenue King Edward
Ottawa, Ontario Canada K1N 6N5

CALL FOR NOMINATION 2005 CMS DOCTORAL PRIZE

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

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

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

Nominations

Candidates must be nominated by their university and the nominator is responsible for preparing the documentation described below, and submitting the nomination to the address below. No university may nominate more than one candidate and the deadline for the receipt of nominations is **January 31, 2005**.

The documentation shall consist of:

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

Chair, Doctoral Prize Selection Committee
CMS Executive Office
577 King Edward Avenue
Ottawa, Ontario K1N 6N5 Canada

FIRST ANNOUNCEMENT

RENAISSANCE BANFF

THE EIGHTH ANNUAL INTERNATIONAL

BRIDGES CONFERENCE
+
COXETER DAY

JULY 31 - AUGUST 3, 2005

MATHEMATICAL CONNECTIONS IN ART, MUSIC, AND SCIENCE

THE BANFF CENTRE, BANFF, ALBERTA, CANADA

In 2005 the Bridges Conference will come to Canada for the first time. The Banff Centre is a centre for the arts and mountain culture, beautifully located in the Canadian Rockies.

Renaissance Banff brings together mathematicians, scientists, artists, educators, musicians,writers, computer scientists, architects, sculptors, quilters and weavers, playwrights, photographers, mathematical model builders in a lively atmosphere of mutual exchange and encouragement.

- mathematics and visualization
- mathematics and art in the classroom
- computer generated and assisted art
- gallery displays of visual art
- working sessions with artists
- invited presentations
- mathematics in music
- ethno-mathematics
- symmetry and tilings
- musical/theatrical presentations
- contributed talks
- exhibits gallery

The fourth day of the conference is COXETER DAY, dedicated to celebrating the life of the late H.S.M. (Donald) Coxeter and his enduring legacy to art, artists, and recreational mathematicians.

Contributed papers are welcome. For information on preparing submissions please consult the Bridges website below. Deadline February 1, 2005

The papers of Renaissance Banff will be published as a PROCEEDINGS distributed at the conference.

http://www.sckans.edu/~bridges OR http://pims.math.ca/RenaissanceBanff

The conference is sponsored by The Banff Centre, The Canadian Mathematical Society, and the Pacific Institute for the Mathematical Sciences.

REPORT OF THE 45TH INTERNATIONAL MATHEMATICAL OLYMPIAD

Christopher Small, University of Waterloo

The six team members at the IMO sendoff held at UQAM in Montreal. From left to right: János Kramár, Yufei Zhao, David Rhee, Jacob Tsimerman, Peng Shi, Oleg Ivrii.

In ancient times, if you wanted to go from Corinth — or Athens for that matter — to consult the oracle at Delphi, you would naturally pass through Thebes. According to ancient tradition, this is what Oedipus did when he wanted to consult the oracle at the temple to Apollo Pythios in Delphi. You may recall that at a crossroads near Thebes he killed a man who turned out later to be his father. Thus Oedipus had the first complex and we have suffered from it ever since. Upon arrival in Thebes, he found the place firmly under the thumb — er, wing — of the sphinx, who let no one enter the city without answering a riddle. Oedipus successfully answered the sphinx's riddle, and she obligingly threw herself from the city walls. The Thebans, pleased with that, made Oedipus king of Thebes and gave him Jocasta to marry. The fact that Jocasta was his mother was a nasty little secret that nobody knew until later.

There are several lessons to be learned from this "oedifying" story for everyone involved in the International Mathematical Olympiad, held in Athens in 2004. The first lesson is that the gentle art of problem solving is a very old business, as the riddle of the sphinx would indicate. It pays to be well prepared in modern times as in ancient times. The second lesson is that it is a good idea not to get sidetracked on your way to Delphi, and that to get to Delphi you should expect to go through Thebes.

Nowadays, Thebes is a fairly small town in Greece called Thiva. But you still go by Thiva on your way to Delphi. Some things never change. In 2004, the International Mathematical Olympiad was hosted by the cities of Athens and Delphi, with Athens as the main competition site for the students, and Delphi for the international jury. However, unlike poor old Oedipus, my trip to Delphi was not so much to consult the oracle but to assist in the annual oracular pronouncements of the jury of Leaders from the participating countries of the IMO.

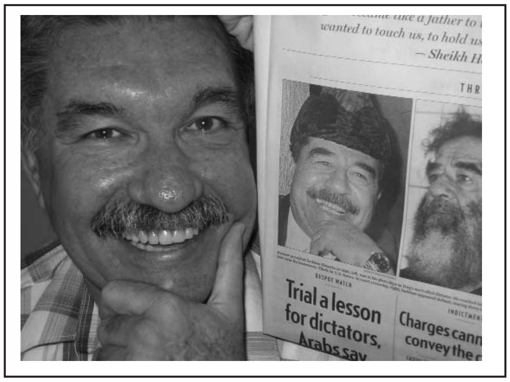
But I am getting ahead of myself. For the six students on the Canadian IMO team, the road to Athens was a lengthy process of competitions and training. Participating in the IMO is the ultimate stage of the competitions ladder. Along the way, the six team members had had to perform well on a number of competitions that included the Canadian Open Mathematics Competition (COMC), the Canadian Mathematical Olympiad (CMO), the Asia-Pacific Mathematical Olympiad (APMO) and the USA Mathematical Olympiad (USAMO). Based in part upon their outstanding results from these competitions, the following students were invited to represent Canada at the 2004 IMO in Athens: Oleg Ivrii (Don Mills Collegiate Institute, Toronto), János Kramár (University of Toronto Schools, Toronto), Dong Uk David Rhee (McNally High School, Edmonton), Peng Shi (Sir John A. MacDonald Collegiate Institute, Toronto), Jacob Tsimerman (University of Toronto Schools, Toronto), and Yufei Zhao (Don Mills Collegiate Institute, Toronto).

For two weeks immediately before the IMO, the Canadian team participated in the summer IMO training camp, which was held at UQAM in Montreal. As a camp organiser, I was joined by my colleagues Edward Wang from Wilfrid Laurier University and Felix Recio from the University of Toronto. Our local host at UQAM was the affable Matthieu Dufour, who arranged accommodation and food for us. Edward's job as Deputy Leader was to accompany the students to Athens while I as Leader, and Felix as Leader Observer, attended jury meetings in Delphi. But before that, we were all responsible for conducting the training sessions for the team at the summer camp in Montreal. The students worked hard, starting early each day on problems, and often working late into the evening. Edward Wang worked particularly hard, not only with mathematics training, but also cooking poached eggs each morning, cleaning up the odd spill, providing advice on laundry and so on. But it was not all work. To fine tune their motor skills, the students built towers of dominos using a set of Cuban dominos generously supplied by Felix Recio.

Jacob and János at work on an applied problem in three dimensional geometry.

We also made a shocking discovery one day when we opened the newspaper. David Rhee said it best when he asked, "What is Dr. Recio doing in the newspaper?" It turned out that Felix has an uncanny resemblance to Saddam Hussein. Naturally, this was played for all it was worth.

REPORT OF THE 45TH INTERNATIONAL MATHEMATICAL OLYMPIAD
Continued



Felix discovers a long lost brother.

We took some time out to watch the Greek miracle team overcome all opposition to win the Euro 2004 soccer title. Having seen the level of noise and enthusiasm that this victory generated in Montreal, Felix and I were a little concerned that Greece might still be celebrating wildly by the time we arrived there. Perhaps worse, Greece might be suffering from a really bad collective hangover.

But our fears were not realised. When we arrived in Greece on July 6, there was no sign of the kind of chaos we had expected. Our flight from Montreal through Frankfurt to Athens had been uneventful, and we were whisked off by bus to Delphi — via Thiva, as I mentioned above. There were signs everywhere on the highway to demonstrate that Greece is a country of great learning and culture. First, was the obvious fact that the Greeks write their language using mathematical formulas. In this respect, they are much more advanced than other cultures, with the possible exception of Arabic countries, who use numbers to write. Greeks all seem to have a solid foundation in Biblical scholarship as well: there were numerous signs listing various references to the book of Exodus on the highway out of Athens. Later, I was to discover that Greece is very scientific also. For example, the elevators have the Greek equivalents to the words "cathode" and "anode" everywhere you look.

The rooftops of Delphi, host town for the international jury.

Delphi itself was like a beautiful dream. The town is very small, with tourism as its main acitivity. If you walk along the main road through town from one end to the other, it only takes twenty minutes or so. However, Delphi is on the side of a mountain, and the change in elevation

The sanctuary of the temple of Apollo in ancient Delphi. From this place the priestess made her famous crytic pronouncements. The international jury did its best to follow in her footsteps.

from highest to lowest is considerable. Thus there are two ways to get around town, one by walking horizontally along roads, the other by climbing the numerous steps that flow along the gradient vector field of the town. The students and Edward Wang arrived in Athens a few days after us. Their journey had been more difficult because of a troublesome connection in Paris. Because Felix and I were sequestered, we did not get to see the students until the opening ceremonies of the IMO, and even then we were only able to see them at a distance. After the second day of competition, we were moved to Athens from Delphi, although not to the same hotel. So it was difficult to see the students even when we were permitted to do so. Edward was moved from the students location to the Ledra Mariott hotel, so that the three of us could work on the coordination (i.e., marking) of the Canadian papers.

As we looked over the students' work, the three of us were pleased to see that everyone on the team had solved at least one problem. That was good news. Provided that we could get full marks from the Greek coordinators for those problems, every student would receive at least an Honourable Mention, which is awarded to any student who completely solves a problem but is not eligible for a medal. In fact, a number of students on our team were in obvious contention for a medal. But some really exciting news emerged as we looked over Jacob Tsimerman's work. We had known that Jacob was very strong. During the previous IMO in Japan he had won a gold medal. This year, he looked even stronger. Looking over his work, we were delighted to see that Jacob had managed to solve every problem. At that point, we started to think the unthinkable: perhaps Jacob could get a perfect score of 42.

REPORT OF THE 45TH INTERNATIONAL MATHEMATICAL OLYMPIAD
Continued

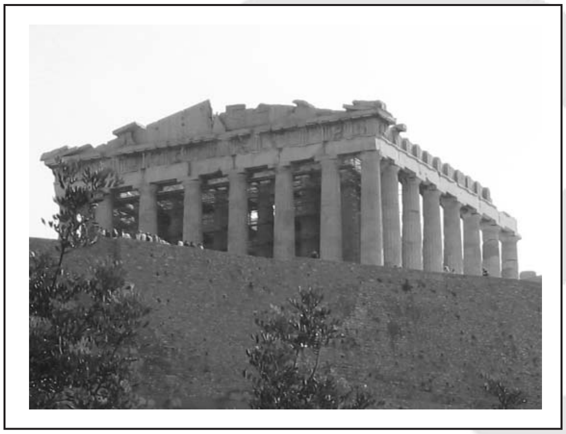
There was a small fly in the ointment. Word got around that the Greek coordinators for Problem 1, a Euclidean geometry problem, were being particularly picky. The problem asked students to show that a particular point lay on the side BC of a triangle ABC. Unfortunately, most students were only showing that the point had to lie on the line through BC and not on the line segment from B to C. Those who did not prove the stronger result got only 6 points out of a possible 7, even if they had no idea that they had to prove the stronger result. Looking over Jacob's paper, we had a sinking feeling. Jacob also had not noticed the distinction between the line segment and the infinite line. It looked as if Jacob might lose his only point on one of the easiest questions of the competition. During coordination, we argued that while Jacob had not stated explicitly that the point had to lie on the segment, his proof nevertheless established the fact. The Greek coordinators, being reasonable men, eventually gave us the extra mark after about ten minutes of spirited debate.

As the results from the different countries slowly went up on the big scoreboard, we had a brief period of seeing that Jacob was the only student with a perfect score. However, he was joined by three other students, the others from Russia and Hungary. It remained to be seen which of the other students would win medals and what colour they would be. In order to determine this, the distribution of marks has to be finalised first. By IMO regulations, no more than one half of the students can get medals, and among medallists, the gold, silver and bronze ratio should be as close to 1:2:3 as possible. At the final meeting of the jury, the medal cutoffs were decided with the numerical results in front of us. Jacob, of course, had his gold medal. János , Peng and Yufei won bronze, and Oleg and David had earned Honourable Mentions. It was heartbreaking to see that Oleg missed a medal by one point.

We went home with many memories. The highs and the lows of competition were among those memories, as were the stark images of ancient columns rising from a timeless landscape. Greece is imbedded in the cultural heritage of European mathematics. For contestants and leaders, the awareness of the legacy of Greek mathematics, science and philosophy was deeper from our experience.

Naturally, people will differ on the IMO problem that they like the best. I liked all the IMO problems chosen in Greece, and that is something I cannot say for every year. Readers may wish to try a problem. For this purpose I offer this geometry nugget, which was the first problem from first day of the competition: Let ABC be an acute-angled triangle with AB not equal to AC. The circle with diameter BC intersects the sides AB and AC at M and N respectively. Denote by O the midpoint of the side BC. The bisectors of the angles BAC and MON intersect at R. Prove that the circumcircles of the triangles BMR and CNR have a common point lying on the side BC.

Students and leaders gather for a photo after the closing ceremonies.



Looking up at the acropolis of Athens, and the Parthenon. Athens was the host city for the 2004 IMO.

CALL FOR NOMINATIONS / APPEL DE CANDIDATURES
Prix CRM/Fields Prize

The Centre de recherches mathématiques (CRM) and the Fields Institute for Research in Mathematical Sciences invite nominations for the joint CRM/Fields prize, in recognition of exceptional achievement in the mathematical sciences. The candidate's research should have been conducted primarily in Canada or in affiliation with a Canadian university. Previous recipients are H.S.M. Coxeter, George A. Elliott, James Arthur, Robert Moody, Stephen A. Cook, Israel Michael Sigal, William T. Tutte, John Friedlander, John McKay, Edwin Perkins, and Donald Dawson.

The Comité consultatif of the CRM and the Fields Institute Scientific Advisory Panel will choose a recipient on the basis of outstanding contributions to the advancement of the mathematical sciences, with excellence in research as the main selection criterion. A prize of $5,000 will be awarded and the recipient will be asked to present a lecture at both the CRM and the Fields Institute.

Nominations should be submitted by October 1, 2004 by at least two sponsors of recognized stature, and should include the following elements: 2 supporting letters, curriculum vitae, list of publications, and up to four preprints. During any academic year, at most one prize will be awarded.

Le Centre de recherches mathématiques (CRM) et le Fields Institute for Research in Mathematical Sciences lancent un nouvel appel de nominations pour le prix conjoint CRM/Fields visant à souligner des réalisations exceptionnelles en sciences mathématiques. Les Professeurs H.S.M. (Donald) Coxeter, George A. Eliott, James Arthur, Robert V. Moody, Stephen A. Cook, Israel Michael Sigal, William T. Tutte, John B. Friedlander, John McKay, Edwin Perkins, et Donald Dawson ont été les précédents récipiendaires du Prix.

Un comité de sélection formé à partir du Comité consultatif du CRM et du Scientific Advisory Panel du Fields Institute choisira le récipiendaire en égard à sa remarquable contribution à l'avancement de sa discipline. Le premier critère de sélection sera l'excellence de la recherche scientifique réalisée. Les travaux des candidats auront été réalisés principalement au Canada ou en collaboration avec une université canadienne.

Le récipiendaire se verra décerner un prix de 5 000 $ et s'engagera àprésenter deux conférences, l'une au CRM, l'autre au Fields Institute. Les candidatures doivent être parrainées par au moins deux personnes de grande renommée et présentées avant le 1er octobre 2004. Les dossiers soumis doivent comprendre une lettre justificative, deux lettres de recommandation, un curriculum vitae, une liste de publications et un maximum de quatre tirés à part. Il y aura tout au plus un prix accordé à chaque année académique.

Submit nominations to / Soumettre les dossiers au ***proposals@fields.utoronto.ca***

The Director
The Fields Institute
222 College Street
Toronto, ON M5T 3J1

UNIVERSITY OF WINDSOR
Department of Mathematics and Statistics

The University of Windsor invites applications for **two tenure-track faculty positions** in the Department of Mathematics and Statistics in the areas of Analysis/Convexity and Statistics at the rank of Assistant Professor commencing July 1, 2005. For detailed position descriptions visit our website at: ***www.uwindsor.ca/facultypositions***. Contact:

Dr. S. E. Ahmed
Head
Mathematics & Statistics
University of Windsor
Windsor, ON, N9B 3P4
Tel: 519.253.3000, Ext. 3015; Fax: 519.971.3649; Email: ***mthsta2@uwindsor.ca***.

For information on the University of Windsor or the City of Windsor, contact Dr. Janice Drakich, Director, Faculty Recruitment at 877-665-6608 (toll free) or ***recruit@uwindsor.ca***. Deadline for applications **October 29/04**.

UNIVERSITY OF VICTORIA
Department of Mathematics and Statistics

The Department of Mathematics and Statistics at the University of Victoria invites applications for **two tenure-track positions** in Statistics to commence on 1 July, 2005. The first is a position in Statistics at the Assistant Professor level and the second is a position in Statistics at the Assistant Professor or Associate Professor level. Eligible candidates may be nominated for an NSERC University Faculty Award.

Applicants for either position must have a Ph.D. in Statistics or related discipline and have an outstanding research record in Statistics. Highest priority will be given to candidates with an excellent publication record in statistical genetics or bioinformatics. Other preferred areas, in order of priority, are spatial statistics, biostatistics and areas of Statistics that supplement the research interests of the Statistics group in the Department. The successful applicant must be able to interact in a research capacity with the Statistics group and beyond and be prepared to be involved with the activities of the Statistics Consulting Centre. A record of, or the demonstrated potential for, excellence in undergraduate and graduate teaching in Statistics is required.

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

Applicants should submit curriculum vitae and a teaching dossier (or equivalent documentation) that outlines their teaching experience and effectiveness. They should also provide names and contact information for three referees. Applications should be directed to:

Dr. Gary MacGillivray, Chair
Department of Mathematics and Statistics
University of Victoria
PO Box 3045 STN CSC, Victoria, B.C. V8W 3P4 CANADA

Telephone: (250) 721-7436 FAX: (250) 721-8962 ***statcomp@math.uvic.ca***

The closing date for applications is **November 30, 2004**. However, applications will be processed as they are received. Interviews will be conducted and the position(s) offered as soon as excellent candidates are identified.

UNIVERSITY OF VICTORIA
Department of Mathematics and Statistics

The Department of Mathematics and Statistics at the University of Victoria invites applications for a **Senior Instructor** position to commence July 1, 2005, or as soon as possible after that date. Applicants should have at least a Masters degree in Mathematics or a related discipline, a strong commitment to teaching, and the ability to teach all Mathematics and Statistics courses at the first and second year levels including calculus, differential equations, linear algebra, finite and discrete mathematics, and statistics. The initial appointment is for three years, with a normal expectation of subsequent 4-year re-appointments. The successful applicant will be expected to teach eight one-term courses per year.

Information about the department, including descriptions of courses offered, can be found at its website: ***www.math.uvic.ca/***

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

Dr. Gary MacGillivray, Chair
Department of Mathematics and Statistics
University of Victoria
PO Box 3045 STN CSC Victoria BC V8W 3P4 Canada

Telephone: (250) 721-7436 Fax: (250) 721-8962 ***instcomp@math.uvic.ca***

The CLOSING DATE for applications is **February 15, 2005**.

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

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

ÉDITORIAL
Le nombre d'or

Au cours des derniers mois, la suite de Fibonacci et le nombre d'or (communément représenté par le symbole ϕ quoique les mathématiciens utilisent plutôt τ ont fait parler d'eux comme jamais auparavant. Dans son roman à succès Da Vinci Code, Dan Brown élève ces deux concepts mathématiques au rang d'éléments principaux d'un scénario d'une grande complexité, qui traite également de sociétés secrètes, de théories ésotériques sur l'origine de la chrétienté, du mythe du Graal, et bien plus encore. C'est un excellent roman d'été : le jeu des personnages et les dialogues laissent un peu à désirer, mais l'histoire ne manque pas d'action, de surprises, de revers de situation et de suspens. L'intérêt du livre est tel qu'il survit même à la multitude de « leçons » que donne un personnage à un autre (et aux lecteurs) sur le Prieuré de Sion, l'alchimie de Newton, les symboles cachés dans les tableaux de Léonard de Vinci, les débuts de l'ère chrétienne ou… le nombre d'or.

Toutefois, il s'agit bien d'une œuvre de fiction. Et une bonne partie (mais certainement pas la totalité) de l'ésotérisme dont l'histoire est généreusement parsemée est une pure invention, sinon de l'imagination de l'auteur, d'une communauté active de mystiques et de théoriciens du complot. Les groupes religieux n'ont d'ailleurs pas tardé à souligner que la majorité des propos sur l'histoire ancienne de l'Église était facilement contestable. Et, malheureusement, les concepts mathématiques qui y sont exposés ne sont pas tous très justes. La valeur de ϕ, par exemple, n'est pas 1,618 comme l'affirme l'auteur (même s'il s'agit d'une bonne approximation); et si certaines des propriétés qui lui sont attribuées sont valides, d'autres ne le sont pas. Il est difficile de lire ce livre sans d'abord « déconnecter » délibérément son détecteur de supercheries…

À l'instar des théories sur le Graal, fondées sur certains faits véridiques, Dan Brown n'a pas lui-même inventé le contexte pseudoscientifique dans lequel il campe son roman. Des occurrences véritables de ϕ dans la nature et dans l'art côtoient depuis des d'années, non sans malaise, les idées saugrenues. On a vu par exemple à la télé dernièrement, un reportage sur un boulanger qui aurait inventé un nouveau pain composé d'ingrédients utilisés dans des proportions équivalant au « nombre d'or, soit 1,6 ». Le journaliste et le boulanger y soulevaient l'importance de ce nombre dans l'art et l'architecture. Le boulanger affirmait que son « pain d'or » contenait des protéines, des hydrates de carbone et autres éléments nutritifs en proportion parfaite pour une saine alimentation. Nous ne doutons pas du goût et de la valeur nutritive extraordinaires de ce pain, mais n'aurait-il pas été tout aussi délicieux si le boulanger avait basé ses calculs sur le nombre 1,5?

Il est parfois plus difficile de distinguer les faits de la fiction. Le Corbusier a-t-il délibérément employé le nombre d'or dans ses travaux? Absolument. Il a d'ailleurs publié des ouvrages pour en expliquer le pourquoi. Et les concepteurs du Parthénon? Possiblement. L'édifice compte cependant de nombreux rectangles dans sa structure, dont quelques-uns seulement s'approchent du « rectangle d'or ». Et les bâtisseurs des Pyramides? Vraisemblablement pas. Mesurez votre carte de crédit, votre carte d'assurance-maladie ou votre permis de conduire : les proportions sont toutes à moins de 2 % du nombre d'or. Est-ce une décision de conception ou pure coïncidence?

Et qu'en est-il des représentations dans la nature? On a déjà observé qu'il y avait un rapport entre le nombre de Fibonacci et les angles que forment les feuilles successives et la tige de nombreuses plantes, ou les spirales de cônes de pin, les ananas et de nombreux autres fruits. Des mécanismes simples ont d'ailleurs été proposés pour expliquer ces phénomènes. Par contre, ne vous donnez pas la peine de chercher une théorie pour expliquer pourquoi le rapport entre la taille d'une personne et la hauteur de son nombril correspond exactement à ϕ (comme l'affirme l'un des personnages de Dan Brown). Car c'est absolument faux.

Les mesures d'objets réels ne sont que des approximations que l'on prend parfois pour des nombres exacts. Bien des nombres « d'or du sot » naissent d'ailleurs ainsi : on arrive à un résultat de 1,6 ou de 1,7 et l'on présume que la valeur réelle doit être ϕ. Encore une fois, comme l'a écrit Martin Gardner il y a quelques années, il existe moins de petits nombres que de tâches à accomplir pour ces nombres. Il suffit que les chiffres 5 et 8 apparaissent dans un certain contexte pour que les « Fibonaccistes » amateur y voient une autre application de leur suite préférée.

Ces exemples de raisonnement par induction non rigoureux sont facilement démontables. Par contre, la rigueur parfaite mène à une totale illisibilité (il n'y a qu'à penser aux Principia Mathematica de Whitehead et Russell). Par conséquent, les ouvrages mathématiques contiennent effectivement des erreurs, des malentendus, des preuves imparfaites, des définitions incohérentes et des conclusions erronées. Il est bien connu que certains auteurs des XVIIe et XVIIIe siècles ne prêtaient pas assez attention à la convergence des suites infinies – même si les résultats obtenus étaient souvent corrects. On a en outre utilisé les nombres infinitésimaux pendant des siècles avant de leur constituer une assise solide. Et bien sûr, le théorème d'incomplétude de Gödel a posé certaines limites aux attentes des mathématiciens sur le plan de la rigueur.

Évidemment, la pensée non rigoureuse a aussi sa place, même en mathématiques. Aux premières étapes de l'obtention d'un nouveau résultat, par exemple, les conjectures publiques et privées jouent certes un grand rôle. Il arrive qu'une étape manquante prenne une si grande importance que l'on se mette à étudier ce qui arriverait si c'était vrai – l'hypothèse de Riemann et P=NP en sont de bons exemples. Aussi assistons-nous depuis quelque temps à une intensification de la recherche « expérimentale » en mathématiques, où l'on se sert de l'ordinateur pour cumuler les preuves d'une proposition, ce qui, parfois, n'aboutit pas du tout à une preuve formelle. Chaitin, par exemple, a bien montré qu'un grand nombre de faits mathématiques n'ont pour toute preuve qu'une liste d'occurrences! Néanmoins, le but général des mathématiques consiste tout de même à trouver des preuves qui, dans la mesure du possible, seront « aussi rigoureuses qu'il le faut ». Le recours à des comités de lecture, implanté au siècle dernier, est l'une des principales « polices d'assurance » à cet égard.

Un roman manquera de crédibilité si son auteur néglige les faits, et nous regretterons sans doute que le bref moment de gloire du nombre d'or n'ait été mieux traité. Quoi qu'il en soit, la fiction n'existerait pas sans un certain relâchement de la rigueur. Si la rigueur est beaucoup plus importante en mathématiques, il est tout de même important de laisser place à l'imagination. À ce sujet, nous vous recommandons deux articles :« Ten Misconceptions about Mathematics » de Michael Crowe, dans Minnesota Studies in the Philosophy of Science, Vol. XI, University of Minnesota Press, 1988, 260-277, et « Fidelity in Mathematical Discourse: Is One and One Really Two? » de Philip J. Davis, dans American Mathematical Monthly, 79 (1972), 252-263.

S. Swaminathan et Robert J. MacG. Dawson

NEWS FROM INSTITUTES

AARMS

When AARMS initiated its summer school program at Memorial University in 2002 it was with the understanding that after three years the school would move to another venue in Atlantic Canada. I am very pleased to announce that Renzo Piccinini (Universita' di Milano-Bicocca and Dalhousie University) and Tony Thompson (Dalhousie University) have kindly agreed to organize next year's edition of the AARMS summer school. It will be held at Dalhousie University in Halifax, with dates to be determined (probably late July or August).

I would like to take this opportunity to express my, and AARMS', gratitude to Edgar Goodaire, the director of the first three schools: he was not only instrumental in setting up these summer schools but – through his dedication – also made them so exciting and successful.

PIMS

The Pacific Institute for the Mathematical Sciences has announced the appointment of Gerald Cliff as Site Director for PIMS at the University of Alberta. Dr Cliff is a Professor in the Department of Mathematical and Statistical Sciences at the University of Alberta. He obtained his B.Sc. at McGill in 1970 and his Ph.D. in Mathematics at the Unversity of Illinois at Urbana in 1975. He has been at the University of Alberta since 1975.

OTHER UPCOMING CONFERENCES

APICS MEETING

Oct 15–17, 2004: A Functional Analysis and Operator Algebras Symposium will be held in conjunction with the APICS meeting at UNB St John. Some of the themes will be operator algebras, noncommutative topology, and classical functional analysis (broadly interpreted). Some travel assistance may be possible. Organizers: Dan Kucerovsky (***dan@math.unb.ca***) and Andrew Toms (***atoms@math.unb.ca***).

TRIVIA

29) In a recent newspaper article, math professor James Murray claimed to have developed a formula that was 94% accurate at predicting what phenomenon?

a) TV ratings
b) Earthquakes
c) Internet traffic
d) Divorce

30) A short article appeared in the Globe and Mail less than a year ago concerning the APICS Math/Stats committee. What was start of the title of the article?

a) UPEI conference to be best yet
b) The Matrix ... Researched
c) Profs pan pencils
d) Study slams math book

Readers are invited to send their favorite mathematical trivia to Gordon MacDonald — ***gmacdonald@upei.ca*** — for possible inclusion.

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CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

OCTOBER 2004 OCTOBRE

2-6 Workshop on Algebraic K-Theory (Centre de Recherches Mathematiques, Universite de Montreal, Montreal, Quebec) ***crm@ere.umontreal.ca***

13-16 Conference on Automorphic Forms and the Trace Formula in honor of James Arthur (Fields Institute, Toronto, ON) ***www.fields.utoronto.ca/programs/scientific/04-05/arthurconf/***

14-15 DIMACS Workshop on Cryptography: Theory meets Practice (Rutgers University, Piscataway, NJ) ***www.dimacs.rutgers.edu/Workshops/Practice/***

21-24 The Psychology of Mathematics Education - North American chapter (PME-NA) (Toronto, ON) ***http://pmena.org/2004***

NOVEMBER 2004 NOVEMBRE

14-17 Multiscale Rehological Models for Fluids (Centre de Recherches Mathematiques, Université de Montreal, Montreal, QC) ***crm@ere.umontreal.ca***

15-17 Coxeter Lecture Series (Fields Institute, Toronto, ON) ***abrand@fields.utoronto.ca***

19-23 Workshop on Mirror Symmetry (The Perimeter Institute, Waterloo, ON) ***abrand@fields.utoronto.ca***

DECEMBER 2004 DÉCEMBRE

6-10 III Joint Meeting Japan-Mexico in Topology and its Applications (Oaxaca, Mexico) ***jamex@matmor.unam.mx***

6-10 Compact Moduli Spaces and Birational Geometry (AIM Research Conference Center, Palo Alto, CA) ***http://aimath.org/ARCC/workshop/birational/***

11-13 **CMS Winter Meeting / Réunion d'hiver de la SMC** (McGill University, Montréal, Québec) ***meetings@cms.math.ca***

16-19 International Conference on History and Heritage of Mathematical Sciences (Holkar Science College, Indore, India) ***bsyadav@indiashm.com***

JANUARY 2005 JANVIER

5-8 Annual Meeting of American Mathematical Society (Atlanta,GA) ***www.ams.org/meetings/***

10-14 Workshop on Topological Strings (Fields Institute, Toronto, ON) ***abrand@fields.utoronto.ca***

26-30 Front Propagation and Nonlinear Stochastic PDEs for Combustion and other applications (CRM, Montreal, Quebec) ***crm@ere.umontreal.ca***

FEBRUARY 2005 FÉVRIER

7-9 IMA Tutorial/Workshop: Where Mathematics Meets Industry (University of Minnesota, Minneapolis, MN) ***visit@ima.umn.edu; www.ima.umn.edu/matter/***

MARCH 2005 MARS

2-5 Representing Unresolved Degrees of Freedom for the Atmosphere and Ocean (CRM, Montreal, Qc) ***crm@ere.umontreal.ca***

21-25 Workshop on $N = 1$ Compactifications (Fields Institute, Toronto, ON) ***abrand@fields.utoronto.ca***

MARCH 2005 MARS

21-25 Extensions of Hilbert's Tenth Problem, AIM Research Conference Center, Palo Alto, CA) ***www.aimath.org/ARCC/workshops/Hilberts10th/***

28-Apr 1 Workshop on String Phenomenology (The Perimeter Institute, Waterloo, ON) ***abrand@fields.utoronto.ca***

APRIL 2005 AVRIL

6-10 Extracting Macroscopic Information from Molecular Dynamics (CRM, Montreal, Quebec) ***crm@ere.umontreal.ca***

27-May 1 Multiscale Modelling in Solids (CRM, Montreal, Quebec) ***crm@ere.umontreal.ca***

MAY 2005 MAI

2-6 Workshop on Gravitational Aspects of String Theory (Fields Institute, Toronto, ON) ***abrand@fields.utoronto.ca***

11-15 Integrative Multiscale Modelling and Simulation in Materials Science, Fluids and Environmental Science (CRM, Montreal, QC)

14-15 Conference in honor of Heydar Radjavi's 70th Birthday (Hotel Golf, Bled, Slovenia) ***Damjana.Kokol@FMF.Uni-Lj.SI, www.law05.si/hrc/***

15-21 ICMI Study15; The Professional Education and Development of Teachers of Mathematics (Aguas de Lindoia, Sao Paulo, Brazil) ***dball@umich.edu***

JUNE 2005 JUIN

1-5 Stochastic Modelling in Financial Mathematics (CRM, Montreal, Quebec) ***crm@ere.umontreal.ca***

4-6 **CMS 2005 Summer Meeting / Réunion d'été 2005 de la SMC** (University of Waterloo) ***meetings@cms.math.ca***

16-19 Second Joint Meeting of American Math. Soc with the Deutsche Math.-Vereinigung and the Osterreichische Math.Gesellschft (Mainz, Germany) ***www.ams.org/meetings/***

26-29 12th International Linear Algebra Society Conference (Regina, SK) ***www.math.uregina.ca/~ilas2005/***

AUGUST 2005 AOÛT

3-9 XXIVièmes Journées Arithmétiques, All branches of Number Theory (Marseilles, France) ***www.latp.univ-mrs.fr/ja2005***

31-Aug.3 Renaissance Banff: the 8th Bridges Conference and Coxeter Day, (The Banff Center, Banff, Alberta). ***rmoody@ualberta.ca www.sckans.edu/~bridges, gsarhangi@towson.edu***

AUGUST 2006 AOÛT

22-30 International Congress of Mathematicians (ICM 2006) (Madrid, Spain) ***www.icm2006.org***

CALL FOR NOMINATIONS / APPEL DE MISE EN CANDIDATURE

The term of office of the present Editors-in-chief of the *CMS Notes*, S. Swaminathan and R. Dawson will end December 31, 2005.

The Publication Committee of the CMS invites applications for the next Editors-in-chief to serve for a five year term. Applications should consist of a formal letter of application and a curriculum vitae. The publications Committee will communicate its recommendation to the Executive Committee of the CMS in April 2005.

Applications and/or comments should be received by the Chair of the Publications Committee no later than **November 30, 2004**.

Le mandat des rédacteurs-en-chef actuels des *Notes de la SMC*, S. Swaminathan et R. Dawson, prendra fin le 31 décembre 2005.

Le Comité des publications de la SMC sollicite les mises en candidature pour le prochain rédacteurs-en-chefs pour un mandat de cinq ans. Les mises en candidature doivent inclure une lettre formelle et un curriculum vitae. Le Comité des publications transmettra ses recommandations au Comité exécutif de la SMC en avril 2005.

Les candidatures et/ou commentaires devraient être acheminés à la présidente du comité de publications avant le **30 novembre 2004**.

Prof. Dana Schlomiuk
Chair Publications Committee / Présidente du Comité de publications
Dép de mathématiques et de statistique
Université de Montréal
CP 6128-Centre-ville
Montréal, Québec Canada H3C 3J7

TRIVIA ANSWERS - from page 25

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RATES AND DEADLINES 2004 / TARIFS ET ÉCHÉANCES 2004

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