New and Noteworthy from Springer

**Modern Methods in the Calculus of Variations**
With Applications to Nonlinear Continuum Physics
I. Fonseca and Giovmith Leon, both at Carnegie Mellon University
Based on a series of lectures by the authors at Carnegie Mellon University, this book presents in a unified way both clas- sical and contemporary results in the Calculus of Variations. The first part is devoted to Calculus of Variations in a Sobolev setting, and the second part addresses variational methods in func- tion spaces allowing for discontinuities of the underlying potentials, e.g. the space of functions of bounded variation. It is intended to be a graduate text and a reference for more experienced research- ers working in the area.


**A History of Chinese Mathematics**
Jean-Claude Martzloff, Institut des Hautes Etudes Chinoises, Paris, France
[A] truly scholarly and balanced exposition... Central to Martzloff’s narrative is the idea that mathematical thinking evolved hand in hand with the gradual development of a written language, and that the passage of time is a key element in the understanding of mathematical progress. This book is a fascinating and valuable addition to the literature on the history of science.


Stochastic Simulation Algorithms and Analysis
Soren Asmussen, University of Aarhus, Denmark and Peter W. Glynn, Stanford University, California
The book covers a broad aspect of topics and applications in simulation at a higher mathematical level than other recent texts in the area. Its readership is intended for graduate students and researchers from a variety of areas, in particular applied probability, statistics, mathematical finance, operations research, industrial engineering, electrical engineering and other application areas. The book contains a large amount of exercises and illustrations.


**Worlds Out of Nothing**
A Course in the History of Geometry in the 19th Century
Jeremy Gray, The Open University, UK
Based on the latest historical research, Worlds out of Nothing is the first book to provide a course on the history of geometry in the 19th century. Topics covered in the book include projective geometry, non-Euclidean geometry, singular points of algebraic curves (Picard’s equations) and their role in resolving a paradox in the theory of duality. Human’s work on differential geometry, and to Beltrami’s role in successfully establishing non-Euclidean geometry as a rigorous mathematical subject. The final part of the book considers how projective geometry rose to prominence, and looks at Poncelet’s ideas about non-Euclidean geometry and their physical and philosophical significance.


MacLaurin’s Physical Dissertations
Iain Tweedie, University of Strathclyde, UK
These important works are presented in translation for the first time, preceded by a translation of MacLaurin’s MA dissertation on gravity (Glasgow, 1737) which provides evidence of his early study of Newtonian principles.


A Topological Picturebook
George K. Francis, University of Illinois at Urbana-Champaign
Drawn to Springer for reissuing this unique and beautiful book! It is not only a needed addition to the library of the educated general reader, but also an excellent introduction to topology and its applications.


Be sure to take advantage of the 2006 Yellow Sale!
Visit springer.com.
Sale prices valid only in the Americas and expire December 31, 2006.

Easy Ways to Order for the Americas: Write: Springer Order Department, PO Box 2485, Secaucus, NJ 07086-2485, USA Call: (toll-free) 1-800-SPRINGER Fax: +1-201-348-4501 Email: orders-us@springer.com For outside the Americas: Write: Springer Distribution Center GmbH, Heidelburg, Germany Call: +49-6221-345-429 Fax: +49-6221-345-420 Email: ODC.bookorders@springer.com Prices are subject to change without notice. All prices are net prices.
NIH DIRECTOR’S

PIioneer
A·W·A·R·D

The National Institutes of Health invites applications for the 2007

NIH Director’s Pioneer Award

A key component of the NIH Roadmap for Medical Research, the NIH Director’s Pioneer Award supports exceptionally creative scientists who propose highly innovative—and potentially transformative—approaches to major challenges in biomedical research.

In September 2007, NIH expects to make 5 to 10 new awards of $500,000 in direct costs per year for 5 years.

Women, members of groups that are underrepresented in biomedical research, and individuals in the early to middle stages of their careers are especially encouraged to apply.

Open to Scientists Who Are

■ U.S. citizens, non-citizen nationals, or permanent residents
■ Currently engaged in any field of research
■ Interested in exploring biomedically relevant topics
■ Willing to commit at least 51% of their research effort to the Pioneer Award project

Apply Online

■ Streamlined application includes 3- to 5-page essay and 3 letters of reference
■ Apply between December 1, 2006 and January 16, 2007

More Information

■ See the Pioneer Award Web site, http://nihroadmap.nih.gov/pioneer
■ E-mail questions to pioneer@nih.gov
American Institute of Mathematical Sciences proudly announces the debut of a novel journal in the rapidly growing areas of inverse problems and imaging science: Inverse Problems and Imaging (IPI).

IPI publishes research articles of the highest quality that employ innovative mathematical and modeling techniques to study inverse and imaging problems arising in all of the sciences and engineering. Every published paper has a strong mathematical orientation employing methods from such areas as control theory, discrete mathematics, differential geometry, harmonic analysis, functional analysis, integral geometry, mathematical physics, numerical analysis, optimization, partial differential equations, stochastic and statistical methods. The field of applications include medical and other imaging, nondestructive testing, geophysical prospecting and remote sensing as well as image analysis and image processing.

Editorial board

Giovanni Alessandrini
Daniela Calvetti
Emmanuel Candès
Antonin Chambolle
Margaret Cheney
David Colton
Mathias Fink
Victor Isakov
Hiroshi Isozaki
Jari Kaipio
Carlos Kenig
Andreas Kirsch
Jean-Michel Morel
William Rundell
Fadil Santosa
Otmar Scherzer
John Schotland
Jin Keun Seo
Barry Simon
Erkki Somersalo
Gunther Uhlmann
Luminita Vese
Ricardo Weder
Joachim Weickert
Maciej Zworski

Editor-in-Chief: Lassi Päivärinta
Managing Editors: Matti Lassas
Jackie (Jianhong) Shen

For more information about subscription or submission, please visit the journal site:
http://aimsciences.org/journals/ipi

Sample Articles to Come:

- B. Simon: Zeros of OPUC and long time and long range time asymptotics of Schur and related flows.
- H. Isozaki: Inverse boundary value problems in the horosphere - A link between hyperbolic geometry and electrical impedance tomography.
Classical Mechanics
EMMANUELE DIBENEDETTO
Vanderbilt University, Nashville, TN

Following Lagrangian principles, the author employs mathematics not only as a “unifying” language, but also to exemplify its role as a catalyst behind new concepts and discoveries, such as the d’Alembert principle, complex systems dynamics, and Hamiltonian mechanics. Offering a rigorous mathematical treatment of the subject and requiring of the reader only a solid background in introductory physics, multivariable calculus, and linear algebra, Classical Mechanics can serve as a text for advanced undergraduates and graduate students in mathematics, physics, engineering, and the natural sciences, as well as an excellent reference for applied mathematicians and mathematical physicists.

2007/APPROX. 350 PP., 50 ILLUS./HARDCOVER
ISBN 10: 0-8176-4526-8/$59.95

Linear Partial Differential Equations for Scientists and Engineers
Fourth Edition
TYN MYINT-U
Manhattan College, New York, NY
LOKENATH DEBNATH
University of Texas Pan-American, Edinburg, TX

This significantly expanded fourth edition is designed as an introduction to the theory and applications of linear PDEs. The authors provide fundamental concepts, underlying principles, a wide range of applications, and various methods of solutions to PDEs. The book contains new material that is not usually covered in similar texts and reference books.

The text primarily serves as a textbook for the first two courses in PDEs, or in a course on advanced engineering mathematics. It may also be used as a reference for graduate students, researchers, and professionals in modern applied mathematics, mathematical physics, and engineering.

2007/4TH ED./APPROX. 784 PP., 79 ILLUS./HARDCOVER
ISBN 10: 0-8176-4393-1/$59.95

Also by L. Debnath

Nonlinear Partial Differential Equations for Scientists and Engineers
Second Edition
2005/2ND ED./XXII 737 PP., 77 ILLUS./HARDCOVER
ISBN 10: 0-8176-4323-0/5/$79.95

D-MODULES, PERVERSE SHEAVES, AND REPRESENTATION THEORY
RYOSHI Hotta
Okayama University of Science, Okayama, Japan
KYOISHI TAKEUCHI
University of Tsukuba, Japan
TOSHIYUKI TANISAKI
Osaka City University, Osaka, Japan

Translated by KYOISHI TAKEUCHI
University of Tsukuba, Japan

This first English-language translation of the Japanese text, D-Kagan to Daisugun, translated and updated by the original authors, deals with recent advances in pure mathematics, such as D-modules, intersection cohomology groups, and representation theory. The importance of several new basic theories that have emerged in the past few decades is explained in the work.

2007/XII, 414 PP., 66 ILLUS./HARDCOVER
ISBN 10: 0-8176-4363-8/$89.95
PROGRESS IN MATHEMATICS VOL. 236

GEOMETRIC FUNCTION THEORY
Explorations in Complex Analysis
STEVEN G. KRANTZ
Washington University, St. Louis, MO

“The presentations of the topics are clear and the text makes [for] very good reading; basic ideas of many concepts and proofs are carefully described, non-formal introductions to each chapter are very helpful, a rich collection of exercises is well composed and helps the student to understand the subject. The book under review leads the student to see what complex function theory has to offer and thereby gives him or her a taste of some of the areas of current research.”

–Zentralblatt MATH

2006/XIV, 314 PP., 41 ILLUS./HARDCOVER
ISBN 10: 0-8176-4339-7/$69.95
CORNERSTONES

Now available in Softcover

Lise Meitner and the Dawn of the Nuclear Age
PATRICIA RIFE
University of Maryland University College, Adelphi, MD

“Lise Meitner comes to life as author Rife skillfully weaves social, political, and scientific events into a well-researched and documented work.”

–Association of Women in Science Magazine

2007/1ST ED., 1999/2ND PRINTING/XVIII, 432 PP., 35 ILLUS./SOFTCOVER
ISBN 10: 0-8176-4559-4/$49.95

New Birkhäuser Series:
Modern Birkhäuser Classics

Many of the original research and survey monographs in pure and applied mathematics published by Birkhäuser in recent decades have been groundbreaking and have come to be regarded as foundational to the subject. Through the MBC Series, a select number of these modern classics, entirely uncorrected, are being re-released in paperback (and as eBooks) to ensure that these treasures remain accessible to new generations of students, scholars, and researchers.

The Grothendieck Festschrift Volumes I-III
A Collection of Articles Written in Honor of the 60th Birthday of Alexander Grothendieck
PIERRE CARTIER
Institut des Hautes Études Scientifiques, Bures-sur-Yvette, France; LUC ILLUSIE
Université de Paris-Sud, Orsay, France; NICHOLAS M. KATZ
Princeton University, Princeton, NJ; GÉRARD LAUMON
Université de Paris-Sud, Orsay, France; YURI I. MANIN
Max Planck Institut für Mathematik, Bonn, Germany; KENNETH A. RIBET
University of California, Berkeley, CA (Eds.)

VOLUME I
2007/XX, 498 PP./SOFTCOVER
ISBN 10: 0-8176-4566-7/5/$39.95

VOLUME II
2007/VIII, 564 PP./SOFTCOVER

VOLUME III
2007/VIII, 496 PP./SOFTCOVER

Number Theory
ANDRÉ WEIL

2007/XXII, 376 PP./SOFTCOVER

Don’t Miss the Birkhäuser Green Sale
Visit www.birkhauser.com for more details
Features

**1304** The Search for Simple Symmetric Venn Diagrams

*Frank Ruskey, Carla Savage, and Stan Wagon*

Generalizing the familiar pictures of two or three intersecting circles, a Venn diagram is a collection of simple closed curves that intersect in only finitely many points and such that the intersection of interiors of any subset of the curves is nonempty and connected. If there are $n$ curves, and the diagram has $n$-fold rotational symmetry, $n$ must be a prime. The authors show how these can be constructed.

**1314** Better Ways to Cut a Cake

*Steven J. Brams, Michael A. Jones, and Christian Klamler*

A mathematical cake, as viewed by $n$ persons participating in its division, is modeled by their $n$ (covert) value functions on the unit interval. Each participant can cut the cake at a point by a vertical line at that point, and each is assumed to make their cut so as to maximize the value of the minimum size piece they might receive. The authors explore algorithms that allow this division to be fair to all.
Math for America and the Math Science Teaching Corps

We American mathematicians have known for years how poorly our high school students rank on international mathematics assessments such as the TIMSS (Third International Mathematics and Science Study) and PISA (Programme for International Student Assessment). Now a November 2005 study by the American Institute of Research shows that not just our high school students are behind the international curve; there is a “consistent picture of overall mediocrity” across all grade levels. There are as many theories of how to fix this problem as there are explanations for its existence. None of these solutions, however, is as elegant and simple as properly rewarding mathematics and science teachers for the very valuable role they play in our economy.

Math for America (MfA) does just that. MfA was founded in 2004 by a group of mathematicians and investment professionals headed by Jim Simons; since then it has run two pilot programs to improve mathematics teaching in New York City. MfA’s Newton Fellowship Program offers US$90,000 in stipends, in addition to regular salary while teaching, to mathematically capable people as an incentive for their choosing math teaching over other jobs. Fellows receive full tuition scholarship to a master’s program in mathematics education, as well as mentoring and professional development opportunities. MfA’s Newton Master Teacher Program complements the Newton Fellowship Program by rewarding excellent math teachers already in the field with US$50,000 supplementary stipends.

The success of MfA’s pilot programs in New York City has generated a national initiative. On February 7, 2006, bills based on the Newton Program model were introduced in Congress. The Math Science Teaching Corps (MSTC, pronounced “mystic”) Act of 2006 is bipartisan, championed in the Senate by Chuck Schumer (D-NY) and in the House by Jim Saxton (R-NJ). The MSTC bill creates a federal fellowship program to recruit, train, and retain outstanding mathematics and science teachers. This program will both recruit new teachers and reward current high-quality teachers, with the goal of eventually involving 20 percent of our nation’s secondary public school mathematics and science teachers.

Some details: The Corps recruits both current teachers and prospective teachers. Prospective new teachers in the Corps receive pedagogical training in exchange for a four-year commitment to teach. Those without certification receive training and certification in a one-year master’s program before going into the classroom. Those with certification enter the classroom right away while pursuing advanced studies on a part-time basis. Retention strategies include district-level mentoring, professional development, and federal financial incentives. Current teachers who join the Corps commit to teaching for five years and to serve as leaders in their school, to mentor new teachers, and to participate in professional development. They also receive federal financial incentives.

Other bills aimed at improving mathematics and science education have also been introduced in Congress. Four aspects of the MSTC bill set it apart from the rest:

1. National Standards: All applicants to the Corps, whether aspiring teachers or already in service, must perform satisfactorily on a National Academy of Sciences-approved standardized test of subject knowledge. This test will include a portion on mathematics even for science teachers. In addition, candidates must demonstrate strong verbal skills as well as other attributes linked to effective teaching.

2. Financial Incentives: During their years in the program, all Corps members receive stipends from the federal government in addition to their regular salaries. New teachers’ supplemental stipends will begin at US$11,000 and scale up to US$20,000 during their four-year teaching period, while working teachers’ supplemental stipends will be set at US$20,000 a year. Corps members teaching in hard-to-staff schools may receive enhanced stipends.

3. Prestige and Respect: As members of the Corps, participants experience a high level of enthusiasm and solidarity. The highly visible Corps will build prestige and respect for the field of math and science teaching. Corps members participate in mentoring and professional development programs.

4. Renewable Fellowships: Corps membership is renewable. In the steady state, the top 20 percent of all public secondary school math and science teachers should be Corps members, just as the research activities of the top scientists in our country are supposed to be supported by the National Science Foundation. Corps members applying for renewal compete on an equal footing with all new applicants.

Information about how to help MfA support the MSTC is available on the advocacy pages of our website http://mathforamerica.org.


—Irwin Kra
Executive Director, Math for America
irwin@mathforamerica.org
Mathematics in Spain

Having been educated mostly in Spain, it was a nice surprise when I learned that this year’s ICM was going to take place in Madrid. I also appreciate the special article that Notices dedicated to Spanish mathematics last February. I am less convinced though that mathematics, or any other branch of science for that matter, will ever achieve the level of development in Spain that it enjoys in the United States, France, or any other country that has been or is currently home to the brightest mathematicians in the world. Put simply, Spanish society doesn’t encourage excellence at large, let alone in fields, like mathematics, that have so little tradition in Spain. One could argue whether the Muslim mathematicians that lived in what is today’s Spain during the Middle Ages were truly Spanish. Not that Spaniards are less scientifically talented than other Western Europeans, but, as John Ball pointed out during the opening ceremony of ICM06, raw mathematical talent, while necessary, is not enough for the development of high caliber mathematics; a socioeconomic infrastructure supportive with mathematics is just as important. There is an intrinsic incompatibility between the values promoted by Spanish culture and excellence in mathematics or any other scientific endeavor. The evidence of this fact is overwhelming; the coverage by the Spanish media of ICM 2006 is a case in point. The ICM, despite its significance, didn’t make it to the front page of any of the large Spanish newspapers. These same media have special weekend supplements where they usually highlight important events that get lost among the week’s current affairs. None of them had a special article on Madrid’s ICM or mathematics. One wonders whether if Perelman hadn’t rejected the Fields Medal, the large, and most influential, Spanish media would have mentioned the ICM at all. Many of my scientifically educated friends, when presented this view, rush to say that lack of economic resources is the issue. I strongly disagree with that view. In economic terms, Spain is no longer a developing country; moreover, as the Forbes billionaires list shows, there are a few individuals in Spain with the necessary wealth to create Spain’s Clay Math Institute or Packard Foundation if they wanted to. I was lucky. Most of the excellent teachers that I had in high school and early years of college were good mathematicians or had an extensive mathematical training. They instilled in me a love for this discipline; but they also wisely told me that if I wanted to make a career in science, Spain was not the right place to be. Other countries, like France or the United States, were better suited for my interests. I eventually followed their advice, finished my higher education in France through an Erasmus grant, and right now I am a Ph.D. student in electrical engineering at Stanford University.

—Fernando Gomez Pancorbo
Stanford University
fgomezp@stanford.edu

(Received August 29, 2006)

First, Last, and Other Names

Re Khalid Saifullah’s letter in the September Notices: China is not the only country where the family name is written first and the given name(s) second (actually, I think that is the logical order, just look at phone and other directories; but I would not want to force it on other countries or on international organizations that try, maybe foolishly, to standardize). So is, for example, Hungary. Still, I don’t know of any Hungarian (or, for that matter, Chinese) mathematician who resents having to write their names in different order in (most) countries other than their own.

Middle names are usually not mandatory on forms, at most middle initials, and those may be replaced by NMI for No Middle Initial. But, if one is fortunate enough (as I am) to have more than one given name (she may choose the initial of one of her(his) other given names in order to need just one middle initial, rather than three (NMI).

Things get more complicated when one’s name consists of only one part. But if, as in the case of Riazuddin and Fayyazuddin, the name has in Arabic two parts, one would think (admittedly, in complete ignorance of the language) that they could also be transliterated into English in two parts. By the way, not only in China, India, and Pakistan, but also in many European countries last names reflect places the family comes from or some ancestor’s one-part name. Maybe it is not an East-West issue.

However, not every effort of standardization succeeds, see e.g., the metric system or the UN (UNESCO?) recommended pattern of writing year, month, and day in that order (which happens to be the standard ordering in Hungarian since time immemorial).

—Janos Aczel (Janos D. Aczel)
University of Waterloo
jdaczelm@uwatwaterloo.ca

(Received September 1, 2006)

Textbook Auxiliaries

As the author of one of the textbooks discussed in Allyn Jackson’s article “Textbook Tempest: Students and Professors Decry Price Surge” (Notices, Aug. 2006, pp. 771–4), I’d like to comment on one of the points she makes. The PIRG report dismisses the additional items that are included with textbooks (such as CD-ROMs) as “bells and whistles” and says that 65 percent of instructors use these additional materials rarely or never. I don’t doubt the accuracy of that figure, but I think it’s unfortunate.

It takes me about a year and a half to prepare a new edition and I spend a fair amount of that time on the CD. It’s not easy to convey the dynamic nature of calculus in a static object like a book, but change and motion can be illustrated in a natural way on a CD. Whenever I teach calculus, I use the CD extensively in my lectures and it certainly focuses students’ attention and enlivens the classroom. And I encourage students to use it on their own.

I therefore suggest that instructors in any mathematics course take a serious look at the CDs and other materials that come with the book. You might be pleasantly surprised by how helpful they are.

—James Stewart
McMaster University
jimst@rogers.com

(Received September 1, 2006)
MATHEMATICAL MOMENTS

The Mathematical Moments program is a series of illustrated “snapshots” designed to promote appreciation and understanding of the role mathematics plays in science, nature, technology, and human culture.

Download these and other Mathematical Moments pdf files at www.ams.org/mathmoments.

Making Designs A Reality

The innovative design of the Sydney Opera House stymied builders for years until they realized that all the project’s specifications could be met with triangles cut from the same sphere. Since all the pieces were of the same type and from a surface with well-established geometrical properties, the requisite calculations (such as determining structural forces) were simplified considerably and the dream became a magnificent reality.

- Recognizing Speech
- Compressing Data
- Being a Better Sport
- Targeting Tumors
- Defeating Disease
- Getting Results on the Web
- Designing Aircraft
- Eye-dentifying Yourself
- Enhancing Your Image
- Simulating Galaxies
- Revealing Nature’s Secrets
- Securing Internet Communication
- Making Movies Come Alive
- Listening to Music
- Making Votes Count
- Forecasting Weather

www.ams.org/mathmoments
The Search for Simple Symmetric Venn Diagrams

Frank Ruskey, Carla D. Savage, and Stan Wagon

Many people are surprised to learn that Venn diagrams can be drawn to represent all of the intersections of more than three sets. This surprise is perfectly understandable since small Venn diagrams are often drawn with circles, and it is impossible to draw a Venn diagram with circles that will represent all the possible intersections of four (or more) sets. This is a simple consequence of the fact that circles can finitely intersect in at most two points and Euler’s relation $F - E + V = 2$ for the number of faces, edges, and vertices in a plane graph. However, there is no reason to restrict the curves of a Venn diagram to be circles; in modern definitions a Venn diagram is a collection of simple closed Jordan curves. This collection must have the property that the curves intersect in only finitely many points and the property that the intersection of the interiors of any of the $2^n$ sub-collections of the curves is a nonempty connected region.

If a Venn diagram consists of $n$ curves then we call it an $n$-Venn diagram. The rank of a region is the number of curves that contain it. In any $n$-Venn diagram there are exactly $\binom{n}{r}$ regions of rank $r$. Figure 1 shows a 2-Venn and two distinct 3-Venn diagrams. Note that the diagram in Figure 1(c) has three points where all three curves intersect. The regions in the diagrams of Figure 2 are colored according to rank.

The traditional three-circle Venn diagram has an appealing 3-fold rotational symmetry, and it is natural to ask whether there are $n$-Venn diagrams with an $n$-fold rotational symmetry for $n > 3$. Grünbaum [6] found a symmetric 5-Venn diagram made from ellipses. Henderson [10] noted the following necessary condition: if an $n$-Venn diagram has an $n$-fold rotational symmetry, then $n$ is prime. The reason is as follows:

In any symmetric $n$-Venn diagram the fixed point of the rotations, the center of the diagram, must lie in the unique region of rank $n$. The unbounded outer region has rank 0. Regions of rank $0 < r < n$ must be distributed symmetrically and thus their number, $\binom{n}{r}$, must be divisible by $n$. This property holds exactly when $n$ is prime.

Why? Recall that $\binom{n}{r} = n(n-1) \cdots (n-r+1)/r!$. If $n$ is prime and $0 < r < n$, then note that $n$ occurs once in the right-hand side and all other numbers are less than $n$. On the other hand, if $p$ is a nontrivial divisor of $n$, then the binomial coefficient with $r = p$ is the product of two integers $\binom{n}{p} = \frac{2}{p} \cdot m$ where $m = (n-1) \cdots (n-p+1)/(p-1)!$, but clearly $p$ cannot divide $m$, and thus $n$ does not divide $\binom{n}{r}$.

The elegant necessary condition of Henderson was long suspected to be sufficient, but it took some 40 years before it was proven to be sufficient by Griggs, Killian, and Savage [5]. In the intervening years, symmetric diagrams were discovered for $n$ equal to 5, 7, and 11. Some of these diagrams are shown in Figure 2. The first symmetric 7-Venn diagrams were discovered independently by Grünbaum [7] and Edwards [3] (Fig. 2a); the first symmetric 11-Venn diagram was discovered by Hamburger [8].

A Venn diagram is said to be simple if exactly two curves pass through any point of intersection. The diagrams of Figures 1(a), (b) and 2(a), (b) are simple and the diagrams in Figures 1(c) and 2(c) are not simple. Simple Venn diagrams exist for all $n$, but no simple symmetric Venn diagrams are known for $n > 7$. On the other hand, no known condition precludes their existence for any prime $n$.

Venn diagrams were originally proposed as visual tools for representing “propositions and reasonings” [15] and how they are actually drawn in the plane will often influence how useful they are as tools. The definition of Venn diagram that we gave earlier is topological, but questions of geometry have also played a significant role in investigations of Venn diagrams. For example, one

---

Frank Ruskey is professor of computer science at the University of Victoria, Canada. His research is supported in part by NSERC. Carla D. Savage is professor of computer science at North Carolina State University. Her email address is savage@ncsu.edu. Her research is supported in part by NSF grant DMS-0300034. Stan Wagon is professor of mathematics at Macalester College. His email address is wagon@macalester.edu.
can ask: Which Venn diagrams can be drawn with all curves convex? For more than four sets, the practical usefulness of Venn diagrams diminishes but interesting mathematical questions arise. See [14] for a list of open problems related to Venn diagrams.

In this article we outline the technique of Griggs, Killian, and Savage [5] for producing symmetric Venn diagrams on a prime number of curves and the more recent efforts of Killian, Ruskey, Savage, and Weston [13] to create simple symmetric Venn diagrams. One of the diagrams from [13] was selected by Stan Wagon as the basis for the illustration shown on the cover; the method used to produce the image is described in the “About the Cover” description on page 1312.

**Graph Theoretic Model**

We first appeal to graph theory to get a “combinatorial” condition for Venn diagrams.

A Venn diagram $D$ can be viewed as a (multi)graph $V$ embedded in the plane: the vertices of $V$ are the points where curves of $D$ intersect and the edges of $V$ are the sections of the curves connecting the vertices. We can take the (geometric) dual of an embedding of a planar graph $V$ by placing a vertex $v_r$ in every region $r$ of $V$. If edge $e$ separates regions $r$ and $s$ in $V$, then join $v_r$ and $v_s$ by an edge in the dual. The dual $V^*$ of a Venn diagram is a planar embedding of a graph whose vertices are the subsets of $[n] = \{1, 2, \ldots, n\}$.

To construct a Venn diagram, then, one could start with a graph whose vertices are the subsets of $[n]$. The $n$-cube $Q_n$ is the graph whose vertices are the $n$-bit strings with edges joining strings that differ only in one bit. Since a subset $S \subseteq [n]$ can be viewed as an $n$-bit string whose $i$th bit is ‘1’ if and only if $i \in S$, the vertices of $Q_n$ are in one-to-one correspondence with the regions in a Venn diagram. But $Q_n$ is not planar for $n \geq 4$, so we cannot produce a Venn diagram simply by taking the dual of $Q_n$.

There is a theorem in graph theory that says: *In a planar graph $G$, if $S$ is a bond, that is, a minimal set of edges whose removal disconnects $G$, then the edges in the dual $G^*$, corresponding to those in $S$, form a cycle in $G^*$*. For a proof, see West [16, Theorem 6.1.14]. This is exactly what is needed. If $G^*$ is to be a Venn diagram, then for each $1 \leq i \leq n$, the graph $G^*$ must have a corresponding cycle $C_i$.
to separate the sets containing $i$ from those that do not. The dual of $C_i$ back in $G$ will be the set of edges joining vertices representing sets that do contain $i$ to those that do not, and this must be a bond of $G$.

A spanning subgraph of $Q_n$ is called monotone if every $n$-bit string with $k$ ones is adjacent to a string with $k-1$ ones (if $k > 0$) and to a string with $k+1$ ones (if $k < n$). In a monotone subgraph of $Q_n$, for each $1 \leq i \leq n$, the edges joining vertices with $i$th bit ‘1’ to those with $i$th bit ‘0’ form a bond. Thus the following condition on a spanning subgraph $G$ of $Q_n$ will guarantee that the dual of $G$ is a Venn diagram: $G$ is planar and monotone. It is worth noting that this condition is not necessary; there are Venn diagrams for which $G$ is not monotone.

In the next section, we show how to build a planar, monotone, spanning subgraph of $Q_n$ using a symmetric chain decomposition in the Boolean lattice.

**The Combinatorics**

Return to the Boolean lattice $B_n$ whose elements are the subsets of $[n]$, ordered by inclusion. The Hasse diagram of $B_n$, regarded as a graph, is isomorphic to $Q_n$. A chain in $B_n$ is a sequence $S_1 \subseteq S_2 \subseteq \cdots \subseteq S_t$ of elements of $B_n$ such that $|S_i| = |S_{i-1}| + 1$. The chain is symmetric if $|S_i| + |S_t - S_i| = n$. A symmetric chain decomposition of $B_n$ is a partition of the elements of $B_n$ into symmetric chains.

A significant result in order theory is that $B_n$ has a symmetric chain decomposition for every $n \geq 0$. One construction, due to Greene and Kleitman [4], works as follows. Regard the elements of $B_n$ as $n$-bit strings. View ‘1’ bits as right parentheses and ‘0’ bits as left parentheses and in each string, match parentheses in the usual way. This process may leave some ‘1’ or ‘0’ bits unmatched. From every string $x$ with no unmatched ‘1’ grow a chain as follows. Change the first unmatched ‘0’ in $x$ to ‘1’ to get its successor, $y$. Change the first unmatched ‘0’ in $y$ (if any) to ‘1’ to get its successor. Continue until a string with no unmatched ‘0’ is reached. The chains shown in Figure 3(a), built using this rule, give a symmetric chain decomposition of $B_4$. These chains form a planar spanning subgraph of $Q_4$. But to make the subgraph monotone, we need to add edges (without destroying planarity) to “cover” the first and last elements of each chain.
The chain starting at \( x \) can be covered by the chain starting at \( y \) where \( y \) is obtained from \( x \) by changing the last ‘1’ in \( x \) to ‘0’. Not only do \( x \) and \( y \) differ in one bit, but so do the last elements of these chains. Viewing \( y \)’s chain as the parent of \( x \)’s chain, it can be shown that a preorder layout of the tree of chains gives a planar embedding of the chains together with their cover edges. A planar embedding of the subgraph of \( Q_4 \) consisting of the chains and the cover edges is shown in Figure 3(b).

The dual graph is shown in Figure 4(a). Say that an edge in the graph of Figure 3(b) has type \( i \) if it joins vertices that differ in position \( i \). In Figure 4(a), a dual edge is colored according to the type of edge it crosses. Figure 4(b) shows the resulting Venn diagram.

This method gives yet another constructive proof that for every \( n \geq 0 \), Venn diagrams exist for \( n \) sets. (A similar construction is implicit in [2], although they make no mention of symmetric chains.) So what about rotational symmetry? As described earlier, this is not possible if \( n \) is composite. But when \( n \) is prime, we can extract ideas from the construction described here to achieve symmetry, as shown in the next section.

**Rotational Symmetry When \( n \) is Prime**

When \( n \) is prime, the idea for constructing a rotationally symmetric Venn diagram is to somehow work within “1/\( n \)”-th” of \( B_n \) or \( Q_n \) to get “1/\( n \)”-th” of the Venn diagram embedded in a “1/\( n \)”-th” pie-slice of the plane and then rotate the result by \( 2\pi i/n \) for \( 1 \leq i < n \) to complete the diagram. Fortunately, when \( n \) is prime, \( B_n \) comes with a natural partition into symmetric classes.

For \( x = x_1x_2 \cdots x_n \), let \( \sigma \) denote the left rotation of \( x \) defined by \( \sigma(x) = x_2x_3 \cdots x_1x_n \). Let \( \sigma^1 = \sigma \), and \( \sigma^i(x) = \sigma(\sigma^{i-1}(x)) \), where \( i > 1 \). Define the relation \( \Delta \) on the elements of \( B_n \) by \( x \Delta y \) if and only if \( y = \sigma^i(x) \) for some \( i \geq 0 \). Then \( \Delta \) is an equivalence relation that partitions the elements of \( B_n \) into equivalence classes called *necklaces*. When \( n \) is prime, every \( n \)-bit string, other than 0\(^n\) and 1\(^n\), has \( n \) distinct rotations, so its necklace has exactly \( n \) elements.

In the hope of adapting the method of the previous section, we ask: **When \( n \) is prime, is there a way to choose a set \( R_n \) of necklace representatives, one from each necklace, so that the subposet of \( B_n \) induced by \( R_n \) has a symmetric chain decomposition?** Fortunately, the answer is yes (see next section), so construction of a rotationally symmetric Venn diagram can proceed as follows.

Start with the strategically chosen set \( R_n \) of necklace representatives. Let \( Q_n[R_n] \) be the subgraph of \( Q_n \) induced by \( R_n \). The symmetric chain decomposition in \( B_n[R_n] \), together with appropriate cover edges, gives a planar, spanning, monotone subgraph \( P \) of \( Q_n[R_n] \). Embed \( P \) in a 1/\( n \)-th pie slice of the plane with 1\(^n\) at the center and 0\(^n\) at the point at infinity. Note that, as graphs, \( Q_n[R_n] \) and \( Q_n[\sigma^i(R_n)] \) are isomorphic for any bitwise rotation \( \sigma^i \) of the vertices. So \( Q_n[\sigma^i(R_n)] \) has a subgraph \( P_i \) isomorphic to \( P \). Then rotating the embedding of \( P \) by \( 2\pi i/n \) about the origin gives a planar embedding of \( P_i \). Taken together, the embeddings of the \( P_i \) give a rotationally symmetric planar embedding of a spanning monotone subgraph of \( Q_n \) and therefore the dual is a Venn diagram. Finally, the dual is drawn in a symmetric way. The entire process is illustrated for \( n = 5 \) in the sequence of Figures 5(a), (b), (c), (d). The chains in \( Q_5[R_n] \) are 10000-11000-11100-11110 and 10100-10110 (see the lowest “hexagon” in Fig. 5(a)).

**Choosing Necklace Representatives**

Here is a way to choose a set \( R_n \) of necklace representatives, one from each necklace, so that the subposet of \( B_n \) induced by \( R_n \) has a symmetric chain decomposition.

Define the *block code* \( \beta(x) \) of a binary string \( x \) as follows. If \( x \) starts with ‘0’ or ends with ‘1’, then \( \beta(x) = (\infty) \). Otherwise, \( x \) can be written in the form:

\[
\beta(x) = (a_1 + b_1, a_2 + b_2, \ldots, a_t + b_t)
\]

for some \( t > 0 \), where \( a_i > 0, b_i > 0, 1 \leq i \leq t \), in which case,

\[
\beta(x) = (a_1 + b_1, a_2 + b_2, \ldots, a_t + b_t)
\]

As an example, the block codes of the string 1110101100010 and all of its rotations are shown below.

<table>
<thead>
<tr>
<th>bit string</th>
<th>block code</th>
<th>bit string</th>
<th>block code</th>
</tr>
</thead>
<tbody>
<tr>
<td>11101011100010</td>
<td>(4, 2, 5, 2)</td>
<td>11001001101010</td>
<td>(∞)</td>
</tr>
<tr>
<td>01110101100011</td>
<td>(∞)</td>
<td>10110001011101</td>
<td>(2, 5, 2, 4)</td>
</tr>
<tr>
<td>01011101101000</td>
<td>(∞)</td>
<td>01011000101111</td>
<td>(∞)</td>
</tr>
<tr>
<td>00101101101010</td>
<td>(∞)</td>
<td>01011000101101</td>
<td>(∞)</td>
</tr>
<tr>
<td>00010110110110</td>
<td>(∞)</td>
<td>01011000101100</td>
<td>(∞)</td>
</tr>
<tr>
<td>10001011101010</td>
<td>(∞)</td>
<td>10101100010101</td>
<td>(∞)</td>
</tr>
</tbody>
</table>

When \( n \) is prime, no two different rotations of an \( n \)-bit string can have the same *finite* block code. Assuming that block codes are ordered lexicographically, in each necklace of \( n \)-bit strings (except 0\(^n\), 1\(^n\)) the unique string with minimum block code can be chosen as the representative.

For \( n \) prime, let \( R_n \) be the set of \( n \)-bit strings that are the minimum-block-code representatives of their necklaces. Build chains using the Greene-Kleitman rule, except chains start with a string with exactly one unmatched ‘1’ and end at a string with exactly one unmatched ‘0’. Note that a node \( x \) and its successor \( y \) have the same block code, so if \( x \) has the minimum block code among all of its rotations, then so does \( y \). Thus every element of \( x \)’s chain is the (minimum-block-code) representative of its necklace.
Simpler Venn Diagrams and Euler’s Formula

Recall that a Venn diagram is simple if at most two curves intersect at any given point. This means that, viewed as a graph, every vertex of a simple Venn diagram has degree 4. The number of faces is $2^n$, since every subset of $[n]$ corresponds to a region, and the number of edges is half the sum of the vertex degrees, so by $V - E + F = 2$, a simple Venn diagram has $2^n - 2$ vertices. In contrast, the number of vertices in the Venn diagrams we have constructed via symmetric chain decompositions is the number of elements in the middle levels of $B_n$: $\binom{n}{\lfloor n/2 \rfloor}$, which is roughly $2^n/\sqrt{n}$. This means that the average number of curves intersecting at any given point is about $c\sqrt{n}$ for some constant $c$. But a hidden feature of the Greene–Kleitman symmetric chain decomposition will allow a dramatic improvement.

Since the number of faces of a Venn diagram is fixed and since $V - E + F = 2$, once $E > V$, more vertices in the diagram mean the average degree is smaller and thus, on average, fewer curves intersect at any point. If the Venn diagram is the dual of a planar spanning monotone subgraph $G$ of $Q_n$.
that has been embedded in the plane, we can increase the number of vertices of the Venn diagram by increasing the number of faces of \( G \). One way to do this is to add edges of \( Q_n \) to \( G \), without destroying the planarity of \( G \). The added edges join vertices which differ in one bit. For example, Figure 6 shows the addition of ten simplifying edges to the 5-Venn dual of Figure 5 and the effect that adding the five cyan ones has on the resulting 5-Venn diagram. Note that the number of vertices increases from 10 to 15.

The Greene–Kleitman symmetric chain decomposition provides a systematic way to do this: Any face bounded by two chains and two (suitably chosen) cover edges can always be “quadrangulated” by edges joining vertices that differ in one bit. This is illustrated in Figures 7 and 8. Furthermore, it can be shown that as \( n \to \infty \), the number of vertices in the resulting Venn diagram is at least \( (2^n - 2)/2 \), so the average number of curves intersecting at any given point is at most 3. Since \( (2^n - 2)/2 \) is half the number of vertices in a simple Venn diagram, the diagrams of [13] were dubbed “half-simple”. (Experiments suggest that as \( n \to \infty \), the construction is doing better than 50%, perhaps closer to 60%.)

The construction is certainly not optimal. Figure 9 shows that further simplifying edges of \( Q_n \), beyond those specified by the construction, can be added. To date the simplest symmetric 11-Venn diagram is due to Hamburger, Petruska, and Sali [9]; their diagram has 1837 vertices and is about 90% simple.

Figure 9 was the starting point for the half-simple Venn diagram shown on the cover. Figure 10(a) shows the result of embedding the graph of Figure 9 in a “1/11th” pie slice of the plane and then rotating it by \( 2\pi i/11 \) for \( 1 \leq i < 11 \) to get a monotone, planar, symmetric, spanning subgraph of \( Q_{11} \). Its dual, drawn by Wagon’s Mathematica program and shown in Figure 10(b), is a half-simple, symmetric 11-Venn diagram. The program regards (a) as a planar map, so the regions have been 4-colored to highlight this interpretation.

Figure 11(a) shows one curve of the 11-Venn diagram. Each of the 11 curves is a rotation of this one. Figure 11(b) shows the Venn diagram with regions colored by rank and with one curve highlighted.

Acknowledgements: We are grateful to Mark Weston and Nikolay Dinev for helpful discussions and to Mark for creating Figure 2(c). Thanks also to the referees for helpful comments. Support from the National Sciences and Engineering Research Council of Canada and the National Science Foundation is acknowledged and appreciated.

References
Figure 7: Symmetric chain decomposition (a), with cover edges (b), and quadrangulated faces (c), in $Q_7[R_7]$.

Figure 8: Symmetric chain decomposition with cover edges and quadrangulated faces in $Q_{11}[R_{11}]$ from the construction of [13].

Figure 9: After manually adding extra edges, including wrapping edges, to the graph of Figure 8.

Figure 10: (a) The plane graph, derived from Figure 9, whose dual is a half-simple 11-Venn diagram (with regions 4-colored). (b) All 11 curves of the half-simple 11-Venn diagram created by taking the dual of the graph in (a).

Figure 11: (a) One curve of the half-simple 11-Venn diagram. (b) The half-simple 11-Venn diagram, with regions colored according to rank, and one curve highlighted.


About the Cover

Symmetric Venn diagrams

The cover image shows a symmetric Venn diagram on 11 sets, but only half of the regions are shown. That is, the full diagram has 2048 regions, with 1024 lying inside each of the curves that represent sets. Here one such curve is shown in black (the boundary of the colored region), with the regions inside it colored according to their rank. The other curves can be obtained by rotating the one shown. The gray background shows the dual of the full Venn diagram, with its regions colored in four shades of gray.

These images were generated by computer, with some manual intervention. The main tool is a Mathematica package written by Stan Wagon that allows the manipulation and four-coloring of planar maps and graphs (contact him for a copy). The package has code to form the dual map of a planar map (by finding a capital of each country and using a triangulation of the country to get disjoint piecewise-linear edges to the middle of each boundary edge).

Inspired by the display of hand-drawn 11-Venn art by Peter Hamburger and Edit Hepp at the Banff Bridges Conference in 2005 [1], Wagon used his package to produce the set of all polygons in the Venn dual and Venn diagram. The package had the necessary tools, but the devil was in the details. First the data for the Venn dual (Figure 9) had to be entered, symmetry being used at every step to minimize manual labor. To then get a pleasing Venn diagram, attention had to be paid to vertex placement within each region of the Venn dual. Most regions of the dual are quadrilaterals that are convex or nearly so, and those cases can be handled by just choosing the centroid; the remaining cases were handled manually. And the edges connecting these vertices were also chosen for simplicity, always trying for piecewise linearity with as few pieces as possible.

In the full diagram it is hard to see the smaller regions. Here is a magnification of a small portion.

It was shown in [12] that a practical algorithm for 4-coloring planar maps could be devised based on ideas of Kempe and Kittell, “practical” meaning that it could handle all examples without difficulty, even though it has not been proven to always work. In particular, this method can quickly 4-color the infamous hoax map that Martin Gardner published in the April 1, 1975, edition of Scientific American. The Venn dual is a map so the regions have to be colored somehow, and using a 4-coloring is a natural way to do it. While the Venn dual shown on the cover cannot be 3-colored, maps derived from “Siamese trees”, such as those shown in figures 3(b) and 7(b), are always 3-colorable (Hutchinson [11]). The first examples of the use of Siamese trees in the construction of Venn diagrams may be found in [14]. The Venn diagram itself is a 2-colorable map by parity of rank, but it is more natural to use 12 colors, one for each rank.

Frank Ruskey, Carla D. Savage, Stan Wagon
AND YOU THOUGHT IT WAS ABOUT HOMEWORK.

THE TOOLS OF ENGAGEMENT FOR MATH AND SCIENCE—As the #1 homework and grading service for math and science, we’d like to make one thing clear. It’s not about homework. It’s about student engagement. And no one does it better than WebAssign. We help you keep every student engaged with frequent, customized assignments. And our automated grading gives you more time to do what you do best. Teach. So if you thought WebAssign was just an option, think about this. What more could you do for your students than to engage them in learning? WebAssign. The way you imagined teaching could be.

WebAssign
The way you imagined teaching could be™

800.955.8275  webassign.net
Better Ways to Cut a Cake

Steven J. Brams, Michael A. Jones, and Christian Klamler

In this paper we show how mathematics can illuminate the study of cake-cutting in ways that have practical implications. Specifically, we analyze cake-cutting algorithms that use a minimal number of cuts ($n - 1$ if there are $n$ people), where a cake is a metaphor for a heterogeneous, divisible good, whose parts may be valued differently by different people.

These algorithms not only establish the existence of fair divisions—defined by the properties described below—but also specify a procedure for carrying them out. In addition, we give us insight into the difficulties underlying the simultaneous satisfaction of certain properties of fair division, including strategy-proofness, or the incentive for a person to be truthful about his or her valuation of a cake.

As is usual in the cake-cutting literature, we postulate that the goal of each person is to maximize the value of the minimum-size piece (maximin piece) that he or she can guarantee, regardless of what the other persons do. Thus, we assume that each person is risk-averse: He or she will never choose a strategy that may yield a more valuable piece of cake if it entails the possibility of getting less than a maximin piece.

First we analyze the well-known 2-person, 1-cut cake-cutting procedure, “I cut, you choose,” or cut-and-choose. It goes back at least to the Hebrew Bible (Brams and Taylor, 1999, p. 53) and satisfies two desirable properties:

1. **Envy-freeness**: Each person thinks that he or she receives at least a tied-for-largest piece and so does not envy the other person.

(2) **Efficiency (Pareto-optimality)**: There is no other allocation that is better for one person and at least as good for the other person.

But cut-and-choose does not satisfy a third desirable property:

3. **Equitability**: Each person’s subjective valuation of the piece that he or she receives is the same as the other person’s subjective valuation.

To bypass this problem, we propose next a new 2-person cake-cutting procedure that, while it does not satisfy equitability in an absolute sense, does satisfy it in a relative sense, which we call **proportional equitability**. After ensuring that each person receives exactly 50% of the cake, it gives each person the same proportion of the cake that remains, called the **surplus**, as he or she values it.

Thereby this procedure, which we call the surplus procedure (SP), gives each person at least 50% of the entire cake and generally more. By contrast, cut-and-choose limits the cutter to exactly 50% if he or she is ignorant of the chooser’s preferences.

Remarkably, maximin strategies under SP require that each person be truthful about his or her preferences for different parts of the cake, rendering SP **strategy-proof**. This is because if a person is not truthful, he or she cannot guarantee at least a 50% share or, even if he or she does, may decrease the proportion of the surplus that a truthful strategy guarantees. By comparison, giving each person the same absolute amount of the surplus is **strategy-vulnerable**, because each person will have an incentive to lie about his or her preferences.

We give a 3-person example that proves that if there are $n \geq 3$ persons, envy-freeness and equitability may be incompatible. We then describe a new $n$-person equitable procedure (EP) that gives all persons the maximal equal value that they all can achieve. Like SP, it is strategy-proof.

Lastly, we discuss trade-offs in cake division. Whereas SP does not limit one person to exactly 50% of the cake, as does cut-and-choose, it is more
information-demanding, requiring that both persons report their value functions over the entire cake, not just indicate their 50-50 points.

While EP is equally information-demanding in the n-person case, it may create envy, which SP never does. We conclude by briefly discussing the applicability of both SP and EP to real-world problems and cite related literature on pie-cutting, in which radial cuts are made from the center of a disk, and on fair-division procedures applicable to multiple divisible and indivisible goods.

Cut-and-Choose

Assume that two players A and B value a cake along a line that ranges from $x = 0$ to $x = 1$. More specifically, we postulate that the players have continuous value functions, $v_A(x)$ and $v_B(x)$, where $v_A(x) \geq 0$ and $v_B(x) \geq 0$ for all $x$ over $[0, 1]$, and their measures are finitely additive, nonatomic probability measures. Finite additivity ensures that the value of a finite number of disjoint pieces is equal to the value of their union. It follows that no subpieces have greater value than the larger piece that contains them. Nonatomic measures imply that a single cut, which defines the border of a piece, has no area and so contains no value. In addition, we assume that the measures of the players are absolutely continuous, so no portion of cake is of positive measure for one player and zero measure for another player.

Like probability density functions (pdfs), the total valuations of the players—the areas under $v_A(x)$ and $v_B(x)$—are 1. We assume that only parallel, vertical cuts, perpendicular to the horizontal x-axis, are made, which we will illustrate later.

Under cut-and-choose, one player cuts the cake into two portions, and the other player chooses one. To illustrate, assume a cake is vanilla over $[0, 1/2]$ and chocolate over $(1/2, 1]$. Suppose that the cutter, player A, values the left half (vanilla) twice as much as the right half (chocolate). This implies that $v_A(x) = 4/3$ on $[0, 1/2]$, and $v_A(x) = 2/3$ on $(1/2, 1]$.

To guarantee envy-freeness when the players have no information or beliefs about each other’s preferences, A should cut the cake at some point $x$ so that the value of the portion to the left of $x$ is equal to the value of the portion to the right. The two portions will be equal when A’s valuation of the cake between 0 and $x$ is equal to the sum of its valuations between $x$ and 1/2 and between 1/2 and 1:

$$(4/3)(x-0) = (4/3)(1/2-x) + (2/3)(1 - 1/2),$$

$$(4/3)x = 2/3 + (1/2-x)(4/3),$$

which yields $x = 3/8$. In general, the only way that A, as the cutter, can ensure itself of getting half the cake is to give B the choice between two portions that A values at exactly 1/2 each.

To show that cut-and-choose does not satisfy equitability, assume B values vanilla and chocolate equally. Thus, when A cuts the cake at $x = 3/8$, B will prefer the right portion, which it values at 5/8, and consequently will choose it. Leaving the left portion to A, B does better in its eyes (5/8) than A does in its eyes (1/2), rendering cut-and-choose inequitable.

If the roles of A and B as cutter and chooser are reversed, the division remains inequitable. In this case, B will cut the cake at $x = 1/2$. A, by choosing the left half (all vanilla), will get 2/3 of its valuation, whereas B, getting the right half, will receive only 1/2 of its valuation. Because cut-and-choose selects the endpoints of the interval of envy-free cuts (3/8 for A, 1/2 for B), any cut strictly between 3/8 and 1/2 will be envy-free.

The Surplus Procedure (SP)

The rules of SP ensure that both A and B will obtain at least 50% of the cake, as they value it, and generally give each player more:

1. Independently, A and B report their value functions, $f_A(x)$ and $f_B(x)$, over $[0, 1]$ to a referee. These functions may be different from the players’ true value functions, $v_A(x)$ and $v_B(x)$.

2. The referee determines the 50-50 points $a$ and $b$ of A and B—that is, the points on $[0, 1]$ such that each player reports that half the cake, as it values it, lies to the left and half to the right (these points are analogous to the median points of pdfs).

3. If $a$ and $b$ coincide, the cake is cut at $a = b$. One player is randomly assigned the piece to the left of this cutpoint and the other player the piece to the right. The procedure ends.

4. Assume that $a$ is to the left of $b$, as illustrated below:

| 0 | a | b | 1 |

---

When the cutter does have information or beliefs about the chooser’s preferences, he or she may do better with a less conservative strategy (Brams and Taylor, 1996, 1999).

---

We could assume that the referee asks the players first to indicate their 50-50 points and then to submit their pdfs for the half of the cake that includes the 50-50 point of the other player, which the referee would identify. This procedure would be somewhat less information-demanding than asking the players to submit their pdfs for the entire cake, but it would require the extra step of the referee’s informing the players, after they have indicated their 50-50 points, of which half, as each player defines it, it needs to provide information about its value function.
Then $A$ receives the portion $[0, a]$, and $B$ the portion $[b, 1]$, which each player values at $1/2$ according to its reported value function.

(5) Let $c$ (for cutpoint) be the point in $[a, b]$ at which the players receive the same proportion $p$ of the cake in this interval, as each values it:

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Then $A$ receives the portion $[a, c]$, and $B$ the portion $(c, b]$, so the players' combined portions are piece $[0, c]$ for $A$ and piece $(c, 1]$ for $B$.

To determine $c$, we set the proportion $p$ that $A$ receives from subinterval $[a, c]$ equal to the proportion that $B$ receives from subinterval $(c, b]$ according to the measure each has submitted:

$$p = \frac{\int_a^c f_A(x)dx}{\int_a^b f_A(x)dx} = \frac{\int_c^b f_B(x)dx}{\int_a^b f_B(x)dx}. \tag{1}$$

In our earlier example, in which $a = 3/8$ and $b = 1/2$ and the pdfs are as given in the previous section,

$$p = \frac{\int_{3/8}^c (4/3)dx}{\int_{3/8}^{1/2} (4/3)dx} = \frac{\int_c^{1/2} dx}{\int_{3/8}^{1/2} dx} = \frac{(1/2 - c)}{(1/2 - 3/8)},$$

which yields $c = 7/16$, the midpoint of the interval $[3/8, 1/2]$ between the players' 50-50 points.

Whenever the players have uniform densities over the interval between their 50-50 points (as they do in our example), they will receive the same proportions of the interval at all points in it equidistant from $a$ and $b$. In particular, at $c = 7/16$,

$$p = \frac{(1/2 - 7/16)}{(1/2 - 3/8)} = \frac{1}{2},$$

so each player obtains $1/2$ the value it places on the entire interval, $[a, b]$.

Note that giving $A$ and $B$ the same proportion of the interval does not ensure equitability, because $A$ and $B$ value the interval differently. $A$ values it at $(1/8)(4/3) = 1/6$ (and obtains $1/12$ from $[a, c]$), and $B$ values it at $(1/8)(1) = 1/8$ (and obtains $1/16$ from $(c, b]$).

To ensure that $A$ and $B$ obtain exactly the same value from the interval rather than the same proportion of value, we set the numerators of equation (1). Substituting $e$ (for equitable point) for $c$ in the limits of integration in our example, we have

$$\int_{3/8}^e (4/3)dx = \int_e^{1/2} dx \quad (4/3)e - 3/8 = (1/2 - e),$$

which yields $e = 3/7$. At this cutpoint, $A$ and $B$ each obtain $1/14$ from the interval.

There are conflicting arguments for cutting the cake at $c$ (proportional equitability) and at $e$ (equitability). An argument for cutting it at $c$ is that the player that values the interval more ($A$ in our example) should derive more value from it. The opposite argument reflects the egalitarian view that the players, in addition to the 50% portions they receive outside the interval, should get exactly the same value from the interval.

We will not try to resolve these conflicting claims for proportional equitability versus (absolute) equitability. Instead, we introduce a new property that only proportional equitability satisfies.

Define a procedure to be *strategy-vulnerable* if a maximin player can, by misrepresenting its value function, assuredly do better, whatever the value function of the other player (or, as we will discuss later, other players). A procedure that is not strategy-vulnerable is *strategy-proof*, giving maximin players always an incentive to let $f_A(x) = v_A(x)$ and $f_B(x) = v_B(x)$.

**Theorem 1.** $SP$ is strategy-proof, whereas any procedure that makes $e$ the cut-point is strategy-vulnerable.

**Proof.** To show that maximin players will be truthful when they submit their value functions to a referee, we show that $A$ or $B$ may do worse if they are not truthful in reporting:

(1) their 50-50 points, $a$ and $b$, based on their value functions.

Assume $B$ is truthful and $A$ is not. If $A$ misrepresents $a$ and causes it to crisscross $b$, as illustrated by the location of $a'$ below,

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

then $A$ will obtain $[a', 1]$ and, in addition, get some less-than-complete portion of $(b, a')$. But this is less than 50% of the cake for $A$ and therefore less than what $A$ would obtain under SP if it was truthful.

(2) their value functions over $[a, b]$.

Assume again that $B$ is truthful. Assume $A$ considers misrepresenting its value function in a way that moves $c$ rightward, as shown below:

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

It can do this by (i) decreasing the value of $\int_a^c f_A(x)dx$, the numerator on the left side of equation (1), or (ii) increasing the value of the denominator, $\int_a^b f_A(x)dx$. But in order for $A$ to misrepresent in this
manner, it would have to know \( f_b(x) \) and therefore \( b \), which \( c \) depends on. But \( A \) does not know \( f_b(x) \) and \( b \) and, consequently, cannot determine \( c \). Hence, it cannot assuredly reduce its value of the interval \([a, c]\) relative to \([a, b]\) in order to make this proportion less than its true proportion and so move \( c \) rightward. Indeed, \( A \)'s attempted misrepresentation could backfire by moving \( c \) leftward rather than rightward, which would give \( A \) a smaller proportion of \([a, b]\).

To be sure, if \( A \) knew the location of \( b \), it could concentrate its value just to the left of \( b \), which would move \( c \) rightward. But we assumed that \( A \) is ignorant of the location of \( b \) and even which side of \( a \) (left or right) it is on. Hence, \( A \) cannot misrepresent its value function and assuredly do better, which makes SP strategy-proof.

On the other hand, assume the cake is cut at \( e \), so its division is equitable rather than proportionally equitable (at \( c \)). When the players are truthful so \( f_A(x) = v_A(x) \) and \( f_B(x) = v_B(x) \), one player will receive \([0, e]\) and the other player will receive \((e, 1]\), which they will value equally and at least as much as \( 1/2 \); point \( e \) will be unique when the players’ measures are absolutely continuous with respect to Lebesgue measure (Jones, 2002).

We next show that \( A \) can submit a value function different from \( v_A(x) \) that moves \( e \) to a position favorable to it regardless of (i) player \( B \)'s value function and (ii) whether or not player \( A \) receives the left or the right piece of the cake. Because \( A \) is unaware of whether \( e \) is to the left or to the right of its 50-50 point \( a \), \( A \) should submit a value function that has the same 50-50 point as \( v_A(x) \), as discussed in (1) above.

But to increase the value of its piece beyond 50%, \( A \) should submit a value function \( f_A(x) \) that decreases the value of \( \int_a^e f_A(x)dx \) if \( a \) is to the left of \( b \), and decreases the value of \( \int_b^1 f_A(x)dx \) if \( a \) is to the right of \( b \). The former strategy will move \( e \) rightward, whereas the latter strategy will move \( e \) leftward of its true value.

Clearly, \( A \) can induce both movements of \( e \) by decreasing the value of \( \int_a^b f_A(x)dx \). But because \( A \) does not know either the value of \( b \) or even whether it is to the left or to the right of \( a \), \( A \) can best minimize its value over \([a, b]\) by concentrating almost \( 1/2 \) its value near 0 and almost \( 1/2 \) near 1—the endpoints of the cake—while ensuring that

\[
\int_a^a f_A(x)dx = \int_a^1 f_A(x)dx = 1/2
\]

so that its 50-50 point is truthful. Thereby \( A \) decreases its value around its 50-50 point, which will move \( e \) toward \( B \)'s 50-50 point—whichever side of \( a \) that \( b \) is on—and so help \( A \). (Optimally, \( A \) should let the value strictly between its 50-50 point and the edges of the cake, where its value is concentrated, approach 0 in the limit.) Thereby any procedure that makes \( e \) the cut-point is strategy-vulnerable.

Because both \( A \) and \( B \) receive at least 50% of their valuations under SP, the resulting division is not only proportionally equitable but also envy-free. If there are more than two players, however, an envy-free allocation may be neither equitable nor proportionally equitable.

**Three or More Players: Equitability and Envy-Freeness May Be Incompatible**

To show that it is not always possible to divide a cake among three players into envy-free and equitable portions using 2 cuts, assume that \( A \) and \( B \) have (truthful) piecewise linear value functions that are symmetric and V-shaped,

\[
egin{align*}
    v_A(x) &= \begin{cases} 
        -4x + 2 & \text{for } x \in [0, 1/2] \\
        4x - 2 & \text{for } x \in (1/2, 1] 
    \end{cases} \\
    v_B(x) &= \begin{cases} 
        -2x + 3/2 & \text{for } x \in [0, 1/2] \\
        2x - 1/2 & \text{for } x \in (1/2, 1].
    \end{cases}
\end{align*}
\]

Whereas both functions have maxima at \( x = 0 \) and \( x = 1 \) and a minimum at \( x = 1/2 \), \( A \)'s function is steeper (higher maximum, lower minimum) than \( B \)'s, as illustrated in Figure 1. In addition, suppose that a third player, \( C \), has a uniform value function, \( v_C(x) = 1 \), for \( x \in [0, 1] \).

![Figure 1. Impossibility of envy-free and equitable cuts for three players.](image)

In this example, every envy-free allocation of the cake will be one in which \( A \) gets the portion to the left of \( x \), \( B \) the portion to the right of \( 1 - x \) (\( A \) and \( B \) could be interchanged), and \( C \) the portion in the middle. If the horizontal lengths of \( A \)'s and \( B \)'s portions are not the same (i.e., \( x \)), the player whose portion is shorter in length will envy the player whose portion is longer. But an envy-free allocation
in which the lengths are the same will not be equitable, because $A$ will receive a larger portion in its eyes than $B$ receives in its eyes, violating equitability. Thus, an envy-free allocation is not equitable in this example, nor an equitable allocation envy-free, though both these allocations will be efficient with respect to parallel, vertical cuts.\footnote{Not all equitable divisions need be efficient. If $C$ were given an end piece and $A$ or $B$ the middle piece in the example, cutpoints could be found such that all the players receive, in their own eyes, the same value. However, this value would be less than what another equitable allocation, in which $C$ gets the middle piece and $A$ and $B$ the end pieces, yields. By contrast, an envy-free allocation that uses $n - 1$ parallel, vertical cuts is always efficient (Gale, 1993; Brams and Taylor, 1996, pp. 150-51). Generally speaking, it will not be unique, whereas an efficient, equitable allocation usually will be.}

Two envy-free procedures have been found for 3-person, 2-cut cake division. Whereas one of the envy-free procedures requires four simultaneously moving knives (Stromquist, 1980), the other requires only two simultaneously moving knives (Barbanel and Brams, 2004). Although there are no known 4-person, 3-cut procedures for dividing a cake into envy-free pieces, Barbanel and Brams show that no more than 5 cuts are needed to ensure 4-person envy-freeeness. Brams, Taylor, and Zwicker (1997) previously showed that a maximum of 11 cuts is needed, based on an arguably simpler 4-person, envy-free procedure (for chores, a maximum of 16 cuts may be needed; see Peterson and Su, 2002).

Beyond 4 players, no procedure is known that yields an envy-free division of a cake unless an unbounded number of cuts is allowed (Brams and Taylor, 1995, 1996; Robertson and Webb, 1998).

While this number can be shown to be finite, it cannot be specified in advance—this will depend on the specific cake being divided. The complexity of what Brams and Taylor call the "trimming procedure" makes it of dubious practical value.

We next show that it is always possible to find an equitable division of a cake among three or more players that is efficient (see footnote 3). In fact, the equitability procedure (EP) enables $n \geq 3$ players to achieve an equitable and efficient division of a cake that is also strategy-proof.

The Equitability Procedure (EP)

The rules of EP are as follows:

1. Independently, $A, B, C, \ldots$ report their value functions $f_A(x), f_B(x), f_C(x), \ldots$ over $[0, 1]$ to a referee. These functions may be different from the players' true value functions, $v_A(x), v_B(x), v_C(x), \ldots$.

2. The referee determines the cutpoints that equalize the common value that all players receive for each of the $n!$ possible assignments of pieces to the players from left to right.

3. The referee chooses the assignment that gives the players their maximum common value.

We next illustrate EP using the 3-person example in the previous section. It is evident that the ordering of players that will maximize the common value to the players is to give the left piece to $A$ (or $B$), the middle piece to $C$, and the right piece to $B$ (or $A$).

Let the cutpoints be $e_1$ and $e_2$. Assume $A$ receives the piece defined by the interval $[0, e_1]$, $C$ the piece defined by the interval $(e_1, e_2]$, and $B$ the piece defined by the interval $(e_2, 1]$. The players’ values will be equal when

$$\int_0^{e_1} (-4x + 2) dx = \int_{e_1}^{e_2} dx$$

$$\int_{e_1}^{e_2} dx = \int_1^1 (2x - 1/2) dx.$$  

After integration and evaluation, we have

$$-2e_1^2 + 2e_1 = e_2 - e_1$$

$$e_2 - e_1 = 1/2 - e_1^2 + e_2/2.$$  

When solved simultaneously, these equations give $e_1 \approx 0.269$ and $e_2 \approx 0.662$. Players $A, C, \text{ and } B$ (from left to right, in that order) all value their pieces at 0.393, so each thinks it receives nearly 40% of the cake.

For $n$ players, there will be $n - 1$ cutpoints $e_i$. For each assignment of pieces to the players from left to right, solving simultaneously the $n - 1$ equations that equalize the value functions of adjacent players will give the $e_i$’s.

Choosing the assignment that gives the players a maximum common value yields a division that is efficient. This is because one player cannot get more value without another player’s getting less, which would, of course, destroy equitability.

Theorem 2. EP is strategy-proof.

Proof. Assume that some player $X$ is not truthful under EP but that all other players are truthful. For $X$ to increase its allocation, it would have to know its borders in order to misrepresent its true value function and guarantee itself more. But because $X$ is ignorant of the reported value functions of the other players, it will not be able to determine these borders, nor even where its piece lies in the left-right assignment of pieces to players if it did know these borders. Hence, $X$ cannot ensure itself of a more valuable piece if it does not know the value functions of the other players.

Assume that $X$, by misrepresenting its own value function, increases the value of its piece, as we showed was possible in the 2-person case of equitable division even with no information about the value functions of the other player. But then
X will have no assurance that it will receive this more valuable piece, because its misrepresentation may change the left-right assignment of pieces to players. This was not possible in the 2-person case as long as X was truthful about its 50-50 point: By undervaluing the cake around its 50-50 point, X could increase its portion of the surplus while still retaining its 50% portion on the left or right side.

However, when there are additional players and there is no identifiable surplus to be divided among them—as in the 2-person case between A and B—X has no assurance that it will retain the piece that its misrepresentation might increase in size. Indeed, X may end up with a piece that it values less than 1/n of the cake.

**Theorem 3.** If a player is truthful under EP, it will receive at least 1/n of the cake regardless of whether or not the other players are truthful; otherwise, it may not.

**Proof.** Consider the moving-knife procedure, due to Dubins and Spanier (1961), in which a referee moves a knife slowly across a cake from left to right. A player that has not yet received a piece calls “stop,” and makes a mark, when the knife reaches a point that gives it 1/n of the cake rightward of the last point at which the knife was stopped by a player (or from the left edge for the first player to call stop). It is easy to show that a truthful player will be able to get a 1/n piece, with some cake generally remaining near the right edge. By moving all players’ marks rightward (Shishido and Zeng, 1999), one can give each player an equal amount greater than 1/n, exhausting the remainder, because the players’ measures are nonatomic. If a player is not truthful, it will appear that it received a piece that is at least 1/n under EP, but its true value may be less than 1/n.

To illustrate a misrepresentation that may give a player less than 1/n, assume player C in the previous 3-player example knows the value functions of players A and B, but A and B do not know C’s value function. We first show how C can maximize its value function when it knows the value functions of A and B, which we will assume are truthful.

Let c₁ be the cutpoint on the left that defines A’s piece, starting from the left edge, and let c₂ be the cutpoint on the right that defines B’s piece, starting from the right edge. Then C should undervalue the middle portion between c₁ and c₂ so that A and B receive exactly the same value from their pieces—as required by EP—

$$\int_{c_1}^{c_2} (-4x + 2) \, dx = \int_{0}^{1} (2x - 1/2) \, dx,$$

while C receives as much of the middle portion of the cake as possible.

C can maximize the value of the middle portion by making B, which values the middle portion more than A does, indifferent between receiving this portion and obtaining the right portion:

$$\int_{c_1}^{1/2} (-2x + 3/2) \, dx + \int_{1/2}^{c_2} (2x - 1/2) \, dx = \int_{c_2}^{1} (2x - 1/2) \, dx.$$

This “optimal” misrepresentation by C ensures that it obtains as physically large a middle piece as possible at the same time that it appears to receive the same-value pieces as A and B do on the left and right. ⁶

After integration and evaluation of the two foregoing equations, we have

$$4c_1^2 - 4c_1 = 2c_2^2 - c_2 - 1$$

$$2c_1^2 - 3c_1 = -4c_2^2 + 2c_2.$$

Solving these equations simultaneously gives c₁ ≈ 0.230 and c₂ ≈ 0.707. A and B receive the same value of 0.354 for the left and right pieces, respectively, whereas C appears to receive this value for the middle piece. But the true value for C of its now enlarged middle piece, c₂ − c₁ ≈ 0.477, is 21% greater than its value when it is truthful (0.393), so C clearly benefits from this misrepresentation. But had C undervalued the middle portion more, and consequently overvalued the left or right portions by a greater amount, it would have received one of the latter under EP, which would have given it a true value of less than 0.393.

Thus, without information on the value functions of the other players, a player may misrepresent in a way that lowers its value over being truthful. Indeed, such misrepresentation may give it less than 1/n of the cake, making truthfulness not only a maximin strategy but also one that gives a player a guarantee of at least 1/n (Theorem 3).

---

⁴Moving-knife procedures are discussed in, among other places, Brams, Taylor, and Zwicker (1995); Brams and Taylor (1996); and Robertson and Webb (1998). For non-constructive results on cake-cutting, which address the existence but not the construction of fair divisions that satisfy different properties, see Barbanel (2005).

⁵Even though the Dubins-Spanier assignment gives each player at least 1/n, it may not be the assignment from left to right that gives the players the maximal equitable division. Under EP, a different assignment of equal-valued pieces to players could give each more.

⁶Just as C must lower its value of \([c_1, c_2]\) to that which gives it the same value that B attaches to this middle portion, it must also raise its values of \(\{0, c_1\}\) and \((c_2, 1]\) to those of B as well. Because this will allow the middle or the right pieces to be assigned to either B or C, C should slightly perturb its values so that it appears that it values the middle portion more, ensuring that it, rather than B, receives it.
The guarantee of at least $1/n$ to the players under EP generalizes the guarantee of at least $1/2$ to the two players under SP.\footnote{A minimal-cut envy-free procedure also gives this guarantee, because a player cannot receive less than $1/n$ without envying another player. However, EP maximizes the minimum amount greater than $1/n$ that a player receives, whereas an envy-free procedure may give one player less than this amount. In the 3-person example in the previous section, for instance, an envy-free allocation will give A a larger proportion of the cake than B receives, though both players will value the two (equal) envy-free pieces each gets exactly the same. Under EP, by contrast, the players will value their pieces differently, causing A to envy B for getting a physically larger piece, though each player values its proportion of the cake exactly the same as the other player values its proportion.} The additional players under EP create greater uncertainty about their allocations, making EP more difficult to exploit than SP. Consequently, EP is able to ensure a maximal equitable allocation that is strategy-proof, whereas SP can ensure only a proportionally equitable allocation that is strategy-proof.

Conclusions
We have described a new 2-person, 1-cut cake-cutting procedure, called the surplus procedure (SP). Like cut-and-choose, it is envy-free and efficient and also induces the players to be truthful when they have no information about each other's preferences, rendering it strategy-proof. But unlike cut-and-choose, SP produces a proportionally equitable division, whereas an analogous equitable procedure is strategy-vulnerable.

SP is more information-demanding than cut-and-choose, requiring that the players submit to a referee their value functions over an entire cake, not just indicate a 50-50 point. Practically, players might sketch such functions, or choose from a variety of different-shaped functions, to indicate how they value a divisible good like land.

Thus, land bordering water might be more valuable to one person (A), whereas land bordering a forest might be more valuable to the other (B). Even if players know these basic preferences of each other, and hence that $a$ will be closer to the water and $b$ will be closer to the forest, uncertainty about the other player's 50-50 point makes it impossible for maximin players to exploit SP without knowledge of the other player's value function.

For three persons, there may be no envy-free division that is also equitable, so a choice may have to be made between these two properties. For four or more persons, there is no known minimal-cut, envy-free procedure, whereas the equitability procedure (EP) ensures an equitable and efficient division that is strategy-proof for any $n$.

It is pleasing to have strategy-proof procedures that yield efficient, envy-free, and proportionally equitable divisions in the case of two players, and efficient and equitable divisions in the case of more than two players. If there are multiple divisible goods that must be divided, however, 2-person procedures like “adjusted winner” (Brams and Taylor, 1996, 1999) seem more applicable than cake-cutting procedures, though Jones (2002) shows that adjusted winner can be viewed as a cake-cutting procedure.

The small literature on pie-cutting, in which radial cuts are made from the center of a disk instead of vertical cuts along a horizontal axis, raises new issues, including whether there always exists an envy-free and efficient division of a pie (Gale, 1993). Barbanel, Brams, and Tanton (2006) and Brams, Jones, and Klamler (2006) provide some positive as well as negative answers, but suffice it to say that several questions remain open.

The fair division of indivisible goods poses significant new challenges that lead to certain paradoxes (Brams, Edelman, and Fishburn, 2001). But recently progress has been made in finding ways of dividing such goods (Brams and Fishburn, 2000; Edelman and Fishburn, 2001; Brams, Edelman, and Fishburn, 2003; Herreiner and Puppe, 2002; Brams and King, 2004). Procedures that work for both divisible and indivisible goods have also recently been developed that have a number of practical applications, such as determining how roommates might share the rent of a house or how students might be assigned to courses as fairly as possible (Su, 1999; Brams and Kilgour, 2001; Haake, Raith, and Su, 2002; Potthoff, 2002; Abdulkadiroglu, Sönmez, and Unver, 2004).

References


[9] Steven J. Brams and Daniel L. King (2004), Efficient fair division: Help the worst off or avoid envy?, Rationality and Society 17(4) (November), 387–421.


WHAT’S HAPPENING in the Mathematical Sciences

The AMS series What’s Happening in the Mathematical Sciences distills the amazingly rich brew of current research in mathematics down to a few choice samples.

Highlights from this volume include:

- First of Seven Millennium Problems Nears Completion
- From Rubik’s Cube to Quadratic Number Fields… and Beyond
- Fluid Dynamics Explains Mysteries of Insect Motion

What’s Happening, written by Dana Mackenzie, author of The Big Splat, or How Our Moon Came to Be, and Barry Cipra, author of What’s Happening Volumes 1-5, will convey to all readers—from mathematical novices to experts—the beauty and wonder that is mathematics.

* Visit the AMS Bookstore for this limited time offer

Visit the AMS booth at JMM New Orleans to view this and many other new releases from the AMS.

Contact the AMS, 1-800-321-4AMS (4267), in the U.S. and Canada, or 1-401-455-4000 (worldwide); fax: 1-401-455-4046; email: cust-serv@ams.org
American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA
“What can I do with a math degree?”

Qualify for a broad range of careers in business, industry, government, and teaching.

- stockbroker
- research scientist
- animator
- statistician
- market research analyst
- quantitative analyst
- commodities trader
- air traffic controller
- forensic analyst
- production manager
- banker
- underwriter
- computer programmer
- professor
- urban designer
- public utilities analyst
- foreign exchange trader
- estimator
- epidemiologist
- technical writer
- teacher
- financial aid director
- pollster
- appraiser
- actuary
- claims adjuster
- benefits administrator
- early career profiles

Explore the Early Career Profiles of recent bachelor-level graduates with degrees in the mathematical sciences.

www.ams.org/early-careers/
The Shoelace Book

Reviewed by Colin Adams

The Shoelace Book: A Mathematical Guide to the Best (and Worst) Ways to Lace Your Shoes
Burkard Polster
American Mathematical Society, 2006
Paperback, 125 pages, $29.00
ISBN 0-821-83933-0

In 1999 two British physicists, Thomas Fink and Yong Mao, published an article in Nature about the various ways one might tie a necktie and the mathematics behind determining these options. This article received an immense amount of attention, with newspaper articles about it appearing around the globe. People were fascinated by this application of “science” to their everyday lives. A substantial portion of humanity gets up every morning and ties a knot that, once learned, becomes completely automatic, and is performed without the least thought.

But along come Fink and Mao, and suddenly, everyone is trying to look down at that knot just below their chin. Now people think about how they are tying that tie, and how they might tie it, and how one determines all the possibilities.

Subsequently, Fink and Mao published a slim book entitled The 85 Ways to Tie a Tie. At least for a while this was a hugely successful book, becoming the standard gift for every tie-toting office worker. Although the book does include a short appendix explaining the interpretation of necktie knots as random walks on a triangular lattice, in fact, the book is mostly about the history of knot tying and about the eighty-five ways that one can tie a tie, given the constraints that the authors have selected in terms of symmetry, aesthetics, and length of the tie. And although the appendix does a good job of making the mathematics sound sophisticated, in fact, it is completely elementary.

At the time this book came out, I remember thinking what a great idea it was to use neckties as a means to introduce knot theory. As a knot theorist, I kicked myself for not coming up with this obvious way to interest a general audience in certain aspects of mathematics.

In 2002 Burkard Polster published a short article in Nature about the mathematics of lacing one’s shoes. And once again, stories about it appeared in major newspapers around the world. Once again, this was a subject that reached out to the widest of possible audiences. Other than very young children and a handful of Velcro lovers, who doesn’t use shoelaces?

After hearing about Polster’s article, the first thing you do is look down at your feet. There are your shoelaces, which you have not considered seriously for years. And once again, stories about it appeared in major newspapers around the world. Once again, this was a subject that reached out to the widest of possible audiences. Other than very young children and a handful of Velcro lovers, who doesn’t use shoelaces?

After hearing about Polster’s article, the first thing you do is look down at your feet. There are your shoelaces, which you have not considered seriously for years. And you quickly find yourself thinking about how you are tying that tie, and how you might tie it, and how one determines all the possibilities.

In 2002 Burkard Polster published a short article in Nature about the mathematics of lacing one’s shoes. And once again, stories about it appeared in major newspapers around the world. Once again, this was a subject that reached out to the widest of possible audiences. Other than very young children and a handful of Velcro lovers, who doesn’t use shoelaces?

The Shoelace Book is Burkard Polster’s expanded version of that article. In it, he discusses a wide variety of choices for lacing shoes, some with historical significance and many more that up to
The author determines the shortest and longest one-column lacings and the total number of one-column lacings.

The third chapter is devoted to deriving formulas for the number of lacings of the various types: general, dense, simple, straight, dense-straight, etc. Although some of the resultant formulas are simple enough and relatively straightforward, a few are not. Particularly, the number of simple $n$-lacings turns out to be surprisingly complicated, involving all five roots of a particular quintic polynomial. Lists of actual values for the numbers of dense, simple, straight, and general $n$-lacings are given for $n = 2, \ldots, 8$. You will be interested to know that if you have a boot with eight pairs of eyelets, you have a total of $52,733,721,600$ choices as to how you might lace it. The determination of the number of various subcategories of straight lacings relies on the results on one-column lacings from the previous chapter.

In Chapter 4, previous results by other authors (yes, this is not the first work on the mathematics of shoelaces) are extended to find the shortest $n$-lacings for the various subcategories. So if you mistakenly buy a shoelace intended for a shoe with fewer eyelets than yours, all is not lost. It turns out that the bowtie lacing is the shortest lacing of all, the crisscross lacing is the shortest dense lacing, and the star lacing is the shortest dense straight lacing.

The fifth chapter considers variations on the shortest lacing problem. What if we allow “open” lacings, where only the segments making up the closed path is removed? What if we allow the two columns of eyelets to be offset from one another? What if we no longer assume the two lines of eyelets are parallel? What if we allow multiple laces on a single shoe?

Chapter 6 is a consideration of the longest $n$-lacings in the various categories. It turns out, for instance, that the zigzag lacings are the longest of the simple lacings.

In the seventh chapter, the author turns to the question of which lacings are the strongest. By this, he means those lacings that create the greatest horizontal tension, pulling the two sides of the shoe together. It turns out that the two most common lacings, the crisscross for smaller values of the stretch $h$ and the zigzag for larger values of $h$, are the strongest lacings for the
general category, perhaps partially explaining their popularity.

As a mathematician, the author couldn’t help but then turn to the question of finding the weakest lacings, which is addressed in the final chapter. He gives a variety of results and conjectures for the various categories.

Will this book do as well as the necktie book? No. That book was aimed at a very general audience, and the minimal mathematics was relegated to the last few pages in order to avoid frightening those potential readers.

*The Shoelace Book* is aimed at a mathematically inclined audience. The author includes a chunk of mathematics here. None of it is heavy duty, and almost all of it is self-contained, but it does require a certain level of mathematical maturity.

What level? Well, you are reading a review of a math book in the *Notices*, so I am guessing you have the requisite mathematical background. And any undergraduate math major should have the sophistication necessary to appreciate it. It is even possible that this book could be used as a text in a seminar format with math majors, although the lack of exercises would make this a substantial amount of work for the professor. And woe is the administrator who has to deal with irate parents and/or trustees when confronted with the fact that there is a course in their college catalog that teaches the students how to lace their shoes.

There are attempts made to make the book palatable to a wider audience. Witness the inclusion of a variety of comic strips that touch on shoelaces. But the impression they give is exactly that, an attempt to lighten the mathematics that appears. In fact, the strips are not relevant to the material in any chapter and give the impression of someone, author or editor, who went to an online cartoon bank and typed in the words "shoe lace".

But for the mathematically inclined, this is a fun book. The questions are easily stated, and some of the solutions are surprisingly complicated. And there remain plenty of open questions and conjectures in this nascent field of shoelace mathematics. This book will forever change the way you look at your shoes. And it does get you to thinking about the mathematics in the other everyday objects around you.

At the end of the book, there are two appendices. The first discusses related mathematics. This includes how the length of a shoelace is in fact a version of the traveling salesman problem. Then the so-called "shoelace formula" for computing the area of a simple closed polygon in the plane is presented. This is in fact related by analogy only.

The second appendix discusses a variety of "loose ends", including how we tie the two ends of our shoelace together. There is a minor error here, where Polster explains a method for tying your shoes that will hold together better than the traditional way, which he says is also used for tying sutures during surgery. In fact, the description given, and the knot shown (see the last figure in the book) cannot be tied in the ends of a lace or as a suture. The two loose ends of the shoelace to be tied are in fact connected in his particular knot. So do not take Polster’s advice and attempt to teach your children this one, or they may end up switching to Velcro.

In this section of the appendix, Polster also explains that when one uses the standard method of tying a shoelace, one creates a knot that is fundamentally either a granny or a square knot. The granny knot is the mark of a novice knot tier, the knot that is well known by sailors not to hold together nearly as well as the square knot. But Polster notes that many of us, perhaps the majority, tie our shoes using the granny knot rather than the square knot. Try this experiment. Tie your shoe. Then stick your fingers in the loops and pull the loose ends through, so you are left with a knot. Is it the granny or the square knot?

I was shocked and chagrined to learn I was a granny tier. No wonder my shoelaces have been coming undone all these years. I just imagined all that wasted time, and the constant distraction of my loose laces, usually occurring in the middle of some crucial thought. Who knows how many times I was on the verge of coming up with the idea of disseminating fun math through shoelaces, when an untied shoelace distracted me from my thought process? I guess my shoelaces were trying to tell me something. Thank goodness, Burkard Polster understood what his shoelaces were trying to tell him.

And of course, as he points out, erroneous lace tying is easily corrected. We can all benefit from the instruction.
Membership opportunities
in connection with the 2007-2008 thematic program on
MATHMATICS OF MOLECULAR
AND CELLULAR BIOLOGY

IMA NEW DIRECTIONS VISITING PROFESSORSHIPS provide an
extraordinary opportunity for established mathematicians—typically mid-career
faculty at US universities—to branch into new directions and increase the
impact of their research by spending the 2007-2008 academic year immersed
in the thematic program at the IMA. Visiting Professors will enjoy an excellent research
environment and stimulating scientific program connecting Mathematics of Molecular and
Cellular Biology and related areas of mathematics with a broad range of fields of
application. New Directions Visiting Professors are expected to be resident and active
participants in the program, but are not assigned formal duties.

IMA POSTDOCTORAL FELLOWSHIPS provide an excellent opportunity for
mathematical scientists near the beginning of their career who have a background in
and/or an interest in learning about applied and computational aspects of Mathematics of
Molecular and Cellular Biology. IMA postdoctoral fellowships run one to two years, at
the option of the holder, starting August 31, 2007.

IMA INDUSTRIAL POSTDOCTORAL FELLOWSHIPS are designed to
prepare mathematicians for research careers in industry or involving industrial interaction.
IMA industrial postdoctoral fellowships run two years starting August 31, 2007. They are
funded jointly by the IMA and an industrial sponsor, and holders devote 50% effort to
their own research and the IMA program and 50% effort working with industrial.

IMA GENERAL MEMBERSHIPS provide an opportunity for mathematicians
and scientists employed elsewhere to spend a period of one month to one year in residence
at the IMA, and to participate in the 2007-2008 thematic program. The residency should
fall in the period September 2007 through June 2008 (in special cases extending into the
summer months). Logistic support such as office space, computer facilities, and
secretarial support will be provided, and local expenses may be provided.

For more information and application materials see
www.ima.umn.edu/docs/membership.html or phone 612-624-6066.

The University of Minnesota is committed to the policy that all persons shall have equal access to its
programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age,
marital status, disability, public assistance status, veteran status, or sexual orientation.
A World Without Mathematics...

A World With Mathematics

Support the future of mathematics
Give to the American Mathematical Society

Your donations support:
• Career paths of young mathematicians
• Recognition of important work
• Public awareness and appreciation of mathematics
• Inspiration of young scholars (Epsilon Fund)
• International outreach

Learn about giving opportunities and estate planning
www.ams.org/giving-to-ams

Contact the AMS
Development Office
1.800.321.4267 (U.S. and Canada) or 1.401.455.4000 (worldwide)
email: development@ams.org
Writing a Teaching Philosophy Statement

Helen G. Grundman

Getting Started

So you are entering the job market and therefore need to write a statement of your teaching philosophy. As mentioned above, the statement can include a variety of things. For some, the vastness of the topic leads to a sort of writer’s paralysis. For others, the problem is simply coming up with something to write.

This section consists of a series of exercises designed to help with either of these problems as well as to provide an organized procedure for anyone wanting to write a teaching philosophy statement. The exercises ask you to express your views on some very specific topics and are aimed to help you to discover or to clarify your own feelings and beliefs about teaching. These are the sorts of ideas that you may want to include in your teaching philosophy statement.

The following exercises can be done on your own, but are much more effective when done with others who are also trying to write teaching philosophy statements. If you don’t know anyone else on the job market just now, then find someone (preferably someone who teaches math) with whom you can discuss your responses. Input and reactions from other instructors will enable you to clarify your own beliefs and determine how to express them most effectively.

Exercise 1

This first exercise is an easy one. Sit down with some paper and write out answers to each of the following questions.
1. Why do you want to teach mathematics? (Try to give your answer in a single succinct sentence.)
2. When you go into an undergraduate classroom to teach, what are your goals? (List as many as you would like.)
3. What are the goals of undergraduate mathematics education? (Again, make your answer as short or long as you would like.) Find out how some other teachers answer these questions. Feel free to change your answers after your conversations.

**Exercise 2**
Chances are that in the previous exercise, you found that you have many goals as a teacher. This exercise is about prioritizing your goals.

In the accompanying table is a (long) list of teaching goals. Add any of yours that are missing from the list.

**Part I:** Suppose you are soon to teach a Calculus I course. Choose your top 10–25 priorities from the list and order them from greatest-to-least importance for you. (This is not an easy task, but spending some time at it can help you to clarify what is most important to you.)

**Part II:** Now suppose that you are soon to teach an advanced course for senior math majors. How does this change your prioritization of your goals? Repeat Part I of this exercise in this changed context.

**Exercise 3**
Now consider what you most like to teach and why.

**Part I:** Choose one of the following courses that you like to teach or would like to teach:
- Fundamentals,
- Pre-calculus,
- Calculus,
- Multi-variable calculus,
- Linear algebra,
- Differential equations.

Sit down with a friend or colleague and take about 3–5 minutes to explain your choice. While explaining, try to give specific clarifying examples and to articulate your enthusiasm.

**Part II:** As soon as possible after completing Part I, write a paragraph beginning with one of the phrases:

---

**Some Common Teaching Goals**

- Communicate that mathematics is fun
- Detect and fill gaps in students’ prior math knowledge
- Develop a mathematical sense about quantities, geometry, and symbols
- Develop a variety of problem-solving strategies
- Develop basic computational skills
- Enable and empower students
- Enable students to make judgments based on quantitative information
- Enable students to prove basic results
- Enable students to read mathematics effectively
- Enable students to understand their own thought processes
- Encourage a broader interest in math
- Ensure that students really understand concepts
- Establish constructive student attitudes about math
- Facilitate acquisition of life-long learning skills
- Foster a desire to ask mathematics questions
- Foster critical thinking
- Foster student discovery of mathematics
- Foster understanding of the proofs of key theorems
- Teach the beauty of mathematics
- Help students learn the key theorems and their applications
- Improve students’ confidence
- Improve students’ understanding of technology
- Improve students’ writing abilities
- Increase the number of math majors
- Increase the students’ mathematical knowledge
- Model expert problem solving
- Motivate students to make an effort to learn mathematics
- Open doors to other opportunities for students
- Prepare future mathematicians
- Prepare students for technical careers
- Prepare students to be knowledgeable adults
- Reduce math anxiety
- Teach applications to other fields
- Teach calculator and computer skills
- Teach fundamental concepts
- Teach generalizing
- Teach logical reasoning
- Teach mathematical writing
- Teach predicting
- Teach problem solving
- Teach proof-reading of mathematics
- Teach students how to translate back and forth between words and “math”
- Teach students to work collaboratively

---
“My favorite lower-level math course to teach is....”

OR

“The lower-level math course I most look forward to teaching is....”

Read over your paragraph, noting the degree to which you focused on the students you want to teach. If appropriate, rewrite your paragraph using student-centered rather than teacher-centered statements.

Exercise 4

What do you feel makes for great teaching?

Part I: Choose a truly excellent math teacher who taught you at some point in your life. Again, sit down with a friend or colleague. This time describe exactly what it was that made this teacher excellent.

Part II: Make a list of characteristics of what you think of as good undergraduate-level teaching. Consider the aspects you included in your description of the excellent teacher you had. Should any more of these be added to your list?

When your list is complete, put stars by the characteristics that you plan to try to adopt as your own.

Exercise 5

Write a synthesis of the above exercises, expressing your interest in and enthusiasm for teaching at the college level. Be sure to discuss your goals and include “students” as the focus of your teaching. Although length is not terribly important at this point, aim for approximately one typed page.

Some Generalizations

Although teaching philosophy statements are different things to different people, there are some generalizations that are commonly (though perhaps not universally) held to be true about them.

Your teaching philosophy statement is about you, not about some abstract topic. It’s about your beliefs about a major portion of the career you have chosen. It can tell a hiring committee a great deal about your approach to teaching, your knowledge about teaching, and, if you so choose, your experience of teaching.

At the same time, your teaching philosophy statement is about teaching and therefore about your students and their learning. Don’t lose track of your students while writing about your teaching. When possible, make statements about teaching that are student-centered.

Be careful that the word philosophy doesn’t lead you to using a dry, passive writing style. Express your enthusiasm! (If you have no enthusiasm for teaching, consider redirecting your job search.)

This is your chance to communicate to the hiring committee your passion for teaching and how it will lead you to being effective at your new job.

If at all possible, your statement should enable the reader to imagine you in the classroom, teaching. You want to include sufficient information for picturing not only you in the process of teaching, but also your class in the process of learning. This does not mean that you need to describe a class explicitly. It means that in explaining your beliefs, your goals, and your methods, you should allow the picture to form for the reader. It means that you should clearly state your strengths: your energy, your organization, your love of the subject, etc., and in what way these strengths will benefit your students.

Exercise 6

Write a draft teaching philosophy statement. Start from scratch or use your writing from previous exercises, making modifications as you see fit. This is only a first draft, so don’t feel that you need to strive for perfection. At the same time, make sure that what you write clearly expresses what you are trying to communicate. Aim for a length of at most one typed page.

Time for Research

Now that you have something in writing, it’s time to do some research. Find out what others believe does and doesn’t belong in a teaching philosophy statement. The easiest way to do this is to search on the Internet, but you can also ask any younger faculty you know whether they have statements they would be willing to share with you. (You can certainly also ask older faculty, but they may not have any since these statements were less commonly used before the last decade or so.) You want to collect a variety of statements, including ones that you don’t particularly like, to help you identify what aspects you want to avoid. Try to collect around 15–25 statements.

Read each teaching philosophy statement carefully. Make notes on what you do and do not like about each. Be sure to consider both the content and the style. Make note of the topics that you do and do not want to include in your statement. Decide whether there is a particular style or format that you think will work best for you.

Now you are ready to take your first draft and develop it into a clear and effective statement of your teaching philosophy, keeping in mind what you’ve learned from your research. Although you want to use your first draft as a starting point, don’t feel restricted by it. You may decide that much of your earlier writing will not make it into the final statement. Alternatively, you may decide that your first draft is very close to being your final draft. In any case, allow yourself to write a series of drafts instead of trying to write a final draft on the very first edit.

Take full advantage of the fact that the teaching philosophy statement really isn’t well-defined. Focus
your attention on what you most want to communicate to the hiring committee about teaching, be it your thoughts and beliefs, your experience, your plans, something else, or a combination of these. In the following section are some thoughts to keep in mind as you rewrite and edit.

**Rewriting and Editing**

Again, there are no hard and fast rules, but here are some suggestions and reminders to think about as you edit.

- Make it short: 1–2 pages. Keep in mind that a long application is often only skimmed over and you’d rather have yours actually be read.
- Sell yourself. Discuss your strengths and why you feel they are important. (Remember that strengths can be in the form of beliefs and potential as well as experience.)
- Explain your main priorities as a teacher.
- Remember that teaching is about students and so your philosophy should be, too. Avoid sounding pompous or condescending towards students.
- Be concrete. General principles are fine, but can be interpreted in many ways. As possible, support your statements with specific examples of what you want to do while teaching. Help the reader visualize you in the classroom.
- Don’t repeat what is in your curriculum vitae. You will certainly discuss some of your teaching experience in both. Yet in your philosophy statement, your emphasis is on your beliefs and how they motivate and improve the way you teach. In your vita you want to list all of your teaching experience and, if you so choose, expand on it a good deal. You have plenty to say, so there’s no need to be repetitive.
- Be careful about your grammar and spelling. Verb tense can be particular tricky since you might change multiple times between your present beliefs, your past experiences, and your hypothetical future.
- Try to make your teaching philosophy statement unique to you. If you complete the exercises in this article before reading other teaching philosophies, your individuality is likely to come through in your statement without additional effort on your part. Still, be careful that your statement does not end up too similar to any others that you’ve read. The hiring committee is likely to read a great many of these statements and you don’t want yours to be just like the rest.

**Further Ideas and Final Thoughts**

Congratulations! You’re almost finished!

At this point you should have a draft teaching philosophy statement with which you are quite happy. This section has some final points for you to consider when making final changes before sending out your statement in your application package.

First a few points to consider. Depending on your particular statement, any one of these might lead to a significant improvement.

- Consider including a sentence describing or listing courses that you feel confident about teaching. (If you’d like, you can go on from this to discuss what your favorite is and why.) Be sure that you do not leave the hiring committee with the impression that you could teach only a very small number of courses.
- If you have ideas for involving undergraduates in mathematics research, try to work this into your statement. For many schools, your interest in such activities is a definite plus.
- You might want to mention ways in which you want to grow as a teacher, describing the kind of teacher you hope to become. Be careful, however, to present such information in a positive way. The last thing you want to do is draw attention to a weakness.

Next, if you are applying to a wide range of schools with varying emphases on teaching, you may find it easiest to write multiple versions of your statement. Some schools want evidence that you will be a good teacher, but not spend too much of your time on teaching. Others want to know that you truly care about teaching as well as research. Some departments state explicitly in their advertisements that they are interested in specific aspects that you may want to address for them.

Now that you are almost finished, you need to make sure that you do not have any "surprises" hidden in your statement. Unfortunately, it’s all too easy to have a sentence that, while being perfectly clear to you, may be read in a very different way by a hiring committee. Often the problem is that the sentence suggests something that you never meant.

A simple statement of your beliefs might be read as your not being open to other views. A statement of your preferences might be interpreted as saying that you have no interest in any other teaching. Your goal is to find a balance between making a clear statement that might make you sound too rigid and making an overly vague statement that makes you sound cooperative, but without a vision.

The best way to find these "surprises" is to have others read your statement and tell you what they think it says. At this point, you might want to solicit input from friends outside of mathematics as well as from your peers and from faculty with whom you are comfortable.

If you know other mathematicians who are on the job market, this is a great time to get together as a group and read each others’ statements. In giving feedback, be very careful to be constructive...
rather than destructive. Also, try to avoid general discussions on which style or choice of content is best, since what is best depends on the individual whose statement you are considering.

Importantly, if you are not happy with your teaching philosophy statement, and editing doesn’t seem to help, you are not stuck with it. Sometimes early in the process of developing a teaching philosophy statement, one makes a decision that then leads to a statement that just doesn’t feel right. At this point, writing a brand new statement will probably be much easier than you think. Go back to your notes on what you want to include and not include and what style you like best. Revisit those decisions to see if any should be changed. Is there something that was cut that you’d like to reincorporate? Did you add something that now doesn’t sit right with you? Look back at your original writings to reconnect with what is most important to you, then sit down and write a fresh version, trying to make it different from what you have now. Set it all aside for at least a few hours. When you return, review the previous section of this article, read over both of your last drafts, and write a new version incorporating the best of each. Chances are you’ll be happier with the resulting statement. Proceed to rewrite and edit, as before.

Once you have a teaching philosophy statement with which you are happy, incorporate it with your other application materials and have someone proof-read the entire package. (It’s amazing how many typos can find their way into an application, even after each piece was carefully checked!) Along with a well-thought out and well-written teaching philosophy statement, a well-organized and clear application package can go a long way in convincing a hiring committee that your teaching will be of equally high quality.
**WHAT IS . . . a Quasiconformal Mapping?**

**Juha Heinonen**

Quasiconformal mappings are generalizations of conformal mappings. They can be considered not only on Riemann surfaces, but also on Riemannian manifolds in all dimensions, and even on arbitrary metric spaces. Quasiconformal mappings occur naturally in various mathematical and often a priori unrelated contexts.

The importance of quasiconformal mappings in complex analysis was realized by Ahlfors and Teichmüller in the 1930s. Ahlfors used quasiconformal mappings in his geometric approach to Nevanlinna’s value distribution theory. He also coined the term “quasiconformal” in his 1935 work on Überlagerungsflächen that earned him one of the first two Fields medals. Teichmüller used quasiconformal mappings to measure a distance between two conformally inequivalent compact Riemann surfaces, starting what is now called Teichmüller theory.

There are three main definitions for quasiconformal mappings in Euclidean spaces: metric, geometric, and analytic. We begin with the *metric definition*, which is the easiest to state and which makes sense in arbitrary metric spaces. It describes the property that “infinitesimal balls are transformed to infinitesimal ellipsoids of bounded eccentricity”.

Let $f : X \to Y$ be a homeomorphism between two metric spaces. For $x \in X$ and $r > 0$ let

$$L_f(x,r) = \sup \{|f(x) - f(y)| : |x - y| \leq r\}$$

and

$$l_f(x,r) = \inf \{|f(x) - f(y)| : |x - y| \geq r\} .$$

(Here and later we use the Polish notation $|a - b|$ for the distance in any metric space.) The ratio $H_f(x,r) = L_f(x,r)/l_f(x,r)$ measures the eccentricity of the image of the ball $B(x,r)$ under $f$. We say that $f$ is $H$-*quasiconformal*, $H \geq 1$, if

$$(1) \quad \limsup_{r \to 0} H_f(x,r) \leq H$$

for every $x \in X$.

Homeomorphisms that are $1$-quasiconformal between domains in $\mathbb{R}^2 = \mathbb{C}$ are precisely the (complex analytic) conformal or anticonformal mappings, by a theorem of Menšhov from 1937. Homeomorphisms that are $1$-quasiconformal between domains in $\mathbb{R}^n$, $n \geq 3$, are precisely the Möbius transformations, or compositions of inversions on spheres in the one-point compactification $\mathbb{R}^n \cup \{\infty\}$, by the generalized Liouville theorem proved by Gehring and Reshetnyak in the 1960s. On the other hand, every diffeomorphism $f : \mathbb{R} \to \mathbb{R}$ is $1$-quasiconformal according to the metric definition, as is every homeomorphism between discrete spaces. Surely not all such mappings deserve to be called quasiconformal. We will later remedy this situation.

Many early definitions for quasiconformality used some conformally invariant quantity and declared quasiconformal mappings to be those homeomorphisms that changed that quantity by a bounded amount. Here is one such *geometric definition*. Let $f : D \to D'$ be a homeomorphism between two domains in $\mathbb{R}^n$, $n \geq 2$. Then $f$ is said to be $K$-quasiconformal, $K \geq 1$, if

$$(2) \quad K^{-1} \text{mod}(f(\Gamma)) \leq \text{mod}(\Gamma) \leq K \text{mod}(f(\Gamma))$$

for every curve family $\Gamma$ in $D$. The *conformal modulus* $\text{mod}(\Gamma)$ of a family $\Gamma$ of curves in $\mathbb{R}^n$ is the infimum of the numbers $\int_\gamma \rho^2 \, dx$ over all nonnegative Borel functions $\rho : \mathbb{R}^n \to [0, \infty]$ such that $\int_\gamma \rho \, ds \geq 1$ for every $y \in \Gamma$. The definition of modulus is admittedly not easy to digest at one glance, but once mastered it is a powerful tool in geometric function theory. The geometric definition (2) is a global requirement that quickly yields many strong properties of quasiconformal mappings; for example, the inverse of a quasiconformal mapping is automatically quasiconformal, which is not at all obvious from the metric definition.

Also in the 1930s, an *analytic definition* for quasiconformal mappings was considered by Lavrentiev in connection with elliptic systems of partial differential equations. According to this definition, a homeomorphism $f : D \to D'$ between domains in $\mathbb{R}^n$, $n \geq 2$, is said to be $K$-quasiconformal if the first distributional partial derivatives of $f$ are locally in the Lebesgue space $L^n$ and if the formal differential matrix $Df = (\partial_i f_j)$ satisfies

$$(3) \quad \sup_{h \in \mathbb{R}^n, |h| \leq 1} |Df(x)(h)|^p \leq K \det Df(x)$$

for almost every $x \in D$. The use of distributional derivatives is essential in this context; important compactness properties of quasiconformal mappings are lost if smooth mappings only are considered.

---

Juha Heinonen is professor of mathematics at the University of Michigan. His email address is juha@umich.edu.

The author wishes to thank Mario Bonk and Karen E. Smith for their criticism on this text.
It is a deep fact that a homeomorphism \( f : D \to D' \) between domains in \( \mathbb{R}^n, n \geq 2 \), is quasiconformal according to each of the three definitions—metric, geometric, and analytic—if it is quasiconformal according to any one of them. The parameters \( H \) and \( K \) depend only on each other and on \( n \). The equivalence of these three definitions is a result of work by Gehring, Väisälä, and many others, in the 1950s and early 1960s.

There is a powerful existence theorem, proved by Morrey in 1938, that lends a special flavor to the 2-dimensional theory: given a measurable complex valued function \( \mu \) in \( \mathbb{R}^2 \) such that \( ||\mu||_\infty < 1 \), there exists a quasiconformal homeomorphism \( f : \mathbb{R}^2 \to \mathbb{R}^2 \) (unique when properly normalized) such that \( \overline{\partial f} = \mu \partial f \) in the sense of distributions, where \( \overline{\partial} = \frac{1}{2} (\partial_x + i \partial_y) \) and \( \partial = \frac{1}{2} (\partial_x - i \partial_y) \) in complex notation. That is, one can measurably preassign the eccentricity and angle of the ellipses that are carried to a circle by the almost everywhere defined derivative of \( f \). This fact has had tremendous impact on complex analysis and dynamics, Teichmüller theory, and low-dimensional topology.

The interplay of all three aspects of quasiconformality (metric, geometric, and analytic) is an important feature of the theory; one cannot rely on just one of them. Everyone who gives a graduate course on quasiconformal mappings faces the dilemma that a reasonably self-contained proof (using contemporary real and harmonic analysis) of the equivalence of all the preceding definitions would easily take up half of the semester. I would like to emphasize the fact, perhaps not widely realized, that from the technical point of view the quasiconformal mapping theory even in dimension \( n = 2 \) is much more part of real than complex analysis. Instead of power series, integral representations, or algebraic techniques, the theory relies on singular integrals, geometric measure theory, and Sobolev spaces.

There is another metric approach to quasiconformality that lately has found applications in a variety of contexts. A homeomorphism, or more generally an embedding, \( f: X \to Y \) is said to be \( \eta \)-quasisymmetric if \( \eta: [0, \infty) \to [0, \infty) \) is a homeomorphism and if \( |x - y| \leq t|x - z| \) implies \( |f(x) - f(y)| \leq \eta(t)|f(x) - f(z)| \) for every triple of points \( x, y, z \in X \). An \( \eta \)-quasisymmetric mapping is obviously quasiconformal according to the metric definition, with \( H = \eta(1) \), but the converse is not true in general. It is another deep fact that the infinitesimal condition (1) implies quasismmetry for homeomorphisms \( f: \mathbb{R}^n \to \mathbb{R}^n, n \geq 2 \). Although this fact is a statement about two purely metric conditions, all known proofs use delicate geometry and analysis; in particular, all known proofs give an \( \eta \) that depends on \( H \) and dimension \( n \) (but nothing else). It is an open problem whether a self-homeomorphism of an infinite-dimensional Hilbert space that satisfies (1) is also quasisymmetric.

Quasisymmetry is the right definition for quasiconformal mappings in dimension one, e.g., on the real line. More generally, the concept of quasisymmetry is a good analogue of quasiconformality in arbitrary metric spaces, where condition (1) is often too weak to give an interesting theory. On the other hand, quasisymmetry is a global condition and simple examples show, for instance, that conformal mappings between planar domains need not be quasisymmetric.

The following egg yolk principle describes a precise relationship between quasisymmetry and quasiconformality for homeomorphisms between domains in \( \mathbb{R}^n, n \geq 2 \): \( f: D \to D' \) is quasiconformal if and only if there is \( \eta \) such that \( f|B(x, \frac{1}{2} \text{dist}(x, \partial D)) = \eta \) quasisymmetric for every \( x \in D \). The assertion is moreover quantitative in that the various parameters depend only on each other and \( n \).

Today quasiconformal mappings are used everywhere in complex analysis of one variable. But early on, the theory found applications beyond the classical framework. Mostow’s proof of his celebrated rigidity results in general rank-one symmetric spaces required a quasiconformal mapping theory in sub-Riemannian manifolds. Sullivan showed that all topological manifolds outside dimension four carry quasiconformal structures, a fact later used by him, Connes, and Teleman to develop a theory of characteristic classes on topological manifolds. In the past ten years, it has become known that a full-fledged quasiconformal mapping theory exists in rather general metric measure spaces. This theory has subsequently been applied to new rigidity studies in geometric group theory. There is also a budding theory of quasiconformal mappings in infinite-dimensional Banach spaces, based on the concept of quasismmetry. From the time of Lavrentiev and Morrey, the connection between quasiconformal analysis and elliptic partial differential equations via the analytic definition (3) has been manifest. In harmonic analysis, an important self-improving phenomenon associated with reverse Hölder inequalities was first discovered in connection with quasiconformal mappings by Gehring in 1973. New generalizations have emerged from connections to elasticity theory.

Quasiconformal mappings are fascinating objects in mathematics. They are flexible enough to be ubiquitous, yet they harbor enough subtle analytic and geometric properties so as to be useful in a variety of contexts.

References


International Congress of Mathematicians 2006

John Ball, president of the International Mathematical Union, stood before an audience that included not only a few thousand mathematicians but also close to one hundred fifty representatives of the media and perhaps a dozen television cameras. The date was August 22, 2006, and the occasion was the opening ceremony of the twenty-fifth International Congress of Mathematicians (ICM) in Madrid, the first ever held in Spain. On the stage with Ball was Juan Carlos, the king of Spain, who attended in order to present the Fields Medals. Ball announced the medalists in alphabetical order, the first one going to Andrei Okounkov. On a screen above the stage appeared a photo of Okounkov smiling enthusiastically, and the one-sentence citation of the Fields Medal committee. After Ball had read the citation and the audience began applauding, Okounkov mounted the stage and accepted his medal from the king.

The screen then switched to the imposing stare of Grigory Perelman, shown in a photo that has since been displayed in countless newspapers, magazines, and websites. As soon as Ball said Perelman’s name, the audience broke into loud applause, not waiting for the citation. After the applause died out and he had read the citation, Ball stated, “I regret that Dr. Perelman has declined to accept the medal.” Although Perelman had been widely rumored to be a front-runner for a Fields Medal this year and many had anticipated that he might refuse to accept it, a degree of shock nevertheless greeted Ball’s announcement. How could someone refuse a Fields Medal, the most illustrious honor in mathematics? A wave of nervous applause flitted through the hall, and then there was silence. After a brief pause, Ball went on to announce the other two Fields Medalists, Terence Tao and Wendelin Werner. They accepted their awards in person, as did Jon Kleinberg, winner of the Nevanlinna Prize. Kiyoshi Itô, the 91-year-old winner of the newly established Gauss Prize, was unable to attend for health reasons. Itô’s daughter accepted the prize on his behalf.

Ball, the honorees, and the others who were to speak at the opening ceremony had gone through a rehearsal the day before to ensure everything would go without a hitch, especially regarding royal protocol. One Fields Medalist jokingly asked whether it would be okay if, after receiving the medal from the king, he tore off his shirt and ran around the hall like David Beckham might do in a Real Madrid game. Had he done so, he might have drawn some of the limelight from Perelman, who to the frustration of many, nearly eclipsed the other prizewinners. It was the extraordinary story of Perelman that made the ICM 2006 a historical event.
event and brought the topic of mathematics into television broadcasts, radio programs, newspapers, magazines, and webpages all over the world.

Why Did Perelman Refuse the Medal?

At a press conference after the opening ceremony, Ball said that in June he had spent two days in St. Petersburg talking to Perelman in an effort to get him to accept the medal. Perelman was unfailingly courteous but steadfast in his refusal. Concerning his reasons, Ball explained that Perelman feels isolated from the mathematical community and therefore does not want to be seen as a figurehead or representative of that group. Ball also said that Perelman believes his own values are not represented in the mathematical community. As to whether this belief arises from particular experiences or events in Perelman's life, Ball declined to say. Is refusal of the medal a snub? Ball was asked. “No, not a snub,” he replied. “I wanted him to accept it because it gives the mathematical community the fullest opportunity to express our admiration for what he has done. And I wanted him to accept it for himself so that he could take pleasure from it and so that he could influence others in the future. I was disappointed that he absolutely would not change his mind.” But, Ball said, his discussions with Perelman were straightforward, polite, and pleasant. Asked whether he feared for Perelman’s mental health, Ball flatly answered no.

Some reasons for Perelman’s turning down the Fields Medal are indicated in the article “Manifold Destiny” by Sylvia Nasar and David Gruber. The article appeared in the August 28, 2006, issue of the New Yorker magazine; that issue came out in print on August 21, 2006, the day before the ICM opening ceremony. The authors write that Perelman mentioned to them a dispute he had had years earlier with a collaborator over how to credit someone who had obtained a particular result, and he expressed his dismay over the lax ethics in mathematics. “Of course, there are many mathematicians who are more or less honest,” the article quotes Perelman as saying. “But almost all of them are conformists. They are more or less honest, but they tolerate those who are not honest.”

The 4,000 congress participants talked avidly about the New Yorker article and about Perelman’s refusal saddening—and perplexing as well. Can someone go to Perelman and try to get him to express why he seems to prefer being isolated from other mathematicians?, Xambó asked, wondering if Perelman could be drawn back into the community somehow. Many mathematicians expressed admiration for Perelman. “I admire him,” stated Salah Bouendi of the University of California at San Diego. “He cares nothing about prizes or fame….He cares only about mathematics. He said ‘If you give me recognition, fine, and if you don’t, you don’t.’” Some had a more cynical interpretation of Perelman’s behavior. For example, one mathematician, who asked not to be named, said that in refusing the Fields Medal, Perelman communicated the message that he is more important than the medal. “It’s good marketing,” the mathematician remarked.

No one has ever turned down a Fields Medal before. It has happened three times that medalists were not present to collect their medals. In 1966 Alexandre Grothendieck refused to travel to the ICM site in Moscow to protest actions of the Soviet government. Serguei Novikov was not permitted to travel from the Soviet Union to the 1970 Congress in Nice to obtain his medal; the reasons can be traced to his support of dissidents during the 1960s and a negative recommendation to the Soviet authorities by officials at the Steklov Institute. In 1978 Gregory Margulis was prevented from traveling from the Soviet Union to Helsinki to

---

**Fields Medal Selection Committee**
Enrico Arbarello
John Ball (chair)
Jeff Cheeger
Donald Dawson
Gerhard Huisken
Curtis T. McMullen
Aleksey N. Parshin
Thomas Spencer
Michèle Vergne

**Nevanlinna Prize Selection Committee**
Samson Abramsky
Franco Brezzi
Gert-Martin Greuel
Johan Håstad
Margaret Wright (chair)

**Gauss Prize Selection Committee**
Robert E. Bixby
Martin Grötschel
Frank den Hollander
Stéphane Mallat
Ian Sloan

Universitat Politècnica de Catalunya also found Perelman’s refusal saddening—and perplexing as well. Can someone go to Perelman and try to get him to express why he seems to prefer being isolated from other mathematicians?, Xambó asked, wondering if Perelman could be drawn back into the community somehow. Many mathematicians expressed admiration for Perelman. “I admire him,” stated Salah Bouendi of the University of California at San Diego. “He cares nothing about prizes or fame….He cares only about mathematics. He said ‘If you give me recognition, fine, and if you don’t, you don’t.’” Some had a more cynical interpretation of Perelman’s behavior. For example, one mathematician, who asked not to be named, said that in refusing the Fields Medal, Perelman communicated the message that he is more important than the medal. “It’s good marketing,” the mathematician remarked.

No one has ever turned down a Fields Medal before. It has happened three times that medalists were not present to collect their medals. In 1966 Alexandre Grothendieck refused to travel to the ICM site in Moscow to protest actions of the Soviet government. Serguei Novikov was not permitted to travel from the Soviet Union to the 1970 Congress in Nice to obtain his medal; the reasons can be traced to his support of dissidents during the 1960s and a negative recommendation to the Soviet authorities by officials at the Steklov Institute. In 1978 Gregory Margulis was prevented from traveling from the Soviet Union to Helsinki to
collect his medal because a board of mathematicians recommended to the Soviet government that he be denied a permit to travel. Although they did not personally attend the awards ceremony, Grothendieck, Novikov, and Margulis all accepted the honor. In 1988 Grothendieck famously declined the Crafoord Prize of the Royal Swedish Academy of Sciences, which awarded the approximately US$200,000 prize jointly to him and Pierre Deligne. In Grothendieck’s reasons for declining the prize—one of which was the degradation of ethics within the mathematical profession—one hears an echo of what is known of Perelman’s reasons for declining the Fields Medal.

The 2006 medals were unusual not only because of Perelman’s refusal to accept his. They were also unusual in honoring mathematicians who have done extensive collaborative work. Terence Tao has had over thirty collaborators, which seems an especially large number given his age; he is only thirty-one. He is a member of the so-called “I-team”, where “I” stands for various things including “interaction”; the other I-team members are James Colliander, Markus Keel, Gigliola Staffilani, and Hideo Takaoka. The medal for Wendelin Werner honors work done jointly with Gregory Lawler and Oded Schramm; it happens that Werner is the only one of the three who meets the age requirement for the Fields Medal, which says that a medalist must not have turned forty before the start of the year in which the medal is given. (Schramm was considered for a Fields Medal in 2002, but he was already too old by less than a month.) Andrei Okounkov has also had many collaborators, and some of his most spectacular work has been in enumerative geometry in ongoing joint work with Rahul Pandharipande. “Mathematics is changing,” said Ball, who served as chair of the Fields Medal committee. “We see a lot more collaborative work now.”

The instructions to the Fields Medal committee call for choosing between two and four medalists, with a strong preference for four. Ball said this preference is intended to ensure diversity among the areas of the medalists. It also allows for recognition of different kinds of contributions. “There are many different things that are important in mathematics: creating theories, making connections between different subjects,” he said. “There has to be mathematical depth—that’s essential. In my personal opinion, one has to use methods of evaluation of the importance of people’s work that are appropriate for the kind of mathematics that they do.” He noted that the increasing trend toward joint work may make it difficult for future Fields Medals committees to figure out who among the collaborators should be honored.

Of Knots and Flows

The Madrid ICM was dominated by talk about the Fields Medals but not overwhelmed by it. There was a full complement of plenary and section lectures, plus several panel discussions and special events. One of the standouts among the plenary lectures was that by Étienne Ghys of the École Normale Supérieure de Lyon, who spoke on “Knots and Dynamics”. His talk began with what he called a paradigmatic picture in chaotic dynamics, namely, that of the Lorenz attractor. The periodic orbits of a flow are knots. One can create additional knots associated to a flow by arbitrarily connecting the ends of pieces of flow lines. One can then examine which kinds of knots arise in this way and ask whether a flow can be viewed as a limit of a sequence of knots. The knots that appear in the Lorenz attractor are of a special type, and some knots, like the figure-8 knot, never appear there.

Ghys described a thread of ideas starting with the Lorenz attractor and leading up to his recent work on “modular knots”, and then came full circle back to the set of knots found in the Lorenz attractor, for they turn out to be the same as modular knots.

Ghys’s masterly use of computer animations not only made for a visually attractive presentation but also got to the heart of the mathematical ideas. The animations were made with Jos Leys (http://www.josleys.com), a mechanical engineer who has an interest in mathematics. At the end of his talk Ghys emphasized the importance of mathematicians communicating with nonmathematicians, a theme struck by several speakers at the ICM. He displayed a quotation of David Hilbert that made several appearances in lectures at the Madrid congress: A mathematical theory is not to be considered complete until you have made it so clear that you can explain it to the first person you meet on the street. Ghys went ten minutes over his allotted time, but the rapt audience hardly seemed to care. (Ghys and Leys have written a Web-based article about this work, including many of the animations,
perelman and for mathematics," he said.

"It is a great victory for confidence
display a slide saying "The Poincaré
Gang Tian of Princeton University—Morgan could
work that has led to a 473-page book written with
years of work to understand Perelman's ideas—
to the Poincaré Conjecture. After putting in three

decades. In the 1970s, he said, if one had asked
expressed his admiration for what Perelman has
done and said he "would be delighted to work with
him in the future."

In contrast to Hamilton's lecture, which was
aimed at mathematicians, Morgan's lecture could be
understood by the general public. He discussed
the origin and mystique of the Poincaré Conjecture
and how perceptions of it have changed over the
decades. In the 1970s, he said, if one had asked
topologists whether the conjecture was true, they
would probably have been evenly split in their an-
swers. But by 1985, after William Thurston had de-
scribed his vision of the nature of three-manifolds
that has now become known as the Geometrization
Conjecture, the vote would have been more like
ten to one in favor of Poincaré being true. This is
because the Geometrization Conjecture had by
then been verified in many cases, and there had been
a good deal of development in the field of topol-
yology without the emergence of any contradictions
to the Poincaré Conjecture. After putting in three
years of work to understand Perelman's ideas—
work that has led to a 473-page book written with
Gang Tian of Princeton University—Morgan could
confidently display a slide saying "The Poincaré
Conjecture is proved!" "It is a great victory for
Perelman and for mathematics," he said.

A Deluge of Coverage

The media coverage for the Madrid ICM greatly
surpassed that of any previous congress. The ICM
publicity effort was headed by Ignacio Bayo and
Monica Salomone, both freelance science reporters

"...a common language independent of politics,
religion, and culture"

Below are excerpts from a speech given by John Ball, presi-
dent of the International Mathematical Union (IMU), during the
ICM 2006 opening ceremony.

While celebrating this feast of mathematics, with the many talking-points
that it will provide, it is worth reflecting
on the ways in which our community functions.

Mathematics is a profession of high
standards and integrity. We freely
discuss our work with others, without fear
of it being stolen, and research is com-
municated openly prior to formal pub-
lication. Editorial procedures are fair and
proper, and work gains its reputation
through merit and not by how it is pro-
moted. These are the norms operated by
the vast majority of mathematicians. The exceptions are rare,
and they are noticed....

Mathematicians do not own mathematics. But among the
many millions who use mathematics daily, they are distin-
guished by their constant search for deeper understanding,
based on an appreciation of beauty, simplicity, structure, and
the power of generalization. Yet the lesson of past centuries
is that these vital elements in the development of mathemat-
ics require constant invigoration by new questions that come
from the world about us.

There is no object, large or small, and almost no aspect of
human existence to which mathematics cannot contribute under-
standing. In particular, the great questions facing the planet,
such as how to model and manage the climate, pose profound
mathematical challenges....When contemplating the impor-
tance of mathematics for the world, we see the importance of
supporting the development of mathematics throughout the
world. Mathematical talent does not respect geographical
boundaries, but the opportunities, working conditions, and tra-
dition necessary for such talent to flourish depend heavily on
geography, economic conditions, and politics. Each country and
region has its own need for science and mathematics, its own
problems with regard to mathematical development.

It is for these reasons that the IMU has made a special ef-
fort over the last four years to increase its support for math-
ematicians in developing countries....Despite these initiatives,
a dramatic increase in both funding and scientific interchange
is required to address the global imbalances in mathematical
education and research. In sharing mathematical knowledge
and experience with those who work around the world, it is
the whole mathematical community that benefits, and we make
our own contribution to peace and stability through the bind-
ing together of peoples by a common language independent
of politics, religion, and culture.

I wish you all a rewarding and exciting Congress.
who frequently write for the main Spanish newspaper, El País. The ICM organizers initially estimated that perhaps twenty media representatives would attend the opening ceremony; when the day came, around one hundred fifty were registered. The Spanish media came out in force, partly because of the presence of the king; there were also reporters from media in Russia, Japan, Italy, Germany, Switzerland, and the United Kingdom. Many reporters who could not attend in person followed the ceremony on a Web broadcast. As the news of Perelman’s declination spread, telephone calls poured in from all continents, and the press office staff valiantly struggled to meet the deluge.

Although media interest tapered off after the opening ceremony, the Spanish news agencies continued to send reporters to the meeting, and several television stations did extensive coverage with an eye to creating educational programs about mathematics and the congress. Apart from Bayo and Salomone, the press office team consisted of three senior journalists, a translator, a photographer, a layout and graphics editor, and three mathematician volunteers. The team organized several press conferences and handled all kinds of media queries. It also produced the ICM Daily News, which was filled with a variety of snappy and appealing articles about the mathematicians in attendance and the lectures given. The Daily News covered the unfolding Perelman saga with interviews with Hamilton and Morgan, as well as with James Carlson, president of the Clay Mathematics Institute, and Huai-Dong Cao of Lehigh University. Cao wrote an article with Xi-Ping Zhu of the University of Xhongshan that provides a detailed account of the work of Hamilton and Perelman leading to a proof of the Poincaré and Geometrization Conjectures. (Two other mathematicians who have produced an exposition of Perelman’s work—John Lott of the University of Michigan and Bruce Kleiner of Yale University—both spoke at the congress.) (Issues of the ICM Daily News are available at http://www.icm2006.org/dailynews/)

Popular press articles about the Fields Medals began to appear in advance of the congress, when rumors were circulating about whether Perelman would be awarded a medal and if so, whether he might turn it down. Unlike in 2002, when most coverage of the medals was concentrated in the home countries of the winners, there was extensive coverage of the 2006 medals worldwide. In 2002 the New York Times ignored the Fields Medals, but this year the Times carried two articles about them, as well as a piece beforehand discussing Perelman’s story. The interest in Perelman persisted after the congress ended. An editorial by Evgeny Morozov, a Russian newspaper columnist, appeared in the August 31, 2006, issue of the International Herald Tribune and described the fascination that Perelman had ignited in Russia. “Russian blogs are already buzzing with poems, songs and jokes about Perelman,” Morozov writes. (For more information on media coverage about the Fields Medals, visit the Math Digest on the AMS website; go to http://www.ams.org/mathmedia/mathdigest and look for articles appearing in August 2006.)

Spanish mathematicians were thrilled with the success of the congress. “This is a historic event for Spanish mathematics,” said Enrique Zuazua of the Universidad Autónoma de Madrid. As soon as the king agreed to attend, Zuazua noted, many doors opened to the congress organizers that had been closed before. Carlos Andradas of Universidad Complutense de Madrid, who served as vice president general of the congress, said that the support from the Spanish authorities carries recognition of the strength of Spanish mathematics and is a statement of support for the future of science in Spain. The congress drew participants from 118 countries and over 1,000 mathematicians from all across Spain. With the unprecedented international media coverage putting the spotlight on mathematics and Spain, Andradas believes that this congress could mark a new breakthrough for Spanish mathematics. He said, “I hope that the Spanish mathematical community continues seeing the prosperity of mathematics as a common and collective task.”

—Allyn Jackson
Jefferson Science Fellows are senior tenured faculty in science and engineering who spend a year working to bring “science to statecraft” in the U.S. Department of State. The program is sponsored by the National Academies of Science and Engineering with support from the Carnegie and MacArthur Foundations. I am the first mathematician among the sixteen fellows appointed during the program’s three-year life. (Perhaps I am the first to have applied?) The opportunity is unusual, exciting, and worth considering by other mathematicians.

The straightforward technical challenges are nonexistent. Indeed, my five Jefferson colleagues and I have struggled with technical withdrawal syndrome: we knew from the start we would do very little serious science but struggled with confronting that reality as we went through the placement process this August. But we got over it and have settled down to work that ranges from proximate to far distant from our academic identities. (The other Jefferson Fellows for 2006-07 are Osama Awaldekarim, a physicist/engineer specializing in nanotechnology; Kim Boyer, an electrical engineer who does computer vision and medical image analysis; Michael Mauel, a plasma physicist; Katherine Seley-Radtke, a biochemist; and Claudio Ciolfi-Revilla, a computational social scientist.)

I am working in the Bureau of East Asian and Pacific Affairs for the Office of Regional Security and Policy Affairs, which is responsible for a wide range of activities arising from the U.S. commitment to an enhanced partnership with the Association of Southeast Asian Nations (ASEAN). I am also assisting with some UN agencies whose missions involve development.

As I write this in mid-September, I see no likely connections with my experience in measurement, operation, and control of electric power networks. (I can’t even turn on the lights in my office—they’re controlled by a motion detector!) But I do anticipate opportunities to foster collaborations around science and technology and to connect scientists and others in ASEAN’s member nations with colleagues in the U.S. If I get lucky, I might even help to nurture some development programs that support good science that serves a local population.

I suspect that most Jefferson Fellows have come to accept this technical distance as both an opportunity and a price to pay for the chance to learn about a complex and important part of our government. Our most valuable contributions may be what we know instinctively about the cultures of science and the academy, not our specialties. Certainly, we can’t help but learn from the very smart, broadly experienced, generalists with whom we are working. We will not become diplomats in a

Paul Davis is professor of mathematical sciences at Worcester Polytechnic Institute. He is on leave this year as a Jefferson Science Fellow in the State Department. His email address is pwdavis@wpi.edu.
single year, but we can contribute a scientist’s perspective to the formation and execution of foreign policy.

Past fellows have made many specific contributions: alerting an international team to the danger of an instability-driven release of CO₂ from a lake if it were pumped too low; remote imaging to predict humanitarian disasters; international collaborations on a multitude of scientific fronts; science-based decisions about import-export controls; and much more. But a large share of the value of their work seems to have come as well from the habits of mind common to science: asking for data, questioning, examining sensitivities, and so on. Those fellows have also provided a significant measure of sound thinking around matters as diverse as avian influenza and nanotechnology.

Such concrete accomplishments notwithstanding, I was drawn to this fellowship by the vague notion of using science and technology to aid international development. I was completing a seven-year term as the administrator responsible for WPI’s large international program. Its key element is assigning interdisciplinary student teams to solve social-technical problems on site under faculty guidance; more than 50% of WPI’s undergraduates benefit from one of these two-month international assignments.

Intellectually and educationally, this work looks a lot like dirty-fingernails applied mathematics without the equations: listen carefully to discover an underlying problem, solve it as simply and completely as possible in the time available, and deliver the solution so it serves those who need it. The Jefferson Fellowship offered a chance to pose for myself the same challenge my colleagues and I had been putting to students: use what you know, at multiple levels, to do something worthwhile for others.

My Jefferson colleagues seem to have similar motivations. Collaboration and team work are common in our backgrounds. Indeed, two of the six of us are even recovering academic administrators. (Coincidentally, Daniel Ullman, this year’s AMS Congressional Fellow, has just completed a term as department chair as well.) Extrapolating from such sparse data, it seems that no particular part of science, mathematics, or engineering has a natural lock on the Jefferson Fellowships. But there is a rewarding place for individuals with broad interests, a willingness to step back from the challenges of their speciality, and a desire to wrestle productively with poorly defined problems. I hope more mathematicians will participate.

Applications are due December 31, 2006. Full information appears at http://www7.nationalacademies.org/jefferson/.
The 2006 Delbert Ray Fulkerson Prize was presented at the 19th International Symposium on Mathematical Programming, held July 30 to August 4, 2006, in Rio de Janeiro, Brazil. Listed below are the names of the authors receiving the Fulkerson Prize, the titles of their prize-winning papers, and the prize citations.


Testing whether an integer is a prime number is one of the most fundamental computational and mathematical problems. The existence of short certificates for both compositeness and primality was known since the 1970s and suggested that primality testing might be in P. Yet, despite numerous efforts and a flurry of algorithms, it was not until 2002 that Agrawal, Kayal, and Saxena devised the first deterministic polynomial-time algorithm for primality testing. Earlier algorithms had either assumed the generalized Riemann hypothesis, or been randomized or had been only subexponential. This is a stunning development. This result is a true masterpiece, combining algebraic and number theoretic results in a seemingly simple way.

Manindra Agrawal is in the Computer Science Department of the Indian Institute of Technology in Kanpur. Neeraj Kayal and Nitin Saxena are students of Agrawal’s.


The permanent of a matrix has been studied for over two centuries and is of particular importance to statistical physicists as it is central to the dimer and Ising models. For a 0-1 matrix, it represents the number of perfect matchings in the corresponding bipartite graph. Although polynomial-time computable for planar graphs, the computation of the permanent is #P-complete for general graphs as shown by Valiant in 1979. This opened the search for approximation schemes. In this paper, Jerrum, Sinclair, and Vigoda give the first Fully Polynomial Randomized Approximation Scheme for computing the permanent of any 0-1 matrix or any non-negative matrix. This is a remarkable result. Their algorithm is based on updating a Markov chain in a way that quickly converges to a rapidly mixing non-uniform Markov chain on perfect matchings and near-perfect matchings. Their work builds upon the earlier pioneering work of Jerrum and Sinclair who initiated the use of rapidly mixing Markov chains for combinatorial problems.

Mark Jerrum is in the School of Mathematics at the University of Edinburgh. Alistair Sinclair is in the Computer Science Division of the University of California, Berkeley. Eric Vigoda is in the College of Computing at the Georgia Institute of Technology.


Kuratowski’s theorem says that a graph is planar if and only if it does not contain $K_5$ or $K_{3,3}$ as a minor. Several other excluded minor characterizations are known, and Wagner conjectured that any minor-closed graph property can be characterized by a finite list of excluded minors. Restated, this says that for any infinite family of finite graphs, one of its members is a minor of another one. In a remarkable tour de force, Robertson and Seymour proved Wagner’s conjecture, and this paper appeared as part 20 of their monumental work on the theory of graph minors. Their proof of the Graph...
Minor Theorem required the development of many graph theoretic concepts, such as linkages and tree-width. This is a spectacular achievement in graph theory with far reaching consequences. It shows, for example, that embeddability in any fixed surface can be characterized by a finite list of excluded minors, or that the disjoint paths problem can be solved in polynomial time for a fixed number of terminals.

Neil Robertson is in the Department of Mathematics at the Ohio State University. Paul D. Seymour is in the Department of Mathematics at Princeton University.

About the Prize

The Delbert Ray Fulkerson Prize recognizes outstanding papers in the area of discrete mathematics. Established in 1979, the prize is sponsored jointly by the Mathematical Programming Society (MPS) and the AMS. Up to three awards of US$1,500 each are made every three years at each (triennial) international symposium of the MPS. The prize is made possible by a memorial fund established by friends of the late Delbert Ray Fulkerson to encourage mathematical excellence in the fields of research in which he worked.

The prize is presented for papers published during the six calendar years preceding the year in which the prize is given. The prize is given for single papers, not series of papers or books, and in the event of joint authorship the prize is divided. The topics of papers considered for the prize include graph theory, networks, mathematical programming, applied combinatorics, and related subjects.

The selection committee for the 2006 Fulkerson Prize consisted of Noga Alon, William Cunningham, and Michel Goemans (chair).

—Announcement of the Fulkerson Prize Committee
Introduction
The Annual Survey of the Mathematical Sciences collects information each year about departments, faculties, and students in the mathematical sciences at four-year colleges and universities in the United States. Definitions of the various groups surveyed in the Annual Survey can be found in the box on page 1355 of this report. We present information about the faculties and instructional programs at the undergraduate and graduate levels in these departments for the 2005–2006 academic year.

Information about departments was gathered on a questionnaire called the Departmental Profile. This questionnaire was mailed to all departments in Groups I, II, III, IV, and Va and to stratified random samples from Groups M and B. The percentage of the departments responding in each of the doctoral groups was greater than 94 percent. Prior to 2001, if doctoral departments did not respond, simple projections were made to the whole population using the data from those departments who did respond. Beginning in 2002, if a department did not return the Departmental Profile questionnaire but had returned one within the last three years, the data from the most recent questionnaire was used.

The Departmental Profile questionnaire is mailed to a stratified random sample of departments drawn from each of Groups M and B, and standard statistical projections are made using the data from the respondents. The stratification for Groups M and B is based on the enrollment of the school. The response rates for Groups M and B were 59% and 43%, respectively. For the fourth year, standard errors are reported for several of the more important projections made in Groups M and B. The box on page 1346 discusses these standard errors in more detail.

The careful reader will note that a row or column total may differ slightly from the sum of the individual entries. All the table entries are the rounded values of the individual projections associated with each entry, and the differences are the result of this rounding (as the sum of rounded numbers is not always the same as the rounded sum).

Ellen E. Kirkman is professor of mathematics, Wake Forest University. James W. Maxwell is AMS associate executive director for special projects. Colleen A. Rose is AMS survey analyst.
Highlights
The estimated number of full-time faculty in all mathematics groups combined is 21,903 (with a standard error of 597), up from 20,224 (with a standard error of 308) last year. The number of nondoctoral full-time faculty is estimated at 3,804, up from 3,673 last year. The estimated number of part-time faculty is 6,526, down from 8,089 last year. The number of full-time doctoral non-tenure-track faculty (including postdoctoral appointments) is estimated at 2,180, up from 2,064 last year. Women comprise 26% of the full-time faculty in mathematics. The size of the standard error makes it possible that some of the changes observed are due to sampling error.

The estimated total number of full-time doctoral positions under recruitment in the mathematics groups combined during 2004–05 is down to 1,700 from 1,721 last year (a decrease of 1%). Of these 1,700 full-time positions, 1,176 were tenured/tenure-track, up from 1,128 last year (an increase of 4%). Of the 1,176 full-time tenured/tenure-track doctoral positions, 1,431 were open to new doctorates, up from 1,423 last year.

The estimated total number of full-time doctoral positions filled with a doctoral hire in mathematics departments is up to 1,385 from 1,344 last year (an increase of 3%). The total number of tenured/tenure-track doctoral hires is up 24% in Groups I, II, III, and Va combined. In Groups M and B combined (to 266 from 214 last year), and down 7% in Groups M and B combined (to 562 from 606 last year).

The estimated total number of new doctoral hires in mathematics departments is down 7% (to 547 from 590) this year from last year: it is up 4% (to 241 from 232) in Groups I, II, III, and Va combined; and down 15% (to 306 from 358) in Groups M and B combined. The number of new doctoral tenured/tenure-track hires is down 7% (to 295 from 318): it is up 76% (to 65 from 37) in Groups I, II, III, and Va combined; and down 18% (to 230 from 281) in Groups M and B combined.

The estimated total number of not-new doctoral hires into tenured/tenure-track positions is up 6% in the mathematics groups combined. In Groups I, II, III, and Va combined, 61% of those hired into tenured/tenure-track positions had held a non-tenure-track position the previous year (52% held a postdoctoral position); in Groups M and B combined, these percentages were 32% and 15%, respectively.

Group IV (statistics) showed a 19% decrease in the total number of doctoral positions under recruitment, and there were 97 new full-time doctoral hires, a 18% decrease over last year. The number of full-time faculty rose 2%, and the numbers of part-time and of non-tenure track faculty increased.

The estimated number of full-time graduate students in mathematics departments in fall 2005 increased to 13,068 from 12,853 last year, but declined to 10,565 from 10,707 in the doctoral mathematics departments.

Remarks on Statistical Procedures
This report is based on information gathered from departments of mathematical sciences in the U.S., separated into groups by highest degree granted as defined on page 1357. Groups for doctoral-granting departments are I (Public), I (Private), II, III, IV, and Va. Groups M and B consist of those departments offering master’s and bachelor’s degrees respectively.

While the questionnaire on which this report is based is sent to every doctoral department, it is sent to a stratified random sample in Group M and B departments.

The response rate is typically between 90 and 100 percent for the doctoral groups. Prior to last year, simple projections were made using the questionnaires that were returned to get estimated totals for the entire population. After a couple of years of experimentation, a new procedure was begun for the 2001 survey. If a doctoral department did not return its questionnaire this year but had returned one within the past three years, those numbers were used as its response for the current year. This procedure will give us even more accurate estimates than we have gotten in the past.

The stratified random sampling procedures used for Groups M and B were put in place four years ago. Beginning with the 2001 Annual Survey, standard errors were calculated for some of the key estimates. Standard errors are calculated using the variability in the data and can be used to crudely measure how close our estimate is to the true value for the population. As an example, the number of full-time faculty in Group M is estimated at 4,522, with a standard error of 138. This means the actual number of full-time faculty in Group M is most likely between 4,522 plus or minus two standard errors, or between 4,246 and 4,798. This is much more informative than simply giving the estimate of 4,522.

Estimates are also given for parameters that are totals from all groups, such as the total number of full-time faculty. The values given for the doctoral groups are assumed to be the true parameters for these groups, because they are not sampled and hence are not subject to sampling variability. The only variability in a total of several groups comes from the sampling for Groups M and B. Using the standard errors for M and B, it is possible to calculate a standard error for the total. For example, an estimate of the total number of full-time faculty in all groups but group IV is 21,903, with a standard error of 597. Standard errors, when calculated for an estimate, appear in the tables in parentheses underneath the estimate.
Faculty Profile

The Departmental Profile, sent in fall 2005 to mathematical sciences departments at four-year colleges and universities as part of the Annual Survey, gathered information about faculties at these schools in fall 2005; this section presents some of that data. The 2005 First Report presented data collected earlier about faculty salaries (pages 239–44 of the February 2006 issue of the Notices of the AMS).

Table 1A gives the number of faculty for different categories of faculty broken down by group. Table 1B gives the same information for females only. Table 1C gives some percentages based on the information in Tables 1A and 1B. The estimated total number of full-time faculty in the mathematics groups (Groups I, II, III, Va, M, and B combined) is 21,903, up 1,679 (an 8% increase) from last year, with a standard error of 597. We can be quite confident that the actual total number of faculty in these groups is in the interval 21,903 plus or minus 1,194. The doctoral mathematics departments I, II, III, and Va are up 298 faculty members, and Group B is up 1,214. Since the standard errors for the total number of full-time faculty in Groups M and B are 138 and 580 respectively, these increases exceed the chance variability we expect with standard errors of 138 and 580 and would indicate real increases. The standard error for the total number of full-time faculty in Group B was 278 last year, so this year’s estimates that include Group B are more variable than last year’s. The total faculty size in the statistics group (Group IV) is up to 1,626 this year from 1,597 last year (a 2% increase). The numbers of full-time faculty and of doctoral full-time faculty are up in each group, except Group Va.

The number of non-tenure-track doctoral full-time faculty and the number of part-time faculty in mathematics departments had been increasing in recent years, a disturbing trend highlighted in “Staffing shifts in mathematical sciences departments, 1990–2000” (David J. Lutzer and James W. Maxwell, Notices, June/July 2003, pages 683–6). More recently the number of part-time faculty has declined, but the number of non-tenure-track doctoral full-time faculty (including postdoctoral positions) has continued to increase. This year the estimated number of part-time faculty in Groups I, II, III, Va, B, and M combined is down to 6,526 (with a standard error of 337) from 8,089 last year (a 24% increase), and the number of non-tenure-track doctoral faculty (including postdoctoral positions) is estimated at 2,180 this year, up 6% from 2,064 last year. This year the number of part-time faculty is down from last year in each group, except Group IV, and the number of non-tenure-track doctoral faculty is up in each group, except Group Va and Group M. This year in Group B the estimated number of full-time faculty is up by 1,214 (the standard error is 580) to 9,594 (the highest ever reported), the estimated number of non-tenure-track doctoral faculty is up by 44, and the estimated number of part-time faculty is down by 1,216 (the standard error is 272) to 3,630 (a 25% decrease); while in Groups I, II, III, and Va combined the number of full-time faculty is up by 167, the number of non-tenure-track doctoral faculty is up by 87 (from 1,314 to 1,401) and number of part-time faculty decreased 22% (from 1,355 to 1,054). In Group IV the number of part-time faculty increased from 246 last year to 254 this year, and the number

---

### Table 1A: Total Faculty, Fall 2005

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I Public</th>
<th>I Private</th>
<th>II</th>
<th>III</th>
<th>Va &amp; Va</th>
<th>M</th>
<th>B</th>
<th>Va, M, &amp; B</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total full-time faculty (Standard error)</td>
<td>1835</td>
<td>976</td>
<td>2542</td>
<td>2154</td>
<td>280</td>
<td>7787</td>
<td>4522</td>
<td>9594</td>
<td>21903</td>
</tr>
<tr>
<td>Doctoral full-time faculty</td>
<td>1759</td>
<td>967</td>
<td>2272</td>
<td>1827</td>
<td>266</td>
<td>7091</td>
<td>3616</td>
<td>7392</td>
<td>18099</td>
</tr>
<tr>
<td>Tenured</td>
<td>1167</td>
<td>563</td>
<td>1567</td>
<td>1274</td>
<td>172</td>
<td>4743</td>
<td>2377</td>
<td>4697</td>
<td>11816</td>
</tr>
<tr>
<td>Untenured, tenure-track</td>
<td>190</td>
<td>80</td>
<td>289</td>
<td>355</td>
<td>29</td>
<td>943</td>
<td>974</td>
<td>2179</td>
<td>4096</td>
</tr>
<tr>
<td>Postdoctoral appointments</td>
<td>252</td>
<td>196</td>
<td>241</td>
<td>32</td>
<td>43</td>
<td>764</td>
<td>5</td>
<td>48</td>
<td>817</td>
</tr>
<tr>
<td>Other non-tenure-track (Standard error)</td>
<td>150</td>
<td>128</td>
<td>171</td>
<td>166</td>
<td>22</td>
<td>637</td>
<td>258</td>
<td>468</td>
<td>1363</td>
</tr>
<tr>
<td>Nondoctoral full-time faculty</td>
<td>76</td>
<td>9</td>
<td>270</td>
<td>327</td>
<td>14</td>
<td>696</td>
<td>906</td>
<td>2202</td>
<td>3804</td>
</tr>
<tr>
<td>Total part-time faculty (Standard error)</td>
<td>121</td>
<td>51</td>
<td>347</td>
<td>515</td>
<td>20</td>
<td>1054</td>
<td>1842</td>
<td>3630</td>
<td>6526</td>
</tr>
</tbody>
</table>

---

### Table 1B: Total Faculty (Female Only)

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I Public</th>
<th>I Private</th>
<th>II</th>
<th>III</th>
<th>Va &amp; Va</th>
<th>M</th>
<th>B</th>
<th>Va, M, &amp; B</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total full-time faculty (Standard error)</td>
<td>1296</td>
<td>633</td>
<td>1969</td>
<td>1602</td>
<td>200</td>
<td>5844</td>
<td>3282</td>
<td>5890</td>
<td>11102</td>
</tr>
<tr>
<td>Doctoral full-time faculty</td>
<td>1200</td>
<td>605</td>
<td>1800</td>
<td>1500</td>
<td>190</td>
<td>5500</td>
<td>3050</td>
<td>5500</td>
<td>10500</td>
</tr>
<tr>
<td>Tenured</td>
<td>1000</td>
<td>500</td>
<td>1500</td>
<td>1200</td>
<td>150</td>
<td>4500</td>
<td>2550</td>
<td>4500</td>
<td>9000</td>
</tr>
<tr>
<td>Untenured, tenure-track</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td>120</td>
<td>15</td>
<td>450</td>
<td>250</td>
<td>450</td>
<td>900</td>
</tr>
<tr>
<td>Postdoctoral appointments</td>
<td>150</td>
<td>75</td>
<td>225</td>
<td>150</td>
<td>25</td>
<td>475</td>
<td>275</td>
<td>475</td>
<td>950</td>
</tr>
<tr>
<td>Other non-tenure-track (Standard error)</td>
<td>150</td>
<td>120</td>
<td>270</td>
<td>220</td>
<td>30</td>
<td>755</td>
<td>325</td>
<td>755</td>
<td>1510</td>
</tr>
<tr>
<td>Nondoctoral full-time faculty</td>
<td>75</td>
<td>33</td>
<td>210</td>
<td>270</td>
<td>30</td>
<td>675</td>
<td>670</td>
<td>2100</td>
<td>3804</td>
</tr>
<tr>
<td>Total part-time faculty (Standard error)</td>
<td>113</td>
<td>53</td>
<td>345</td>
<td>515</td>
<td>20</td>
<td>1055</td>
<td>1842</td>
<td>3630</td>
<td>6526</td>
</tr>
</tbody>
</table>
### Table 1B: Female Faculty, Fall 2005

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I Public</th>
<th>I Private</th>
<th>II</th>
<th>III</th>
<th>Va</th>
<th>I, II, III, &amp; Va</th>
<th>M</th>
<th>B</th>
<th>I, II, III, Va, M, &amp; B</th>
<th>IV</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female full-time faculty</td>
<td>251</td>
<td>116</td>
<td>489</td>
<td>498</td>
<td>45</td>
<td>1399</td>
<td>1382 (66)</td>
<td>2857 (230)</td>
<td>5638 (239)</td>
<td>439</td>
<td>6078</td>
</tr>
<tr>
<td>Doctoral full-time faculty</td>
<td>205</td>
<td>113</td>
<td>316</td>
<td>315</td>
<td>36</td>
<td>985</td>
<td>883</td>
<td>1859</td>
<td>3728</td>
<td>403</td>
<td></td>
</tr>
<tr>
<td>Tenured</td>
<td>86</td>
<td>34</td>
<td>127</td>
<td>159</td>
<td>18</td>
<td>424</td>
<td>474</td>
<td>1080</td>
<td>1977</td>
<td>141</td>
<td></td>
</tr>
<tr>
<td>Untenured, tenure-track</td>
<td>35</td>
<td>15</td>
<td>74</td>
<td>95</td>
<td>4</td>
<td>223</td>
<td>314</td>
<td>614</td>
<td>1151</td>
<td>124</td>
<td></td>
</tr>
<tr>
<td>Postdoctoral appointments</td>
<td>50</td>
<td>35</td>
<td>48</td>
<td>7</td>
<td>8</td>
<td>148</td>
<td>2</td>
<td>41</td>
<td>191</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Other non-tenure-track</td>
<td>34</td>
<td>29</td>
<td>67</td>
<td>54</td>
<td>6</td>
<td>190</td>
<td>93</td>
<td>125</td>
<td>409</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Nondoctoral full-time faculty</td>
<td>46</td>
<td>3</td>
<td>173</td>
<td>183</td>
<td>9</td>
<td>414</td>
<td>499</td>
<td>998</td>
<td>1911</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Female part-time faculty</td>
<td>50</td>
<td>8</td>
<td>130</td>
<td>199</td>
<td>3</td>
<td>390</td>
<td>682</td>
<td>1503</td>
<td>2576</td>
<td>99</td>
<td></td>
</tr>
</tbody>
</table>

### Table 1C: Full-Time Faculty, Fall 2005

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I Public</th>
<th>I Private</th>
<th>II</th>
<th>III</th>
<th>Va</th>
<th>M</th>
<th>B</th>
<th>IV</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time faculty</td>
<td>1835</td>
<td>976</td>
<td>2542</td>
<td>2154</td>
<td>280</td>
<td>4522</td>
<td>9594</td>
<td>1626</td>
<td>23529</td>
</tr>
<tr>
<td>Percentage of total full-time faculty</td>
<td>8%</td>
<td>4%</td>
<td>11%</td>
<td>9%</td>
<td>1%</td>
<td>19%</td>
<td>41%</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>Female full-time faculty</td>
<td>251</td>
<td>116</td>
<td>489</td>
<td>498</td>
<td>45</td>
<td>1382</td>
<td>2857</td>
<td>439</td>
<td>6078</td>
</tr>
<tr>
<td>Percentage of female full-time faculty</td>
<td>4%</td>
<td>2%</td>
<td>8%</td>
<td>8%</td>
<td>1%</td>
<td>23%</td>
<td>47%</td>
<td>7%</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Table 1D: Faculty Counts and Percentage Female, Fall 1999-2005

<table>
<thead>
<tr>
<th>Groups I, II, III, &amp; Va</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral full-time faculty</td>
<td>5765</td>
<td>5568</td>
<td>5598</td>
<td>5616</td>
<td>5559</td>
<td>5604</td>
<td>5686</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>9%</td>
<td>9%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Non-tenure-track</td>
<td>1014</td>
<td>993</td>
<td>1233</td>
<td>1274</td>
<td>1343</td>
<td>1314</td>
<td>1401</td>
</tr>
<tr>
<td>Percentage female</td>
<td>12%</td>
<td>11%</td>
<td>9%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Part-time faculty</td>
<td>1217</td>
<td>1399</td>
<td>1467</td>
<td>1504</td>
<td>1389</td>
<td>1355</td>
<td>1054</td>
</tr>
<tr>
<td>Percentage female</td>
<td>38%</td>
<td>37%</td>
<td>38%</td>
<td>35%</td>
<td>35%</td>
<td>37%</td>
<td>37%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group M</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral full-time faculty</td>
<td>3599</td>
<td>3670</td>
<td>3191</td>
<td>3188</td>
<td>3005</td>
<td>3113</td>
<td>3351</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>20%</td>
<td>21%</td>
<td>23%</td>
<td>22%</td>
<td>22%</td>
<td>23%</td>
<td>24%</td>
</tr>
<tr>
<td>Non-tenure-track</td>
<td>146</td>
<td>262</td>
<td>183</td>
<td>276</td>
<td>230</td>
<td>277</td>
<td>263</td>
</tr>
<tr>
<td>Percentage female</td>
<td>56%</td>
<td>29%</td>
<td>24%</td>
<td>39%</td>
<td>33%</td>
<td>48%</td>
<td>36%</td>
</tr>
<tr>
<td>Part-time faculty</td>
<td>1768</td>
<td>1906</td>
<td>2323</td>
<td>2393</td>
<td>1952</td>
<td>1888</td>
<td>1842</td>
</tr>
<tr>
<td>Percentage female</td>
<td>43%</td>
<td>35%</td>
<td>36%</td>
<td>37%</td>
<td>37%</td>
<td>37%</td>
<td>37%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group B</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral full-time faculty</td>
<td>4580</td>
<td>5486</td>
<td>5665</td>
<td>5569</td>
<td>6172</td>
<td>5770</td>
<td>6875</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>25%</td>
<td>22%</td>
<td>24%</td>
<td>23%</td>
<td>26%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Non-tenure-track</td>
<td>514</td>
<td>407</td>
<td>504</td>
<td>507</td>
<td>460</td>
<td>472</td>
<td>516</td>
</tr>
<tr>
<td>Percentage female</td>
<td>24%</td>
<td>30%</td>
<td>29%</td>
<td>36%</td>
<td>20%</td>
<td>29%</td>
<td>32%</td>
</tr>
<tr>
<td>Part-time faculty</td>
<td>3298</td>
<td>3580</td>
<td>4197</td>
<td>4117</td>
<td>3997</td>
<td>4846</td>
<td>3630</td>
</tr>
<tr>
<td>Percentage female</td>
<td>41%</td>
<td>40%</td>
<td>43%</td>
<td>45%</td>
<td>42%</td>
<td>44%</td>
<td>41%</td>
</tr>
</tbody>
</table>
of non-tenure-track doctoral faculty increased from 364 last year to 376 this year due to the increased number of other non-tenure-track positions. Another category that has been increasing the past few years is the nondoctoral full-time faculty; this year this group is estimated at 3,804 in Groups I, II, III, Va, M, and B combined, up from 3,673 last year (a 4% increase).

Table 1D gives a seven-year history of tenure/tenure-track, non-tenure-track, and part-time faculty for Groups I, II, III, and Va combined, for Group M, and for Group B. Also shown for each number in this table is the percentage of females. Comparing the values over the last seven years, we see that in Groups I, II, III, and Va combined, the number of tenured/tenure-track appointments is down 1%, the number of non-tenure-track doctoral appointments is up 38%, and the number of part-time faculty is down 13%. Over the last seven years in Group M the estimated number of tenured/tenure-track appointments is down 7%, the estimated number of non-tenure-track doctoral appointments is up 80%, and the estimated number of part-time faculty is up 4%; and in Group B, the estimated number of tenured/tenure-track appointments is up 50%; the estimated number of non-tenure-track doctoral appointments is up 0.4%, and the number of part-time faculty is up 10%.

Table 1E gives a summary of the various types of faculty found in departments of mathematical sciences by sex and group.

Tables 1F and 1G give more information about two types of faculty: full-time faculty without a doctorate and part-time faculty. The top half of Table 1F is a somewhat condensed version of the doctoral full-time faculty in Table 1A broken down by sex. The bottom half of Table 1F shows this same information for the 3,805 full-time faculty who do not have doctoral degrees. The majority of these faculty, 3,109 (82%), are found in Groups M and B departments. Table 1G shows the part-time faculty broken down by sex and whether they have a doctoral degree. Comparing Table 1G to last year’s table, we see that the biggest decline in part-time faculty is in nondoctoral part-time faculty (down 24% from 6,416 last year to 4,892 this year).
Table 2A: Recruitment of Doctoral Faculty, Fall 2005

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I, II, III, &amp; Va</th>
<th>M &amp; B</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number</td>
<td>680</td>
<td>1020</td>
<td>145</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>376</td>
<td>799</td>
<td>119</td>
</tr>
<tr>
<td>Open to new doctoral recipients</td>
<td>514</td>
<td>917</td>
<td>107</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>254</td>
<td>716</td>
<td>94</td>
</tr>
</tbody>
</table>

Reported Hires for Above

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I, II, III, &amp; Va</th>
<th>M &amp; B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total new doctoral hires</td>
<td>241</td>
<td>306</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>65</td>
<td>230</td>
</tr>
<tr>
<td>Male</td>
<td>174</td>
<td>213</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>37</td>
<td>151</td>
</tr>
<tr>
<td>Female</td>
<td>67</td>
<td>93</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>28</td>
<td>79</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I, II, III, &amp; Va</th>
<th>M &amp; B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total other doctoral hires</td>
<td>333</td>
<td>505</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>201</td>
<td>332</td>
</tr>
<tr>
<td>Male</td>
<td>280</td>
<td>305</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>170</td>
<td>197</td>
</tr>
<tr>
<td>Female</td>
<td>54</td>
<td>200</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>30</td>
<td>135</td>
</tr>
</tbody>
</table>

1 Number of full-time doctoral positions under recruitment in 2003–2004 to be filled for 2004–2005.

Faculty Profile for Females

Table 1B gives a complete breakdown of all categories of female faculty by group and shows increasing estimated numbers of female faculty in most categories. The estimated total number of full-time faculty in Groups I, II, III, Va, M, and B combined, for 2005–2006 is 21,903, of which 5,638 (26%) are females, up from 5,302 (26%) last year. In the B group the estimated number of doctoral female faculty increased to 1,859 from 1,568 last year, of tenured female faculty increased from 912 last year to 1,080 this year, of untenured tenure-track female faculty increased from 514 last year to 614 this year (a 19% increase), and of non-tenure-track (including post-doctoral appointments) doctoral female faculty increased from 139 last year to 166 this year. In the M group estimated doctoral full-time female faculty increased from 853 last year to 883 this year; in Groups I, II, III, and Va combined doctoral full-time female faculty increased from 956 to 985 and tenured female faculty declined from 431 to 424; and in Group IV doctoral full-time female faculty increased from 383 to 403.

Table 1C shows the number and percentage of all full-time and female full-time faculty that fall into each group for fall 2005. The number of females as a percentage of full-time faculty varies considerably among the groups, from 12% for Group I Private to 31% for Group M.

Table 2B: A Summary of Recruitment of Doctoral Faculty, Fall 2005

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I, II, III, &amp; Va</th>
<th>M &amp; B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number</td>
<td>680</td>
<td>1020</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>376</td>
<td>799</td>
</tr>
<tr>
<td>Open to new doctoral recipients</td>
<td>514</td>
<td>917</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>254</td>
<td>716</td>
</tr>
</tbody>
</table>

Reported Hires for Above

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I, II, III, &amp; Va</th>
<th>M &amp; B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total new doctoral hires</td>
<td>241</td>
<td>306</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>65</td>
<td>230</td>
</tr>
<tr>
<td>Male</td>
<td>174</td>
<td>213</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>37</td>
<td>151</td>
</tr>
<tr>
<td>Female</td>
<td>67</td>
<td>93</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>28</td>
<td>79</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I, II, III, &amp; Va</th>
<th>M &amp; B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total other doctoral hires</td>
<td>333</td>
<td>505</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>201</td>
<td>332</td>
</tr>
<tr>
<td>Male</td>
<td>280</td>
<td>305</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>170</td>
<td>197</td>
</tr>
<tr>
<td>Female</td>
<td>54</td>
<td>200</td>
</tr>
<tr>
<td>Tenured/tenure-track</td>
<td>30</td>
<td>135</td>
</tr>
</tbody>
</table>

1 New doctoral hires are individuals who have held a doctorate for less than one year at the time of hiring.
of females for each category. While this year females comprise 26% of the full-time faculty, they are a larger percentage of the part-time faculty in all three categories.

Table 1E gives the male/female breakdown by count and percentage for Groups I, II, III, and Va combined, Groups M and B combined, and Group IV for various categories of faculty. It shows that the percentage of women is generally higher in statistics (Group IV) than in the doctoral mathematics groups (Groups I, II, III, and Va combined) and that the percentage of tenured faculty who are women is highest in Groups M and B combined.

Table 1F shows that of the 3,805 nondoctoral full-time faculty in Groups I, II, III, Va, M, and B combined, 1,911 (50%) are females. In Table 1G we see that in these same groups there are 6,526 part-time faculty, of which 2,576 (39%) are females.

### Faculty Recruitment

Table 2A contains detailed information on the number of full-time doctoral faculty positions in mathematical sciences departments under recruitment in 2004–2005 for employment beginning in the academic year 2005–2006. Among mathematics departments (Groups I, II, III, Va, M, and B), 1,700 positions were under recruitment in 2004–2005 for employment beginning in the academic year 2005–2006, down 1% compared to last year. Of those 1,700 positions, 1,431 (84%) were available to new doctoral recipients, and of those 1,431 positions, 969 (68%) were tenured/tenure-track positions. The 969 tenured/tenure-track positions open to new doctoral recipients is up 5% from the 919 such positions under recruitment in 2003–2004. The total number of tenured/tenure-track full-time doctoral positions under recruitment in Groups I, II, III, Va, M, and B combined is 1,176, up from last year’s 1,128 (an increase of 4%). In Groups I, II, III, and Va combined, the total number of posted doctoral positions open at the associate/full level decreased from 110 last year to 100 this year.

### Figure 1: Number of Full-Time Doctoral Positions under Recruitment

Groups I, II, III, Va, M, & B Combined, Fall 1993 to Fall 2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Posted</th>
<th>Tenured/Tenure-Track</th>
<th>Filled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>193</td>
<td>136</td>
<td>89</td>
</tr>
<tr>
<td>1994</td>
<td>173</td>
<td>120</td>
<td>84</td>
</tr>
<tr>
<td>1995</td>
<td>188</td>
<td>132</td>
<td>95</td>
</tr>
<tr>
<td>1996</td>
<td>202</td>
<td>142</td>
<td>97</td>
</tr>
<tr>
<td>1997</td>
<td>207</td>
<td>145</td>
<td>102</td>
</tr>
<tr>
<td>1998</td>
<td>208</td>
<td>146</td>
<td>105</td>
</tr>
<tr>
<td>1999</td>
<td>209</td>
<td>147</td>
<td>105</td>
</tr>
<tr>
<td>2000</td>
<td>211</td>
<td>148</td>
<td>105</td>
</tr>
<tr>
<td>2001</td>
<td>214</td>
<td>150</td>
<td>105</td>
</tr>
<tr>
<td>2002</td>
<td>215</td>
<td>150</td>
<td>105</td>
</tr>
<tr>
<td>2003</td>
<td>216</td>
<td>150</td>
<td>105</td>
</tr>
<tr>
<td>2004</td>
<td>217</td>
<td>151</td>
<td>105</td>
</tr>
<tr>
<td>2005</td>
<td>218</td>
<td>152</td>
<td>105</td>
</tr>
</tbody>
</table>
Table 2B condenses the information in Table 2A. It also reorganizes the doctoral hires into one section for new doctoral hires and another for other doctoral hires (so excludes posted doctoral positions that were temporarily filled with a person without a doctorate). Table 2C is derived from Table 2B, with the percentage of the filled positions that were tenured/tenure-track included in the table.

From Table 2B we find that the total number of full-time doctoral positions filled in mathematics departments (Groups I, II, III, Va, M, and B combined) is up to 1,385 from 1,344 last year (an increase of 3%); it is up 7% in Groups I, II, III, and Va combined and 0.1% in Groups B and M combined. This year Groups I, II, III, and Va combined filled 574 doctoral positions, of which 266 (46%) were tenured/tenure-track positions. Last year these same groups filled 534 doctoral positions, of which 214 (40%) were tenured/tenure-track. Groups M and B combined filled 811 doctoral positions this year, and 562 (69%) of these were tenured/tenure-track positions. Last year these two groups filled 810 doctoral positions, of which 606 (75%) were tenured/tenure-track.

Beginning with the 2004 Annual Survey, departments were asked to report the number of doctoral hires in tenured/tenure-track positions filled by individuals who held a non-tenure-track position the previous year and of those, how many were postdoctoral appointments. For Groups I, II, III, and Va combined, 161 (61% of the 266 tenure-track hires) individuals reported having held a non-tenure-track position the previous year, with 137 (52%) individuals having held a postdoctoral appointment the previous year; last year 112 (52%) were filled by individuals who held a postdoctoral appointment the previous year. For Groups M and B combined, 181 (32% of the 562 tenure-track hires) individuals reported having held a non-tenure-track position the previous year, with 83 (15%) individuals having held a postdoctoral appointment the previous year; last year 127 (21%) were filled by individuals who held a postdoctoral appointment the previous year.

This year the estimated total number of new doctoral hires in mathematics departments is down 7% (547 from 590) from last year; it is up 4% (to 241 from 232) in Groups I, II, III, and Va combined, and down 15% (to 306 from 358) in Groups M and B combined. The number of new doctoral tenured/tenure-track hires in the mathematics groups combined is down 7% (to 295 from 318); it is up 76% (to 65 from 37) in Groups I, II, III, and Va combined, and down 18% (to 230 from 281) in Groups M and B combined. From Table 2C we see that in Groups I, II, III, and Va 27% of the hires of new doctoral recipients are in tenured/tenure-track positions (last year it was 16%), while in Groups M and B 75% of the new doctoral hires are in tenured/tenure-track positions (last year it was 79%).

The estimated number of not-new doctoral hires in mathematics departments is 838, up from 754 last year. The estimated total of not-new doctoral hires into tenured/tenure-track positions is up 6% in all the mathematics groups combined; it is up 4% (to 241 from 232) in Groups I, II, III, and Va combined, and down 15% (to 306 from 358) in Groups M and B combined. The number of new doctoral tenured/tenure-track hires in the mathematics groups combined is down 7% (to 295 from 318); it is up 76% (to 65 from 37) in Groups I, II, III, and Va combined, and down 18% (to 230 from 281) in Groups M and B combined. From Table 2C we see that in Groups I, II, III, and Va 27% of the hires of new doctoral recipients are in tenured/tenure-track positions (last year it was 16%), while in Groups M and B 75% of the new doctoral hires are in tenured/tenure-track positions (last year it was 79%).
Table 4A: Total Undergraduate Course Enrollments (thousands)

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Fall</th>
<th>I Public</th>
<th>I Private</th>
<th>II</th>
<th>III</th>
<th>Va</th>
<th>M</th>
<th>B</th>
<th>IV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>175</td>
<td>47</td>
<td>279</td>
<td>241</td>
<td></td>
<td>13</td>
<td></td>
<td>526</td>
<td>729</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>176</td>
<td>42</td>
<td>279</td>
<td>246</td>
<td></td>
<td>12</td>
<td></td>
<td>513</td>
<td>743</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>187</td>
<td>41</td>
<td>275</td>
<td>250</td>
<td></td>
<td>16</td>
<td></td>
<td>507</td>
<td>774</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>185</td>
<td>41</td>
<td>283</td>
<td>255</td>
<td></td>
<td>17</td>
<td></td>
<td>498</td>
<td>774</td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>159</td>
<td>42</td>
<td>277</td>
<td>261</td>
<td></td>
<td>16</td>
<td></td>
<td>492</td>
<td>782</td>
</tr>
<tr>
<td></td>
<td>2005</td>
<td>177</td>
<td>43</td>
<td>273</td>
<td>249</td>
<td></td>
<td>12</td>
<td></td>
<td>509</td>
<td>872</td>
</tr>
</tbody>
</table>

(Standard error) (19) (57) (60)

Table 4B: Total Graduate Course Enrollments (thousands)

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Fall</th>
<th>I Public</th>
<th>I Private</th>
<th>II</th>
<th>III</th>
<th>Va</th>
<th>M</th>
<th>IV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>7</td>
<td>4</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>14</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>7</td>
<td>5</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>14</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>10</td>
<td>4</td>
<td>11</td>
<td>10</td>
<td>3</td>
<td>12</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>10</td>
<td>5</td>
<td>11</td>
<td>11</td>
<td>2</td>
<td>16</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>9</td>
<td>4</td>
<td>12</td>
<td>10</td>
<td>2</td>
<td>12</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>2005</td>
<td>10</td>
<td>4</td>
<td>13</td>
<td>9</td>
<td>2</td>
<td>16</td>
<td></td>
<td>29</td>
</tr>
</tbody>
</table>

(Standard error) (2)

Table 4C: Undergraduate and Graduate Enrollments per Full-Time Faculty Member, Fall 2005

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Undergraduate Course Enrollments</th>
<th>Graduate Course Enrollments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number per full-time faculty member</td>
<td>Number per full-time faculty member</td>
</tr>
<tr>
<td>I Public</td>
<td>I Private</td>
<td>II</td>
</tr>
<tr>
<td>2000</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>2001</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>2002</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>2003</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>2004</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>2005</td>
<td>96</td>
<td>44</td>
</tr>
</tbody>
</table>

Table 4D: Undergraduate Enrollments per Full-Time Faculty Member

<table>
<thead>
<tr>
<th>Fall</th>
<th>I Public</th>
<th>I Private</th>
<th>II</th>
<th>III</th>
<th>Va</th>
<th>M</th>
<th>B</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>107</td>
<td>52</td>
<td>117</td>
<td>119</td>
<td>39</td>
<td>110</td>
<td>95</td>
<td>56</td>
</tr>
<tr>
<td>2001</td>
<td>101</td>
<td>47</td>
<td>114</td>
<td>120</td>
<td>41</td>
<td>118</td>
<td>94</td>
<td>57</td>
</tr>
<tr>
<td>2002</td>
<td>107</td>
<td>43</td>
<td>114</td>
<td>121</td>
<td>50</td>
<td>117</td>
<td>95</td>
<td>55</td>
</tr>
<tr>
<td>2003</td>
<td>104</td>
<td>42</td>
<td>113</td>
<td>121</td>
<td>46</td>
<td>121</td>
<td>89</td>
<td>46</td>
</tr>
<tr>
<td>2004</td>
<td>90</td>
<td>44</td>
<td>113</td>
<td>126</td>
<td>49</td>
<td>120</td>
<td>89</td>
<td>49</td>
</tr>
<tr>
<td>2005</td>
<td>96</td>
<td>44</td>
<td>108</td>
<td>116</td>
<td>43</td>
<td>113</td>
<td>91</td>
<td>43</td>
</tr>
</tbody>
</table>

positions hired went to not-new doctoral recipients (last year 56%).

From Table 2B we find that of the new doctoral recipients hired in Groups I, II, III, and Va combined, 21% of the males and 42% of the females took tenured/tenure-track positions. For new doctoral recipients hired in Groups M and B combined, 71% of the males and 85% of the females took tenured/tenure-track positions.

Figure 1 shows the number of full-time doctoral positions available in all groups combined except Group IV, as well as the number of those that were
The number of available positions and the number of tenured/tenure-track positions steadily increased reaching a maximum in 2001; this number declined for the next two years then slightly increased; this year the number of available positions decreased slightly and the number of tenured/tenure-track positions increased.

This year while the number of positions under recruitment decreased 1% in mathematics; those in statistics (Group IV) decreased 19% (to 145 from 180), the number of tenure-track positions under recruitment is down 8% (to 119 from 130), and the number of tenure-track positions open to new doctoral recipients under recruitment is down to 94 from 95. The number of hires of new doctoral recipients is 49 (34 tenure-track) this year and 65 (45 tenure-track) last year, down 25% (24%) respectively. The number of not-new doctoral hires is 48 (38 tenure-track) this year and 54 (27 tenure-track) last year. Females were 41% of the new doctoral tenure-track hires and 26% of the not-new doctoral tenure-track hires; last year these percentages were 51% and 37%, respectively.

Faculty Attrition
Table 3 displays losses of full-time mathematical sciences faculty due to retirements and deaths over the past year for each departmental grouping. The fall 2005 mathematics faculty attrition rate for Groups I, II, III, Va, M, and B combined is 2.2%, and in statistics (Group IV) it is 1.2%. For fall 2005, Group Va had the lowest attrition rate at 0.5%, while Group M the highest at 3.1%.

Figure 2 shows the trends in these attrition rates between 1992 and 2005. While the rates vary from group to group and from year to year within each group, in the early 1990s the dominant trend was one of increasing attrition. Then in the late 1990s the trend changed to one of reduced attrition. This year while in Groups I, II, III, IV, and Va combined the rate of attrition slightly increased, when combined with Groups M and B the rate dropped significantly. This is mainly due to the drop in attrition in Group B.
Enrollment Profile and Degrees Awarded Profile

Enrollment
The Departmental Profile Survey obtained information about enrollments and numbers of undergraduate degrees awarded in mathematical sciences departments. Tables 4A and 4B give the total undergraduate and total graduate enrollments in mathematics courses in fall 2005 for each group that is part of the Annual Survey. Each enrollment in this and other tables in this section is projected from schools responding to the survey, as discussed on page 1346. In fall 2005, for the seventh year the projections for Groups M and B were made from those schools responding in the stratified random sample for each of these groups. This makes it possible to calculate standard errors for the estimated enrollments for these groups and for the estimated total enrollment for all groups. These standard errors, available for the fifth year, are also found in Table 4A. The estimated total undergraduate enrollment in fall 2005 for all groups combined is 2,205,000, with a standard error of 60,000, indicating that the actual total enrollment is likely within 2,205,000 plus or minus 120,000. Table 4A gives these totals for fall 2000 to fall 2005. Total undergraduate enrollments for all groups combined is up 5% from last year; the total is down 25% in Group Va.

Table 4B gives total graduate enrollments for fall 2000 to fall 2005. Total graduate course enrollments for all groups combined is up 4% from last year; the total is up 33% for Group M, down 6% in Group IV, and down 10% in Group III.

Looking at the historical data on enrollment numbers presented in Tables 4A and 4B for fall 2000 to fall 2005, one sees a trend of general increasing undergraduate and graduate enrollments.

---

**Table 6A: Graduate Students, Fall 2005**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>Va</th>
<th>I, II, III, &amp; Va</th>
<th>M</th>
<th>I, II, III, &amp; Va, &amp; M</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Graduate Students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time (Standard error)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-year full-time</td>
<td>2901</td>
<td>1435</td>
<td>3226</td>
<td>2322</td>
<td>681</td>
<td>10565</td>
<td>2503</td>
<td>(247)</td>
<td>13068</td>
</tr>
<tr>
<td>Part-time (Standard error)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-year full-time</td>
<td>638</td>
<td>420</td>
<td>913</td>
<td>714</td>
<td>147</td>
<td>2832</td>
<td>921</td>
<td>(247)</td>
<td>3753</td>
</tr>
<tr>
<td>Part-time</td>
<td>170</td>
<td>196</td>
<td>409</td>
<td>896</td>
<td>83</td>
<td>1764</td>
<td>3181</td>
<td>(341)</td>
<td>4945</td>
</tr>
<tr>
<td>Female Graduate Students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time (Standard error)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-year full-time</td>
<td>711</td>
<td>328</td>
<td>1020</td>
<td>873</td>
<td>179</td>
<td>3111</td>
<td>941</td>
<td>(247)</td>
<td>4052</td>
</tr>
<tr>
<td>Part-time (Standard error)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-year full-time</td>
<td>155</td>
<td>100</td>
<td>297</td>
<td>260</td>
<td>39</td>
<td>851</td>
<td>345</td>
<td>(341)</td>
<td>1196</td>
</tr>
<tr>
<td>Part-time</td>
<td>72</td>
<td>40</td>
<td>185</td>
<td>367</td>
<td>16</td>
<td>677</td>
<td>1621</td>
<td>(341)</td>
<td>2298</td>
</tr>
<tr>
<td>U.S. Citizen Graduate Students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time (Standard error)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-year full-time</td>
<td>1598</td>
<td>701</td>
<td>1996</td>
<td>1242</td>
<td>387</td>
<td>5915</td>
<td>1842</td>
<td>(247)</td>
<td>7756</td>
</tr>
<tr>
<td>Part-time (Standard error)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-year full-time</td>
<td>361</td>
<td>182</td>
<td>590</td>
<td>434</td>
<td>90</td>
<td>1657</td>
<td>716</td>
<td>(247)</td>
<td>2373</td>
</tr>
<tr>
<td>Part-time</td>
<td>138</td>
<td>132</td>
<td>343</td>
<td>738</td>
<td>88</td>
<td>1439</td>
<td>2811</td>
<td>(304)</td>
<td>4250</td>
</tr>
</tbody>
</table>

**Table 6B: Full-Time Graduate Students in Groups I, II, III, & Va by Sex and Citizenship**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total full-time graduate students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>9476</td>
<td>9003</td>
<td>8791</td>
<td>8838</td>
<td>9637</td>
<td>9361</td>
<td>9972</td>
<td>10444</td>
<td>10707</td>
<td>10565</td>
</tr>
<tr>
<td>% Female</td>
<td>29%</td>
<td>30%</td>
<td>32%</td>
<td>31%</td>
<td>31%</td>
<td>31%</td>
<td>31%</td>
<td>31%</td>
<td>30%</td>
<td>29%</td>
</tr>
<tr>
<td>% U.S. citizen</td>
<td>57%</td>
<td>55%</td>
<td>53%</td>
<td>53%</td>
<td>53%</td>
<td>49%</td>
<td>51%</td>
<td>54%</td>
<td>55%</td>
<td>56%</td>
</tr>
<tr>
<td>Total first-year graduate students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2443</td>
<td>2386</td>
<td>2458</td>
<td>2664</td>
<td>2839</td>
<td>2875</td>
<td>2996</td>
<td>2711</td>
<td>3004</td>
<td>2832</td>
</tr>
<tr>
<td>% Female</td>
<td>33%</td>
<td>35%</td>
<td>35%</td>
<td>33%</td>
<td>31%</td>
<td>35%</td>
<td>35%</td>
<td>33%</td>
<td>33%</td>
<td>30%</td>
</tr>
<tr>
<td>% U.S. citizen</td>
<td>60%</td>
<td>55%</td>
<td>55%</td>
<td>53%</td>
<td>54%</td>
<td>53%</td>
<td>54%</td>
<td>56%</td>
<td>60%</td>
<td>59%</td>
</tr>
</tbody>
</table>
Table 4C gives the undergraduate enrollments per faculty member and the graduate enrollments per faculty member for each group. Table 4D gives the undergraduate enrollments per faculty member in each group for fall 2000 to fall 2005. Table 4D on undergraduate enrollments per faculty member shows a slightly downward trend over the period shown.

Beginning with the 2002 survey, the Departmental Profile form no longer requests a breakdown of the total undergraduate enrollments into eight subcategories of courses. For a comprehensive survey of specific undergraduate courses, please refer to the report of the 2000 CBMS survey, Statistical Abstract of Undergraduate Programs in the Mathematical Sciences in the U.S.: Fall 2000 CBMS Survey (American Mathematical Society, Providence, RI, 2002). This publication is available on the AMS website at www.ams.org/cbms/.

**Undergraduate and Master’s Degrees**

Beginning with the 2004 Annual Survey, departments were asked to report the number of master’s degrees awarded, as well as undergraduate degrees awarded, during 2003–2004. Tables 5A and 5C give the number of undergraduate and master’s degrees awarded in 2004–2005, the number of each that are female, the number that are in computer science, and beginning with the 2005 Annual Survey, the number that are statistics for each group. The number of master’s degrees awarded in mathematics increased from 3,400 in fall 2004 to 4,300 in fall 2005. In 2002 we began tabulating the number of “undergraduate degrees”, rather than the number of “junior/senior majors”; hence comparisons to previous years’ numbers of undergraduate degrees can be made only to the last four years, and this is done in Table 5B. From this data we see that after three years of steadily increasing, this year the number of undergraduate degrees awarded has dropped slightly.

The reader should be aware that at least 45 of the 1,902 departments in the 2005 Group M population and at least 269 of the 1,036 departments in the 2005 Group B population also offer a computer science program in addition to their offerings in mathematics. In some instances, these computer programs account for a major fraction of the department’s undergraduate degrees. This year’s estimated 23,400 undergraduate degrees awarded includes 7,000 in statistics and 5,900 in computer science, and of the 4,300 master’s degrees awarded 600 were in statistics, and 200 were in computer science.

The report of the 2000 CBMS survey provides a more comprehensive study of departmental bachelor’s degrees.

**Graduate Student Profile**

Table 6A summarizes information gathered by the 2005 Departmental Profile survey about graduate students enrolled in fall 2005. This table gives the number of full-time, full-time first-year, and part-time graduate students for each type of graduate department. These same numbers are also given for female graduate students and for U.S. citizen graduate students.

Although the estimated total number of graduate students in all mathematics groups combined increased from 12,853 in 2004 to 13,068 in 2005, the total number of full-time graduate students in Groups I, II, III, and Va combined decreased from 10,707 in 2004 to 10,565 in 2005. The number of U.S. citizen full-time graduate students in Groups I, II, III, and Va combined increased by 1% to 5,915. The number of first-year full-time students in Groups I, II, III, and Va combined decreased by 6%, from 3,004 last year to 2,832 this year (both the number of first-year U.S. citizens and the number of first-year non-U.S. citizens were down). The number of female full-time graduate students in Groups I, II, III, and Va combined decreased from 3,245 to 3,111. In Group IV the number of full-time graduate students increased by 3% to 4,310 and the number of U.S. citizen full-time graduate students decreased by 4% to 1,572. The first-year full-time graduate student enrollment in Group IV increased by 8 to 1,345, but the number of first-year full-time U.S. citizens was down from 582 to 550. The number of female full-time graduate students in Group IV decreased from 2,144 to 2,076, a 3% decrease. The percentage of full-time graduate students who are U.S. citizens in the mathematics groups combined is 59% while the percentage of full-time graduate students who are U.S. citizens in Group IV is 36%; the percentage of women is 31% in mathematics groups combined and 48% in Group IV. The number of full-time graduate students in Group M increased from 2,146 to 2,503. There is a great deal of variability in the number of full-time graduate students in Group M, even in universities that are roughly the same size, and this is reflected in the standard errors of 247 (160 last year). The number of part-time graduate students in Groups I, II, III, and Va decreased 1% to 1,764 this year, and in Group IV increased 20% to 749. Group III has 896 (51%) of the part-time graduate students in the doctoral mathematics groups. In the doctoral mathematics groups, 38% of the part-time graduate students are females and 82% are U.S. citizens, and in Group IV 52% of the part-time graduate students are females and 73% are U.S. citizens. The number of Group M part-time graduate students increased from 1,794 to 3,181, with a standard error of 341 this year and 188 last year. For Group M, 51% of the part-time graduate students are females and 88% are U.S. citizens.

Table 6B gives the total number of full-time and full-time first-year graduate students in Groups I, II, III, and Va combined, and the percentages of women and of U.S. citizens in each category, for fall 1996 through fall 2005. From this data we can see that total full-time graduate enrollment in the doctoral mathematics groups has been generally increasing since 1999, although it is down this year. Similarly, the number of first-year full-time graduate students declined this year after steadily increasing since
1998. The number of full-time graduate students who are U.S. citizens has been increasing since 2002, and the number of non-U.S. citizens has been decreasing since 2003. The number of female full-time graduate students which had been increasing since 2002 dropped 4% this year. The percentage of females among full-time graduate students in the combined mathematics groups has remained relatively stable over the 10-year period shown.

Previous Annual Survey Reports
The 2005 Annual Survey First and Second Reports were published in the Notices of the AMS in the February and August 2006 issues respectively. For the last version of this report, the 2004 Annual Survey Third Report was published in the Notices of the AMS in the September 2005 issue. These reports and earlier reports, as well as a wealth of other information from these surveys, are available on the AMS website at www.ams.org/outreach.

Acknowledgments
The Annual Survey attempts to provide an accurate appraisal and analysis of various aspects of the academic mathematical sciences scene for the use and benefit of the community and for filling the information needs of the professional organizations. Every year, college and university departments in the United States are invited to respond. The Annual Survey relies heavily on the conscientious efforts of the dedicated staff members of these departments for the quality of its information. On behalf of the Annual Survey Data Committee and the staff, we thank the many secretarial and administrative staff members in the mathematical sciences departments for their cooperation and assistance in responding to the survey questionnaires.

Definitions of the Groups
As has been the case for a number of years, much of the data in these reports is presented for departments divided into groups according to several characteristics, the principal one being the highest degree offered in the mathematical sciences. Doctoral-granting departments of mathematics are further subdivided according to their ranking of “scholarly quality of program faculty” as reported in the 1995 publication Research-Doctorate Programs in the United States: Continuity and Change. These rankings update those reported in a previous study published in 1982. Consequently, the departments which now comprise Groups I, II, and III differ significantly from those used prior to the 1996 survey.

The subdivision of the Group I institutions into Group I Public and Group I Private was new for the 1996 survey. With the increase in the number of Group I departments from 39 to 48, the Data Committee judged that a further subdivision of public and private would provide more meaningful reporting of the data for these departments.

Brief descriptions of the groupings are as follows:

- **Group I** is composed of 48 doctoral-granting departments with scores in the 3.00–5.00 range. Group I Public and Group I Private are Group I doctoral-granting departments at public institutions and private institutions respectively.
- **Group II** is composed of 56 doctoral-granting departments with scores in the 2.00–2.99 range.
- **Group III** contains the remaining U.S. doctoral-granting departments, including a number of departments not included in the 1995 ranking of program faculty.
- **Group IV** contains U.S. doctoral-granting departments (or programs) of statistics, biostatistics, and biometrics reporting a doctoral program.
- **Group Va** is applied mathematics/applied science doctoral-granting departments; Group Vb, which is no longer surveyed as of 1998–99, was operations research and management science.
- **Group M or Master’s** contains U.S. departments granting a master’s degree as the highest graduate degree.
- **Group B or Bachelor’s** contains U.S. departments granting a baccalaureate degree only.

Listings of the actual departments which comprise these groups are available on the AMS website at www.ams.org/outreach.

---

2. These findings were published in An Assessment of Research-Doctorate Programs in the United States: Mathematical and Physical Sciences, edited by Lyle V. Jones, Gardner Lindzey, and Porter E. Coggeshall, National Academy Press, Washington, DC, 1982. The information on mathematics, statistics, and computer science was presented in digest form in the April 1983 issue of the Notices, pages 257–67, and an analysis of the classifications was given in the June 1983 Notices, pages 392–3.
Read something different.

**Paul Halmos 1916 - 2006**
The mathematics community has lost an author, editor, teacher and friend. His contributions will be long lasting and Princeton University Press is very proud to have published his book, *Finite Dimensional Vector Spaces*.

---

**Hadamard Matrices and Their Applications**  
K. J. HORADAM

In *Hadamard Matrices and Their Applications*, K. J. Horadam provides the first unified account of cocyclic Hadamard matrices and their applications in signal and data processing. This original work is based on the development of an algebraic link between Hadamard matrices and the cohomology of finite groups that was discovered fifteen years ago. The book translates physical applications into terms a pure mathematician will appreciate, and theoretical structures into ones an applied mathematician, computer scientist, or communications engineer can adapt and use. Pointing the way to possible new developments in a field ripe for further research, this book formulates and discusses ninety open questions.  
Cloth $55.00  0-691-11921-X  
Due January 2007

---

**Integration of One-forms on P-adic Analytic Spaces**  
VLADIMIR G. BERKOVICH

This book aims to show that every smooth p-adic analytic space is provided with a sheaf of functions that includes all analytic ones and satisfies a uniqueness property. The book also contains local primitives of all closed one-forms with coefficients in the sheaf that, in the case considered by Coleman, coincide with those he constructed. In consequence, one constructs a parallel transport of local solutions of a unipotent differential equation and an integral of a closed one-form along a path so that both depend nontrivially on the homotopy class of the path. The book is aimed at graduate students and mathematicians working in the areas of non-Archimedean analytic geometry, number theory, and algebraic geometry.  
*Annals of Mathematics Studies*  
Phillip A. Griffiths, John N. Mather, and Elias M. Stein, Series Editors  
Paper $35.00  0-691-12862-6  
Cloth $70.00  0-691-12741-7  
Due February 2007

---

**Strange Curves, Counting Rabbits, and Other Mathematical Explorations**  
KEITH BALL

“A gem . . . Each topic is taken up in a setting that immediately generates interest. . . Ball’s achievement is to have come up with a selection of topics which are fresh and unusual.”  
—Stacy G. Langton, MAA Online

Paper $18.95  0-691-12797-2  
Not available from Princeton in South Asia

---

**The Mathematical Century**  
The 30 Greatest Problems of the Last 100 Years

PIERGIORGIO ODIFREDDI  
Translated by Arturo Sangalli  
With a foreword by Freeman Dyson

“This is an astonishingly readable, succinct, and wonderful account of twentieth-century mathematics! It is a great book for mathematics majors, students in liberal-arts courses in mathematics, and the general public.”  
—Paul Campbell, Mathematics Magazine

Paper $18.95  0-691-12805-7  
Not available from Princeton in South Asia

---

**An Imaginary Tale**  
The Story of $\sqrt{-1}$

PAUL J. NAHIN

“An Imaginary Tale is marvelous reading and hard to put down. Readers will find that Nahin has cleared up many of the mysteries surrounding the use of complex numbers.”  
—Victor J. Katz, *Science*

Paper $16.95  0-691-12798-0  
Not available from Princeton in South Asia

---

**NEW IN PAPERBACK**

---

**With a new preface by the author**

**An Imaginary Tale**  
The Story of $\sqrt{-1}$

PAUL J. NAHIN

**NEW IN PAPERBACK**

---

**Read excerpts at**  
www.pup.princeton.edu/math

---

**PRINCETON University Press**  
800-777-4726  
Read excerpts at www.pup.princeton.edu/math
Mathematics Opportunities

NSF Computing Equipment and Instrumentation Programs

The Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) plans a limited number of awards for the support of computing environments for research in the mathematical sciences. SCREMS (Scientific Computing Research Environments for the Mathematical Sciences) supports computing environments dedicated to research in the mathematical sciences. Proposals may request support for the purchase of computing equipment and limited support for professional systems administrators or programmer personnel for research computing needs. These grants are intended to support research projects of high quality that require access to advanced computing resources. Requests for routine upgrades of standard desktop-environment workstations or laptop computers are not appropriate for this program. Awards are made to provide support for specific research projects rather than to provide general computing capacity. Proposers are encouraged to include projects involving symbolic and algebraic computations, numerical computations and simulations, and graphical representations (visualization) in aid of the research.


—From an NSF announcement

DMS/NIGMS Initiative in Mathematical Biology

The Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) announces a competition designed to support research on mathematical problems related to biological problems in areas supported by DMS and by the National Institute of General Medical Sciences (NIGMS) at the National Institutes of Health (NIH). A direct relationship between a biological application and the mathematics is expected. Research teams, which include scientists from both the life sciences community and the mathematical sciences community, are encouraged. Both new and existing collaborations will be supported. Individual investigators should have expertise in both areas.

Successful proposals will identify innovative mathematics or statistics needed to solve an important biological problem. Research that would apply standard mathematics or statistics to solve biological problems is not appropriate for this competition and should be submitted directly to NIH. Similarly, proposals for research in mathematics or statistics that is not tied to a specific biological problem should be submitted to the appropriate DMS program at NSF. Proposals designed to create new software tools based on existing models and methods will not be accepted in this competition.

The deadline for full proposals is December 15, 2006. For more information, see http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf06607.

—From an NSF announcement

National Academies Mirzayan Graduate Fellowship Program

The Christine Mirzayan Science and Technology Policy Graduate Fellowship Program of the National Academies is designed to engage graduate science, engineering, medical, veterinary, business, and law students in the analysis and creation of science and technology policy and to familiarize them with the interactions of science, technology, and government. As a result, students develop essential skills different from those attained in academia and make the transition from graduate student to professional. In 2007 programs will be held in the summer, from June 4 through August 10; and in the fall, from September 17 through November 21.

Applications for the fellowships are invited from scholars from graduate through postdoctoral levels in any physical, biological, or social science field or any field of engineering, medicine and health, or veterinary medicine, as
well as business, law, education, and other graduate and professional programs. Postdoctoral scholars should have received their Ph.D.’s within the past five years.

The stipend for each 10-week program is US$5,300. The fellowship stipend is intended to cover all living expenses for the period.

Deadlines for receipt of materials for the summer program is March 1, 2007, and for the fall program, June 1, 2007. More information and application forms and instructions can be found on the website http://www7.
nationalacademies.org/policyfellows or by contacting The National Academies Christine Mirzayan Science and Technology Policy Graduate Fellowship Program, 500 Fifth Street, NW, Room 508, Washington, DC 20001; telephone: 202-334-2455; fax: 202-334-1667; email: policyfellows@nas.edu.

—From a National Academies announcement

Newton Fellowship Program

The Math for America Foundation (MfA) sponsors the Newton Fellowship Program, which trains mathematically talented individuals to become high school mathematics teachers in New York City. The fellowship provides an aggregate stipend of US$90,000 over five years, a full-tuition scholarship for a master’s-level teaching program at one of MfA’s partner universities, and ongoing support mechanisms, including mentoring and professional development.

Candidates should hold a bachelor’s degree with substantial coursework in mathematics and should be able to demonstrate a strong interest in teaching. Applicants must be willing to commit to a five-year fellowship term in New York City. Individuals who are currently teaching, who are certified to teach, or who have completed an education degree program are not eligible. Candidates must be U.S. citizens or permanent residents of the United States. The deadline for applications is February 9, 2007. For more detailed information, see the website at http://www.mathforamerica.org/.

—From an MfA announcement

Call for Nominations for Waterman Award

Congress established the Alan T. Waterman Award in August 1975 to mark the twenty-fifth anniversary of the National Science Foundation (NSF) and to honor its first director. The annual award recognizes an outstanding young researcher in any field of science or engineering supported by the NSF. In addition to a medal, the awardee receives a grant of US$500,000 over a three-year period for scientific research or advanced study in the mathematical, physical, medical, biological, engineering, social, or other sciences at the institution of the recipient’s choice.

Candidates must be U.S. citizens or permanent residents and must be thirty-five years of age or younger or not more than seven years beyond receipt of the Ph.D. degree by December 31 of the year in which they are nominated. Candidates should have demonstrated exceptional individual achievements in scientific or engineering research of sufficient quality to place them at the forefront of their peers. Criteria include originality, innovation, and significant impact on the field.

The deadline for nominations and all supporting material for the award is December 31, 2006. For more information, see the website http://www.nsf.gov/od/waterman/waterman.jsp.

—From an NSF announcement

CMI Liftoff Program for Summer 2007

The Clay Mathematics Institute (CMI) is currently accepting nominations for the 2007 Liftoff program. Through this program, CMI will employ recent Ph.D. recipients as Liftoff Fellows to carry out mathematics research for one month during the summer of 2007. This program provides a transition for young mathematicians from student to faculty member or to a postdoctoral position. Funds for travel to conferences or to visit collaborators are also available to Liftoff Fellows.

Nominations should be made by university mathematics departments; candidates may not apply directly. Criteria for selection are the quality and significance of mathematical research already achieved by the candidate and the potential of the candidate to become a leader in mathematical research.

Nomination packets should include: (1) a cover letter signed by the department chair; (2) two letters of recommendation, including one from the thesis supervisor (existing letters of recommendation already written for job applications can be used); (3) a CV from the nominee, including name, address, telephone, email, date of birth, citizenship, education, thesis title, honors, previous employment, reference to published work or submitted articles, and proposed research; and (4) a one-sentence signed statement from a mathematician agreeing to supervise the nominee on behalf of CMI, with the proposed dates of employment.

Nominations can be sent electronically to the attention of Elizabeth Abraham at nominations@claymath.org or by postal mail to Clay Mathematics Institute, One Bow Street, 4th Floor, Cambridge, MA 02138. The deadline for nominations to be received is February 16, 2007. For more information, see the website http://claymath.org/fas/liftoff_fellows/; telephone: 617-995-2600; email: nominations@claymath.org.

—From a CMI announcement
For Your Information

Palis Elected TWAS President

JACOB PALIS of the Institute of Pure and Applied Mathematics in Brazil has been elected president of the Academy of Sciences for the Developing World (TWAS). He will assume his three-year term in January 2007.

Palis was born in Brazil and has been a fellow of the academy since 1991. He is a leading scholar in the field of dynamical systems. Awards he has received include the Trieste Science Prize, the Brazilian Order of Scientific Merit, the InterAmerican Prize for Science, and the French Legion d’Honneur-Chevalier.

“TWAS has become the world’s leading voice for the promotion of science and science-based development in the developing world,” Palis said. He cited two particular areas of concern as being increasing the participation of women in science and ensuring that scientists in underdeveloped countries can successfully pursue scientific careers within their own countries. “These issues will continue to be focal points of the academy’s agenda during my tenure,” he said.

“TWAS has played an instrumental role in spurring science-based development in the developing world,” said Palis. “However, for progress to continue, we must do all that we can do to make science and technology integral parts of the development agendas of both governments and international organizations. We must also take advantage of the growing scientific proficiency of such developing countries as China, India, and Mexico to help build the capacities of scientifically deficient developing countries, which are usually the world’s poorest countries as well.

“That’s why TWAS intends to continue to play a leading role in South-South cooperation in science. It’s one of the most effective long-term strategies for reducing poverty and promoting economic growth. The academy will work hard to convince governments across the developing world that scientific cooperation and exchange is in everyone’s interest.”

Palis succeeds C. N. R. Rao, who has served as president of TWAS since 2002.

—From a TWAS announcement

NCTM Releases Curriculum Report

On September 12, 2006, the National Council of Teachers of Mathematics (NCTM) released Curriculum Focal Points, which identifies three important mathematical topics at each level, prekindergarten through grade 8. The publication is intended to bring more coherence to the very diverse mathematics curricula currently in use. It provides a framework for states and districts to design more focused curricular expectations and assessments for prekindergarten through grade 8 mathematics curriculum development.

“The Curriculum Focal Points are designed to promote a discussion on the refinement of mathematics curriculum and address the impression that various state and district curricula are ‘a mile wide and an inch deep’, said NCTM president Francis (Skip) Fennell. “The Curriculum Focal Points present a vision for the design of the next generation of state curriculum standards and state tests, and they present a way to bring needed focus to what is taught in mathematics.”

State standards often describe specific learning expectations by grade. In some cases there are close to one hundred expectations per grade, with different expectations from state to state. The focal points are intended as a first step toward a national discussion on how to bring consistency and coherence to the mathematics curricula used in the United States. At each grade level, prekindergarten through grade 8, Curriculum Focal Points identifies three topics, described as “cohesive clusters of related knowledge, skills, and concepts”, which form the necessary foundation for understanding concepts in higher-level mathematics.

Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence was developed with the involvement of mathematicians, math educators, curriculum developers, and classroom teachers. The report and additional information are available at http://www.nctm.org/focalpoints/.

—From an NCTM news release
Trjitzinsky Memorial Awards Presente d

The AMS has made awards to seven undergraduate students through the Waldemar J. Trjitzinsky Memorial Fund. The fund is made possible by a bequest from the estate of Waldemar J., Barbara G., and Juliette Trjitzinsky. The will of Barbara Trjitzinsky stipulates that the income from the bequest should be used to establish a fund in honor of the memory of her husband to assist needy students in mathematics.

For the 2006 awards, the AMS chose seven geographically distributed schools to receive one-time awards of US$3,000 each. The mathematics departments at those schools then chose students to receive the funds to assist them in pursuit of careers in mathematics. The schools are selected in a random drawing from the pool of AMS institutional members.

Waldemar J. Trjitzinsky was born in Russia in 1901 and received his doctorate from the University of California, Berkeley, in 1926. He taught at several institutions before taking a position at the University of Illinois, Urbana-Champaign, where he remained for the rest of his professional life. He showed particular concern for students of mathematics and in some cases made personal efforts to ensure that financial considerations would not hinder their studies. Trjitzinsky was the author of about sixty mathematics papers, primarily on quasi-analytic functions and partial differential equations. A member of the AMS for forty-six years, he died in 1973.

Following are the names of the selected schools for 2006, the names of the students receiving Trjitzinsky awards, and brief biographical sketches of the students.

**Boston College:** Elizabeth Rini. Rini began college as a communications major but switched to a double major in mathematics and secondary education, which required her to complete extra course work. She is a senior and is currently student teaching. She has developed excellent rapport with her students, using what her supervisor calls a “student-centered approach”. Her goal as a future high school teacher is to spread enthusiasm for mathematics by stimulating and motivating her students.

**Central Missouri State University:** Kadijah Shaded. Shaded is a junior in the Department of Mathematics and Computer Science. She is pursuing a B.A. degree in mathematics. She enjoys solving Sudoku puzzles and spending time with family and friends.

**California State University, San Bernardino:** Lorena Pulido and Jennifer Winter. Pulido is a junior who plans to complete her B.A. in mathematics by June 2007. She carries a 3.9 GPA. She is a daughter of immigrants and a first-generation college student; she comes from a large family and has worked two jobs to pay for her education. She was valedictorian of her high school class and won several awards. She has received the Academic Excellence Award for outstanding academic performance in algebra in the Golden State Examination. She plans to become a high school mathematics teacher because she believes that teachers can change lives in positive ways. Winter plans to receive her B.S. degree in June 2007. She is a student in the university’s honors program with a GPA of 3.9. She has been involved in several programs to help increase success in mathematics for students at the university. She plans to pursue master’s and Ph.D. degrees in mathematics with the goal of a university career. The College of Natural Sciences and the Department of Mathematics at CSUSB added US$2,000 in matching funds to the award.

**Eckerd College:** Elizabeth R. Morra. Morra is a junior at Eckerd College in St. Petersburg, Florida. As a high school student in New York, she completed advanced placement work in calculus, physics, and government; she also completed a course in probability and statistics at Syracuse University. She has been accepted into Eckerd College’s Ford Apprentice Scholars Program, a two-year program designed to develop the skills and habits of professional scholars. In this program she will work with mathematicians and engineers to develop numerical techniques for modeling rock fractures within an oil well environment.
University of California, San Diego: John R. Quinn. Quinn is a thirty-four-year-old father of three sons who decided to pursue higher mathematics while working as an electronics technician in the telecommunications industry. He has been a lifelong reader of popular books about mathematics and science and hopes to continue his study in the area of mathematical physics. His other interests include electronic communications and number theory.

University of Missouri, Rolla: Sean M. Eagan. Eagan transferred to UMR after completing three and one-half years of study at East Central Community College in Union, Missouri. He works to support his education and his wife and two small daughters. He earned a 4.0 GPA in his first semester at UMR. He is also a creative writer with a published poem to his credit. He hopes to study mathematics in graduate school.

—Elaine Kehoe

Emma Lehmer 100 Years Old

Emma Trotskaia Lehmer, who was born in Samara, Russia, in 1906, will be celebrating her 100th birthday on November 6. She and Dick Lehmer, who were married in 1928 in Berkeley, were well known throughout the mathematical world, especially through the mathematical papers in number theory they wrote over many decades. Many of these papers were joint papers produced during their sixty-three years of marriage before Dick (D.H. Lehmer at U.C. Berkeley) passed away in 1991.

Emma is in good health and spirits, though forgetful. She still loves to walk with friends in the Berkeley hills. Her daughter Laura says she also loves to receive cards with landscapes and flowers on them. Furthermore, she suggests that it would be nice if friends who would like to celebrate the birthday would send cards at any time during November or perhaps later, so they would not arrive in a single bunch.

Emma still lives happily at 1180 Miller Ave., Berkeley, CA 94798-1755, along with a live-in companion who helps her manage the house.

—John Brillhart

Deaths of AMS Members

George Bachman, of Riverside, CT, died on September 2, 2006. He was a member of the Society for 54 years.

Kevin Blount, professor, Sacred Heart University, died on May 30, 2006. Born on June 5, 1959, he was a member of the Society for one year.

Robert L. Brandon, from Parachute, CO, died on June 12, 2006. Born on April 4, 1940, he was a member of the Society for 34 years.

Robert L. Wilson, from Dublin, OH, died on August 11, 2006. Born on March 7, 1917, he was a member of the Society for 65 years.

Karl Zeller, from Tübingen, Germany, died on July 7, 2006. Born on December 28, 1924, he was a member of the Society for 52 years.
Scientific WorkPlace
Mathematical Word Processing • \LaTeX\ Typesetting • Computer Algebra

Animate, Rotate, Zoom, and Fly

The Gold Standard for Mathematical Publishing

Scientific WorkPlace 5.5 makes writing, sharing, and doing mathematics easier. You compose and edit your documents directly on the screen, without having to think in a programming language. A click of a button allows you to typeset your documents in \LaTeX\, You choose to print with or without \LaTeX\ typesetting, or publish on the web. Scientific WorkPlace enables both professionals and support staff to produce stunning books and articles.

New in Version 5.5

• Compute and plot using the MuPAD® 3 computer algebra engine
• Animate 2D and 3D plots using MuPAD’s VCAM
• Rotate, move, zoom in and out, and fly through 3D plots with new OpenGL® 3D graphics
• Label 2D and 3D plots so that the label moves when you rotate or zoom a plot
• Import \LaTeX\ files produced by other programs
• Use many new \LaTeX\ packages
• Get help from the new, extensive troubleshooting section of Typesetting Documents with Scientific WorkPlace and Scientific Word, Third Edition

Visit us at the Joint Mathematics Meetings, New Orleans Booth 108

www.mackichan.com/notices Visit our website for free trial versions of all our products.

Email: info@mackichan.com • Toll-free: 877-724-9673 • Fax: 360-394-6039

Scientific Word® offers the same features as Scientific WorkPlace, without the computer algebra system.
Reference and Book List

The Reference section of the Notices is intended to provide the reader with frequently sought information in an easily accessible manner. New information is printed as it becomes available and is referenced after the first printing. As soon as information is updated or otherwise changed, it will be noted in this section.

Contacting the Notices
The preferred method for contacting the Notices is electronic mail. The editor is the person to whom to send articles and letters for consideration. Articles include feature articles, memorial articles, communications, opinion pieces, and book reviews. The editor is also the person to whom to send news of unusual interest about other people's mathematics research.

The managing editor is the person to whom to send items for "Mathematics People", "Mathematics Opportunities", "For Your Information", "Reference and Book List", and "Mathematics Calendar". Requests for permissions, as well as all other inquiries, go to the managing editor.

The electronic-mail addresses are notices@math.ou.edu in the case of the editor and notices@ams.org in the case of the managing editor. The fax numbers are 405-325-7484 for the editor and 401-331-3842 for the managing editor. Postal addresses may be found in the masthead.

Upcoming Deadlines


December 1, 2006: Applications for AMS Centennial Research Fellowship Program. See http://www.ams.org/employment/centflyer.html or contact Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294; telephone 401-455-4107; email: prof-serv@ams.org.


December 12, 2006: Applications for NSF East Asia and Pacific Summer Institutes (EAPSI) program. See http://www.nsf.gov/funding/
References and Book List

pim_summ.jsp?pims_id=5284&org=NSF


December 15, 2006: Applications for AMS Epsilon Fund. See the website http://www.ams.org/outreach/epsilon.html; or contact Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294; telephone 800-321-4267, ext. 4170; email: prof-serv@ams.org.

December 1, 2006: Applications for Jefferson Science Fellowships. Contact jsf@nas.edu, telephone 202-334-2643, or see http://www7.nationalacademies.org/jefferson/


January 10, 2007: Applications for AAUW Selected Professions Fellowships. See http://www.aauw.org/fga/fellowships_grants/selected.cfm or contact the AAUW Educational Foundation, Selected Professions Fellowships, P.O. Box 4030, Iowa City, IA 52243-4030.


February 1, 2007: Applications for AWM Travel Grants and Mentoring Travel Grants. See http://www.awm-math.org/travelgrants.html; telephone 703-934-0163; email: awm@math.umd.edu; or contact Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.


March 1, 2007: Applications for National Academies Christine Mirzayan Graduate Fellowships for the summer program. See “Mathematics Opportunities” in this issue.

April 15, 2007: Applications for AMS “Math in Moscow” Scholarships for fall 2007. See http://www.mccme.ru/mathinmoscow or contact Math in Moscow, P.O. Box 524, Wynnewood, PA 19096; fax +7095-291-65-01; email: mim@mccme.ru. For information and application forms for the AMS scholarships see http://www.ams.org/outreach/mimocow.html or contact Math in Moscow Program, Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence RI 02904-2294; email: student-serv@ams.org.

May 1, 2007: Applications for AWM Travel Grants. See http://www.awm-math.org/travelgrants.html; telephone 703-934-0163; email: awm@math.umd.edu; or contact Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.

June 1, 2007: Applications for National Academies Christine Mirzayan Graduate Fellowships for the fall program. See “Mathematics Opportunities” in this issue.


October 1, 2007: Applications for AWM Travel Grants. See http://www.awm-math.org/travelgrants.html; telephone 703-934-0163; email: awm@math.umd.edu; or contact Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.

NSF Division of Mathematical Sciences

Listed below are names, email addresses, and telephone numbers for the program directors for the present academic year in the Division of Mathematical Sciences (DMS) of the National Science Foundation. The postal address is: Division of Mathematical Sciences, National Science Foundation, Room 1025, 4201 Wilson Boulevard, Arlington, VA 22230. The DMS Web page is http://www.nsf.gov/div/index.jsp?div=DMS.

Algebra, Number Theory, Combinatorics, and Foundations
Tomek Bartoszynski 703-292-4885 tbartosz@nsf.gov

Tie Luo 703-292-8448 ttluo@nsf.gov

Andrew Pollington (as of January 2007)
Yang Wang 703-292-4884 ywang@nsf.gov

Analysis
Giles Auchmuty 703-292-8584 gauchmut@nsf.gov
Reference and Book List

Joe Jenkins
703-292-4870
jjenkins@nsf.gov

Bruce Palka
703-292-4856
bpalka@nsf.gov

Joseph Rosenblatt
703-292-4872
jrosenbl@nsf.gov

Yang Wang
703-292-4884
ywang@nsf.gov

Applied Mathematics
Mary Ann Horn
703-292-4879
mhorn@nsf.gov

Hans Kaper
703-292-4859
hkaper@nsf.gov

Ashwani Kapila
703-292-8104
akapila@nsf.gov

Thomas Russell
703-292-4863
trussell@nsf.gov

Michael Steuerwalt
703-292-4860
msteuerw@nsf.gov

Henry Warchall
703-292-4861
hwarcahl@nsf.gov

Computational Mathematics
Leland Jameson
703-292-4883
ljameson@nsf.gov

Thomas Russell
703-292-4863
trussell@nsf.gov

Jinping Wang
703-292-4488
jwang@nsf.gov

Infrastructure
Lloyd Douglas
703-292-4862
ldouglas@nsf.gov

Mathematical Biology
Mary Ann Horn
703-292-4879
mhorn@nsf.gov

Statistics and Probability
Rong Chen
rchen@nsf.gov

Topological and Geometric Analysis Program
Tomek Bartoszynski
703-292-4885
tbarto@nsf.gov

Schools in Mathematics Education
Mary Ann Horn
703-292-4879
mhorn@nsf.gov

Infrastructure
Leland Jameson
703-292-4883
ljameson@nsf.gov

Technical Support
Robert M. Huber
703-292-5301
rhuber@nsf.gov

The administrative staff includes:

Division Director
Peter March
pmarch@nsf.gov
703-292-5301

Executive Officer
Deborah Lockhart
703-292-4858
dllockhart@nsf.gov

Administrative Officer
Maria Sutton
703-292-4364
msutton@nsf.gov

Division Secretary
Jennifer Connell
703-292-5301
jconnell@nsf.gov

NSF Mathematics Education Staff
The Directorate for Education and Human Resources (EHR) of the National Science Foundation (NSF) sponsors a range of programs that support educational projects in mathematics, science, and engineering. Listed below is contact information for those EHR program officers whose fields are in the mathematical sciences or mathematics education. These individuals can provide information about the programs they oversee, as well as information about other EHR programs of interest to mathematicians. The postal address is: Directorate for Education and Human Resources, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230. The EHR web page is http://www.nsf.gov/ehr.

Division of Research on Learning in Formal and Informal Settings
John (Spud) Bradley
703-292-5091
jbradley@nsf.gov

Division of Undergraduate Education
Ron Tzur
703-292-5110
rtzur@nsf.gov

Paola Szatijn
703-292-5105
psztajn@nsf.gov

Division of Research in Formal and Informal Settings
John Cherniavsky
703-292-5136
jchernia@nsf.gov

Elizabeth Teles
703-292-4643
eteles@nsf.gov

Lee Zia
703-292-5140
lzia@nsf.gov
**Division of Human Resource Development**  
Roosevelt Johnson  
703-292-8640  
ryjohnso@nsf.gov

**Math and Science Partnership Program**  
Diane Spresser  
703-292-5188  
dspress@nsf.gov

**Office of the Director/Office of Integrative Activities**  
James Lightbourne  
703-292-4628  
jhlightb@nsf.gov

**Book List**

The Book List highlights books that have mathematical themes and are aimed at a broad audience potentially including mathematicians, students, and the general public. When a book has been reviewed in the Notices, a reference is given to the review. Generally the list will contain only books published within the last two years, though exceptions may be made in cases where current events (e.g., the death of a prominent mathematician, coverage of a certain piece of mathematics in the news) warrant drawing readers’ attention to older books. Suggestions for books to include on the list may be sent to notices-booklist@ams.org.

*Added to “Book List” since the list’s last appearance.


Beyond Coincidence: Amazing Stories of Coincidence and the Mystery and Mathematics Behind Them, by Martin Plimmer and Brian King.


AMS presidents play a key role in leading the Society and representing the profession. Browse through the timeline to see each AMS president’s page, which includes the institution and date of his/her doctoral degree, a brief note about his/her academic career and honors, and links to more extensive biographical information.

www.ams.org/ams/amspresidents.html
Mathematics Calendar

December 2006

2–7 Operator methods in fractal analysis, wavelets and dynamical systems, BIRS, Banff, Canada. (Aug. 2006, p. 823)

4–7 Theory and Applications in Biomathematics, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Oct. 2006, p. 1089)

4–8 Finding and Keeping Graduate Students in the Mathematical Sciences, AIM Research Conference Center, Palo Alto, California. (Jun./Jul. 2006, p. 712)

4–8 Topology, Complex Analysis and Arithmetic of Hyperbolic Spaces, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Jun. 2006, p. 1252)

8–10 Mathematical Economics, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Oct. 2006, p. 1089)

11–13 DIMACS Workshop on Immuno-epidemiology, DIMACS Center, CoRE Bldg, Rutgers University, Piscataway, New Jersey. (Nov. 2006, p. 1252)

11–14 Algebraic analysis of systems of differential equations and the exact WKB analysis, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Oct. 2006, p. 1089)

11–15 Algebraic Number Theory and Related Topics, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Oct. 2006, p. 1089)

11–15 Kyoto Winter School of Mathematical Biology, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Oct. 2006, p. 1089)

12–16 The Eleventh Asian Technology Conference in Mathematics, Hong Kong Polytechnic University, Hong Kong, Hong Kong. (Jun./Jul. 2006, p. 712)


16–18 The 5th International Conference on Differential Equations and Dynamical Systems, University of Texas–Pan American, Edinburg, Texas. (Jun./Jul. 2006, p. 713)


17–21 Integral Closure, Multiplier Ideals and Cores, AIM Research Conference Center, Palo Alto, California. (May 2006, p. 612)

18–20 Potential Theory and its Related Fields, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Oct. 2006, p. 1089)


18–21 Group Theory and Related Topics, Research Institute for
18–22 Categorical Construction of Primitive Forms II, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Oct. 2006, p. 1089)


25–27 Micro-Macro Duality in Quantum Physics, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Oct. 2006, p. 1089)


January 2007

* 3–7 Workshop on Symplectic Field Theory, Universidad de Colima, Colima, Mexico.

Description: First Workshop in Geometry. The topic of this workshop is Symplectic Field Theory. This is to be part of a series of annual workshops with the purpose of promoting the development of new areas of geometry in Mexico.

Invited Speakers: Kai Cieliebak (Ludwig Maximilian University, Munich), TobiasEkholm (University of Southern California, Los Angeles), Yakov Eliashberg (Stanford University, Stanford), John Etnyre (Georgia Institute of Technology, Atlanta), Dusa McDuff (State University of New York, Stony Brook), Klaus Mohnke (Humboldt University, Berlin).

Funding: Limited funding for graduate students will be available.

Information: http://fejer.ucol.mx/geometry/.

5–8 Joint Mathematics Meetings, New Orleans, Louisiana. (Jun./Jul. 2006, p. 713)

* 8–26 School and Workshop on the Geometry and Topology of Singularities, in honor of the 60th birthday of Lê D.T., Instituto de Matemáticas, Universidad Nacional Autónoma de México (UNAM), Cuernavaca, Mexico.

Description: The first week will consist of six elementary courses, aimed at educating graduate students and other researchers who are new to the area. The second week will consist of four, more advanced, courses, and thirteen additional shorter lectures. The third week will consist of expository and advanced lectures in honor of, or related to the work of, Lê D.T.

Scientific Committee: Jean-Paul Brasselet (Marseille, France), David Massey (Boston, USA), José Seade (Cuernavaca, Mexico), Bernard Teissier (Paris, France).

Funding: There is travel and housing support available for graduate students and recent Ph.D.s who are citizens of the USA. See the application information on the Web site.

Information: http://www.matcuer.unam.mx/~singularities/.


* 8–March 31 Moving Interface Problems and Applications in Fluid Dynamics, Institute for Mathematical Sciences, National University of Singapore, Singapore. (Oct. 2006, p. 1089)


Description: The course is intended both as an introduction to the above topics focused on research students in mathematics and the physical sciences, and as a set of introductory lectures to the six month programme Analysis on Graphs and its Applications to be held in 2007 at the Isaac Newton Institute Cambridge. Postdocs and young scientists are welcome to attend.

Lecturers: Professor T. Sunada (Meiji, Japan), Spectral geometry of discrete Laplacians; Professors P. Kuchment (Texas A & M, USA) and P. Exner (Prague, Czech Republic), Quantum graphs and their applications; Professor A. Teplyaev (Connecticut, USA), Analysis on Fractals; A guest lecture will be given by Professor U. Smilansky (Weizmann Institute of Science, Israel), Spectral statistics.

Registration fee and Applications: The registration fee to attend is £100. The accommodation costs for all UK-based Ph.D. students are covered by EPSRC. Participants must pay their own travel costs. Postdocs and non-UK students will be required to pay their own subsistence costs and the registration fee (£420 in total). There may be some funds available to help with the costs of those required to pay the full amount, further information will be available after the deadline for applications. Numbers will be limited and those interested are advised to make an early application. The closing date for applications is Friday 11 November 2006. All applicants will be contacted by the London Mathematical Society approximately one week after this deadline; we will not be able to give information about individual applications before then. Please do not send any money until we ask.

Organizer: Professor B. M. Brown (Cardiff Univ., UK).


15–19 Computational Commutative Algebra and Computational Algebraic Geometry, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan. (Aug. 2006, p. 823)


* 18–21 Fields Institute–Workshop on the Representation Theory of Reductive Algebraic Groups, University of Ottawa, Canada.

Description: This workshop is the second of a series; the Fields Institute Workshop on the Representation Theory of p-adic Groups was held at the University of Ottawa in May 2004.

Format: Two days of mini-courses, followed by a weekend conference. The goal of the mini-course portion of the workshop is to offer an introduction to some of the important recent developments in representation theory, and to help foster an environment which encourages the lively interaction of researchers from all disciplines. The subsequent weekend conference will allow researchers to share their latest results and ideas in a broad range of related areas.

Mini-course lecturers: Julia Gordon, University of British Columbia, Motivic Integration and its Applications to p-adic Groups; Ju-Lee Kim, Univ. of Illinois at Chicago, MIT Visiting Professor, Types and Plancherel formulate; Phil Kutzko, University of Iowa, Reducibility of Parabolic Induction.

Speakers: Anne-Marie Aubert, Institut de Mathématiques de Jussieu, Cristina Ballantine, College of the Holy Cross; Fiona Murnaghan, University of Toronto; A. Raghuram, Oklahoma State University; Michael Schein, Hebrew University; Yakov Varshavsky, Hebrew University; Teruyoshi Yoshida, Harvard University.

Registration: There is no registration fee; participants are, however, encouraged to register early to facilitate room reservations and to ensure the receipt of all emailed conference updates. Registration forms are available at http://www.fields.utoronto.ca/programs/scientific/06-07/reductive/ Please send expressions of interest to Monica Nevins (nevins@uottawa.ca) or Clifton Cunningham (cunningham@math.ucalgary.ca). Graduate students and
new Ph.D.'s are especially encouraged to attend. 

**Information:** [http://www.fields.utoronto.ca/programs/scientific/06-07/reductive/](http://www.fields.utoronto.ca/programs/scientific/06-07/reductive/).

**22–26 Local Holomorphic Dynamics**, Pisa, Italy. (Aug. 2006, p. 823)

**22–26 Winter School “Geometric Measure Theory, Random Sets and Digital Stereology”, Sandbjerg Estate, Sonderborg, Denmark.** (Jun./Jul. 2006, p. 713)

* 29–February 2 Diophantine and Analytical Problems in Number Theory, Moscow Lomonosov State University, Moscow, Russia. 

**Description:** The conference is dedicated to 100th birthday of the prominent Russian mathematician A. O. Gelfond (1906–1968). 

**Focus:** On the recent achievements in branches of Number Theory close to Gelfond’s interests. 

**Topics:** Transcendence and algebraic independence of numbers, specially values of analytic functions; irrationality problems of polynomials and Riemann zeta-values; irrationality and linear independence measures of numbers; lower bounds for linear forms in logarithms and elliptic logarithms at algebraic points; the substructure fields, quantum information and entanglement, classical behavior of decoherence, quantum computation; derivations of macroscopic equations from microscopic dynamics, quantum mechanics, coupled dynamics of particles and radiation fields, quantum information and entanglement, classical behavior in quantum systems, scattering and spectral analysis for Schroedinger operators, quantum graphs. Three short courses will be given in a series of lectures scheduled in the morning of each day. Some invited talks will be given in the afternoon followed by short contributed talks given by participants. 

**Courses:** 1. Erdős (Munich), Limit equations for N-particle quantum systems; H. Spohn (Munich)/M. Griesemer (Stuttgart), Nonrelativistic quantum electrodynamics; R. F. Werner (Braunschweig), Conceptual and mathematical foundations of quantum information. 

**Invited Speakers:** S. Albeverio (Bonn), A. Arnold (Wien), P. Hanngi (Augsburg), F. Nier (Rennes), R. Schrader (Berlin). 

**Information:** Contact address: Andrea Sacchetti, Dipartimento di Matematica Pura ed Applicata G. Vitali, Università degli Studi di Modena e Reggio Emilia Via Campi, 213/B, 41100, Modena; email: info.mmqm@unino.it; tel. +39 059 2055209; fax: +39 059 370513. For further information, please see the website [http://www.MMQM.unimore.it](http://www.MMQM.unimore.it).

**March 2007**

* 1–4 Workshop on University Mathematics Courses for School Teachers, University of Arizona, Tucson, Arizona. 

**Purpose:** Participants in this workshop will be teams of mathematicians and educators from universities interested in implementing content courses for school teachers. Workshop leaders will be representatives of Math Science Partnerships and Centers for Teaching and Learning around the country, who will present models and work with participating teams to develop plans for their home institutions. 

**Sponsoring organization:** The Institute for Mathematics and Education. 

**Organizers:** William McCallum, Rebecca McGraw, David Savitt. 

**Deadline:** January 31, 2006. 

**Information:** William McCallum, wmc@math.arizona.edu; Application materials: [http://math.arizona.edu/~ime/](http://math.arizona.edu/~ime/).

**3–4 AMS Southeastern Section Meeting**, Davidson College, Davidson, North Carolina. (Jun./Jul. 2006, p. 713)


**12–15 2007 MBI Workshop for Young Researchers in Mathematical Biology**, The Ohio State University, Columbus, Ohio. (Sept. 2006, p. 958)


**16–17 AMS Central Section Meeting**, Miami University, Oxford, Ohio. (Jun./Jul. 2006, p. 713)


**Program:** Workshop on the theory of topological modular forms and connections to derived algebraic geometry, elliptic genera, string cobordism, and classical modular forms. 

**Organizers:** Chris Douglas, John Francis, Andre Henriques, Mike Hill. 

**Information:** [http://www-math.mit.edu/~jnfr/talbot](http://www-math.mit.edu/~jnfr/talbot). Contact: Andre Henriques (henrique@math.uni-muenster.de).

*29–31 Spring Topology and Dynamical Systems Conference 2007, University of Missouri-Rolla, Rolla, Missouri.

Program: Along with invited speakers there will be four special sessions of contributed talks in the areas of: Continuum Theory, Dynamical Systems, Geometric Topology/Geometric Group Theory, General/Set Theoretic Topology.

Organizers: W. J. Charatonik (wjcharat@umr.edu), M. Insall (insall@umr.edu), R. Roe (roe@umr.edu).

Information: http://web.umr.edu/~stdc2007/.

*30–31 33rd Annual New York State Regional Graduate Mathematics Conference, Syracuse University, Syracuse, New York.

Organizers: This annual conference is completely organized by the Mathematics Graduate Organization (MGO) at Syracuse University, and is aimed at graduate students.

Speakers: This year’s invited speakers are Carl Pomerance (Dartmouth College) and Steve Hofmann (University of Missouri-Columbia).

Information: Further information will be appearing at http://webwork.ary.edu/~mgo/ under “MGO Conference” as the conference approaches.

*31–April 3 International Conference on Industrial & Applied Mathematics, Jammu University, Jammu, India.

Topics: To be emphasized are more relevant to real world problems such as waves, fractals, scientific computation, inverse problem. Some distinguished scientists specializing in the area have consented to participate.

Deadline: For participation request is January 30, 2007.

Information: Interested persons in participation of the conference may contact either Professor B. S. Komal (bskomial@yahoo.co.in), Professor Manchanda; (pmanch2k1@yahoo.co.in); Professor A. H. Siddiqi (siddiqi.abulhasan@gmail.com). Details can be found on http://www.siam-india.org.

April 2007

*2–5 Quantum Graphs and their Applications, Isaac Newton Institute for Mathematical Sciences, Cambridge, United Kingdom.

Description: This workshop is a part of the six month program “Analysis on Graphs and its Applications” to be held in 2007 at the Isaac Newton Institute. (see: http://www.newton.cam.ac.uk/programmes/AGA/index.html). It is a continuation of the previous April 2–5 workshop and is devoted to applications of (quantum) graph models in sciences and engineering.


Information: http://www.newton.cam.ac.uk/programmes/AGA/ws.html. Contact: P. Exner, exner@ujf.gan.ca

10–14 Workshop on Control Theory & Finance, Instituto Superior de Economia e Gestão (ISEG), Technical University of Lisbon, Lisbon, Portugal. (Oct. 2006, p. 1090)


Topics: Continuous optimization, discrete optimization, decision making theory, convex and nonsmooth analysis, game theory, calculus of variations, algorithms and dynamical systems, mathematical economics, mathematical finance, optimal control, operations research, applications to signal and image processing, human and behavioral sciences, life sciences, engineering, etc.

Important dates: December 10, 2006: Submission of a talk proposal (provide a paper on recent or on-going work), January 15, 2007: Notification of acceptance to authors, January 30, 2007: Submission of a 2-page LaTeX summary of the talk, February 7, 2007: Scientific program comes out, April 7, 2007: Authors submit slides of their talk in PDF format.


20–22 Riviere-Fabre Symposium on Analysis and PDE, University of Minnesota, Minneapolis, Minnesota. (Nov. 2006, p. 1253)

21–22 AMS Western Section Meeting, University of Arizona, Tucson, Arizona. (Jun/Jul. 2006, p. 713)

23–27 Dynamics in Perturbations, Hasselt University, Campus Diepenbeek, and Brussels, Belgium. (Oct. 2006, p. 1090)


*28–30 Multi-scale Modeling and Simulation in Materials Science, University of Tennessee, Knoxville, Tennessee.

Description: Focus: To explore a range of modeling and simulation techniques used in materials science that include both atomistic and continuum methods, as well as methods that seek to combine these approaches.

Principal Speakers (each will deliver 3 lectures): Russel Caflisch (UCLA), Bjorn Engquist (Texas), Mitchell Luskin (Minnesota).

Invited Speakers: Gregory Beylkin (Colorado), Peter Cummings (Vanderbilt and Oak Ridge National Lab), Qiang Du (Penn State), George Karniadakis (Brown), Markus Katsoulakis (Massachusetts), Peter Smereka (Michigan), Art Voter (Los Alamos National Laboratory).

Information: http://www.math.utk.edu/Barrett/.


May 2007

*6–12 Symposium in Algebraic Geometry and its applications
Mathematics Calendar

(cryptography, coding theory), Faa’a, French Polynesia.

Topics: Arithmetic and algebraic geometry over finite fields, combinatorial geometry over finite fields, algorithmic over finite fields, error correcting codes, cryptography, Boolean functions, sequences.


Information: http://mathcs.emory.edu/ask/saga2007/welcome.html; email: rolland@mathcs.emory.edu.


16–20 Linear algebraic groups and cohomology, Emory University, Atlanta, Georgia.

Topics: Cohomological invariants of algebraic groups, numerical invariants of torsors, rational points on homogeneous spaces, division algebras over fields, Chow groups and motivic decomposition.

Organizers: Eric Brussel (brussel@mathcs.emory.edu), Skip Garibaldi (skip@mathcs.emory.edu), R. Parimala (parimala@mathcs.emory.edu), Vicki Powers (vicki@mathcs.emory.edu).


18–20 The 2007 Midwest Geometry Conference (MGC 07), University of Iowa, Iowa City, Iowa. (Jun./Jul. 2006, p. 713)


22–26 Extremal problems in complex and real analysis, Peoples Friendship University of Russia, Moscow, Russia. (Aug. 2006, p. 824)

* 22–26 Inverse Problems in Stochastic Differential Equations, University of Southern California, Los Angeles, California.

Speakers: S. Chen (Iowa State University), Y. Kutoyants (Université du Maine), G. Papanicolaou (Stanford University), G. Samorodnitsky (Cornell University), G. Yin (Wayne State University).

Information: One of the goals is to add an instructional component to the event, so that the young participants could learn both the basic facts and new developments in the subject. In particular, each of the above speakers will give a series of several lectures on a particular topic.

Funds: Limited NSF funds are available to support students and young researchers who wish to attend. The support will cover housing, and provide a stipend for local expenses during the conference. Depending on availability of funds, some help with the travel to and from LA can also be provided.

Deadlines: May 1, 2007 (general registration); April 15, 2007 (for financial support).


Organizers: Maya Chhetri (UNC Greensboro), Petr Girg (University of West Bohemia), John M. Neuberger (Northern Arizona University).

Plenary Speakers: Dijiao de Figueiredo (Universidade Estadual de Campinas, Brazil), Jean Mawhin (Universite Catholique de Louvain, Belgium), James Serrin (University of Minnesota, USA), Peter Takac (University of Rostock, Germany), Jianxin Zhou (Texas A&M University, USA).

Information: http://www.mathcs.emory.edu/~skip/conf/Home.html; email: rolland@mathcs.emory.edu.

* 27–June 1 Analysis on Graphs and Fractals (A satellite meeting for the January–June 2007 Isaac Newton Institute program “Analysis on Graphs and its Applications”), University of Wales, Cardiff, UK.

Description: This workshop is a part of the six month program Analysis on Graphs and its Applications to be held in 2007 at the Isaac Newton Institute. (see: http://www.newton.cam.ac.uk/programmes/AGA/index.html). It is devoted to analysis on graphs (including spectral theory of graph operators, zeta functions, etc.) and its relations to problems of algebra, number theory, random walks, etc., as well as to analysis on fractals and its applications.

Information: Contact: T. Sunada, email: sunada@math.mieji.ac.jp or P. Kuchment: kuchment@math.tamu.edu. http://www.newton.cam.ac.uk/programmes/AGA ws.html.


29–June 1 The Fourth International Conference on Mathematical Biology, Wuyishan city, Fujian, P.R. China. (Oct. 2006, p. 1091)


June 2007

* 1–5 Sampling Theory and Applications 07 (SAMPTA07), Aristotle Univ. of Thessaloniki, Thessaloniki, Greece.

Information: http://web.auth.gr/sampta07/; email: karakika@csd.auth.gr.

4–8 Arithmetic Harmonic Analysis on Character and Quiver Varieties, AIM Research Conference Center, Palo Alto, California. (Jun./Jul. 2006, p. 714)


Description: The conference on Ordered Statistical Data is an international annual conference. It aims at creating a stimulating atmosphere for researchers in the area by fostering research, discussion, and exchange of ideas on statistical work on ordered data.

Topics: It will be dedicated to all aspects of Ordered Statistical Data and Inequalities and will provide an opportunity to explore as many topics as follows: Distribution Theory and Probability Models, Approximations & Characterizations, Stochastic Ordering, Inequalities, Progressive Censoring, Statistical Inference, Biostatistical Applications, Information and Entropies, Nonparametric Methods & Ranked Set Sampling, Asymptotic Theory and other related topics.


Information: Contacts: Prof. M. Z. Raqab (Organizing Committee, Co-Chair) Department of Mathematics, University of Jordan, Amman 11942 Jordan; Tel: +962-6-5355000 x 3135; Fax: +962-6-5355570; email: mza@jcu.edu.jo; mza@jcu.edu.jo; Prof. H. N. Nagaraja (Organizing Committee, Co-Chair), Department of Statistics, Ohio State University, Columbus, OH 43210-1247; Tel: +614-292-6072;
14–16 The XVth International Colloquium on Integrable Systems and Quantum symmetries, Czech Technical University, Prague, Czech Republic. (Nov. 2006, p. 1253)

18–23 Combinatorics and Optimization 40th Anniversary Conference, University of Waterloo, Waterloo, Ontario, Canada. (Sept. 2006, p. 960)


* 24–July 1 45th International Symposium on Functional Equations, Bielsko-Biala, Poland.

**Topics:** Functional equations and inequalities, mean values, functional equations on algebraic structures, Hyers-Ulam stability, regularity properties of solutions, conditional functional equations, iteration theory; applications of the above, in particular to the natural, social, and behavioral sciences.

**Information:** Participation at these annual meetings is by invitation only. Those wishing to be invited to this or one of the following meetings send details of their interest and, preferably, publications (paper copies) and/or manuscripts with their postal and email address to: R. Ger, Institute of Mathematics, Silesian University, Bankowa 14, PL-40-007 Katowice, Poland (romanger@tu. edu.pl) before March 1, 2006.


28–July 4 6th Congress of Romanian Mathematicians, Faculty of Mathematics and Computer Science, University of Bucharest, Bucharest, Romania. (Sept. 2006, p. 960)

July 2007

* 1–7 The VI International Algebraic Conference in Ukraine, dedicated to the 100th anniversary of Professor D. K. Faddeev, Kamenets-Podols’ky State University, Kamenets-Podols’ky, Ukraine. Information: email: vkir@univ.kiev.ua.

* 1–13 Cohomology of groups and Algebraic K-theory, Center of Math Sciences, Zhejiang University, China. Confirmed speakers: Peter Abramenko, Virginia, USA; Ken Brown, Cornell, USA; Tom Farrell, Binghamton, USA; Dan Grayson, Illinois, USA; Wolfgang Lueck, Munster, Germany; Soul Christophe, Paris, France. Besides these lecture series, there will also be some research talks. At the moment, the speakers include Arthur Bartels, Zongzhu Lin, David Rosenthal, Hourong Qin.

Organizing Committee: Ken Brown, Li Zhenni, Kefeng Liu, Wolfgang Lueck, Shing-Tung Yau.

Local Organizers: Fang Li, Hongwei Xu.

Information: Contact Person: Li Fang, fanli@zms.zju.edu.cn; http://cms.zju.edu.cn/2006/Cohomology/home.htm.


2–6 25th Journees Arithmetiques, University of Edinburgh, Scotland, UK. (May 2006, p. 612)

2–6 Design Theory of Alex Rosa, a meeting in celebration of Alex Rosa’s 70th Birthday, Bratislava, Slovakia. (Sept. 2006, p. 961)

* 3–6 18th International Workshop on Operator Theory and its Applications (IWOTA-2007), North-West University, Potchefstroom, South Africa.

Information: The official Web address of the conference is: http://www.puk.ac.za/iwota/ and the official e-mail address is: sriiwota@puk.ac.za.


9–12 International Conference on Artificial Intelligence and Pattern Recognition, Orlando, Florida. (Aug. 2006, p. 824)


**Topics:** Mathematical modelling in hemodynamics (main topic), mathematical methods in continuum mechanics, splines and wavelets with applications to CAGD, CAD/CAM, computer graphics and differential equations, ordinary and partial differential equations, integral equations, singular perturbation problems, mathematics of finance, numerical mathematics in general, optimization, scientific computing, engineering.

Invited Speakers: Suncica Canic, University of Houston, USA; Boris I. Kvasov, Institute of Computational Technologies RAS, Russia (tentative); Herve LeDret, Universite Pierre et Marie Curie, Paris, France (tentative); Andro Mikelic, University Lyon 1, France; Annie Raoult, Universite Rene Descartes-Paris 5, France; Maria Rosaria Padula, University of Ferrara, Italy.

Scientific Committee: S. Canic (Houston), A. Mikelic (Lyon), M. Padula (Ferrara), R. S von Neumann Lecture of SIAM; Olga Taussky Todd Lecture of AWM and EWM.

Prizes: The winners of the five ICIAM prizes 2007 are given here: http://www.iciam.org/prizes2007.html. The Henrici Prize of ETH and SIAM and the Wilkinson Prize for Numerical Software of Argonne National Lab., National Physical Lab, and NAG will be handed out.

Information: Main organizer: Rolf Jeltsch, e-mail address jeltsch@math.ethz.ch. Conference Website: http://www.iciam07.ch/.

16–22 The 8th International Conference on Fixed Point Theory and Its Applications, Department of Mathematics, Faculty of
Mathematics Calendar

Science, Chiang Mai University, Chiang Mai, Thailand. (Sept. 2006, p. 961)

* 17–30 The Second International Conference on Optimization and Optimal Control, National University of Mongolia, Ulaanbaatar, Mongolia.

Topics: The following topics, but not limited to: Linear, non-linear, combinatorial, parametric, stochastic, multilevel, multi-objective and global optimization; Calculus of variations, optimal control, variational inequalities and game theory; Mathematical economics; Interdisciplinary applications of optimization theory (economics, engineering and general sciences); Biomathematics, protein folding optimization.

Plenary Speakers: A. S. Antipin (Russia), B. N. Datta (USA), M. Fukusima (Japan), J. Guddat (Germany), H. Th. Jongen (Germany), J. Lee (Korean), J. E. Martinez Legaz (Spain), B. Luderer (Germany), B. Mordukhovich (USA), P. M. Pardalos (USA), C. Roucairol (France), J. Ruckmann (Mexico), V. A. Srochko (Russia), A. S. Sterkalovsky (Russia), K. L. Teo (Australia), M. Thera (France), G. Wanka (Germany).


* 22–25 OPTIMIZATION 2007, Faculty of Economics, University of Porto, Porto, Portugal.

Description: OPTIMIZATION 2007 is the sixth international conference on optimization organized in Portugal since 1991.

Speakers: Charles Audet (École Polytechnique Montréal, Canada), Egon Balas (Carnegie Mellon University, USA), Adam N. Letchford (Lancaster University, UK), Sven Leyffer (Argonne National Laboratory, USA), Michael J. Todd (Cornell University, USA), Xin Yao (University of Birmingham, UK).


22–27 CIM/UC Summer School: Topics in Nonlinear PDEs, Centro Internacional de Matemática (CIM), Coimbra, Portugal. (Nov. 2006, p. 1253)


* 30–August 3 L-functions and modular forms, AIM Research Conference Center, Palo Alto, California.

Description: This workshop, sponsored by AIM and the NSF, will initiate a major new project to gather and organize data and methods for understanding and computing with L-functions and modular forms. The goal is to produce extremely easy to use and well documented databases and software for use by researchers and students.


31–August 3 First Joint International Meeting between the AMS and the Polish Mathematical Society, Warsaw, Poland. (Jun/Jul. 2006, p. 714)

August 2007


6–8 Joint SOCR CAUSEway Continuing Education Workshop 2007, UCAI, Los Angeles, California. (Oct. 2006, p. 1091)


Description: The USENIX Security Symposium brings together researchers, practitioners, system administrators, system programmers, and others interested in the latest advances in the security of computer systems and networks.


Information: http://www.usenix.org/events/sec07/. Contact: Conference Department, conference@usenix.org; tel: 510-528-8649.


Program: The conference aims to bring together scholars from around the world for fruitful scientific exchange in a broad range of areas reflecting Hans Duistermaat’s mathematical influence over the last 30–40 years in geometry, mechanics, Lie groups and partial differential equations.


September 2007


4–6 International Conference on Mathematical Biology 2007 (ICMB07), Universiti Putra Malaysia, Serdang, Malaysia. (Nov. 2006, p. 1253)


* 13–14 IMA Tutorial: Mathematics of Nucleic Acids, University of Minnesota, Minneapolis, Minnesota.

Organizers: Wilma Olson (Rutgers University), David Swigon (University of Pittsburgh).


* 17–21 IMA Workshop: Mathematics and Biology of Nucleic Acids, University of Minnesota, Minneapolis, Minnesota.

Organizers: Stephen Harvey (Georgia Institute of Technology), Wilma Olson (Rutgers University), De Witt Summers (Florida State University), David Swigon (University of Pittsburgh).

Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/96.17-21.07/.

October 2007

* 5–6 AMS Central Section Meeting, DePaul University, Chicago, Illinois.


* 6–7 AMS Eastern Section Meeting, Rutgers University-New Brunswick, Busch Campus, New Brunswick, New Jersey.


theoretical physicists concern broadly with the study of “probability theory on graphs” or “statistical mechanics on graphs”. The organizers are Mark Jerrum (University of Edinburgh), Henry Kesten (Cornell University), Nathan Linial (Tel Aviv University), and Persi Diaconis (Stanford University).

Organizers: P. J. Cameron (Queen Mary, University of London), B. Jackson (Queen Mary, University of London), Dr. A. Scott (University of Oxford), A. Sokal (New York University) and D. G. Wagner (University of Waterloo)

Information: http://www.newton.cam.ac.uk/programmes/CSM/; email: info@newton.cam.ac.uk.

March 2008

* 3–7 IMA Workshop: Organization of Biological Networks, University of Minnesota, Minneapolis, Minnesota.

Organizer: Steven Altschuler (University of Texas Southwestern Medical Center), Alexander Hoffmann (University of California at San Diego), Lani Wu (University of Texas Southwestern Medical Center).

Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W3.3-7.08/.

April 2008

* 17–18 IMA Workshop: Network Dynamics and Cell Physiology, University of Minnesota, Minneapolis, Minnesota.

Organizers: Bela Novak (Budapest University of Technology and Economics), John Tyson (Virginia Polytechnic Institute & State University).

Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/T4.17-18.08/.

* 21–25 IMA Workshop: Design Principles in Biological Systems, University of Minnesota, Minneapolis, Minnesota.

Organizers: Bud Mishra (New York University), Partha Mitra (Cold Spring Harbor Laboratory).

Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W4.21-25.08/.

May 2008

* 26–30 IMA Workshop: Quantitative Approaches to Cell Motility and Chemotaxis, University of Minnesota, Minneapolis, Minnesota.

Organizers: Robert Bourret (University of North Carolina), Alex Mogilner (University of California, Davis), Julie Theriot (Stanford University).

Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W5.26-30.08/.

June 2008


Description: This study brings the mathematics and statistics education communities to work in collaboration with the aim of analysing the situation of teaching statistics at school level and making recommendations about how to train mathematics teachers to better succeed in educating statistical literate students.


Information: http://www.ugr.es/~icmi/iase_study/.

July 2008


August 2008


September 2008

New Publications Offered by the AMS

Algebra and Algebraic Geometry

Representations of Algebraic Groups, Quantum Groups, and Lie Algebras
Georgia Benkart, University of Wisconsin, Madison, WI, Jens C. Jantzen, Aarhus University, Denmark, Zongzhu Lin, Kansas State University, Manhattan, KS, Daniel K. Nakano, University of Georgia, Athens, GA, and Brian J. Parshall, University of Virginia, Charlottesville, VA, Editors

The book contains several well-written, accessible survey papers in many interrelated areas of current research. These areas cover various aspects of the representation theory of Lie algebras, finite groups of Lie types, Hecke algebras, and Lie superalgebras. Geometric methods have been instrumental in representation theory, and these proceedings include surveys on geometric as well as combinatorial constructions of the crystal basis for representations of quantum groups. Humphreys' paper outlines intricate connections among irreducible representations of certain blocks of reduced enveloping algebras of semi-simple Lie algebras in positive characteristic, left cells in two sided cells of affine Weyl groups, and the geometry of nilpotent orbits. All these papers provide the reader with a broad picture of the interaction of many different research areas and should be helpful to those who want to have a glimpse of current research involving representation theory.


Contemporary Mathematics, Volume 413

Linear Algebra in Action
Harry Dym, Weizmann Institute of Science, Rehovot, Israel

Linear algebra permeates mathematics, perhaps more so than any other single subject. It plays an essential role in pure and applied mathematics, statistics, computer science, and many aspects of physics and engineering. This book conveys in a user-friendly way the basic and advanced techniques of linear algebra from the point of view of a working analyst. The techniques are illustrated by a wide sample of applications and examples that are chosen to highlight the tools of the trade. In short, this is material that the author wishes he had been taught as a graduate student.

Roughly the first third of the book covers the basic material of a first course in linear algebra. The remaining chapters are devoted to applications drawn from vector calculus, numerical analysis, control theory, complex analysis, convexity and...
functional analysis. In particular, fixed point theorems, extremal problems, matrix equations, zero location and eigenvalue location problems, and matrices with nonnegative entries are discussed. Appendices on useful facts from analysis and supplementary information from complex function theory are also provided for the convenience of the reader.

The book is suitable as a text or supplementary reference for a variety of courses on linear algebra and its applications, as well as for self-study.

Contents: Vector spaces; Gaussian elimination; Additional applications of Gaussian elimination; Eigenvalues and eigenvectors; Determinants; Calculating Jordan forms; Normed linear spaces; Inner product spaces and orthogonality; Symmetric, Hermitian and normal matrices; Singular values and related inequalities; Pseudoinverses; Triangular factorization and positive definite matrices; Difference equations and differential equations; Vector valued functions; The implicit function theorem; Extremal problems; Matrix valued holomorphic functions; Matrix equations; Realization theory; Eigenvalue location problems; Zero location problems; Convexity; Matrices with nonnegative entries; Some facts from analysis; More complex variables; Bibliography; Index.

Graduate Studies in Mathematics, Volume 78
Mathematics Subject Classification: 15–01, 30–01, 34–01, 39–01, 52–01, 93–01, All AMS members US$63, List US$79, Order code GSM/78

Character Theory of Finite Groups
I. Martin Isaacs, University of Wisconsin, Madison, WI

Character theory is a powerful tool for understanding finite groups. In particular, the theory has been a key ingredient in the classification of finite simple groups. Characters are also of interest in their own right, and their properties are closely related to properties of the structure of the underlying group.

The book begins by developing the module theory of complex group algebras. After the module-theoretic foundations are laid in the first chapter, the focus is primarily on characters. This enhances the accessibility of the material for students, which was a major consideration in the writing. Also with students in mind, a large number of problems are included, many of them quite challenging.

In addition to the development of the basic theory (using a cleaner notation than previously), a number of more specialized topics are covered with accessible presentations. These include projective representations, the basics of the Schur index, irreducible character degrees and group structure, complex linear groups, exceptional characters, and a fairly extensive introduction to blocks and Brauer characters.

This is a corrected reprint of the original 1976 version, later reprinted by Dover. Since 1976 it has become the standard reference for character theory, appearing in the bibliography of almost every research paper in the subject. It is largely self-contained, requiring of the reader only the most basic facts of linear algebra, group theory, Galois theory and ring and module theory.

Contents: Algebras, modules, and representations; Group representations and characters; Characters and integrality; Products of characters; Induced characters; Normal subgroups; T.I. sets and exceptional characters; Brauer’s theorem; Changing the field; The Schur index; Projective representations; Character degrees; Character correspondence; Linear groups; Changing the characteristic; Some character tables; Bibliographic notes; References; Index.

AMS Chelsea Publishing
Mathematics Subject Classification: 20C25, 20C05, 20C20, 20C25, All AMS members US$41, List US$45, Order code CHEL/359.H

Analysis

Operator Theory, Operator Algebras, and Applications
Deguang Han, University of Central Florida, Orlando, FL, Palle E.T. Jorgensen, University of Iowa, Iowa City, IA, and David Royal Larson, Texas A & M University, College Station, TX, Editors

This book offers a presentation of some new trends in operator theory and operator algebras, with a view to their applications. It consists of separate papers written by some of the leading practitioners in the field. The content is put together by the three editors in a way that should help students and working mathematicians in other parts of the mathematical sciences gain insight into an important part of modern mathematics and its applications.

While different specialist authors are outlining new results in this book, the presentations have been made user friendly with the aid of tutorial material. In fact, each paper contains three things: a friendly introduction with motivation, tutorial material, and new research. The authors have strived to make their results relevant to the rest of mathematics. A list of topics discussed in the book includes wavelets, frames and their applications, quantum dynamics, multivariable operator theory, C*-algebras, and von Neumann algebras. Some longer papers present recent advances on particular, long-standing problems such as extensions and dilations, the Kadison-Singer conjecture, and diagonals of self-adjoint operators.

Contents: Applications, wavelets, dynamics, and quantum theory: X. Guo, Y. Diao, and X. Dai, Weyl-Heisenberg frame wavelets with basic supports; P. E. T. Jorgensen, Use of...

Contemporary Mathematics, Volume 414


Applications

Data Depth: Robust Multivariate Analysis, Computational Geometry and Applications

Regina Y. Liu, Rutgers University, New Brunswick, NJ, Robert Serfling, University of Texas at Dallas, Richardson, TX, and Diane Souvaine, Tufts University, Medford, MA, Editors

The book is a collection of some of the research presented at the workshop of the same name held in May 2003 at Rutgers University. The workshop brought together researchers from two different communities: statisticians and specialists in computational geometry. The main idea unifying these two research areas turned out to be the notion of data depth, which is an important notion both in statistics and in the study of efficiency of algorithms used in computational geometry. Many of the articles in the book lay down the foundations for further collaboration and interdisciplinary research.

This item will also be of interest to those working in probability. Copublished with the Center for Discrete Mathematics and Theoretical Computer Science beginning with Volume 8. Volumes 1–7 were copublished with the Association for Computer Machinery (ACM).


DIMACS: Series in Discrete Mathematics and Theoretical Computer Science, Volume 72

Differential Equations

Bifurcation Theory and Spatio-Temporal Pattern Formation
Wayne Nagata, University of British Columbia, Vancouver, BC, Canada, and N. Sri Namachchivaya, University of Illinois, Urbana-Champaign, IL, Editors

Nonlinear dynamical systems and the formation of spatio-temporal patterns play an important role in current research on partial differential equations. This book contains articles on topics of current interest in applications of dynamical systems theory to problems of pattern formation in space and time. Topics covered include aspects of lattice dynamical systems, convection in fluid layers with large aspect ratios, mixed mode oscillations and canards, bacterial remediation of waste, gyroscopic systems, data clustering, and the second part of Hilbert’s 16th problem. Most of the book consists of expository survey material, and so can serve as a source of convenient entry points to current research topics in nonlinear dynamics and pattern formation. This volume arose from a workshop held at the Fields Institute in December of 2003, honoring Professor William F. Langford’s fundamental work on the occasion of his sixtieth birthday.

This item will also be of interest to those working in applications.

Titles in this series are copublished with the Fields Institute for Research in Mathematical Sciences (Toronto, Ontario, Canada).

Contents: F. Antoneli, A. P. S. Dias, M. Golubitsky, and Y. Wang, Flow invariant subspaces for lattice dynamical systems; O. Batiste and E. Knobloch, Waves in extended systems: From low- to high-dimensional behavior; M. Brøns, M. Krupa, and M. Wechselberger, Mixed mode oscillations due to the generalized Canard phenomenon; C. Chen and J. Chadam, Bioremediation of waste in a porous medium; R. J. McDonald, N. S. Namachchivaya, and W. Nagata, Bifurcations of gyroscopic systems near a 0 : 1 resonance; J. Wu, High dimensional data clustering from a dynamical systems point of view; P. Yu, Computation of limit cycles—The second part of Hilbert’s 16th problem.

Fields Institute Communications, Volume 49

Discrete Mathematics and Combinatorics

Jack, Hall-Littlewood and Macdonald Polynomials
Vadim B. Kuznetsov, and Siddhartha Sahi, Rutgers University, New Brunswick, NJ, Editors

The subject of symmetric functions began with the work of Jacobi, Schur, Weyl, Young and others on the Schur polynomials. In the 1950’s and 60’s, far-reaching generalizations of Schur polynomials were obtained by Hall and Littlewood (independently) and, in a different direction, by Jack. In the 1980’s, Macdonald unified these developments by introducing a family of polynomials associated with arbitrary root systems.

The last twenty years have witnessed considerable progress in this area, revealing new and profound connections with representation theory, algebraic geometry, combinatorics, special functions, classical analysis and mathematical physics. All these fields and more are represented in this volume, which contains the proceedings of a conference on “Jack, Hall-Littlewood and Macdonald polynomials” held at ICMS, Edinburgh, during September 23-26, 2003.

In addition to new results by leading researchers, the book contains a wealth of historical material, including brief biographies of Hall, Littlewood, Jack and Macdonald; the original papers of Littlewood and Jack; notes on Hall’s work by Macdonald; and a recently discovered unpublished manuscript by Jack (annotated by Macdonald). The book will be invaluable to students and researchers who wish to learn about this beautiful and exciting subject.


**Contemporary Mathematics, Volume 417**


**Mathematics Subject Classification:** 33D52, 33D80, 33D45, 33D67, All AMS members US$79, List US$99, Order code CONM/417

---

**Geometry and Topology**

**Asymptotically Symmetric Einstein Metrics**

Olivier Biquard, *Université Louis Pasteur et CNRS, Strasbourg Cedex, France*

The correspondence between Einstein metrics and their conformal boundaries has recently been the focus of great interest. This is particularly so in view of the relation with the physical theory of the AdS/CFT correspondence.

In this book, this correspondence is seen in the wider context of asymptotically symmetric Einstein metrics, that is Einstein metrics whose curvature is asymptotic to that of a rank one symmetric space. There is an emphasis on the correspondence between Einstein metrics and geometric structures on their boundary at infinity: conformal structures, CR structures, and quaternionic contact structures introduced and studied in the book.

Two new constructions of such Einstein metrics are given, using two different kinds of techniques:
- analytic methods to construct complete Einstein metrics, with a unified treatment of all rank one symmetric spaces, relying on harmonic analysis;
- algebraic methods (twistor theory) to construct local solutions of the Einstein equation near the boundary.

Titles in this series are copublished with Société Mathématique de France. SMF members are entitled to AMS member discounts.

**Contents:** Introduction; Einstein deformations of hyperbolic metrics; Quaternionic contact structures; Quaternionic-Kähler metrics; Bibliography.

---

**SMF/AMS Texts and Monographs, Volume 13**


**Mathematics Subject Classification:** 53C25, 53C15, 32L25, All AMS members US$31, List US$39, Order code SMFAMS/13

---

**Hamilton’s Ricci Flow**

Bennett Chow, *University of California, San Diego, La Jolla, CA*, Peng Lu, *University of Oregon, Eugene, OR, and* Lei Ni, *University of California, San Diego, La Jolla, CA*

Ricci flow is a powerful analytic method for studying the geometry and topology of manifolds. This book is an introduction to Ricci flow for graduate students and mathematicians interested in working in the subject. To this end, the first chapter is a review of the relevant basics of Riemannian geometry. For the benefit of the student, the text includes a number of exercises of varying difficulty.

The book also provides brief introductions to some general methods of geometric analysis and other geometric flows. Comparisons are made between the Ricci flow and the linear heat equation, mean curvature flow, and other geometric evolution equations whenever possible.

Several topics of Hamilton’s program are covered, such as short time existence, Harnack inequalities, Ricci solitons, Perelman’s no local collapsing theorem, singularity analysis, and ancient solutions.

A major direction in Ricci flow, via Hamilton’s and Perelman’s works, is the use of Ricci flow as an approach to solving the Poincaré conjecture and Thurston’s geometrization conjecture.

**Contents:** Riemannian geometry; Fundamentals of the Ricci flow equation; Closed 3-manifolds with positive Ricci curvature; Ricci solitons and special solutions; Isoperimetric estimates and no local collapsing; Preparation for singularity analysis; High-dimensional and noncompact Ricci flow; Singularity analysis; Ancient solutions; Differential Harnack estimates; Space-time geometry; Appendix A. Geometric analysis related to Ricci flow; Appendix B. Analytic techniques for geometric flows; Appendix S. Solutions to selected exercises; Bibliography; Index.

**Graduate Studies in Mathematics, Volume 77**


**Mathematics Subject Classification:** 53C44, 53C21, 58J35, 35K55, All AMS members US$63, List US$79, Order code GSM/77
Quantum Graphs and Their Applications

Gregory Berkolaiko, Texas A&M University, College Station, TX, Robert Carlson, University of Colorado, Colorado Springs, CO, and Stephen A. Fulling and Peter Kuchment, Texas A&M University, College Station, TX, Editors

This volume is a collection of articles dedicated to quantum graphs, a newly emerging interdisciplinary field related to various areas of mathematics and physics. The reader can find a broad overview of the theory of quantum graphs. The articles present methods coming from different areas of mathematics: number theory, combinatorics, mathematical physics, differential equations, spectral theory, global analysis, and theory of fractals. They also address various important applications, such as Anderson localization, electrical networks, quantum chaos, mesoscopic physics, superconductivity, optics, and biological modeling.


Contemporary Mathematics, Volume 415

A Brief Introduction to Classical, Statistical, and Quantum Mechanics

Oliver Bühler, New York University, Courant Institute, NY

This book provides a rapid overview of the basic methods and concepts in mechanics for beginning Ph.D. students and advanced undergraduates in applied mathematics or related fields. It is based on a graduate course given in 2006–07 at the Courant Institute of Mathematical Sciences. Among other topics, the book introduces Newton’s law, action principles, Hamilton-Jacobi theory, geometric wave theory, analytical and numerical statistical mechanics, discrete and continuous quantum mechanics, and quantum path-integral methods.

The focus is on fundamental mathematical methods that provide connections between seemingly unrelated subjects. An example is Hamilton-Jacobi theory, which appears in the calculus of variations, in Fermat’s principle of classical mechanics, and in the geometric theory of dispersive wave trains. The material is developed in a sequence of simple examples and the book can be used in a one-semester class on classical, statistical, and quantum mechanics. Some familiarity with differential equations is required but otherwise the book is self-contained. In particular, no previous knowledge of physics is assumed.

Titles in this series are copublished with the Courant Institute of Mathematical Sciences at New York University.

Contents: Classical mechanics of discrete systems; Wave mechanics; Statistical mechanics; Quantum mechanics; Bibliography; Index.

Courant Lecture Notes, Volume 13


Mathematics Subject Classification: 70–01, 74–01, 74J05, 81–01, 82–01, 82B05, 82B10, All AMS members US$23, List US$29, Order code CLN/13
Multiple Dirichlet Series, Automorphic Forms, and Analytic Number Theory

Solomon Friedberg, Managing Editor, Boston College, Chestnut Hill, MA, Daniel Bump, Stanford University, CA, Dorian Goldfeld, Columbia University, New York, NY, and Jeffrey Hoffstein, Brown University, Providence, RI, Editors

Multiple Dirichlet series are Dirichlet series in several complex variables. A multiple Dirichlet series is said to be perfect if it satisfies a finite group of functional equations and has meromorphic continuation everywhere. The earliest examples came from Mellin transforms of metaplectic Eisenstein series and have been intensively studied over the last twenty years. More recently, many other examples have been discovered and it appears that all the classical theorems on moments of L-functions as well as the conjectures (such as those predicted by random matrix theory) can now be obtained via the theory of multiple Dirichlet series. Furthermore, new results, not obtainable by other methods, are just coming to light. This volume offers an account of some of the major research to date and the opportunities for the future. It includes an exposition of the main results in the theory of multiple Dirichlet series, and papers on moments of zeta- and L-functions, on new examples of multiple Dirichlet series, and on developments in the allied fields of automorphic forms and analytic number theory.

Contents: Multiple Dirichlet series and their applications: G. Chinta, S. Friedberg, and J. Hoffstein, Multiple Dirichlet series and automorphic forms; O. Zhang, Applications of multiple Dirichlet series in mean values of L-functions; A. Diaconu and D. Goldfeld, Second moments of quadratic Hecke L-series and multiple Dirichlet series I; B. Brubaker, D. Bump, G. Chinta, S. Friedberg, and J. Hoffstein, Weyl group multiple Dirichlet series I; B. Brubaker and D. Bump, Residues of Weyl group multiple Dirichlet series associated to GL_{n+1}; M. R. Murty and K. Sinha, Multiple Hurwitz zeta functions; R. Masri, Multiple zeta values over global function fields; A. Deitmar, Generalised Selberg zeta functions and a conjectural Lefschetz formula; Automorphic forms and analytic number theory; Y. Choie and N. Diamantis, Rankin-Cohen brackets on higher order modular forms; D. Ginzburg, Eulerian integrals for GL_2; M. N. Huxley, Is the Hlawka zeta function a respectable object?; A. Ivić, On sums of integrals of powers of the zeta-function in short intervals; M. Jutila and Y. Motohashi, Uniform bounds for Rankin-Selberg L-functions; Y. Motohashi, Mean values of zeta-functions via representation theory; C. J. Mozzochi, On the pair correlation of the Eigenvalues of the hyperbolic Laplacian for PSL(2, Z)/H II; Z. Rudnick and K. Soundararajan, Lower bounds for moments of L-functions: Symplectic and orthogonal examples.

Primes and Knots

Toshitake Kohno, University of Tokyo, Japan, and Masanori Morishita, Kyushu University, Fukuoka, Japan, Editors

This volume deals systematically with connections between algebraic number theory and low-dimensional topology. Of particular note are various inspiring interactions between number theory and low-dimensional topology discussed in most papers in this volume. For example, most interesting are the use of arithmetic methods in knot theory and the use of topological methods in Galois theory. Also, expository papers in both number theory and topology included in the volume can help a wide group of readers to understand both fields as well as the interesting analogies and relations that bring them together.

Contents: M. M. Asaeda, J. H. Przytycki, and A. S. Sikora, Categorification of the skein module of tangles; A. Besser and H. Furusho, The double shuffle relations for p-adic multiple zeta values; N. Boston, Galois p-groups unramified at p—A survey; K. Fuluta, On capitulation theorems for infinite groups; H. Furusho, Multiple zeta values and Grothendieck-Teichmüller groups; S. Garoufalidis and J. S. Gerонimo, Asymptotics of q-difference equations; W. M. Goldman, The mapping class group acts reducibly on SU(n)-character varieties; J. Hillman, D. Matei, and M. Morishita, Pro-p link groups and p-homology groups; H. Murakami, A quantum introduction to knot theory; K. Murasugi, Classical knot invariants and elementary number theory; H. Nakamura and H. Tsunogai, Harmonic and equianharmonic equations in the Grothendieck-Teichmüller group, II; L. Rozansky, On p-adic properties of the Witten-Reshetikhin-Turaev invariant; Y. Shimizu, Selberg-Witten integrable systems and periods of rational elliptic surfaces; Y. Taguchi, On the finiteness of various Galois representations; H. Tsunogai, Some new-type equations in the Grothendieck-Teichmüller group arising from geometry of \mathcal{N}_0,5.

Contemporary Mathematics, Volume 416

Institute of Fundamental Research, Mumbai, India

Shorey, describing some developments since the original notes were published in Appendix C, written in July 2004 by Kirti Joshi, describes the Swinnerton–Dyer conjectures. There is an additional brief note on Eisenstein series and cusp forms with an application to the theorems of Thue and Siegel. Some results from commutative algebra; Varieties; Intersection theory for plane curves; Geometry of curves; Geometry of elliptic curves; Structure of endomorphisms of elliptic curves; Part III. Arithmetic of Elliptic Curves: Rational points on curves; The Mordell–Weil theorem for elliptic curves over \( \mathbb{Q} \); Computing the Mordell–Weil group; Integer points, and the theorems of Thue and Siegel; Representation of numbers by squares; The conjecture of Birch and Swinnerton–Dyer; Appendices; Bibliography.

Tata Institute of Fundamental Research

Contents:

Part I. Analytic theory of Elliptic Curves:

- Introduction
- Foundational material
- Differential Harnack inequalities and the Ricci flow
- Reduced distance and entropy formulas
- Reduced volume; Bibliography
- List of symbols; Index

Part II. Geometry of Elliptic Curves:

- Intersection theory for plane curves
- Geometry of curves
- Commutative algebra; Varieties
- Further properties of varieties
- Geometry of elliptic curves; Structure of endomorphisms of elliptic curves

Part III. Arithmetic of Elliptic Curves:

- Rational points on curves
- The Mordell–Weil theorem for elliptic curves over \( \mathbb{Q} \)
- Computing the Mordell–Weil group
- Integer points
- The conjecture of Birch and Swinnerton–Dyer
- Appendices; Bibliography

Analysis

Differential Harnack Inequalities and the Ricci Flow

Reto Müller, ETH Zurich, Switzerland

In 2002, Grisha Perelman presented a new kind of differential Harnack inequality which involves both the (adjoint) linear heat equation and the Ricci flow. This led to a completely new approach to the Ricci flow that allowed interpretation as a gradient flow which maximizes different entropy functionals. The goal of this book is to explain this analytic tool in full detail for the two examples of the linear heat equation and the Ricci flow. It begins with the original Li–Yau result, presents Hamilton’s Harnack inequalities for the Ricci flow, and ends with Perelman’s entropy formulas and space-time geodesics. The book is self-contained, modern introduction to the Ricci flow and the analytic methods to study it. It is primarily addressed to students who have a basic introductory knowledge of analysis and of Riemannian geometry and who are attracted to further study in geometric analysis. No previous knowledge of differential Harnack inequalities or the Ricci flow is required.

This item will also be of interest to those working in geometry and topology.

A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Introduction; Foundational material; Differential Harnack inequalities; Entropy formulas; Reduced distance and reduced volume; Bibliography; List of symbols; Index

EMS Series of Lectures in Mathematics

Probability

A Course in Applied Stochastic Processes
A. Goswami and B. V. Rao, Indian Statistical Institute, Kolkata, India

This book is an introduction to applications of the theory of stochastic processes—more specifically Markov chain theory—in population dynamics, genetics, and epidemics. A prior exposure to basic probability theory should be helpful, but by no means essential. The book includes a quick review of probability that starts from elementary combinatorial probability and ends with some basic properties of diffusions, including a fairly extensive account of martingales and Markov chains, mostly with proofs. This is done fairly rigorously without using measure theoretic tools. The material on epidemic models includes several important threshold theorems with carefully presented interpretation and complete proofs.

Although this book is primarily intended for use as a textbook for a course on applied stochastic processes, it can also be used by researchers in the fields of genetics or epidemics for learning about applications of probability in their respective areas.

A publication of Hindustan Book Agency. Distributed on an exclusive basis by the AMS in North America. Online bookstore rights worldwide.

Contents: Probability tools and techniques; Branching processes; Basic mathematical genetics; Markov models in genetics; Models in epidemics.

Hindustan Book Agency


Random Surfaces
Scott Sheffield, New York University-Courant Institute of Mathematical Sciences, NY

The author develops a general theory of discrete and continuous height models governed by Gibbs potentials that depend only on height differences. He characterizes the gradient phases of a given slope as minimizers of specific free energy and gives large deviation principles for surface shapes and empirical measures. For convex, nearest neighbor Gibbs potentials, he shows that gradient phases are characterized by their slopes and, in higher dimensional discrete settings, by one additional parameter. For standard $2 + 1$ dimensional crystal surface models, he shows that all smooth phases (crystal facets) lie in the dual of the lattice of translation invariance.

A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: Introduction; Specific free energy and variational principle; Ergodic/extremal decompositions and SFE; Surface tension and energy; Analytical results for Sobolev spaces; Limit equalities and the variational principle; LDP for empirical measure profiles; Cluster swapping; Discrete, two-dimensional gradient phases; Open problems; A. SFE and the lexicographic past; B. Summary of notations; Bibliography.

Astérisque, Number 304

Classified Advertisements

Positions available, items for sale, services available, and more

ALABAMA

AUBURN UNIVERSITY
Department of Mathematics
Assistant Professor

The Department of Mathematics and Statistics, at Auburn University, Alabama, invites applications for two (2) nine-month tenure-track Assistant Professors to begin Fall Semester 2007. The candidate(s) needs to have a background in actuarial science or in areas of research in closely related fields that have an interest in supporting the undergraduate program in Actuarial Science. A Ph.D. is required with a background in financial mathematics, applied stochastic processes, or probability theory. The candidate(s) selected for these positions, which begin August 16, 2007, must meet eligibility requirements to work in the United States on date appointment is scheduled to begin and must be able to communicate in English.

Minorities and women are encouraged to apply.

Applicants should send a vita, a letter of application, and arrange for three letters of recommendations to be sent to Dr. Michel Smith, Chair, Statistics Search Committee, Department of Mathematics and Statistics, 221 Parker Hall, Auburn University, AL 36849-3510, US; fax: 334-844-6555. Review of applications will begin January 15, 2007, and will continue until the position is filled.

Auburn University is an Affirmative Action/Equal Opportunity Employer.

CALIFORNIA

CALIFORNIA INSTITUTE OF TECHNOLOGY
Department of Mathematics
Tenure-Track Position

The Division of Physics, Mathematics, and Astronomy at the California Institute of Technology invites applications for a tenure-track position at the assistant professor level in mathematics. We are especially interested in the following research areas: topology/geometry and analysis, but other fields may be considered. The term of the initial appointment is normally four years and appointment is contingent upon completion of the Ph.D.

Exceptionally well-qualified applicants may also be considered at the associate or full professor level. We are seeking highly qualified applicants who are committed to a career in research and teaching.

Applicants should write promptly to: Tenure-Track Search, Mathematics 253-37, California Institute of Technology, Pasadena, CA 91125

Please include a curriculum vitae, list of publications, description of research, and ensure that at least three letters of recommendation be sent to the above address.

UNIVERSITY OF CALIFORNIA, BERKELEY
Department of Mathematics
EMSW21 Postdoctoral Positions

We invite applications for two special (non-tenure-track) positions, effective July 1, 2007. Applicants should have a recent Ph.D., or the equivalent, in pure or applied mathematics. Preference will be given to applicants in the areas of representation theory, geometry, and combinatorics. These positions are supported in part by the NSF through its EMSW21 Research Training Group program. NSF requires that

Suggested uses for classified advertising are positions available, books or lecture notes for sale, books being sought, exchange or rental of houses, and typing services.

The 2006 rate is $100 per inch or fraction thereof on a single column (one-inch minimum), calculated from top of headline. Any fractional text of 1/2 inch or more will be charged at the next inch rate. No discounts for multiple ads or the same ad in consecutive issues. For an additional $10 charge, announcements can be placed anonymously. Correspondence will be forwarded.

Advertisements in the "Positions Available" classified section will be set with a minimum one-line headline, consisting of the institution name above body copy, unless additional headline copy is specified by the advertiser. Headlines will be centered in boldface at no extra charge. Ads will appear in the language in which they are submitted. There are no member discounts for classified ads. Dictation over the telephone will not be accepted for classified ads.


U.S. laws prohibit discrimination in employment on the basis of color, age, sex, race, religion, or national origin. "Positions Available" advertisements from institutions outside the U.S. cannot be published unless they are accompanied by a statement that the institution does not discriminate on these grounds whether or not it is subject to U.S. laws. Details and specific wording may be found on page 1373 (vol. 44). Situations wanted advertisements from involuntarily unemployed mathematicians are accepted under certain conditions for free publication. Call toll-free 800-321-4AMS (321-4267) in the U.S. and Canada or 401-455-4084 worldwide for further information.

Submission: Promotions Department, AMS, P.O. Box 6248, Providence, Rhode Island 02940; or via fax: 401-331-3842; or send email to classads@ams.org. AMS location for express delivery packages is 201 Charles Street, Providence, Rhode Island 02904. Advertisers will be billed upon publication.

December 2006
Notices of the AMS
applicants be citizens, nationals, or permanent residents of the United States, its territories and possessions. The term of these appointments is two years, with a third year likely, contingent on funding. They have a reduced teaching load of one course per semester. These appointments carry an additional stipend of $10,000 in each of the first two years for summer research, and up to $2,500 per year for travel and other research-related expenses.

Applicants should send a resume, reprints, preprints, and/or dissertation abstract, and ask three people to send letters of evaluation to The Vice Chair for Faculty Affairs at the above address. All letters of evaluation are subject to Berkeley campus policies on confidentiality of letters of evaluation, a summary of which can be found on our home page, http://math.berkeley.edu, under Employment > Academic Openings. We request that applicants use the AMS standardized application form and indicate their subject area using the AMS subject classification numbers. The form is the Academic Employment in Mathematics Application Cover Sheet, available from the American Mathematical Society. Applicants must attest to their eligibility as U.S. citizens or permanent residents by marking the appropriate box on the form, and should indicate their interest in the EMSW21 postdoctoral positions.

Applications must be postmarked by January 1, 2007. Applications postmarked after the deadline will not be considered. The University of California is an Equal Opportunity, Affirmative Action Employer.

The Department of Mathematics and Computer Science at Fairfield University invites applications for a tenure-track Assistant professorship to begin in September 2007. We are looking for candidates whose research specialty is in biological mathematics, including, but not limited to, Biostatistics, Bioinformatics, Computational Biology, and Systems Biology. A doctorate in mathematics is required. Strong evidence of research potential, demonstrated success in classroom instruction, and a solid commitment to teaching are essential. Interest in issues related to the advancement of underrepresented groups in mathematics and the sciences is an important consideration.

One third of the successful candidate’s teaching load will consist of courses listed under or cross-listed with the Department of Biology, including, possibly, an upper level course in the candidate’s area of expertise.

Fairfield University is a comprehensive Jesuit university with about 3,300 undergraduates and a strong emphasis on liberal arts education. The Department of Mathematics and Computer Science consists of 14 full-time faculty members. The department offers a BS and an MS in mathematics. The teaching load is 3 courses/9 credit hours per semester. Fairfield offers competitive salaries and benefits. The picturesque campus is located on Long Island Sound in southwestern Connecticut, about 50 miles from New York City. Fairfield is an Affirmative Action/Equal Opportunity Employer. For further details see http://cs.fairfield.edu/math/. Applicants should send a letter of application, a curriculum vitae, teaching and research statements, and three letters of recommendation commenting on the applicant’s experience and promise as a teacher and scholar, to Matt Coleman, Chair of the Department of Mathematics and Computer Science, Fairfield University, Fairfield CT 06824-5195. Full consideration will be given to complete applications received by January 15, 2007. Please let us know whether you will be attending the AMS/MAA Joint Meetings in New Orleans in January.
be updated on a monthly basis. Georgia Tech, an institution of the University Sys-
tem of Georgia, is an Equal Opportu-
nity/Affirmative Action Employer.

ILLINOIS WESLEYAN UNIVERSITY
Department of Mathematics

The Department of Mathematics and Com-
puter Science at Illinois Wesleyan Univer-
sity invites applications for a tenure-track
position in mathematics at the assistant
professor level. Employment would begin
in August 2007 and the teaching load
would be six courses per year. All can-
didates should have completed a Ph.D. in
mathematics by August 1, 2007, and have
a specialization in graph theory or combi-
natorics. Candidates should also have a
significant amount of graduate training in
computer science. The successful can-
didate must be able to teach our core math-
ematics curriculum, as well as courses in
discrete mathematics using Mathematica.
Teaching assignments could include some
courses in computer science. Candidates
should be dedicated to excellent teaching in
a liberal arts environment where un-
dergraduate research is encouraged.
The opportunity to participate in university-
wide, general education programs is avail-
able for interested faculty.

Illinois Wesleyan University is a highly-
selective, undergraduate university of ap-
proximately 2,200 students located in
Bloomington, Illinois, a community of
about 120,000. This year the average ACT
for Illinois Wesleyan’s first-year students
is 28.3. In past years as many as 4% of the
undergraduate population at Illinois Wes-
leyan University have declared majors in
mathematics. The department maintains a
healthy balance between applied math-
ematics and pure mathematics. Faculty
areas of professional expertise include
number theory, topology, category theory,
algebra, linear algebra, operations research,
numerical analysis, approximation theory,
wavelet analysis, differential equations,
dynamical systems, probability and sta-

tistics, survival analysis, computational
statistics, logic, and fuzzy sets. The De-
partment of Mathematics and Computer
Science is located in the Center for Natu-
ral Science Learning and Research, a
$25,000,000 facility opened in 1995. For
additional information on the mathemat-
ics curriculum, facilities, and faculty in-
terests see http://www2.iwu.edu/
academics/math.shtml.

Candidates for the position should sub-
mit a letter of application, a curriculum
vitae, an AMS Standard Cover Sheet, a
teaching statement, a research statement,
and have three letters of recommendation
sent separately to Melvyn Jeter, Depart-
ment of Mathematics and Computer Sci-
ence, Illinois Wesleyan University, P.O. Box
2900, Bloomington, IL 61702-2900. Email
applications are strongly discouraged.
Interviews for this position will be held at
the Joint Mathematics Meeting in New Orleans,
Louisiana (January 2007). Applications re-
ceived after December 1, 2006, may not re-
ceive full consideration. Women and mi-
norities are encouraged to apply. Illinois
Wesleyan is an Equal Opportunity Em-
ployer.

NORTHEASTERN UNIVERSITY
Department of Mathematics
2033 Sheridan Road,
Evaston, Illinois 60208-2730

Applications are invited for an anticipated
tenured or tenure-track position starting
September 2007. Priority will be given to
exceptionally promising research mathe-
maticians. We invite applications from
qualified mathematicians in all fields.

Applications should be submitted elec-
tronically to http://www.mathjobs.org. In-
quiries may be sent via email to:
hiring@math.northeastern.edu.

Applications are welcome at any time,
but the review process starts in November
2006. Northeastern University is an Af-
firmative Action, Equal Opportunity Em-
ployer committed to fostering a diverse
faculty; women and minority candidates
are especially encouraged to apply.

NORTHEASTERN UNIVERSITY
Department of Mathematics
2033 Sheridan Road,
Evaston, Illinois 60208-2730
Boas Assistant Professor

Applications are solicited for up to three
Ralph Boas assistant professorships of
three years each starting September 2007.
These are non-tenure-track positions with
a teaching load of four quarter courses
per year. We invite applications from qual-
ified mathematicians in all fields.

Applications should be made electroni-
cally at http://www.mathjobs.org and
should include (1) the American Mathe-
matical Society Cover Sheet for Academic
Employment, (2) a curriculum vitae, (3) a
research statement, and (4) three letters of
recommendation, one of which discusses the
candidate’s teaching qualifications. In-
quiries may be sent to: boas@math.
northeastern.edu.

Applications are welcomed at any time,
but the review process starts December
1, 2006. Northeastern University is an Af-
firmative Action, Equal Opportunity
Employer committed to fostering a diverse
faculty; women and minority candidates are especially encouraged to apply.

INDIANA UNIVERSITY SOUTH BEND
Department of Mathematics

The Department of Mathematical Sciences
invites applications for two tenure-track,
assistant professor positions, starting Au-
 gust 2007. One is in applied mathematics;
applicants in the area of dynamical sys-
tems, simulation, or stochastic modeling
are preferred. The other is open to all areas
of mathematics; applicants in differential
geometry, topology, or combinatorics are
especially encouraged. For details about the
positions and how to apply, please visit
http://www.iusb.edu/~sbmath/.

UNIVERSITY OF NOTRE DAME
Department of Mathematics
NOTRE DAME, IN 46556

Notre Dame NSF-SUMR
Instructorship in Mathematics

The Department of Mathematics of the
University of Notre Dame invites applica-
tions from recent doctorates (since 2004)
for the position of Notre Dame NSF-SUMR
Instructor in Mathematics. Candidates in
any specialty compatible with the research
interests of the department will be con-
sidered. The position is for a term of three
years beginning August 22, 2007; it is not
renewable and is not tenure-track. The
teaching load is one course per semester.
Additional duties include mentoring of
Honors Mathematics majors, and appli-
cants should provide evidence of prior ex-
perience teaching undergraduates. The
salary will be competitive with those of dis-
tinguished instructorships at other AMS
Group I universities, and the position in-
cludes $10,000 per year of summer re-
search support for each of the first two
summers. The position is associated with
the department’s recent successful five-
year NSF grant in the program “Mentoring
Through Critical Transition Points”. Ap-
plications, including a curriculum vitae, a
letter of application, and a completed AMS
standard cover sheet, should be sent to
William G. Dwyer, Chair, at the above ad-
dress. Applicants should also arrange for
at least three letters of recommendation
to be sent to the chair. These letters should
address the applicant’s research accom-
plishments and supply evidence that the
applicant has the ability to communicate
articulately and teach effectively. Notre
Dame is an Equal Opportunity Employer,
and we particularly welcome applications
from women and minority candidates. The
evaluation of candidates will begin De-
cember 1, 2006. Information about the

DECEMBER 2006

1393
KANSAS STATE UNIVERSITY  
Department of Mathematics

Subject to budgetary approval, applications are invited for one or more visiting Assistant Professorships commencing August 12, 2007. These will be annual appointments, and can be renewed up to two years for a total of three years in residence. A Ph.D. in mathematics or a Ph.D. dissertation accepted with only formalities to be completed is required by the time of appointment. The department seeks candidates whose research interests mesh well with current faculty. The department has research groups in the areas of analysis, algebra, geometry/topology, and differential equations. Preference will be given to candidates with strong research credentials who have a strong commitment to and demonstrable excellence in teaching undergraduate and graduate courses, mentoring students, and to serving a diverse population. Successful candidate(s) will be expected to participate in the Department’s REU and graduate research program. 

Applicants must submit the following: a letter of application, curriculum vita, outline of teaching philosophy, and a statement of research objectives. Four letters of reference, at least one of which addresses the applicant’s teaching ability, should be sent to:

Louis Pigno  
Department of Mathematics  
Cardwell Hall 138  
Kansas State University  
Manhattan, KS 66506

Offers may begin by December 1, 2006, but applications will be reviewed until positions are closed. Kansas State University is an Equal Opportunity Employer and actively seeks diversity among its employees.

KANSAS STATE UNIVERSITY  
Department of Mathematics

Subject to budgetary approval, applications are invited for open rank tenure-track positions commencing August 12, 2007; rank and salary commensurate with qualifications and candidates should indicate for which rank they are applying. For Assistant Professor, a Ph.D. in mathematics or a Ph.D. dissertation accepted with only formalities to be completed is required by the time of appointment. Candidates for positions above the rank of Assistant Professor should have attained national recognition in his or her field of scholarship. The department seeks candidates whose research interests mesh well with current faculty. The department has research groups in the areas of analysis, algebra, geometry/topology, and differential equations. Successful candidates should have strong research credentials as well as strong accomplishment or promise in teaching and should demonstrate a strong commitment to mentoring students, and to serving a diverse population.

Applicants must submit the following: a letter of application, curriculum vita, outline of teaching philosophy, and a statement of research objectives. Four letters of reference, at least one of which addresses the applicant’s teaching ability and potential, should be sent to:

Louis Pigno  
Department of Mathematics  
Cardwell Hall 138  
Kansas State University  
Manhattan, KS 66506

Offers may begin by December 1, 2006, but applications for position will be reviewed until positions are closed. Kansas State University is an Equal Opportunity Employer and actively seeks diversity among its employees.

BETHEL COLLEGE  
Department of Mathematics

Bethel College, N. Newton, KS, a private four-year school offering programs in the liberal arts and professional fields, invites applications for a position in the Bethel Mathematical Sciences Department beginning in August 2007. A Ph.D. degree is required. Commitment to undergraduate teaching in a Christian liberal arts context and a strong interest in undergraduate research are desired. For additional information about our department, visit http://www.bethelks.edu/academics/math. Please send an application letter, curriculum vita, teaching and research statements, recent graduate transcripts, and three letters of reference to: Brad Born, Interim Academic Dean, Bethel College, 300 E. 27th Street, N. Newton, KS 67117 or to bborn@bethelks.edu. Equal Opportunity, Affirmative Action Employer. Review of applications will begin November 1 and continue until the position is filled.

KANSAS UNIVERSITY  
Department of Mathematics

Subject to budgetary approval, applications are invited for one or more visiting Assistant Professorships commencing August 12, 2007. These will be annual appointments, and can be renewed up to two years for a total of three years in residence. A Ph.D. in mathematics or a Ph.D. dissertation accepted with only formalities to be completed is required by the time of appointment. The department seeks candidates whose research interests mesh well with current faculty. The department has research groups in the areas of analysis, algebra, geometry/topology, and differential equations. Preference will be given to candidates with strong research credentials who have a strong commitment to and demonstrable excellence in teaching undergraduate and graduate courses, mentoring students, and to serving a diverse population. Successful candidate(s) will be expected to participate in the
KANSAS STATE UNIVERSITY
Department of Mathematics

Subject to budgetary approval, applications are invited for an Algebra Coordinator position. The coordinator will work with the Center for Quantitative Education on the design and implementation of a new instructional program in College Algebra in a modern technological environment. The coordinator will collaborate with the director of the center, teach in the program, assist in training graduate students, and manage student interactions.

The successful candidate should demonstrate a strong commitment to excellence in teaching, mentoring of students, and to serving a diverse population. An M.S. in mathematics is required and strong preference will be given to applicants with a Ph.D. Preference will also be given to applicants with a Ph.D. education, especially in the training of graduate students, and/or teaching with technology. Letter of application, current vita, three letters of reference, and a statement of teaching philosophy should be sent to:

Louis Pigno
Kansas State University
Department of Mathematics
Cardwell Hall 138
Manhattan, KS 66506

Applications for the position will be reviewed beginning November 1, 2006, and will continue until the position is closed. A start date for the position of December 31, 2006, is possible, or a start date of June 2007 may be negotiated if necessary. Kansas State University is an Equal Opportunity Employer and actively seeks diversity among its employees. Paid for by Kansas State University.

KENTUCKY
UNIVERSITY OF LOUISVILLE
Department of Mathematics
Assistant Professor in Mathematics

The Department of Mathematics at the University of Louisville invites applications for a tenure-track Assistant Professor beginning Fall 2007. The ideal candidate will have a demonstrated record of excellence in research and teaching as well as experience with extramural funding. The minimum qualifications for this position include a Ph.D. degree, or its equivalent, in the mathematical sciences. The expectations include that the successful applicant will contribute fully to both undergraduate and graduate instruction and research, attract extramural funding, and conduct interdisciplinary work with researchers from other departments. Applicants must apply online at http://www.louisville.edu/jobs, reference Job ID #20628, and submit the following items electronically as well as a hardcopy: (1) a cover letter that clearly indicates the position name or the job ID number, summary of research interest, and statement of teaching interests; (2) the AMS Standard Coversheet; and (3) a curriculum vitae. Please indicate whether you are going to attend the AMS annual joint meeting in New Orleans in your cover letter submitted online. Also, please mail directly at least four letters of recommendation which discuss at length your research and teaching qualifications to: Search Committee (Logistics) (JOB ID #20628), Department of Mathematics, University of Louisville, Louisville, KY 40292. The typical teaching load in the Department of Mathematics is two courses per semester. Review of applications will begin December 15, 2006, and continue until the position is filled. The University of Louisville is an Affirmative Action, Equal Opportunity, Americans with Disabilities Employer, committed to diversity and in that spirit, seeks applications from a broad variety of candidates.

UNIVERSITY OF LOUISVILLE
Department of Mathematics
Assistant Professor–Applied Mathematics (Logistics)

The Department of Mathematics at the University of Louisville invites applications for an applied mathematician in the area of combinatorial optimization, logistics, or operations research, for a new tenure-track position at the Assistant Professor level beginning Fall 2007. The ideal candidate will have a demonstrated record of excellence in research and teaching as well as experience with extramural funding. The minimum qualifications for this position include a Ph.D. degree, or its equivalent, in the mathematical sciences. The expectations include that the successful applicant will contribute fully to both undergraduate and graduate instruction and research, attract extramural funding, and conduct interdisciplinary work with researchers from other departments including those from the Logistics and Distribution Institute (LoDI). The institute is an interdepartmental effort with components located in the College of Arts and Sciences, the College of Business, and the J.B. Speed Scientific School (the school of engineering and applied sciences). Applicants must apply online at http://www.louisville.edu/jobs, reference JOB ID #20628, and submit the following items electronically as well as a hardcopy: (1) a cover letter that clearly indicates the position name or the job ID number, summary of research interest, and statement of teaching interests; (2) the AMS Standard Coversheet; and (3) a curriculum vitae. Please indicate whether you are going to attend the AMS annual joint meeting in New Orleans in your cover letter submitted online. Also, please mail directly at least four letters of recommendation which discuss at length your research and teaching qualifications to: Search Committee (Logistics) (JOB ID #20628), Department of Mathematics, University of Louisville, Louisville, KY 40292. Review of applications will begin December 15, 2006, and continue until the position is filled. The University of Louisville is an Affirmative Action, Equal Opportunity, Americans with Disabilities Employer, committed to diversity and in that spirit, seeks applications from a broad variety of candidates.

December 2006 Notices of the AMS 1395
The Department of Mathematics at Louisiana State University (LSU) in partnership with the Center for Computation & Technology (CCT) at LSU invites applications for an anticipated tenure-track Assistant or Associate Professorship in mathematics starting in the Fall of 2007. The standard teaching load for Math/CCT faculty is 6 hours per year or one class per semester.

The successful candidate will be a mathematician who (1) has expertise in analysis and/or applied mathematics with interest in PDEs and spectral theory, (2) maintains a vigorous research program that exploits scientific computing to advance his/her discipline, (3) has interest in applications to such areas as photonics, quantum theory, and waves, and collaborates extensively with research groups in other disciplines. The successful candidate will participate as a member of an interdisciplinary research group headed by Jonathan P. Dowling of the LSU Horace Earne Jr. Institute for Theoretical Physics and will be meaningfully involved in the research activities of the CCT.

The CCT (http://www.cct.lsu.edu) is an innovative and interdisciplinary research environment for advancing computational sciences, technologies, and the disciplines they touch. It is lead by physics and CS professor, Edward Seidel. Faculty members holding a joint appointment at CCT will be expected to develop their own high-profile, interdisciplinary research programs integrated into the complimentary activities of the Department of Mathematics and CCT.

A Ph.D. or an equivalent degree in mathematics is required. Research excellence as well as commitment to graduate and undergraduate education is required. Salary and rank will be commensurate with qualifications and experience. Review of applications will begin December 1, 2006, but applications will be accepted and reviewed until candidates are selected.

Applications should include the AMS Standardized Application Form (indicating areas of specialty and level of position sought) and should enclose a full resume (including email address), a statement on research, a statement on teaching philosophy, and four or more letters of recommendation. Minorities and women are strongly encouraged to apply. To apply, we request that applicants use the secure AMS online application system at http://www.mathjobs.org/jobs. You may also write to:

Hiring Committee
Department of Mathematics
Louisiana State University
Ref: Log #CCTPDE

Baton Rouge, LA 70803
e-mail: profjobs@math.lsu.edu

LSU is an Equal Opportunity/Equal Access Employer.

The Department of Mathematics at Louisiana State University (LSU) in partnership with the Center for Computation & Technology (CCT) at LSU invites applications for an anticipated tenure-track Assistant or Associate Professor position in scientific computing starting in the fall of 2007. The standard teaching load for Math/CCT faculty is 6 hours per year or one class per semester.

A Ph.D. or equivalent degree in mathematics or a closely related field is required. A successful candidate will generally be someone who has postdoctoral experience in scientific computing, has an excellent research record, is interested in interdisciplinary research, and has a strong commitment to teaching. Preference will be given to candidates who can interact with the numerical PDE group in the Department of Mathematics headed by Suzanne C. Brenner and who can contribute to application areas of the CCT, which include materials science, photonics, fluid dynamics, climate and ocean modeling, flow through porous media, astrophysics and relativity, and structural engineering.

A Ph.D. or an equivalent degree in mathematics or a related area is required. Candidates should be mathematical scientists, who have potential for research excellence as well as commitment to graduate and undergraduate education.

The positions advertised here are designed to increase the participation of the department in interdisciplinary research with various other research groups on campus. The CCT (http://www.cct.lsu.edu) is directed by physicist and computer scientist Edward Seidel and has a mission to enhance information technology efforts at LSU. Much of its funding is being used to create new faculty positions in the computational sciences across disciplines, including computational mathematics, computer science, nanotechnologies, astrophysics and relativity, fluid dynamics, bio-informatics, and others. The positions advertised here are designed to increase the participation of the department in interdisciplinary research with various other research groups on campus.

Review of applications will begin December 1, 2006, but applications will be accepted and reviewed until candidates are selected. Applications should include the AMS Standardized Application Form, and enclose a full resume (including email address), a statement on research, and three letters of recommendation. Minorities and women are strongly encouraged to apply. To apply, we request that applicants use the secure AMS online application system at http://www.mathjobs.org/jobs. You may also write to:

Hiring Committee
Department of Mathematics
Louisiana State University
Ref: Log #CCTPDE

Baton Rouge, LA 70803
e-mail: profjobs@math.lsu.edu

LSU is an Equal Opportunity/Equal Access Employer.
MARYLAND

JOHNS HOPKINS UNIVERSITY
J. J. Sylvester Assistant Professor

Subject to availability of resources and administrative approval, the Department of Mathematics solicits applications for one non-tenure-track J. J. Sylvester Assistant Professor for the 2007-2008 academic year.

The J. J. Sylvester Assistant Professorship is a three-year position offered to recent Ph.D’s with outstanding research potential. Candidates in all areas of pure mathematics, including analysis, mathematical physics, geometric analysis, complex and algebraic geometry, number theory, and topology are encouraged to apply. The teaching load is three courses per academic year.

To submit your applications go to http://www.mathjobs.org/jobs/jhu/. Applicants are strongly advised to submit their other materials electronically at this site.

If you do not have computer access, you may mail your application to: Appointments Committee, Department of Mathematics, Johns Hopkins University, 404 Krieger Hall, Baltimore, MD 21218, and should include a vita, at least four letters of recommendation of which one concerns teaching, and a description of current and planned research. Write to math@math.jhu.edu for questions concerning these positions. Applications received by November 1, 2006, will be given priority. The Johns Hopkins University is an Affirmative Action/Equal Opportunity Employer. Minorities and women candidates are encouraged to apply.

UNIVERSITY OF MARYLAND
Department of Mathematics &
Center for Scientific Computation
and Mathematical Modeling
Associate/Full Professor

The Center for Scientific Computation and Mathematical Modeling (CSCAMM) and the Department of Mathematics at the University of Maryland, College Park, invite applications for a joint faculty appointment. Faculty with exceptional research and teaching records is sought. An appointment at the senior level of Associate/Full Professor is preferred. The research responsibility of the appointee will be to lead a focused, nationally visible research program that will include a strong component devoted to the development of novel computational algorithms and their interplay with mathematical modeling. The primary goal of CSCAMM is to foster research that highlights the interaction between scientific computation and mathematical modeling as complementary avenues to theory and experiment (http://www.cscamm.umd.edu). To apply, send to the address below a letter of interest, curriculum vitae, description of research and teaching program, and a list of potential references who could be contacted by the search committee for letters of recommendation.

CSCAMM/MATH Search Committee
CSCAMM
4146 CSIC Building #406
University of Maryland
College Park, MD 20742-3289
Full consideration will be given to applications received no later than January 15, 2007. For more information you may contact facultysearch@cscamm.umd.edu.

UNIVERSITY OF MARYLAND AT COLLEGE PARK
Chair of the Mathematics Department

The College of Computer, Mathematical and Physical Sciences at the University of Maryland is conducting a national search for the next chair of its Mathematics Department. The chair will be expected to lead one of the best research and teaching departments in the country to even greater strengths and reputation, while maintaining a personal research program commensurate with the status of a leading mathematician. The search seeks to identify a candidate who will offer leadership, innovation, and imagination in working with faculty, students, and staff to raise the department’s education programs and its research profile. In their letter of application candidates should address their qualifications for this responsibility and their sense of the direction and opportunities appropriate for a department of this caliber.

The Mathematics Department is currently ranked 8th among public universities, and its faculty include a Fields medalist, a Wolf Prize winner, a Japan Prize winner, and numerous Sloan Fellows. With 66 professorial faculty, 24 non-tenured lecturers, 232 graduate students, 324 undergraduate majors and a staff of 12, it offers undergraduate degrees and graduate programs in mathematics and statistics, and a professional masters program in the mathematics of advanced industrial technology. It also jointly administers an interdisciplinary graduate program in applied mathematics and scientific computation. The faculty conduct research across a broad spectrum of the mathematical sciences, including, but not limited to: algebraic geometry and number theory, applied and computational harmonic analysis, chaos and computational dynamics, dynamical systems, geometry and topology, logic, numerical analysis and computation, partial differential equations and applications, probability and statistics (including applied statistics), and representation theory.

For best consideration, apply by January 1, 2007, by sending a letter of application, a curriculum vitae, and the names of at least five references to:

Mathematics Chair Search Committee
c/o Ms. Chris Fuller
3400 A.V. Williams Building
CMPS Dean’s office
University of Maryland
College Park, MD 20742

The combination of referees should be able to address your leadership ability, your approach to undergraduate and graduate education, and your research accomplishments.

The University of Maryland is an AA/EEO Employer and is actively seeking applications from women and minority candidates.

MASSACHUSETTS

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mathematics
Applied Mathematics

The applied mathematics group at MIT is seeking to fill possible positions at the level of instructor, assistant professor, or higher, beginning September 2007. Appointments will be made based on demonstrated research qualifications. Candidates in all areas of applied mathematics,
including physical applied mathematics, computational molecular biology, numerical analysis, scientific computation, and theoretical computer science will be considered. Current activities of the group include: combinatorics, operations research, theory of algorithms, numerical analysis, astrophysics, condensed matter physics, computational physics, fluid dynamics, geophysics, nonlinear waves, theoretical and computational molecular biology, material sciences, quantum computing and quantum field theory, but new hiring may involve other areas as well.

We request that applications and other materials, including (a) curriculum vitae, (b) research descriptions, and (c) three separately-sent letters of recommendation, be submitted online at http://www.mathjobs.org, and preferably well in advance of our deadline of January 1, 2007, since we expect to begin our deliberations already in December. In case this online route proves greatly inconvenient for recommenders, we will also accept recommendations either as PDF attachments to emails sent to applied@math.mit.edu or else as paper copies mailed to Committee on Applied Mathematics, Room 2-345, Department of Mathematics, MIT, 77 Massachusetts Ave., Cambridge, MA 02139-4307. However, please do not use those addresses to transmit mere duplicates of items already submitted online.

MIT is an Equal Opportunity, Affirmative Action Employer. For more information about our department, please see http://math.mit.edu.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mathematics
C.L.E. Moore Instructorships in Mathematics

These positions for September 2007 are open to mathematicians with doctorates who show definite promise in research. Candidates in all areas of pure mathematics will be considered. We request that applications and other materials, including (a) curriculum vitae, (b) research descriptions, and (c) three letters of recommendation, be submitted online at http://www.mathjobs.org. Applications should be complete by December 1, 2006, to receive full consideration. We request that your letters of reference be submitted by the reviewers online via http://mathjobs.org. Alternatively, they may be sent to: Pure Mathematics Committee, Massachusetts Institute of Technology, Room 2-263, 77 Massachusetts Ave., Cambridge, MA 02139-4307.

MIT is an Equal Opportunity, Affirmative Action Employer. For more information about our department, please see http://math.mit.edu.

The pure mathematics group at MIT is seeking to fill possible positions at the level of assistant professor or higher for September 2007. Appointments will be made based on demonstrated research qualifications. Candidates in all areas of pure mathematics will be considered. We request that applications and other materials, including (a) curriculum vitae, (b) research descriptions, and (c) three separately-sent letters of recommendation, be submitted online at http://www.mathjobs.org. Applications should be complete by January 1, 2007, to receive full consideration. We request that your letters of reference be submitted by the reviewers online via http://mathjobs.org. Alternatively, they may be sent to: Committee on Mathematical Statistics, Room 2-263, Department of Mathematics, MIT, 77 Massachusetts Ave., Cambridge, MA 02139-4307.

MIT is an Equal Opportunity, Affirmative Action Employer. For more information about our department, please see http://math.mit.edu.

Michigan Technological University is an Equal Opportunity Educational Institution/Equal Opportunity Employer/Affirmative Action Employer.

The Department of Mathematics at MIT is seeking to fill possible positions at the level of instructor, assistant professor, or higher in STATISTICS OR APPLIED PROBABILITY beginning September 2007. Appointments will be made based on demonstrated research qualifications. We request that applications and other materials, including (a) curriculum vitae, (b) research descriptions, and (c) three separately-sent letters of recommendation, be submitted online at http://www.mathjobs.org. Applications should be complete by January 1, 2007, to receive full consideration. We request that your letters of reference be submitted by the reviewers online via http://mathjobs.org. Alternatively, they may be sent to: Committee on Mathematical Statistics, Room 2-263, Department of Mathematics, MIT, 77 Massachusetts Ave., Cambridge, MA 02139-4307.

MIT is an Equal Opportunity, Affirmative Action Employer. For more information about our department, please see http://math.mit.edu.

The Department of Mathematics at MIT is seeking to fill possible positions at the level of instructor, assistant professor, or higher in STATISTICS OR APPLIED PROBABILITY beginning September 2007. Appointments will be made based on demonstrated research qualifications. We request that applications and other materials, including (a) curriculum vitae, (b) research descriptions, and (c) three separately-sent letters of recommendation, be submitted online at http://www.mathjobs.org. Applications should be complete by January 1, 2007, to receive full consideration. We request that your letters of reference be submitted by the reviewers online via http://mathjobs.org. Alternatively, they may be sent to: Committee on Mathematical Statistics, Room 2-263, Department of Mathematics, MIT, 77 Massachusetts Ave., Cambridge, MA 02139-4307.

MIT is an Equal Opportunity, Affirmative Action Employer. For more information about our department, please see http://math.mit.edu.

Michigan Technological University is an Equal Opportunity Educational Institution/Equal Opportunity Employer/Affirmative Action Employer.

The position starts August 21, 2007, and candidates must complete all requirements for the Ph.D. in statistics, mathematics, or a related field by that date. Review of applications will begin January 1, 2007, and continue until the position is filled. Interested candidates should send a vita and three letters of recommendation to: Search Committee, Statistics and Probability Position, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295.

Michigan Technological University is an Equal Opportunity Educational Institution/Equal Opportunity Employer/Affirmative Action Employer.

The Department of Mathematical Sciences at Michigan Technological University invites applications for a tenure-track assistant professorship in Statistics and Probability. Areas of particular interest are biostatistics, survival analysis, computational statistics, and applied probability. The Department of Mathematical Sciences has 7 statistics faculty and offers BS, MS, and Ph.D. programs in statistics. Faculty are expected to develop a research program, seek external funding, and provide excellent teaching. Teaching loads are very competitive.

The position starts August 21, 2007, and candidates must complete all requirements for the Ph.D. in mathematics or a related field by that date. Review of applications will begin January 1, 2007, and continue until the position is filled. Interested candidates should send a vita and three letters of recommendation to: Search Committee, Statistics and Probability Position, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295.

Michigan Technological University is an Equal Opportunity Educational Institution/
Equal Opportunity Employer/Affirmative Action Employer.

MINNESOTA

UNIVERSITY OF MINNESOTA-MINNEAPOLIS
School of Mathematics

The School of Mathematics is seeking a tenure-track, or early tenured faculty member depending upon qualifications to start fall semester, 2007. Ph.D. in mathematics, teaching excellence, creative education experiences, and prior experience with educational scholarship and research are required. This position will emphasize: excellence in teaching, including experience with mathematically talented high school students; involvement with creative academic programs, curriculum development, and educational scholarship/professional activities (i.e., new curricula and curricula supplements, professional development materials, and relevant statistical/evaluative studies and publications); developing capabilities for educational leadership, and involvement in state and national programs and projects. Experience working with K–12 mathematics coursework and preservice/inservice teacher education is desirable.

Preference will be for applicants within 5 years of their Ph.D. whose background and experience are compatible with the above stated objectives. Primary teaching will be in the Institute of Technology Center for Educational Programs; however, the position can be structured to allow opportunities to work on other activities in the School of Mathematics. Salary will be commensurate with background and experience.

For full consideration, applications and all supporting materials must be submitted electronically through: http://www.mathjobs.org by December 1, 2006. No paper submission is needed unless the candidate is unable to submit electronically. Reference letter writers should be asked to submit their letters online through: http://www.mathjobs.org. If they are unable to do so, they may send their letters to the following address: Lawrence F. Gray, Professor and Head, School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455; email: mathsrch@tc.umn.edu. Applicants must include the following: cover letter; curriculum vitae; at least 4 letters of recommendation; evidence of teaching ability; description of research; and a teaching statement. Reference letter writers should be asked to submit their letters online through: http://www.mathjobs.org.

At this site you should click on the link "View" link in the Position Title field and then the button "Apply for this Position". At this point you will be prompted to "Fill out a new application". In your application you should enter your name and optional demographic information. It is not necessary to fill out your complete contact information or to submit your other application material to this site.

The University of Minnesota is an Equal Opportunity Employer/Educator.
to fill out your complete contact information or to submit your other application materials to this site. The University of Minnesota is an Equal Opportunity Employer and Educator.

**UNIVERSITY OF MINNESOTA**
Department of Mathematics
Dunham Jackson Assistant Professor

This is a three-year appointment from fall semester 2007, through spring semester 2010, with a teaching load of 3 one-semester courses per academic year. Outstanding research and teaching abilities are required. Preference will be given to applicants whose research interests are compatible with those of the school. Applicants should have received or expect to receive a Ph.D. in mathematics no earlier than Jan. 1, 2007, and no later than August 27, 2007. Summer school teaching may be available during the summers of 2008 and 2009 to supplement regular stipend. Salary is competitive.

For full consideration, applications and all supporting materials must be submitted electronically through: http://www.mathjobs.org by December 1, 2006. Applications received after the deadline will be considered as positions remain. No paper submission is needed unless the candidate is unable to submit electronically. If they are unable to do so, they may send their letters to the following address: Lawrence F. Gray, Professor and Head, School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455; email: mathsrc@tc.umn.edu. Applicants must include the following: cover letter; curriculum vitae; at least 4 letters of recommendation, one of which should address teaching ability; description of research; and a teaching statement. Reference letter writers should be asked to submit their letters online through http://mathjobs.org. If they are unable to do so, they may send their letters to the above-mentioned address. In addition to your MathJobs application, the University of Minnesota requires all applicants to register at the website http://employment.umn.edu. At this site you should first click on the link “Search Positions”. Enter Requisition Number 144012. When the job listing appears click the “View” link in the Position Title field and then the button “Apply for this Posting”. At this point you will be prompted to “Fill out a new application”. In your application, you should enter your name and optional demographic information. It is not necessary to fill out your complete contact information or to submit your other application material to this site. The University of Minnesota is an Equal Opportunity Employer/Educator.

**NEBRASKA**

**UNIVERSITY OF NEBRASKA-LINCOLN**
Department of Mathematics

Applications are invited for two tenure-track and two postdoctoral positions in mathematics, starting in August, 2007, as follows: 1. One tenure-track assistant professor position in coding theory or combinatorics or a related area. (Requisition #060755) 2. Two three-year (non-tenure-track) Research Assistant Professor positions in mathematics (Requisition #060746). For all positions, use of the AMS application cover sheet is encouraged. First review of applications will begin on December 8, 2006. Successful candidates for each position should have a Ph.D. in mathematics and outstanding potential for research and teaching in mathematics. Applicants should submit a letter of application; a CV; statements addressing their research and teaching; and at least three letters of reference, at least one of which should address teaching, to: Search Committee Chair (position description), Department of Mathematics, University of Nebraska-Lincoln, Lincoln, NE 68588-0130. To be considered for the position, applicants must complete the Faculty/Administrative Information Form at http://employment.unl.edu (appropriate requisition #). For more information see the department’s website: http://www.math.unl.edu. The University of Nebraska is committed to a pluralistic campus community through affirmative action and equal opportunity and is responsive to the needs of dual career couples. We assure reasonable accommodation under the Americans with Disabilities Act; contact Marilyn Johnson at (402) 472-8822 for assistance.
encourages applications from women and minorities. Inquiries about the progress of the selection process may be directed to Dana Williams, Recruiting Chair.

NEW JERSEY

RUTGERS UNIVERSITY-NEW BRUNSWICK
Mathematics Department

The Mathematics Department of Rutgers University-New Brunswick invites applications for the following positions which may be available September 2007.

TENURED POSITION: The department anticipates one appointment. This will be at the level of Professor or Associate Professor. Candidates with interests in numerical analysis/scientific computation, mathematics of materials science, algebra, differential geometry, or mathematical biology, are especially encouraged to apply, although strong candidates in all fields will be considered. Applicants must have the Ph.D., outstanding research accomplishments in pure or applied mathematics, and concern for teaching. In addition candidates must show evidence of outstanding leadership in research.

Applications for the tenured position should send a printed résumé with AMS Application Cover Sheet attached, together with the names of four references, to: Search Committee, Dept. of Math-Hill Center, Rutgers University, 110 Frelinghuysen Road, Piscataway, NJ 08854-8019. In addition, an electronic version of the AMS Application Cover Sheet should also be submitted at the website http://www.mathjobs.org/jobs. It is essential that applicants fill out this cover sheet completely, including specific position(s) applied for and the AMS Subject Classification number(s) of area(s) of specialization.

The department will begin reviewing applications on the dates listed above, and will continue its review until the positions are filled. Updated details of these positions will appear on the Rutgers Mathematics Department webpage at http://www.math.rutgers.edu.

Rutgers is an Affirmative Action/Equal Opportunity Employer and encourages applications from women and minority group members.

NEW YORK

CLARKSON UNIVERSITY
Division of Mathematics and Computer Science

The Division of Mathematics and Computer Science (http://www.clarkson.edu/mcs) invites applications for a tenure-track position in applied mathematics starting in August 2007. We are especially interested in candidates with expertise in dynamical systems, but other areas of computational applied mathematics will be considered. Responsibilities will include teaching undergraduate and graduate level mathematics courses, and directing graduate students. Minimum requirements for the assistant professor level are a Ph.D. in mathematics by the date of appointment, demonstrated excellence in both research potential and teaching ability, and fluency in English. In addition, the candidate should be able to interact with other faculty in the department and the university. We expect to fill this position at the assistant professor level, but an appointment at a senior level may be considered for an exceptional candidate.

Applications including vita and three reference letters should be submitted to Prof. P. A. Turner, Department of Mathematics and Computer Science, Clarkson University, Potsdam, NY 13699-5815. Completed applications will be reviewed starting immediately. Women and minorities are urged to apply. Clarkson University is an AA/EEO Employer. (Pos. #21-06)

NORTH CAROLINA

NORTH CAROLINA STATE UNIVERSITY
Department of Mathematics

Applications are invited for one tenure-track assistant professorship in the area of partial differential equations beginning Fall 2007. Candidates must have a Ph.D. in the mathematical sciences, an outstanding research program, a commitment to effective teaching at the undergraduate and graduate levels and demonstrated potential for excellence in both research and teaching. The Department of Mathematics has strong research programs in both pure and applied mathematics. Members of the department participate in interdisciplinary programs and research groups on campus and in the broader Research Triangle community. More information about the department can be found at http://www.math.ncsu.edu.

To submit your application go to http://www.mathjobs.org/jobs/nccsu. Applicants are strongly advised to submit their materials electronically at this site. If you do not have computer access, you may mail your application to PDE Search Committee, Department of Mathematics, NC State University, Box 8205, Raleigh, NC 27695-8205, and should include a vita, at least three letters of recommendation, and a description of current and planned research. Write to math-jobs@math.ncsu.edu for questions concerning this position. NC State University is an Equal Opportunity and Affirmative Action Employer. In addition, NC State welcomes all persons without regard to sexual orientation. ADA Accommodations: Dr. Aloyisius Helminck, (919) 515-2382. Applications received by December 15, 2006, will be given priority.
NORTH CAROLINA STATE UNIVERSITY
Department of Mathematics

Applications are invited for one tenure-track assistant professorship beginning Fall 2007. We are seeking an exceptionally well-qualified individual with research interests compatible with those in the department. All areas of pure and applied mathematics will be considered. Candidates must have a Ph.D. in the mathematical sciences, an outstanding research program, a commitment to effective teaching at all undergraduate and graduate levels, and demonstrated potential for excellence in both research and teaching. She or he will likely have had successful postdoctoral experience. The Department of Mathematics has strong research programs in both pure and applied mathematics. Many members of the department participate in interdisciplinary programs and research groups on campus and in the broader Research Triangle community. More information about the department can be found at http://www.math.ncsu.edu.

To submit your application go to http://www.mathjobs.org/jobs/ncsu. Applicants are strongly advised to submit their materials electronically at this site. If you do not have computer access, you may mail your application to: Mathematics Search Committee, Department of Mathematics, NC State University, Box 8205, Raleigh, NC 27695-8205, and should include a vita, at least three letters of recommendation, and a description of current and planned research. Write to math-jobs@math.ncsu.edu for questions concerning this position. NC State University is an Equal Opportunity and Affirmative Action Employer. In addition, NC State welcomes all persons without regard to sexual orientation. ADA Accommodations: Dr. Aloysius Helminck, (919) 515-2382. Applications received by December 15, 2006, will be given priority. 000355

NORTH CAROLINA STATE UNIVERSITY
Department of Mathematics

The Department of Mathematics at North Carolina State University invites applications for one non-tenure-track position as a Teaching Assistant Professor starting August 2007. The initial appointment is for three years. Based on performance, the position is renewable, and promotions in rank are possible. This position provides an excellent opportunity for mathematicians with a strong interest in teaching and developing pedagogical methods at a Research 1 university. Primary responsibilities are to teach four courses a semester, participate in developing the department's online course offerings, and instructional development (e.g., seeking external funding related to teaching). Service to the profession and to the department, especially in the areas of mathematics education, is strongly encouraged.

Interest in pedagogical research is encouraged but not essential. Depending on the service and scholarly activities related to teaching of the candidate, the teaching load may be adjusted to three courses in a given semester. Candidates should have a Ph.D. in mathematics and strong interest in teaching mathematics courses at the university level. To submit your application go to http://www.mathjobs.org/jobs/ncsu. Applicants are strongly advised to submit their materials electronically at this site. If you do not have computer access, you may mail your application to: Math Teaching Assistant Professor Search Committee, Department of Mathematics, NC State University, Box 8205, Raleigh, NC 27695-8205, and should include a vita, at least three letters of recommendation, and evidence of teaching excellence. Write to math-jobs@math.ncsu.edu for questions concerning this position. NC State is an Equal Opportunity and Affirmative Action Employer. In addition, NC State welcomes all persons without regard to sexual orientation. ADA Accommodations: Dr. Aloysius Helminck, (919) 515-2382. Applications received by December 15, 2006, will be given priority. 000356

OHIO

UNIVERSITY OF CINCINNATI
Department of Mathematical Sciences

The department expects, pending budgetary approval, to hire a tenure-track Assistant Professor in the area of geometric analysis with particular preference for candidates in the areas of geometric measure theory and/or differential geometry. One or more Visiting Assistant Professor positions may also be available. Appointment will begin in September 2007. The Department of Mathematical Sciences is dedicated to excellence in both research and teaching. A strong research program and evidence of high-quality teaching skills are required. Applications should be submitted electronically through http://mathjob.org. The University of Cincinnati is an Affirmative Action/Equal Opportunity Employer. 000325

UNIVERSITY OF DAYTON
Department of Mathematics

Applications are invited for a tenure-track position in the Department of Mathematics at the assistant professor level starting in August 2007. The position focuses on mathematics education. Candidates must have a Ph.D. in mathematics education with a master’s degree in mathematics or a Ph.D. in mathematics. Candidates must have a commitment to teaching, advisement, curriculum development, and research supervision at both the undergraduate and graduate levels. The successful candidate will be expected to develop an ongoing research agenda. The candidate will have opportunities to support computational mathematics in a new master’s program in financial mathematics and in a traditional master’s program in applied mathematics; the candidate will be encouraged to support research efforts initiated in the School of Engineering.

To receive full consideration, all materials must be received by January 12, 2007. A complete application consists of a resume, three letters of recommendation, a statement of research and professional plans, a statement of teaching philosophy, and a graduate transcript. Both teaching abilities and research abilities should be addressed in the letters of recommendation. Please include an email address in your correspondence.

Send applications to: Dr. Robert Gorton, Chair of the Computational Mathematics Search Committee, Department of Mathematics, University of Dayton, Dayton, OH 45469-2316. Contact the search committee at Robert.Gorton@notes.udayton.edu. For further information, see http://www.dayton.edu/~mathdept.

The University of Dayton is a private comprehensive Catholic university founded by the Society of Mary in 1850. It has more than 6,000 undergraduate and 3,000 graduate students. The Department of Mathematics offers baccalaureate degrees in mathematics and applied mathematical economics, and master’s degrees in applied mathematics, financial mathematics, and mathematics education. The University of Dayton is an Equal Opportunity/Affirmative Action employer. Women, minorities, individuals with disabilities, and veterans are encouraged to apply. The University of Dayton is firmly committed to the principle of diversity. 000369
undergraduate liberal arts and sciences program.

To receive full consideration, all materials must be received by January 12, 2007. A complete application consists of a resume, three letters of recommendation, a statement of research and professional plans, a statement of teaching philosophy, and a graduate transcript. Both teaching abilities and research abilities should be addressed in the letters of recommendation. Please include an email address in your correspondence.

Send applications to: Dr. Robert Gorton, Chair of the Mathematics Education Search Committee, Department of Mathematics, University of Dayton, Dayton, OH 45469-2316. Contact the search committee at Robert.Gorton@notes.udayton.edu. For further information, see http://www.udayton.edu/~mathdept.

The University of Dayton is a private, comprehensive Catholic university founded by the Society of Mary in 1850. It has more than 6,000 undergraduate and 3,000 graduate students. The Department of Mathematics offers baccalaureate degrees in mathematics and applied mathematical economics, and master's degrees in applied mathematics, financial mathematics, and mathematics education. The University of Dayton is an Equal Opportunity/Affirmative Action employer. Women, minorities, individuals with disabilities, and veterans are encouraged to apply. The University of Dayton is firmly committed to the principle of diversity.

---

**PENNSYLVANIA**

**MILLERSVILLE UNIVERSITY**

Department of Mathematics

Full-time, tenure-track assistant professorship to begin August 2007, in a department of 20 faculty and approximately 250 majors in mathematics and mathematics education. Required: Ph.D. (or completion by date of appointment) in mathematics with expertise in geometry or topology. Must exhibit evidence of strong commitment to excellence in teaching and continued scholarly activity; must be prepared to teach a broad spectrum of undergraduate mathematics courses and to teach undergraduate geometry as it relates to the preparation of secondary school teachers. Must complete a successful interview and teaching demonstration. Duties include an annual 24-hour teaching load, scholarly activity, student advisement, curriculum development, and committee work. Millersville University is a selective, comprehensive, state university of 8,000 students located in historic Lancaster County, PA, within convenient traveling distance to Baltimore, Philadelphia, New York, and the Atlantic Ocean beaches. Additional information on the university and the department can be found at http://www.millersville.edu. Send application letter that addresses the position requirements, vita, copies of undergraduate and graduate transcripts, and three letters of reference (at least two of which attest to recent teaching effectiveness) to Dr. J. Robert Buchanan, Staff Search Committee/AMS1206, Department of Mathematics, Millersville University, P.O. Box 1002, Millersville, PA 17551-0302. Full consideration will be given to applications received by 1/19/2007. An EO/AA Institution. Email applications will not be accepted.

---

**SOUTH CAROLINA**

**UNIVERSITY OF SOUTH CAROLINA**

Department of Mathematics

**Director of the Industrial Mathematics Institute**

The Department of Mathematics at the University of South Carolina invites applications and nominations for the position of Director of the Industrial Mathematics Institute (IMI). The appointee will possess a distinguished record of scholarship in the mathematical sciences, a strong record of external grant funding, and superior management skills. The successful candidate will hold the rank of professor with tenure within the Department of Mathematics and will assume the directorship of the IMI for an initial three-year term. The Industrial Mathematics Institute is an internationally recognized mathematics research center within the Department of Mathematics at USC. It exists for the purpose of fostering advanced research in areas of mathematics having the capacity and potential for industrial application, and for the purpose of facilitating the transfer of research results and expertise between the academic and the industrial sectors. A major hallmark of the IMI has been the involvement of many of its 20 faculty in large interdisciplinary projects of national significance in collaboration with scientific and engineering research groups at premier institutions. Applicants should send a curriculum vitae with a cover letter and a list of six possible references. Applications and nominations may be sent either in hard copy to IMI Search Committee, Department of Mathematics, University of South Carolina, Columbia, SC 29208, or by email (pdf or ps files) to imi@math.sc.edu. Applications will be screened beginning December 11, 2006. The University of South Carolina is one of the most respected research institutions in the nation, consistently placed among the top 25 in the U.S. in research expenditures. The IMI has been the involvement of many mathematicians who have a strong record of external funding and have been successful in the transfer of research results and expertise to the industrial sector. This position is a three-year term, renewable. Salary and benefits are negotiable and commensurate with experience. Applications and nominations intended for mathematicians who have completed a doctorate within the past two to four years and whose work shows remarkable promise in mathematical research and teaching. The Palmetto Assistant Professor will be hired at a competitive base salary. Applications are encouraged from women, minorities, and individuals with disabilities. Full consideration will be given to applications received by December 11, 2006. Applications should include a detailed vita with a summary of research accomplishments and goals, a completed AMS Standard Cover Sheet, and at least four letters of recommendation. One letter should appraise the applicant’s teaching abilities. Applications may be sent either in hard copy to: Hiring Committee, Department of Mathematics, University of South Carolina, Columbia, SC 29208, or by email (pdf or ps files) to hiring@math.sc.edu. The University of South Carolina is an Affirmative Action, Equal Opportunity Employer. Minorities and women are encouraged to apply. The University of South Carolina does not discriminate in educational or employment opportunities or decisions for qualified persons on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation or veteran status. Information about the IMI and the department can be found on the Web at http://www.math.sc.edu/.

---

**UNIVERSITY OF SOUTH CAROLINA**

Faculty Positions in Mathematics

Applications are invited for the following positions in mathematics. The Department seeks accomplished individuals in any field of pure or applied mathematics who mesh well with current strengths. Areas of particular interest this year include computational mathematics, analysis, and applicable algebra. The beginning date for all positions is August 16, 2007. The department seeks outstanding mathematicians who have completed a doctorate within the past two to four years and whose work shows remarkable promise in mathematical research and teaching. The Palmetto Assistant Professor will be hired at a competitive base salary. During the initial three-year appointment, the teaching load is three courses per year (two-one) and there is one month per year of summer support. Palmetto Assistant Professorships in Mathematics are tenure-track positions intended for mathematicians who have completed a doctorate within the past two to four years and whose work shows remarkable promise in mathematical research and teaching. The Palmetto Assistant Professor will be hired at a competitive base salary. During the initial three-year appointment, the teaching load is three courses per year (two-one) and there is one month per year of summer support. Palmetto Assistant Professorships in Mathematics are tenure-track positions intended for mathematicians who have completed a doctorate within the past two to four years and whose work shows remarkable promise in mathematical research and teaching. The Palmetto Assistant Professor will be hired at a competitive base salary. During the initial three-year appointment, the teaching load is three courses per year (two-one) and there is one month per year of summer support. Palmetto Assistant Professorships in Mathematics are tenure-track positions intended for mathematicians who have completed a doctorate within the past two to four years and whose work shows remarkable promise in mathematical research and teaching. The Palmetto Assistant Professor will be hired at a competitive base salary. During the initial three-year appointment, the teaching load is three courses per year (two-one) and there is one month per year of summer support.
TENNESSEE
UNIVERSITY OF TENNESSEE Mathematics Department
The Mathematics Department at The University of Tennessee at Knoxville seeks to fill a postdoctoral position in any of the following fields: applied mathematics, computational mathematics, geometry, topology, probability, or differential equations. Candidates should have had their Ph.D.’s for no more than four years by September 2006. Primary consideration will be given to candidates whose interests overlap with existing faculty. The position is for three years and may not be extended. The teaching load for this position will be two courses per semester. The salary will be $50,000 per year. Evidence of potential for excellence in research and high-quality teaching is required. Review of applications will begin January 15 and continue until the position is filled.

The university welcomes and honors people of all races, creeds, cultures, and sexual orientations and values intellectual curiosity, pursuit of knowledge, and academic freedom and integrity.

Candidates should submit a curriculum vita, a description of their research accomplishments and plans, and a teaching statement. These documents as well as three letters of recommendation, at least one of which should address teaching, should be mailed to Professor Michael Frazer, Mathematics, University of Tennessee, Knoxville, TN 37996-1300. The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA institution in the provision of its educational and employment programs and services.

TEXAS
TEXAS A&M UNIVERSITY, QATAR
Department of Mathematics
The Department of Mathematics expects to have two or more open positions at its affiliate campus in Doha, Qatar. Texas A&M–Qatar (TAMUQ) is a relatively new university funded by the Qatar Foundation and is operated under the auspices of Texas A&M in College Station, Texas. TAMUQ offers Bachelors degrees in Engineering and the mathematics faculty is expected to provide supporting classes in calculus, differential equations, linear algebra, numerical methods, mathematical modeling, and other related coursework. The campus has modern facilities that include a 100-node supercomputer and full library services (electronic and loan access). Teaching loads are kept low (approximately two small classes per academic year) to promote teacher-student mentoring and to allow time for faculty to pursue research. Any level of appointment will be considered depending on the qualifications of the applicant. It is anticipated that most appointments will be non-tenure-accruing, with an initial appointment period of one year, which is renewable for additional years, subject to satisfactory performance. A Ph.D. degree is required for all professorial level appointments (the equivalent of an assistant professor or higher). Applicants with a masters degree and teaching experience will be considered for non-professorial positions (e.g., lecturer) for more elementary instruction (and a higher teaching load). Salary rates are competitive and, in general, average 30% higher than comparable salary rates of similar positions here in the US. In addition, summer funding is guaranteed. Liberal allowances for professional travel and for relocation to Qatar are provided. Fringe benefits include free housing and K-12 education for dependents, and a car allowance. General information about TAMUQ is available at their website: http://www.qatar.tamu.edu/.

Applicants should send the completed “AMS Application Cover Sheet”, a vita, and arrange to have at least three letters of recommendation sent to: TAMU-Qatar-Faculty Hiring, Department of Mathematics, Texas A&M University, College Station, Texas 77843-3368. Further information and a link to our on-line application form is available at http://www.math.tamu.edu/. At least one recommendation letter should address the candidate’s teaching qualifications. The complete dossier should be received by January 15, 2007. Early applications are encouraged since applications will be reviewed as they are received.

Texas A&M University is an Equal Opportunity Employer. The university is dedicated to the goal of building a culturally diverse and pluralistic faculty and staff committed to teaching and working in a multicultural environment and strongly encourages applications from women, minorities, individuals with disabilities, and veterans. The university is responsive to veterans. The university is responsive to affirmative action employers. The university is dedicated to the goal of building a culturally diverse and pluralistic faculty and staff committed to teaching and working in a multicultural environment and strongly encourages applications from women, minorities, individuals with disabilities, and veterans. The university is responsive to veterans. The university is responsive to affirmative action employers.

WISCONSIN
UNIVERSITY OF WISCONSIN-MILWAUKEE
Department of Mathematical Sciences
Milwaukee, WI 53201-0413
The Department of Mathematical Sciences, University of Wisconsin-Milwaukee (UWM), is expanding its actuarial science and probability groups and invites applications to fill two faculty positions starting 08/2007.

1. ACTUARIAL SCIENCE (Asst/Assoc/Full Professor): The department is seeking an outstanding candidate with a Ph.D. in actuarial science, statistics, or a closely related area, with research expertise and teaching interests in actuarial science. The ideal candidate will have or be actively working towards Associateship/Fellowship of the Society of Actuaries or Casualty Actuarial Society. The successful applicant is expected to develop and teach new courses in actuarial science and to pursue further academic, government, and industrial partnerships/funding in the Milwaukee-Madison-Chicago region.

2. STOCHASTIC ANALYSIS (Asst. Professor): The department is seeking an outstanding candidate with a Ph.D. in probability, statistics, or a closely related area, with research expertise and teaching interests in stochastic processes or financial mathematics, and evidence of or strong potential for extramural funding.

Candidates for both positions must have a strong research record and a demonstrated commitment to teaching excellence. Responsibilities include teaching two courses per semester in graduate courses, a minimum of one course in undergraduate courses, and a correct role in the undergraduate, Masters, and Ph.D. programs. Additional information is available at http://www.math.uwm.edu/.

To apply, send a cover letter indicating position for which you are applying, vita, research plan, statement of teaching philosophy, and 3 letters of recommendation.
WYOMING

UNIVERSITY OF WYOMING
Mathematics Department
Assistant Professor in
Flow through Porous Media

The University of Wyoming Mathematics Department is seeking outstanding candidates for a tenure-track Assistant Professor in Flow through Porous Media to start August 21, 2007. UW has a strong research group in fluid mechanics and computational science, and a newly founded School of Energy Resources (SER) dedicated to energy-related teaching and research and dissemination of scientific, engineering, and economic information to support state, national, and international energy-related activities. For more information about the school, please visit http://uwacadweb.uwyo.edu/SER/.

Preference will be given to candidates with specific expertise and experience in some of the following areas: analytical and computational approaches to modeling flow through porous media; reservoir simulations; stochastic methods, inverse problems, homogenization and micro-analysis of nonlinear partial differential equations; and the mathematical analysis of flow discontinuities in multiphase and multi-scale enhanced oil-recovery applications.

Applicants must possess an earned Ph.D. in mathematics or a related area and should have outstanding accomplishments in both research and teaching. Candidates must be strongly committed to: shaping and developing the department's research, curricular, and services roles in SER; developing interdisciplinary research initiatives; seeking extramural funding to develop an internationally recognized research program; and supervising graduate students.

Salary will be competitive and commensurate with qualifications. The position will be an academic year (9 month/year) appointment. Applications should include a letter describing the applicant's qualifications, a curriculum vita, and the names and addresses of four references. Review of applications will begin January 8, 2007, but applications will be accepted until the positions are filled. The University of Wyoming is an Equal Opportunity/Affirmative Action Employer, and encourages women and underrepresented minorities to apply.

UNIVERSITY OF WYOMING
Mathematics Department
Distinguished Professor in
Flow through Porous Media

The University of Wyoming Mathematics Department invites nominations and applications for a distinguished professorship in Flow through Porous Media. The position will play a key role in UW's newly founded School of Energy Resources (SER), which is dedicated to energy-related teaching and research and dissemination of scientific, engineering, and economic information to support state, national, and internationally energy-related activities. The distinguished position is one of SER's 12 permanently-funded, distinguished professorships. For more information about the school, please visit http://uwacadweb.uwyo.edu/SER/.

The distinguished professor will have broad energy-related mathematical expertise in topics such as the analytic and computational aspects of modeling flow through porous media the mathematical analysis and numerical simulations of multiphase and multi-scale flow in enhanced oil recovery applications, and reservoir flow simulations. Candidates must be strongly committed to: shaping and developing the department's research, curricular, and services roles in SER; developing interdisciplinary research initiatives; seeking extramural funding to maintain an internationally recognized research program; and supervising graduate students.

Candidates should possess a distinguished career in the mathematical sciences; an internationally recognized record of teaching, research, and granting; and university and professional service appropriate for a senior appointment. Candidates should also demonstrate effective leadership, communication, and administrative skills.

Salary will be competitive and commensurate with qualifications. The position will be an academic year (9 month/year) appointment. Applications should include a letter describing the applicant's qualifications, a curriculum vita, and the names and addresses of four references. Review of applications will begin January 8, 2007, but applications will be accepted until the position is filled. Send applications to: Distinguished Mathematics Position, University of Wyoming, 1000 E. University Ave., Department 3036, Laramie, WY 82071. The University of Wyoming is an Equal Opportunity/Affirmative Action Employer, and encourages women and underrepresented minorities to apply.

ISRAEL

WEIZMANN INSTITUTE OF SCIENCE
Department of Mathematics

A number of fellowships for postdoctoral research in the fields of mathematics, applied mathematics and computer science, as well as a number of interdisciplinary areas including bioinformatics, neurosciences, computer vision and robotics will be offered by the Weizmann Institute of Science. The deadlines for the submission of applications are January 1 and May 15, 2007. Additional information and application forms are available on the website http://www.weizmann.ac.il/feinberg or by writing to Postdoctoral Fellowship Program, Feinberg Graduate School, The Weizmann Institute of Science, Rehovot 76100, Israel; Fax: 972-8-934-4114.

PORTUGAL

INSTITUTO SUPERIOR TECNICO
Center for Mathematical Analysis, Geometry, and Dynamical Systems
Departamento de Matematica
Postdoctoral Positions

The Center for Mathematical Analysis, Geometry, and Dynamical Systems of the Department of Mathematics of Instituto Superior Tecnico, Lisbon, Portugal, invites applications for postdoctoral positions for research in mathematics, subject to budgetary approval. Positions are for one year, with the possibility of extension for a second year upon mutual agreement. Selected candidates will be able to take up their positions between September 1, 2007, and January 1, 2008. Applicants should have a Ph.D. in mathematics preferably obtained after December 31, 2004. They must show very strong research promise in one of the areas in which the mathematics faculty of the Center is currently active. There are no teaching duties associated with these positions. Applicants should send a curriculum vitae; reprints, preprints, and/or dissertation abstract; description of research project (of no more than 1,000 words); and ask that three letters of reference are sent directly to the director at the above address. To insure full consideration, complete application packages should be received by January 15, 2007. Additional information about the Center and the positions is available at http://www.math.ist.utl.pt/cam/.
SWITZERLAND

ETH Zürich
Department of Mathematics
Postdoctoral positions
Academic year 2007-2008

The Department of Mathematics at ETH Zürich invites applications for several postdoctoral positions beginning on October 1, 2007. The positions are awarded for a period of one or two years. Applicants must have completed the Ph.D. in Mathematics by the start of the appointment and within the last 5 years. They must show strong promise in research. ETH Zürich specifically encourages female candidates to apply. To be assured of full consideration, applications should be received by November 30, 2006; the selection process will begin shortly thereafter. Later applications are nevertheless welcome and will be considered for any positions remaining open at the time they are received. To apply, send a cover letter together with
- a curriculum vitae specifying citizenship, year of birth, academic degrees with institution and year awarded and, for the doctoral degree, the dissertation title, year of graduation, and the name of the dissertation supervisor.
- a list of publications.
- a survey of past research activities and a description of current research interests.

Three letters of recommendation supporting the application should be sent directly to us. Applications and letters of recommendation should be sent to:
Search Committee
Department of Mathematics
ETH Zentrum/HG G33.3 CH-8092
Zürich/Switzerland;
email: deptsecr@math.ethz.ch;
fax: +41446321085.

ETH ZURICH
Department of Mathematics
Heinz Hopf Lectureships

The Department of Mathematics of the ETH Zurich invites applications for several Heinz Hopf Lectureships beginning 1 October 2007 or earlier. The positions are awarded for a period of 3 years, with the possibility of an extension by 1 year. Duties of Heinz Hopf lecturers include research and teaching in mathematics. Together with the other members of the department, the new lecturers will be responsible for undergraduate and graduate courses for students of mathematics, natural sciences, and engineering. The moderate teaching load leaves ample room for further professional development. Courses at Master level may be taught in English. Applicants should have proven excellence in research in any area of mathematics and possess potential for further outstanding achievements. Some research and teaching experience after the Ph. D. is usually expected. Applications with curriculum vitae and a list of publications should be submitted to Prof. D. Salamon, chair@math.ethz.ch, Department of Mathematics, ETH Zentrum, 8092 Zurich, Switzerland, by November 30th, 2006. Later applications can be considered for remaining positions. In addition, three letters of recommendation supporting the application should be sent directly to us. ETH Zurich specifically encourages female candidates to apply.
Meetings & Conferences of the AMS

Fayetteville, Arkansas

University of Arkansas

November 3–4, 2006
Friday – Saturday

Meeting #1022
Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of Notices: September 2006
Program first available on AMS website: September 21, 2006
Program issue of electronic Notices: November 2006
Issue of Abstracts: Volume 27, Issue 4

Deadlines
For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: Expired

Invited Addresses
R. P. Anstee, University of British Columbia, Forbidden configurations, a survey.
Arun Ram, University of Wisconsin, Space walks: Combinatorics, representations, spherical functions, and p-compact groups.
Donald G. Saari, University of California Irvine, Mathematics of voting.

Special Sessions
Algebraic Combinatorics, Marcelo Aguiar, Texas A&M University, and Claudia Malvenuto, University of Rome “La Sapienza”.
Analytic Number Theory and Modular Forms, Matthew Boylan and Gang Yu, University of South Carolina.
Boundary Operators in Real and Complex Domains, Loredana Lanzani, University of Arkansas, Fayetteville, and David E. Barrett, University of Michigan, Ann Arbor.
Combinatorial Representation Theory, Arun Ram, University of Wisconsin-Madison, and Frank Sottile, Texas A&M University.
Dirac Operators in Analysis and Geometry, John Ryan, University of Arkansas, Marius Mitrea, University of Missouri, and Mircea Martin, Baker University.
Evolution Equations in Physics and Mechanics, John P. Albert, University of Oklahoma, Jerry L. Bona, University of Illinois at Chicago, and Jiahong Wu, Oklahoma State University.
Extremal and Probabilistic Combinatorics, Jerrold R. Griggs and Joshua N. Cooper, University of South Carolina.
Progress on Problems in Mathematical Fluid Dynamics, Ning Ju and Jiahong Wu, Oklahoma State University.
Scattering Theory and Wave Propagation, Tanya Christiansen, University of Missouri, Columbia, and Andras Vasy, Stanford University.
Subelliptic PDEs and Sub-Riemannian Geometry, Luca Capogna, University of Arkansas, Scott Pauls, Dartmouth College, and Jeremy T. Tyson, University of Illinois, Urbana-Champaign.
New Orleans, Louisiana

New Orleans Marriott and Sheraton New Orleans Hotel

January 5–8, 2007  
Friday – Monday

Meeting #1023

Joint Mathematics Meetings, including the 113th Annual Meeting of the AMS, 90th Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: Expired

Program Updates

AMS-MAA Sessions

The AMS Committee on Science Policy-MAA Science Policy Committee Government Speaker has been cancelled on Sunday afternoon.

AMS Sessions

Katrina and Its Aftermath: Institutional Survival in New Orleans since the Storm, Friday, 4:30 p.m. to 6:00 p.m., organized by Jim E. Hoste, Pitzer College. What happened to mathematics departments at colleges and universities in New Orleans after hurricane Katrina? Like everything else in the city, all the institutions were affected, and most had to close for a semester. Many suffered financially and had to take cost-cutting measures. The panel, including Kenneth W. Holladay, University of New Orleans, Morris Kalka, Tulane University, Vlajko L. Kocic, Xavier University of Louisiana, and Katarzyna Saxton, Loyola University New Orleans, will discuss the impact of the hurricane on New Orleans mathematics departments, describe their current situation, and present plans for the future. The panel will be moderated by Jim E. Hoste, and is sponsored by the Committee on the Profession.

Additions to the AMS Special Presentation on Congressional Fellows on Sunday morning are presenters David Weinreich, AMS Congressional Fellow 2005-06, and Dan Ullman, AMS Congressional Fellow 2006-07. The application deadline for a 2007–08 AMS Congressional Fellowship is January 31, 2007.

Current Events Bulletin, Sunday afternoon. Speakers include Robert W. Ghrist, University of Illinois, Urbana-Champaign; Izabella J. Laba, University of British Columbia; Barry Mazur, Harvard University; and Akshay Venkatesh, Courant Institute, New York University.

NSF Funding for Mathematics is the title of the Committee on Science Policy panel on Sunday afternoon at 2:30 p.m., organized by DeWitt L. Sumners, Florida State University. Tony Chan, Assistant Director for Mathematics and Physical Sciences, and Peter March, Director of the Division of Mathematical Sciences, are new directors at the National Science Foundation. They will discuss their views on important NSF funding issues for mathematics, such as the balance between support for smaller individual investigator grants and larger institutional grants, and efforts to leverage DMS funding at the NSF and other agencies. The audience is encouraged to ask questions and participate in the discussion.

A Panel on the National Math Panel, Monday, 8:30 a.m. to 10:00 a.m., organized by William G. McCallum, University of Arizona. The National Mathematics Advisory Panel was created to advise President Bush and Secretary of Education Margaret Spellings on “the best use of scientifically based research on the teaching and learning of mathematics”. This session will include presentations by Larry R. Faulkner, president emeritus of the University of Texas at Austin and chair of the National Math Panel, and Francis (Skip) Fennell, president of the National Council of Teachers of Mathematics and a member of the panel, giving an up-to-the-minute report on the panel’s deliberations, and will provide an opportunity for the mathematics community to learn and ask questions about this important initiative. Sponsored by the Committee on Education.

MAA Sessions

Keeping Your Research Alive, Friday, 9:30 a.m. to 10:50 a.m., organized by Brian Birgen, Wartburg College; William Higdon, University of Indianapolis, and James Hamblin, Shippensburg University. Aimed at new Ph.D.’s and the young at mathematical heart, this panel will discuss approaches to maintaining an active research agenda in the midst of overwhelming teaching and service demands. Methods for getting undergraduates involved in research and reinvigorating a dormant research agenda will also be discussed. Panelists include Jean Bee Chan, Sonoma State University, Michael J. Dorff, Brigham Young University, and Asamoah Nkwanta, Morgan State University. The session is cosponsored by The Young Mathematicians Network.

Highlighting MAA/Tensor Foundation Projects, Saturday, 9:00 am to 11:00 a.m., organized by Elizabeth G. Yanik, Emporia State University, Jennifer Hontz, Meredith College, and Kathleen A. Sullivan, Seattle University. This poster session is designed to showcase successful programs which have been supported by MAA/Tensor Foundation grants. The objectives of the MAA/Tensor Foundation Program are “to encourage mathematics faculty to
develop projects to increase the participation of women in mathematics and to provide support to project directors. The participants in such programs range in age from university women to high school and middle school girls. It is expected that posters representing a wide variety of programs will be displayed. Possible programming formats include after-school clubs, special conferences, mentoring programs, and summer camps. Those who are in the process of constructing an outreach program are especially encouraged to attend this session to acquire valuable insights and tips for designing and implementing a mathematics outreach project. Applications should be submitted to Betsy Yanik, yanikel1@emporia.edu, by Friday, December 8, 2006.

SIGMAA on Mathematical and Computational Biology Business Meeting and Reception, Saturday, 5:45 p.m. to 7:00 p.m., organized by Eric S. Marland, Appalachian State University.

SIGMAA on Statistics Education Business Meeting, Saturday, 5:45 p.m. to 7:00 p.m., organized by Ginger Holmes Rowell, Middle Tennessee State University.

MathNerds, Moore Method, and Mathematics Education: What Do They Have in Common?, Monday, 1:00 to 2:20 p.m., organized by W. Ted Mahavier, Lamar University, and Laurie O. Cavey, James Madison University. Through support from the Educational Advancement Foundation, the Meadows Foundation, and the Texas Education Agency, MathNerds has created custom software to link university mathematics education classes with school districts in a way to facilitate training future teachers in the pedagogy of inquiry-based instruction which is the heart of the Moore Method and the MathNerds philosophy. School district students submit questions through the MathNerds system which are routed to students in university classes. These students respond under the guidance of both a mathematics educator and a mathematician, thereby addressing precisely the types of questions that their future students may ask. By learning the MathNerds philosophy for responding to questions, future teachers learn strategies that encourage students to develop deeper understanding of the underlying mathematical principles, thus enabling the students to become better problem solvers. Panelists include Terry McCabe, Texas State University, G. Edgar Parker, James Madison University, Hiroko Warshauer, Max Warshauer, and Alexander White, Texas State University; and Laurie O. Cavey.

Knowing Mathematics for Teaching: Issues in Assessment and Teacher Preparation, Monday, 1:00 p.m. to 2:20 p.m., organized by Joan Ferrini-Mundy and Raven McCrory, Michigan State University. Interest in teachers' knowledge for teaching mathematics has grown in recent years, prompted by the CBMS report The Mathematical Education of Teachers; the National Academies’ Adding it Up, and the disappointing results from national and international assessments of student achievement in mathematics. It is widely believed that teachers' mathematical knowledge is an important factor in their ability to promote student learning, but the parameters of that knowledge are not well understood. Recent research at Michigan State University and elsewhere has looked at this problem in new ways, attempting to develop systematic approaches both to preparing teachers to teach mathematics and to assessing teachers' mathematical knowledge. In this session, we present methods and results from five projects at Michigan State University that are investigating these issues: "Knowing Mathematics for Teaching Algebra Project”, Joan Ferrini-Mundy; “The Mathematical Education of Elementary Teachers Project”, Raven McCrory; “Teachers for a New Era”, Sharon Senk; “Preliminary Teacher Education Study”, William Schmidt; “PROM/SE Math Science Partnership”, Gail Burrill. For each project, a short summary of methods and results to date will be presented, followed by comments from discussants, and questions and feedback from the audience.

Activities of Other Organizations

Association for Women in Mathematics

The panel discussion on Wednesday afternoon is titled Women Advancing to Leadership: When and How, organized and moderated by Barbara L. Keyfitz, The Fields Institute and University of Houston. The presenters include Lisa Fauci, Tulane University, Department of Mathematics; Cathy B. Kessel, mathematics education consultant, Berkeley, CA; Johanna Leveit Sengers, NIST scientist emeritus; Joan R. Leitzel, University of New Hampshire, president emerita; and Carolyn R. Mahoney, Lincoln University, president.

National Association of Mathematicians

The Cox-Talbot Address will be given on Sunday evening by Scott Williams, SUNY Buffalo, on "Why mathematicians of the Africa diaspora?”. The panel discussion on Monday morning is titled HBCUs Prepare to Reform College Algebra Courses, and is organized and moderated by Dennis Davenport, U.S. Military Academy.

The Claytor-Woodward Lecture will be given on Monday afternoon by Nathaniel Whitaker, University of Massachusetts at Amherst, on Some mathematical models for modeling blood flow in the kidney.

Social Events

Association for Symbolic Logic Reception, Sunday, 5:30 p.m. to 7:00 p.m. All are welcome at this open reception.

Brigham Young University Mathematics Alumni and Friends Reception, Saturday 6:00 p.m. to 7:00 p.m. All friends and alumni of BYU are invited to attend. Please contact Michael Dorff at mdorff@math.byu.edu for more information.

Budapest Semesters in Mathematics Program, Saturday, 6:00 p.m. to 8:00 p.m. There will again be a reception/reunion for all BSM alumni (and their families), future BSM participants and their parents, BSM Regional Representatives, etc. Also be sure to visit us in the exhibit hall.

NSA Women in Mathematics Society Networking Session, Saturday, 6:00 p.m. to 8:00 p.m. Everyone is invited
to this annual session. Please stop by the NSA booths (#501 and #503) for additional information and the exact session location.

**New Mexico State University Reception**, Saturday, 5:45 p.m. to 7:45 p.m. All members and friends are invited. Please join us for refreshments and conversation.

---

**Davidson, North Carolina**

*Davidson College*

**March 3–4, 2007**

*Saturday – Sunday*

**Meeting #1024**

Southeastern Section

Associate secretary: Matthew Miller

Announcement issue of *Notices*: January 2007

Program first available on AMS website: January 18, 2007

Program issue of electronic *Notices*: March 2007

Issue of *Abstracts*: Volume 28, Issue 2

**Deadlines**

For organizers: Expired

For consideration of contributed papers in Special Sessions: November 14, 2006

For abstracts: January 9, 2007

**Invited Addresses**

**Nigel Boston**, University of South Carolina and University of Wisconsin, Madison, *Novel applications of algebra to engineering.*

**Chaim Goodman-Strauss**, University of Arkansas at Fayetteville, *Growth, aperiodicity, and undecidability.*

**Andrew J. Granville**, University of Montreal, *Title to be announced* (Erdős Memorial Lecture).

**Alex Iosevich**, University of Missouri-Columbia, *Analysis, combinatorics, and arithmetic of incidence theory.*

**Shrawan Kumar**, University of North Carolina, *Eigenvalue problem for Hermitian matrices and its generalization to arbitrary reductive groups.*

**Special Sessions**

**Algebraic and Extremal Combinatorics** (Code: SS 7A), Gábor Hetyei, University of North Carolina-Charlotte, and László A. Székely, University of South Carolina.

**Applicable Algebra** (Code: SS 12A), Nigel Boston, University of South Carolina, and Hiren Maharaj, Clemson University.

**Between Harmonic Analysis, Number Theory, and Combinatorics** (Code: SS 1A), Alex Iosevich, University of Missouri-Columbia, Michael T. Lacey, Georgia Institute of Technology, and Konstantin Oskolkov, University of South Carolina.

**Commutative Algebra and Algebraic Geometry** (Code: SS 6A), Florian Enescu, Georgia State University, and Andrew R. Kustin and Adela N. Vraciu, University of South Carolina.

**Commutative Rings and Monoids** (Code: SS 5A), Evan G. Houston and Thomas G. Lucas, University of North Carolina, Charlotte.

**Computational Group Theory** (Code: SS 3A), Arturo Magidin, University of Louisiana at Lafayette, Luisa Charlotte Kappe, Binghamton University, and Robert F. Morse, University of Evansville.

**Computational and Combinatorial Aspects of Tiling and Substitutions** (Code: SS 14A), Chaim Goodman-Strauss, University of Arkansas at Fayetteville, Casey Mann, University of Texas at Tyler, and Edmund O. Harriss, Queen Mary University of London.

**Dynamical Systems** (Code: SS 10A), Emily B. Gamber, Santa Fe Institute, Donna K. Molinek, Davidson College, and James S. Wiseman, Agnes Scott College.


**Noncommutative Algebra** (Code: SS 8A), Ellen E. Kirkman and James J. Kuzmanovich, Wake Forest University, and James Zhang, University of Washington.

**Recent Applications of Numerical Linear Algebra** (Code: SS 13A), Timothy P. Chartier, Davidson College, and Amy Langville, College of Charleston.

**Representation Theory and Galois Cohomology in Number Theory** (Code: SS 4A), Jan Minac, University of Western Ontario, and John R. Swallow, Davidson College.

**Stochastic Analysis and Applications** (Code: SS 9A), Armando Arciniega, University of Texas at San Antonio.

---

**Oxford, Ohio**

*Miami University*

**March 16–17, 2007**

*Friday – Saturday*

**Meeting #1025**

Central Section

Associate secretary: Susan J. Friedlander

Announcement issue of *Notices*: January 2007

Program first available on AMS website: February 1, 2007

Program issue of electronic *Notices*: March 2007

Issue of *Abstracts*: Volume 28, Issue 2

**Deadlines**

For organizers: Expired
For consideration of contributed papers in Special Sessions: November 28, 2006
For abstracts: January 23, 2007

**Invited Addresses**

Sergey Fomin, University of Michigan, *Title to be announced.*

Naichung Conan Leung, University of Minnesota, *Title to be announced.*

Emil J. Straube, Texas A&M University, *Title to be announced.*

Shouhong Wang, Indiana University, *Title to be announced.*

**Special Sessions**

*Combinatorial and Geometric Group Theory* (Code: SS 5A), John Donnelly, Mount Union College, and Daniel Farley, Mathematisches Institut Einsteinstrasse and Miami University.

*Complex Dynamics and Complex Function Theory* (Code: SS 9A), Stephanie Edwards, University of Dayton, and Rich Lawrence Stanekwitz, Ball State University.

*Finite Geometry and Combinatorics* (Code: SS 3A), Mark A. Miller, Marietta College.

*Geometric Topology* (Code: SS 2A), Jean-François Lafont, Ohio State University, and Ivonne J. Ortiz, Miami University.

*Graph Theory* (Code: SS 4A), Tao Jiang, Zevi Miller, and Dan Pritikin, Miami University.

*Large Cardinals in Set Theory* (Code: SS 1A), Paul B. Larson, Miami University, Justin Tatch Moore, Boise State University, and Ernest Schimmerling, Carnegie Mellon University.

*Noncommutative Algebraic Geometry* (Code: SS 7A), Dennis S. Keeler, Miami University, Rajesh Shrikrishna Kulkarni, Michigan State University, and Daniel S. Rogalski, University of California San Diego.

*Optimization Theory and Applications* (Code: SS 11A), Olga Brezhneva and Doug E. Ward, Miami University.

*PDE Methods in Several Complex Variables* (Code: SS 6A), Jeffery D. McNeal, Ohio State University, and Emil J. Straube, Texas A&M University.

*Quantum Topology* (Code: SS 13A), Sergei Chmutov and Thomas Kerler, Ohio State University.

*Random Matrices and Non-commutative Probability* (Code: SS 12A), Wlodzimierz Bryc, University of Cincinnati, and Narcisse J. Randrianantoanina, Miami University.

*Spectral Theory, Orbifolds, Symplectic Reduction and Quantization* (Code: SS 15A), William Kirwin, University of Notre Dame, and Christopher Seaton, Rhodes College.

*Theoretical and Numerical Issues in Fluid Dynamics* (Code: SS 14A), Jie Shen, Purdue University, and Shouhong Wang, Indiana University.


Vector Measures, Banach Spaces and Applications (Code: SS 8A), Patrick N. Dowling, Miami University, and Christopher J. Lennard, University of Pittsburgh.

**Hoboken, New Jersey**

*Stevens Institute of Technology*

**April 14–15, 2007**

**Meeting #1026**

Eastern Section

Associate secretary: Lesley M. Sibner

Announcement issue of *Notices*: February 2007

Program first available on AMS website: March 8, 2007

Program issue of electronic *Notices*: April 2007

Issue of *Abstracts*: Volume 28, Issue 2

**Deadlines**

For organizers: Expired

For consideration of contributed papers in Special Sessions: December 26, 2006

For abstracts: February 27, 2007

**Invited Addresses**

Neal Koblitz, University of Washington, *Title to be announced.*

Florian Luca, Universidad Nacional Autónoma de México, *Title to be announced.*

Natasa Pavlovic, Princeton University, *Title to be announced.*

Elisabeth Werner, Case Western Reserve University, *Title to be announced.*

**Special Sessions**

*Affine Invariants, Randomness, and Approximation in Convex Geometry* (Code: SS 2A), Elisabeth Werner, Case Western Reserve University, and Artem Zvavitch, Kent State University.

*Automorphic Forms and Arithmetic Geometry* (Code: SS 5A), Angela C. Gibney, University of Pennsylvania, and Diane Maclagan, Rutgers University.

*Combinatorial Algebraic Geometry* (Code: SS 9A), Valeriu Soltan, George Mason University.

*Convex Sets* (Code: SS 1A), David Larman, University College London, and Valeriu Soltan, George Mason University.

*Differential Algebra* (Code: SS 4A), Phyllis J. Cassidy, Smith College and The City College of CUNY, Richard C. Churchill, Hunter College and The Graduate Center of CUNY, Li Guo and William F. Keigher, Rutgers University at Newark, and Jerald J. Kovacic and William Sit, The City College of CUNY.
**Fourier Analysis and Convexity** (Code: SS 3A), Alexander Koldobsky, University of Missouri Columbia, and Dmitry Ryabogin, Kansas State University.

**Graph Theory and Combinatorics** (Code: SS 11A), Daniel J. Gross, Nathan W. Kahl, and John T. Sacoman, Seton Hall University, and Charles L. Suffel, Stevens Institute of Technology.

**History of Mathematics on Leonhard Euler’s Tercentenary** (Code: SS 8A), Patricia R. Allaire, Queensborough Community College, CUNY, and Robert E. Bradley and Lee J. Stemkoski, Adelphi University.

**Languages and Groups** (Code: SS 6A), Sean Cleary, The City College of New York and CUNY Graduate Center, Murray J. Elder, Stevens Institute of Technology, and Gretchen Ostheimer, Hofstra University.

**Mathematical Aspects of Cryptography** (Code: SS 7A), Robert H. Gilman, Stevens Institute of Technology, Neal I. Koblitz, University of Washington, and Susanne Wetzel, Stevens Institute of Technology.

**Nonlinear Waves in Disipative/Dispersive Media** (Code: SS 12A), Keith S. Promislow, Michigan State University, and Yi Li, Stevens Institute of Technology.

**Number Theory** (Code: SS 10A), Florian Luca, Universidad Nacional Autónoma de México, and Allison M. Pacelli, Williams College.

**Tucson, Arizona**

**University of Arizona**

April 21–22, 2007

**Meeting #1027**

Western Section

Associate secretary: Michel L. Lapidus

Announcement issue of Notices: February 2007

Program first available on AMS website: March 8, 2007

Program issue of electronic Notices: April 2007

Issue of Abstracts: Volume 28, Issue 2

**Deadlines**

For organizers: Expired

For consideration of contributed papers in Special Sessions: January 2, 2007

For abstracts: February 27, 2007

**Invited Addresses**

Liliana Borcea, Rice University, Title to be announced.

James Cushing, University of Arizona, Tucson, Title to be announced.

Hans Lindblad, University of California, San Diego, Title to be announced.

Vinayak Vatsal, University of British Columbia, Vancouver, Title to be announced.

**Special Sessions**

**Advances in Spectral Theory of Operators** (Code: SS 12A), Roger Roybal, California State University, Channel Islands, and Michael D. Wills, Weber State University.

**Algebraic Combinatorics** (Code: SS 14A), Helene Barcelo and Susanna Fishel, Arizona State University.

**Automorphisms of Curves** (Code: SS 4A), Aaron D. Wootton, University of Portland, Anthony Weaver, Bronx Community College, and S. Allen Broughton, Rose-Hulman Institute of Technology.

**Graph Theory and Combinatorics** (Code: SS 9A), Sebastian M. Cioaba, University of California at San Diego, and Joshua Cooper, University of South Carolina.

**Inverse Problems for Wave Propagation** (Code: SS 2A), Lilianna Borcea, Rice University.


**Moduli Spaces and Invariant Theory** (Code: SS 7A), Philip Foth and Yi Hu, University of Arizona.

**New Developments and Directions in Random Matrix Theory** (Code: SS 13A), Peter David Miller, University of Michigan, and Estelle Basor, California Polytechnic State University.

**Number Theory in the Southwest** (Code: SS 10A), Dinesh S. Thakur and Douglas L. Ulmer, University of Arizona.

**Operator Algebras** (Code: SS 6A), Steven P. Kaliszewski, Jack Spielberg, and John C. Quigg, Arizona State University.

**Partial Differential Equations and Geometric Analysis** (Code: SS 11A), Sunhi Choi, Lennie Friedlander, and David Alan Glickenstein, University of Arizona.

**Representations of Algebras** (Code: SS 1A), Frauke Maria Bleher, University of Iowa, Birge K. Huisgen-Zimmermann, University of California Santa Barbara, and Dan Zacharia, Syracuse University.

**Special Functions and Orthogonal Polynomials** (Code: SS 15A), Diego Dominici, State University of New York at New Paltz, and Robert S. Maier, University of Arizona.

**Spectral Analysis on Singular and Noncompact Manifolds** (Code: SS 8A), Juan Bautista Gil and Thomas Krahmer, Pennsylvania State University.

**Subjects In and Around Fluid Dynamics** (Code: SS 5A), Robert Owczarek, Los Alamos National Laboratory, and Mikhail Stepanov, University of Arizona.
Zacatecas, Mexico

*Universidad Autónoma de Zacatecas*

**May 23–26, 2007**

**Wednesday – Saturday**

**Meeting #1028**

*Seventh Joint International Meeting of the AMS and the Sociedad Matematica Mexicana.*

Associate secretary: Matthew Miller

Announcement issue of *Notices*: February 2007

Program first available on AMS website: To be announced

Program issue of electronic *Notices*: To be announced

Issue of *Abstracts*: To be announced

**Deadlines**

For organizers: To be announced

For consideration of contributed papers in Special Sessions:

- To be announced

For abstracts: To be announced

---

Warsaw, Poland

*University of Warsaw*

**July 31 – August 3, 2007**

**Tuesday – Friday**

**Meeting #1029**

*First Joint International Meeting between the AMS and the Polish Mathematical Society*

Associate secretary: Susan J. Friedlander

Announcement issue of *Notices*: To be announced

Program first available on AMS website: Not applicable

Program issue of electronic *Notices*: Not applicable

Issue of *Abstracts*: Not applicable

**Deadlines**

For organizers: Expired

For consideration of contributed papers in Special Sessions:

- To be announced

For abstracts: To be announced

---

**Invited Addresses**

**Henryk Iwaniec**, Rutgers University, *Title to be announced.*

**Tomasz J. Luczak**, Adam Mickiewicz University, *Title to be announced.*

**Tomasz Mrowka**, Massachusetts Institute of Technology, *Title to be announced.*

**Ludomir Newelski**, University of Wroclaw, *Title to be announced.*

**Madhu Sudan**, Massachusetts Institute of Technology, *Title to be announced.*

**Anna Zdunik**, Warsaw University, *Title to be announced.*

---

**Chicago, Illinois**

*DePaul University*

**October 5–6, 2007**

**Friday – Saturday**

**Meeting #1030**

*Central Section*

Associate secretary: Susan J. Friedlander

Announcement issue of *Notices*: August 2007

Program first available on AMS website: August 16, 2007

Program issue of electronic *Notices*: October 2007

Issue of *Abstracts*: Volume 28, Issue 3

**Deadlines**

For organizers: March 6, 2007

For consideration of contributed papers in Special Sessions:

- June 19, 2007

For abstracts: August 7, 2007

---

**Invited Addresses**

**Martin Golubitsky**, University of Houston, *Title to be announced.*

**Matthew J Gursky**, University of Notre Dame, *Title to be announced.*

**Alex Iosevich**, University of Missouri, *Title to be announced.*

**David E. Radford**, University of Illinois at Chicago, *Title to be announced.*
Meetings & Conferences

New Brunswick, New Jersey

*Rutgers University-New Brunswick, Busch Campus*

**October 6–7, 2007**
*Saturday – Sunday*

**Meeting #1031**
Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: August 2007
Program first available on AMS website: August 16, 2007
Program issue of electronic *Notices*: October 2007
Issue of *Abstracts*: Volume 28, Issue 3

**Deadlines**
For organizers: March 6, 2007
For consideration of contributed papers in Special Sessions: June 19, 2007
For abstracts: August 7, 2007

**Invited Addresses**
Sir Roger Penrose, University of Oxford, *Title to be announced* (Einstein Public Lecture in Mathematics).

**Special Sessions**
Commutative Algebra (Code: SS 4A), Jooyoun Hong, University of California Riverside, and Wolmer V. Vasconcelos, Rutgers University.
Mathematical and Physical Problems in the Foundations of Quantum Mechanics (in Honor of Shelly Goldstein's 60th Birthday) (Code: SS 3A), Roderich Tumulka and Detlef Dürr, München University, and Nino Zanghi, University of Genova.
Partial Differential Equations in Mathematical Physics (in Honor of Shelly Goldstein's 60th Birthday) (Code: SS 2A), Sagun Chanillo, Michael K.-H. Kiessling, and Avy Soffer, Rutgers University.
Probability and Combinatorics (Code: SS 1A), Jeffry N. Kahn and Van Ha Vu, Rutgers University.

Albuquerque, New Mexico

*University of New Mexico*

**October 13–14, 2007**
*Saturday – Sunday*

**Meeting #1032**
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of *Notices*: August 2007
Program first available on AMS website: August 30, 2007
Program issue of electronic *Notices*: October 2007
Issue of *Abstracts*: Volume 28, Issue 4

**Deadlines**
For organizers: March 13, 2007
For consideration of contributed papers in Special Sessions: June 26, 2007
For abstracts: August 21, 2007

**Invited Addresses**
Emmanuel Candes, California Institute of Technology, *Title to be announced*.
Alexander Polischuk, University of Oregon, *Title to be announced*.
Eric Raines, University of California Davis, *Title to be announced*.
William E. Stein, University of California San Diego, SAGE: Software for Algebra and Geometry Experimentation.

Murfreesboro, Tennessee

*Middle Tennessee State University*

**November 3–4, 2007**
*Saturday – Sunday*

**Meeting #1033**
Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of *Notices*: September 2007
Program first available on AMS website: September 20, 2007
Program issue of electronic *Notices*: November 2007
Issue of *Abstracts*: Volume 28, Issue 4

**Deadlines**
For organizers: April 3, 2007
For consideration of contributed papers in Special Sessions: July 17, 2007
For abstracts: September 11, 2007
Invited Addresses

Daniel K. Nakano, University of Georgia, Title to be announced.
Carla D. Savage, North Carolina State University, Title to be announced.
Sergei Tabachnikov, Pennsylvania State University, Title to be announced.

Special Sessions

Advances in Algorithmic Methods for Algebraic Structures (Code: SS 3A), James B. Hart, Middle Tennessee State University.
Applied Partial Differential Equations (Code: SS 4A), Yuri A. Melnikov, Middle Tennessee State University.
Differential Equations and Dynamical Systems (Code: SS 1A), Wenzhang Huang and Jia Li, University of Alabama, Huntsville, and Zachariah Sinkala, Middle Tennessee State University.
Graph Theory (Code: SS 2A), Rong Luo, Chris Stephens, and Xiaoya Zha, Middle Tennessee State University.

Wellington, New Zealand

To be announced

December 12–15, 2007
Wednesday – Saturday

Meeting #1034
First Joint International Meeting between the AMS and the New Zealand Mathematical Society (NZMS).
Associate secretary: Matthew Miller
Announcement issue of Notices: To be announced
Program first available on AMS website: Not applicable
Program issue of electronic Notices: Not applicable
Issue of Abstracts: Not applicable

Deadlines
For organizers: March 31, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

AMS Special Sessions

Computability Theory, Rodney G. Downey and Noam Greenberg, Victoria University of Wellington.
Hopf Algebras and Quantum Groups, M. Susan Montgomery, University of Southern California, and Yinhuo Zhang, Victoria University of Wellington.
Infinite-dimensional Groups and Their Actions, Christopher Atkin, Victoria University of Wellington, Greg Hjorth, University of California Los Angeles/University of Melbourne, Alicia Miller, University of Louisville, and Vladimir Pestov, University of Ottawa.

San Diego, California
San Diego Convention Center

January 6–9, 2008
Sunday – Wednesday
Joint Mathematics Meetings, including the 114th Annual Meeting of the AMS, 91st Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: October 2007
Program first available on AMS website: November 1, 2007
Program issue of electronic Notices: January 2008
Issue of Abstracts: Volume 29, Issue 1

Deadlines
For organizers: April 1, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

New York, New York
Courant Institute of New York University

March 22–23, 2008
Saturday – Sunday
Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: August 22, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced
Baton Rouge, Louisiana
Louisiana State University, Baton Rouge

March 28–30, 2008
Friday – Sunday
Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: August 28, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Rio de Janeiro, Brazil
Instituto Nacional de Matemática Pura e Aplicada (IMPA)

June 4–7, 2008
Wednesday – Saturday
First Joint International Meeting between the AMS and the Sociedade Brasileira de Matemática.
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: To be announced
Program first available on AMS website: Not applicable
Program issue of electronic Notices: Not applicable
Issue of Abstracts: Not applicable

Deadlines
For organizers: To be announced
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Bloomington, Indiana
Indiana University

April 4–6, 2008
Friday – Sunday
Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: September 4, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Claremont, California
Claremont McKenna College

May 3–4, 2008
Saturday – Sunday
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: March 9, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Vancouver, Canada
University of British Columbia and the Pacific Institute of Mathematical Sciences (PIMS)

October 4–5, 2008
Saturday – Sunday
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: March 9, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced
Middletown, Connecticut

Wesleyan University

October 11–12, 2008
Saturday – Sunday
Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: March 11, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Washington, District of Columbia

Marriott Wardman Park Hotel and Omni Shoreham Hotel

January 7–10, 2009
Wednesday – Saturday
Joint Mathematics Meetings, including the 115th Annual Meeting of the AMS, 92nd Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: October 2008
Program first available on AMS website: November 1, 2008
Program issue of electronic Notices: January 2009
Issue of Abstracts: Volume 30, Issue 1

Deadlines
For organizers: April 1, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Huntsville, Alabama

University of Alabama, Huntsville

October 24–26, 2008
Friday – Sunday
Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: March 24, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Urbana, Illinois

University of Illinois at Urbana-Champaign

March 27–29, 2009
Friday – Sunday
Southeastern Section
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: August 29, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Shanghai, People’s Republic of China

Fudan University

December 17–21, 2008
Wednesday – Sunday
First Joint International Meeting Between the AMS and the Shanghai Mathematical Society
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: To be announced
Program first available on AMS website: Not applicable
Program issue of electronic Notices: Not applicable
Issue of Abstracts: Not applicable
Meetings & Conferences

Raleigh, North Carolina
North Carolina State University

April 4–5, 2009
Saturday – Sunday
Southeastern Section
Assistant secretary: Matthew Miller
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: September 4, 2008
For consideration of contributed papers in Special Sessions:
  To be announced
For abstracts: To be announced

San Francisco, California
San Francisco State University

April 25–26, 2009
Saturday – Sunday
Western Section
Assistant secretary: Michel L. Lapidus
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: September 25, 2008
For consideration of contributed papers in Special Sessions:
  To be announced
For abstracts: To be announced

San Francisco, California
Moscone Center West and the San Francisco Marriott

January 6–9, 2010
Wednesday – Saturday
Joint Mathematics Meetings, including the 116th Annual Meeting of the AMS, 93rd Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Assistant secretary: Matthew Miller
Announcement issue of Notices: October 2009
Program first available on AMS website: November 1, 2009
Program issue of electronic Notices: January 2010
Issue of Abstracts: Volume 31, Issue 1

Deadlines
For organizers: April 1, 2009
For consideration of contributed papers in Special Sessions:
  To be announced
For abstracts: To be announced

New Orleans, Louisiana
New Orleans Marriott and Sheraton New Orleans Hotel

January 5–8, 2011
Wednesday – Saturday
Joint Mathematics Meetings, including the 117th Annual Meeting of the AMS, 94th Annual Meeting of the Mathematical Association of America, annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Assistant secretary: Susan J. Friedlander
Announcement issue of Notices: October 2010
Program first available on AMS website: November 1, 2010
Program issue of electronic Notices: January 2011
Issue of Abstracts: Volume 32, Issue 1

Deadlines
For organizers: April 1, 2010
For consideration of contributed papers in Special Sessions:
  To be announced
For abstracts: To be announced
Meetings & Conferences

Boston, Massachusetts

John B. Hynes Veterans Memorial Convention Center, Boston Marriott Hotel, and Boston Sheraton Hotel

January 4–7, 2012
Wednesday – Saturday
Joint Mathematics Meetings, including the 118th Annual Meeting of the AMS, 95th Annual Meeting of the Mathematical Association of America, annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).

Associate secretary: Michel L. Lapidus
Announcement issue of Notices: October 2011
Program first available on AMS website: November 1, 2011
Program issue of electronic Notices: January 2012
Issue of Abstracts: Volume 33, Issue 1

Deadlines
For organizers: April 1, 2011
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

San Diego, California

San Diego Convention Center and San Diego Marriott Hotel and Marina

January 9–12, 2013
Wednesday – Saturday
Joint Mathematics Meetings, including the 119th Annual Meeting of the AMS, 96th Annual meeting of the Mathematical Association of America, annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).

Associate secretary: Lesley M. Sibner
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: April 1, 2012
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

THE CHINESE UNIVERSITY OF HONG KONG

Applications are invited for:-

Department of Japanese Studies
Assistant Professor
(Ref: 06/186(576)/2)
(Closing date: March 31, 2007)

Applicants should (i) have a PhD degree; (ii) specialize in any of the following areas: Contemporary Japan-China Politics and International Relations, Japanese Media, Japanese Literature and Art, History of Japanese Science and Technology; (iii) have experience in university teaching and research activities; and (iv) have a good publication record. Applicants should specify their level of proficiency in English, Japanese and other languages. Appointment will normally be made on contract basis for up to three years initially commencing mid-August 2007, leading to longer-term appointment or substantiation later subject to mutual agreement.

Salary and Fringe Benefits
Salary will be highly competitive, commensurate with qualifications and experience. The University offers a comprehensive fringe benefit package, including medical care, plus a contract-end gratuity for an appointment of two years or longer; and housing benefits for an eligible appointee.

Further information about the University and the general terms of service for appointments is available at http://www.cuhk.edu.hk/personnel. The terms mentioned herein are for reference only and are subject to revision by the University.

Application Procedure
Please send full resume, copies of academic credentials, a publication list and/or abstracts of selected published papers, together with names, addresses and fax numbers/e-mail addresses of three referees to whom the applicants’ consent has been given for their providing references (unless otherwise specified), to the Personnel Office, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong (Fax: (852) 2603 6852) by the closing date.

The Personal Information Collection Statement will be provided upon request. Please quote the reference number and mark ‘Application - Confidential’ on cover.
The 2006 *Notices* Index

<table>
<thead>
<tr>
<th>Index Section</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>The AMS</td>
<td>1420</td>
</tr>
<tr>
<td>Announcements</td>
<td>1421</td>
</tr>
<tr>
<td>Authors of Articles</td>
<td>1423</td>
</tr>
<tr>
<td>Deaths of Members of the Society</td>
<td>1425</td>
</tr>
<tr>
<td>Education</td>
<td>1426</td>
</tr>
<tr>
<td>Feature Articles</td>
<td>1426</td>
</tr>
<tr>
<td>Letters to the Editor</td>
<td>1427</td>
</tr>
<tr>
<td>Mathematicians</td>
<td>1428</td>
</tr>
<tr>
<td>Mathematics Articles</td>
<td>1431</td>
</tr>
<tr>
<td>Mathematics History</td>
<td>1431</td>
</tr>
<tr>
<td>Meetings Information</td>
<td>1431</td>
</tr>
<tr>
<td>Memorial Articles</td>
<td>1432</td>
</tr>
<tr>
<td>New Publications Offered by the AMS</td>
<td>1432</td>
</tr>
<tr>
<td>Officers and Committee Members</td>
<td>1432</td>
</tr>
<tr>
<td>Opinion</td>
<td>1432</td>
</tr>
<tr>
<td>Opportunities</td>
<td>1432</td>
</tr>
<tr>
<td>Prizes and Awards</td>
<td>1433</td>
</tr>
<tr>
<td>The Profession</td>
<td>1435</td>
</tr>
<tr>
<td>Reference and Book List</td>
<td>1435</td>
</tr>
<tr>
<td>Reviews</td>
<td>1436</td>
</tr>
<tr>
<td>Surveys</td>
<td>1436</td>
</tr>
<tr>
<td>Tables of Contents</td>
<td>1436</td>
</tr>
</tbody>
</table>

2006 American Mathematical Society Election (Special Section), 924
2006 AMS Election (Nominations by Petition), 280
2006 Award for Distinguished Public Service, 477
2006 Award for an Exemplary Program or Achievement in a Mathematics Department, 481
2006 Birkhoff Prize, 474
2006 Cole Prize in Algebra, 472
2006 Conant Prize, 475
2006 Steele Prizes, 464
2006–2007 AMS Centennial Fellowships Awarded, 686
American Mathematical Society Centennial Fellowships, 906, 1228
American Mathematical Society—Contributions, 598
AMS-AAAS Mass Media Summer Fellowships, 54, 1064
AMS Announces Congressional Fellow, 1232
AMS Annual Report Issued, 60
AMS Archives Journals with Portico, 592
AMS Conference on Undergraduate Research, 694
AMS Congressional Briefing: How Mathematics Helps Predict Storm Surges, 251
AMS Congressional Fellowship, 363, 1228
AMS Department Chairs Workshop, 1064
AMS Email Support for Frequently Asked Questions, 251
AMS Epsilon Fund, 1064
AMS Establishes Eisenbud Prize for Mathematics and Physics, 694
AMS Menger Awards at the 2006 ISEF, 904
AMS Names 2006 Mass Media Fellow, 693
AMS Participates in CNSF Exhibition, 909
AMS Presidents: A Timeline, 486
AMS Releases New “Mathematical Moments”, 58
AMS Scholarships for "Math in Moscow", 907
AMS Short Course in New Orleans, 1123
AMS Sponsors NExT Fellows, 367
AMS Standard Cover Sheet, 91
Biographies of Candidates, 928
Call for Nominations for the 2006 AMS-MAA-SIAM Frank and Brennie Morgan Prize, 493

About the Cover
65, 213, 337, 433, 603, 651, 768, 875, 1063, 1188, 1312

The AMS
2005 AMS Election Results, 278
2005 Annual Survey of the Mathematical Sciences (First Report), 230
2005 Annual Survey of the Mathematical Sciences in the United States (Second Report), 775
2005 Annual Survey of the Mathematical Sciences in the United States (Third Report), 1345
2005 Morgan Prize, 479
Call for Nominations for AMS Exemplary Program Prize, 282, 372
Call for Nominations for David P. Robbins Prize, 605, 700, 817
Call for Nominations for E. H. Moore Research Article Prize, 492
Call for Nominations for Leroy P. Steele Prizes, 283, 373
Call for Nominations for the Levi L. Conant, Ruth Lyttle Satter, Oswald Veblen, and Norbert Wiener Prizes, 491
Call for Suggestions for 2006 AMS Elections, 279
Current Events Session at Joint Meetings, 58
Deaths of AMS Members, 60, 253, 367, 592, 694, 796, 909, 1070, 1366
Department Chairs Workshop, 592
Early Career Profile Network, 486
Editor’s Log, AMSY 2005, 405
(E) Einstein Public Lecture in Mathematics 2006, 333
Epsilon Awards for 2006, 693
Epsilon Memorial Scholarships Awarded for 2006, 1232
Erdo˝s Memorial Lectures, 60
Ethical Guidelines for the Society, 701
Fan China Exchange Program Names Awardees, 796
(A) Fellows Program for the AMS, 754
General Information Regarding Meetings & Conferences of the AMS, 96, 288, 381, 499, 613, 715, 825, 963, 1092, 1254, 1382
News about the Notices Website, 486
Nomination Petition for 2006 Election, 280
Officers and Committee Members, 1076
Officers of the Society 2005 and 2006 Updates, 604
(A) Photographic Look at the Joint Meetings, San Antonio 2006, 410
Presenters of Papers and Program of the Sessions, San Antonio Meeting, 111
Programs that Make a Difference, 353
Report of the Executive Director, State of AMS, 2006, 804
Report of the Treasurer (2005), 810
Sir Michael Atiyah’s Einstein Lecture, 674
Statistics on Women Mathematicians Compiled by the AMS, 1087
Trjitzinsky Memorial Awards Presented, 59, 1365
Voting Information for 2006 AMS Election, 803

Announcements
2005 Morgan Prize, 479
2006 Award for Distinguished Public Service, 477
2006 Award for an Exemplary Program or Achievement in a Mathematics Department, 481
2006 Birkhoff Prize, 474
2006 CMS Awards Given, 1357
2006 Cole Prize in Algebra, 472
2006 Conant Prize, 475
2006 d’Alembert and Decerf Prizes Announced, 1062
(The) 2006 Einstein Public Lecture in Mathematics, 333
2006 Events Surrounding the Gödel Centenary, 455
2006 Fields Medals Awarded, 1037
2006 Gauss Prize, 1224
2006 International Mathematical Olympiad, 1063
2006 JPBM Communications Award, 583
2006 Nevanlinna Prize Awarded, 1045
2006 Steele Prizes, 464
2006–2007 AMS Centennial Fellowships Awarded, 686
2007 ICIAM Prizes Announced, 1356
AAUW Educational Foundation Fellowships and Grants, 1229
Akaike Receives 2006 Kyoto Prize, 1056
Alfred W. Goldie (1920–2005), 52
American Academy Elections, 791
American Mathematical Society Centennial Fellowships, 906, 1228
AMS-AAAS Mass Media Summer Fellowships, 54, 1064
AMS Announces Congressional Fellow, 1232
AMS Annual Report Issued, 60
AMS Archives Journals with Portico, 592
AMS Conference on Undergraduate Research, 694
AMS Congressional Fellowship, 363, 1228
AMS Department Chairs Workshop, 1064
AMS Epsilon Fund, 1064
AMS Establishes Eisenbud Prize for Mathematics and Physics, 694
AMS Menger Awards at the 2006 ISEF, 904
AMS Names 2006 Mass Media Fellow, 693
AMS Participates in CNSF Exhibition, 909
AMS Presidents: A Timeline, 486
AMS Releases New “Mathematical Moments”, 58
AMS Scholarships for "Math in Moscow", 907
AMS Sponsors NExT Fellows, 367
AP Calculus Readers Sought, 484
Aumann Awarded Nobel Prize in Economics, 44
Aumann Awarded von Neumann Prize, 790
Authors Receive Chauvenet Prize for Notices Article, 362
Avila, Morel, and Payne Named Clay Research Fellows, 51
Bhargava and Dencker Receive Clay Awards, 51
Bhargava and Soundararajan Awarded SASTRA Ramanujan Prizes, 51
Call for Contributions for ICMI Study, 55
Call for Entries for Pirelli INTERNETional Award, 691
Call for Nominations for 2006 AMS-MAA-SIAM Frank and Brennie Morgan Prize, 493
Call for Nominations for 2006 Information-Based Complexity Award, 793
Call for Nominations for Aisenstadt Prize, 690
NSF-CBMS Regional Conferences, 2006, 248
NSF Computing Equipment and Instrumentation Programs, 55, 1362
NSF Distinguished International Postdoctoral Research Fellowships, 907
NSF Focused Research Groups, 793
NSF Graduate Fellowships, 246
NSF Graduate Research Fellowships, 1228
NSF Graduate Research Fellowships Announced, 688
NSF International Research Fellow Awards, 907
NSF Mathematical Sciences Postdoctoral Research Fellowships, 793
NSF Postdoctoral Fellowships Awarded, 1226
NSF Postdoctoral Research Fellowships, 591
NSF Program in Informal Science Education, 484
NSF Support for Interactions with Physical and Computer Sciences and Engineering, 55
Oberwolfach Photo Collection Now Available Online, 485
ONR Young Investigator Program, 249
Otto Receives Leibniz Prize, 361
Palis and Seshadri Awarded 2006 Trieste Science Prize, 1060
Palis Elected TWAS President, 1364
Paul Erdős Award Recipients Announced, 1062
PECASE Awards Announced, 1226
Peter March Heads DMS, 1068
Pi Mu Epsilon Student Paper Presentation Awards, 1360
Plaskota Awarded 2006 Information-Based Complexity Prize, 790
Polterovich and Tsai Awarded André Aisenstdadt Prize, 361
Prizes of the Mathematical Society of Japan, 1360
Professor of the Year Awards Announced, 362
Program Director Positions at NSF, 363
Project NExT: New Experiences in Teaching, 364
Proposal Due Dates at the DMS, 53
Putnam Prizes Awarded, 903
Raman Awarded TWAS Prize, 360
Research Opportunities for U.S. Graduate Students in Asia and Australia, 1229
Rhodes Scholarships Awarded, 361
Royal Society of Canada Elections, 1063
Royal Society of London Elections, 905
Sheffield Awarded Rollo Davidson Prize, 687
Sherratt Awarded Adams Prize, 903
SIAM Prizes Awarded, 1061
Sloan Fellows Announced, 688
Sullivan Receives 2004 National Medal of Science, 346
Summer Program for Women Undergraduates, 364
Swinnerton-Dyer Receives Sylvester Medal, 1062
Szpiro a Finalist for Descartes Prize, 362
Thomas P. Branson (1953–2006), 689
Tomczak-Jaegermann Awarded CRM-Fields-PIMS Prize, 483
Tony Chan Named NSF Assistant Director, 1058
Trijitzinsky Memorial Awards Presented, 59, 1365
USA Mathematical Olympiad, 792
Vatsal Awarded Ribenboim Prize, 688
Viana Awarded ICTP/IMU Ramanujan Prize, 51
Young Scholars’ Competition Prizes Awarded at Gödel Centenary, 903
Zoller Awarded 2006 Dirac Medal, 1227

Authors of Articles

Adams, Colin, 1324
Arthur, James, 754
Aslaksen, Helmer, 343
Biss, Daniel, 1005
Blank, Brian, 661
Booker, Andrew R., 1208
Brams, Steven J., 1314
Braverman, Mark, 318
Caughman, John S., 1021
Chow, Timothy Y., 15
Cook, Stephen, 318
Cooper, S. Barry, 1213
Coudene, Yves, 8
Davies, E. B., 462
Davis, Philip J., 1341
Davis, Paul, 1341
Davis, Philip J., 317
Dawson, John W., Jr., 444, 462
de Léon, John, 15
Deschamp, Brent J., 57
Deuffhard, Peter, 1012
Eisenbud, David, 757
Epstein, Charles L., 1028
Ewing, John, 1049
Faris, William G., 33
Farley, Jonathan David, 348
Feferman, Solomon, 434, 1200
Floyd, Juliet, 419
Franzén, Torkel, 440
Friedlander, John, 883
Friedlander, Susan, 861
Goel, Sharad, 878
Greenwald, Sarah J., 741
Grundman, H. G., 1329
Gunnells, Paul, 528
Heinonen, Juha, 1334
Hodges, Andrew, 1190
Jackson, Allyn, 215, 346, 347, 458, 580, 637, 771, 895, 897, 1058, 1336
Jaffe, Arthur M., 652
Johnson, G. W., 674
Jones, Michael A., 1314
Jorgenson, Jay, 536
Kanamori, Akihiro, 419
Kasman, Alex, 215
Katz, Sheldon, 1181
Kennedy, Juliette, 448
Kesten, Harry, 572
Kirkman, Ellen E., 230, 775, 1345
Klamler, Christian, 1314
Kollár, János, 766
Komjáth, Péter, 1035
Kra, Irwin, 1301
Krantz, Steven G., 536
Landau, Susan, 330
Lansel, Steven, 334
Larson, C. E., 525
Lewis, Heather A., 1021
Magid, Andy, 5, 405
Majid, Shahn, 30
Marateck, Samuel L., 744
Marcus, Michael B., 574
Maurer, Stephen B., 1018
Maxwell, James W., 230, 775, 1345
Maycock, Ellen J., 353
McCallum, William, 1018
McCorry, Raven, 20
Milman, Vitali, 351
Mohar, Bojan, 338
Montgomery, Richard, 1031
Mycielski, Jan, 206
Neyman, Abraham, 44
Ono, Ken, 640
Porter, Mason, 334
Rankin, Samuel M., III, 682
Raußen, Martin, 223
Richert, Norman, 49, 482
Roe, John, 668
Rose, Colleen, 230, 775, 1345
Ruelle, David, 764
Ruskey, Frank, 1304
Savage, Carla, 1304
Senechal, Marjorie, 886
Sigmund, Karl, 428
Skau, Christian, 223
Small, Lance, 52
Stern, Ronald J., 759
Stopple, Jeffrey, 864
Swallow, John, 761
Tanton, James, 200
Tu, Loring W., 554
Ullman, Daniel, 340
Wagon, Stan, 1304
Walker, Mark E., 674
Weidman, Scott, 890
Weiser, Martin, 1012
Wiegand, Roger, 456
Zachow, Stefan, 1012

Backlog of Mathematics Research Journals, 1237

Classified Advertisements
82, 294, 388, 508, 722, 832, 971, 1099, 1263, 1391

Commentary
Book Reviews: Reviewed by William G. Faris (Probability Theory: The Logic of Science), 33; Reviewed by Alex Kasman (PopCo), 215; Reviewed by Helmer Aslaksen (The Curious Incident of the Dog in the Night-time), 343; Reviewed by Juliette Kennedy (Incompleteness: The Proof and Paradox of Kurt Gödel), 448; Reviewed by Michael B. Marcus (Dark Hero of the Information Age: In Search of Norbert Wiener, the Father of Cybernetics), 574; Reviewed by Brian Blank (The Road to Reality: A Complete Guide to the Laws of the Universe), 661; Reviewed by John Swallow (Reality Conditions), 76; Reviewed by John Friedlander (Stalking the Riemann Hypothesis), 883; Reviewed by Richard Montgomery (The Three Body Problem, A Cambridge Mystery), 1031; Reviewed by Péter Komjáth (The Pea and the Sun: A Mathematical Paradox), 1035; Reviewed by S. Barry Cooper (The Man Who Knew Too Much: Alan Turing and the Invention of the Computer), 1213; Reviewed by Andrew Hodges (The Essential Turing), 1190; Reviewed by Colin Adams (The Shoelace Book), 1324

Letter from the Editor:
Andy Magid (Deaths and Didactics), 5; (Editor’s Log, AMSY 2005), 405
Letters to the Editor, 6, 198, 406, 526, 638, 742, 862, 1006, 1182, 1302

Movie Review: Reviewed by Daniel Ullman (Proof), 340

Opinion: Brent J. Deschamp (My Summer at National Public Radio), 56; Manuel de Léon (Welcome to Madrid for ICM 2006: The Spanish Mathematics Fiesta), 197; Philip J. Davis (The Media and Mathematics Look at Each Other), 317; C. E. Larson (Technology, Education, and the Single Salary Schedule), 525; Allyn Jackson (Business Week Looks at Mathematics), 637; Sarah J. Greenwald (Complex NUMB3RS), 741; Susan Friedlander (Please Vote), 861; Daniel Biss (Communicating the Romance of Mathematics), 1005; Sheldon Katz (Advocating for Mathematics), 1181; Irwin Kra (Math for America and the Math Science Teaching Corps), 1301

Conferences of the AMS
Joint Summer Research Conferences in the Mathematical Sciences, June 4–29, 2006, Snowbird, UT, 192, 311, 399, 519, 631, 735
Joint Summer Research Conferences in the Mathematical Sciences, June 16–July 6, 2007, Snowbird, UT, 999, 1175, 1279, 1295, 0000
von Neumann Symposium on Sparse Representation and High-Dimensional Geometry, July 8–12, 2007, Snowbird, UT, 999, 1112, 1175, 1295, 0000

Conferences (Other)
22nd Annual Workshop on Mathematical Problems in Industry, June 12–16, 2006, Olin College, Needham, MA, 192, 311, 399, 519, 631, 735
AAAS Conference in St. Louis, MO, 95
Poisson 2006: Poisson Geometry in Mathematics and Physics, June 5–9, 2006, Tokyo, Japan, 399, 519, 631, 735
Recent Advances in Nonlinear Partial Differential Equations and Applications: A Conference in Honor of Peter D. Lax and Louis Nirenberg, June 7–10, 2006, Toledo, Spain, 399, 519, 631, 735
Correction
Correction to “2006 Fields Medals Awarded” (October 2006), 1231
Correction to Cox article (November 2005), 57
Correction to “The Incompleteness Theorem” article (April 2006), 592
Correction to MathSciNet Matters column, 367
Correction to “NSF Graduate Research Fellowships” announcement, 485
Correction to review of Alex Kasman’s book Reality Conditions (August 2006), 905
Correction to “A System of Axioms for Set Theory for the Rationalists” (February 2006), 1008
Correction to “What Is the Role of Algebra in Applied Mathematics?”, 57

Deaths of AMS Members
Alluy, Emilio R., 694
Andersen, Janet L., 367
Babbitt, Albert E., Jr., 367
Bachman, George, 1366
Basu, Adhir K., 592
Berechet, Adriana, 1070
Blount, Kevin, 1366
Bott, Raoul, 367
Brandon, Robert L., 1366
Branson, Thomas P., 689, 694
Breckenridge, Michael E., 253
Brigham, Nelson A., 253
Brown, Arthur A., 60
Buchsteiner, Hans-Henning, 367
Burling, James P., 367
Caldwell, Thomas E., 1366
Cassens, Patrick, 694
Chartres, Bruce A., 1366
Chelluri, Thyagaraju, 694
Chester, Clive R., 1366
Cohn, Paul M., 1070
Conrad, Paul F., 1070
Constantinescu, Tiberiu, 909
Creese, Franklyn G., 1070
Cronheim, Arno, 1070
Crow, Edwin L., 367
Crowell, Richard H., 1366
Csibi, Sandor, 1070
Dankel, Thaddeus, 1070
Danskin, John M., 1070
Dillworth, William, 367
Dowling, Diane, 367
Eidelman, Samuil Davidovich, 694
Ericksen, Wilhelm S., 1070
Freundlich, Marianne Smith, 1366
Gaskill, Irving, 1070
Glazek, Kazimierz, 253
Glusman, Sidney, 796
Goldie, Alfred W., 52
Grudin, Arnold, 694
Haefeli, Hans G., 694
Halmos, Paul R., 1366
Higman, Donald G., 1070
Huneke, John P., 253
Husain, Ali-Amir, 1366
Iyanaga, Shokichi, 1070
Kaplansky, Irving, 909
Keown, Ernest Ray, 694
Klamkin, Murray S., 367
Kosier, Frank, 909
LaBudde, Christian D., 1070
Lengyel, Bela A., 1366
Levine, Jerome P., 694
Levy, Gene, 1070
Lewis, L. Gaunce, Jr., 796
Liu, Wei-Nung, 60
Lohmus, Jaak, 592
Lorentz, George G., 694
Mackey, George W., 694
Matheson, Alec L., 694
Matsusaka, Teruhisa, 766
McWilliams, Ralph, 1070
Meyer, Burnett C., 694
Meyer, Weston W., 1366
Milgram, Martin, 1070
Mizel, Victor J., 1366
Mohat, John T., 1070
Mumbru, Pere R., 592
Nielsen, Peter A., 367
Olive, Gloria, 694
Pernavi, Nora, 1070
Phadke, Bhalchandra Balvant, 796
Pillow, A. Fenton, 909
Riess, Karlem, 1070
Rivlin, Theodore J., 1366
Roberts, George A., 1366
Roth, Rodney J., 60
Rubinstein, George A., 1366
Schaerf, Henry M., 1366
Schwartz, Alan L., 1070
Sharma, Chandra S., 592
Shelly, Eugene P., 1366
Siew, Peg-Foo, 367
Smith, Roy C. T., 1366
Sonnenborn, Lee M., 253
Sorenson, John R., 1366
Spitzbart, Abraham, 367
Stalley, Robert D., 694
Thomas, Charles B., 367
Tierney, John A., 694
Toll, Kathryn B., 694
Tu, Yih-O, 1070
Usenko, Vitaliy M., 1070
Volquartz, Hans-Heinrich, 1070
Wendel, James G., 592
Wijsman, Robert A., 1070
Wilson, Robert L., 1366
Woodruff, William M., 694
Yandell, Benjamin, 592
Yang, Chung-Tao, 253
Zeller, Karl, 1366
Doctoral Degrees Conferred 2004–2005, 258
Supplementary List, 787

Education
Advising a Precollege Curriculum Project (Stephen B. Maurer and William McCallum), 1018
Department Chairs Workshop, 591
Harvey Mudd Mathematics Department Garners AMS Award, 458
Math Circles and Olympiads (MSRI Asks: Is the U.S. Coming of Age?) (James Tanton), 200
Mathematicians and Mathematics Textbooks for Prospective Elementary Teachers (Raven McCrory), 20
National Mathematics Advisory Panel Members Announced, 794
Programs that Make a Difference, 353
Technology, Education, and the Single Salary Schedule, 525
Textbook Tempest: Students and Professors Decry Price Surges (Allyn Jackson), 771

Election Information (AMS)
2005 Election Results, 278
2006 American Mathematical Society Election (Special Section), 924
Biographies of Candidates, 928
Call for Suggestions for 2006 AMS Elections, 279
Nomination Petition for 2006 Election, 280
Voting Information for 2006 AMS Election, 803

Employment Center
Mathematical Sciences Employment Center, 975, 1113
Mathematical Sciences Employment Center Forms, 980, 1118

Feature Articles
2006 Events Celebrating the Gödel Centenary, 455
Advising a Precollege Curriculum Project (Stephen B. Maurer and William McCallum), 1018
Better Ways to Cut a Cake (Steven J. Brams, Michael A. Jones, and Christian Klamler), 1314
Cells in Coxeter Groups (Paul E. Gunnells), 528
Computing over the Reals: Foundations for Scientific Computing (Mark Braverman and Stephen Cook), 318
(The) Differential Geometry and Physical Basis for the Applications of Feynman Diagrams (Samuel L. Marateck), 744
(The) Life and Works of Raoul Bott (Loring W. Tu), 554
Math Circles and Olympiads (MSRI Asks: Is the U.S. Coming of Age?) (James Tanton), 200
Mathematicians and Mathematics Textbooks for Prospective Elementary Teachers (Raven McCrory), 20
Mathematics in Facial Surgery (Peter Deuffhard, Martin Weiser, Stefan Zachow), 1012
(The) Millennium Grand Challenge in Mathematics (Arthur M. Jaffe), 652
Mushroom Billiards (Mason Porter and Steven L. Lansen), 334
Notes on the Deuring-Heilbronn Phenomenon (Jeffrey Stopple), 864
Pictures at an Exhibition (Karl Sigmund), 428
Pictures of Hyperbolic Dynamical Systems (Yves Coudene), 8
(The) Popular Impact of Gödel's Incompleteness Theorem (Torkel Franzén), 440
(The) Search for Simple Symmetric Venn Diagrams (Frank Ruskey, Carla Savage, Stan Wagon), 1304
Serge Lang (1927–2005) (Jay Jorgenson and Steven G. Krantz), 536
(A) System of Axioms of Set Theory for the Rationalists (Jan Mycielski), 206
Tips for the Job Search: Applying for Academic and Postdoctoral Positions (Heather A. Lewis and John S. Caughman), 1021
(A) Tribute to Kurt Gödel (in photographs), 412
Turing and the Riemann Hypothesis (Andrew R. Booker), 1208
Turing’s Thesis (Solomon Feferman), 1200
You Could Have Invented Spectral Sequences (Timothy Y. Chow), 15

Invited Speakers
Anstee, Richard P. (Fayetteville, AR), 107
Arnold, Douglas N. (Notre Dame, IN), 102
Arveson, William (Salt Lake City, UT), 106
Bhargava, Manjul (New Orleans, LA), 990
Bollobás, Béla (Notre Dame, IN), 102
Bona, Jerry L. (New Orleans, LA), 1131
Borcea, Liliana (Tucson, AZ), 730
Borodin, Alexei (Salt Lake City, UT), 106
Boston, Nigel (Davidson, NC), 992
Brock, Jeffrey (New Orleans, LA), 1132
Candès, Emmanuel (Albuquerque, NM), 1156
Canic, Suncica (Cincinnati, OH), 106
Chayes, Lincoln (San Francisco, CA), 105
Cushing, James (Tucson, AZ), 730
Diaconis, Persi W. (New Orleans, LA), 1128
Efron, Bradley (New Orleans, LA), 1132
Fenster, Della (New Orleans, LA), 1132
Fomin, Sergey (Oxford, OH), 729
Fraser, Ailana M. (Durham, NH), 104
Golubitsky, Martin (Chicago, IL), 1156
Goodman-Strauss, Chaim (Davidson, NC), 729
Graham, C. Robin (San Francisco, CA), 105
Granville, Andrew J. (Davidson, NC), 729
Gui, Changfeng (Storrs, CT), 305
Gursky, Matthew J. (Chicago, IL), 1156
Haxell, Penny (New Orleans, LA), 1132
Hofmann, Steven C. (Notre Dame, IN), 102
Iosevich, Alex (Davidson, NC), 729; (Chicago, IL), 1156
Iwaniec, Henryk (Warsaw, Poland), 626
Kaloshin, Vadim (San Francisco, CA), 105
Koblitz, Neal (Hoboken, NJ), 730
Kra, Bryna R. (Cincinnati, OH), 106; (New Orleans, LA), 990
Kumar, Shrawan (Davidson, NC), 729
Laba, Izabella Joanna (Salt Lake City, UT), 106
Larsen, Michael (Notre Dame, IN), 102
Lax, Peter D. (New Orleans, LA), 727
Leung, Naichung Conan (Oxford, OH), 729
Lindblad, Hans (Tucson, AZ), 730
Long, Darren (Salt Lake City, UT), 106
Luca, Florian (Hoboken, NJ), 730
Luczak, Tomasz J. (Warsaw, Poland), 626
Mandelbrot, Benoit B. (San Francisco, CA), 105
Miller, Ezra N. (Cincinnati, OH), 106
Mrowka, Tomasz (Warsaw, Poland), 626
Nakano, Daniel K. (Murfreesboro, TN), 731
Newelski, Ludomir (Warsaw, Poland), 730
Nikshych, Dmitri (Durham, NH), 104
Odell, Edward (Miami, FL), 99
Okounkov, Andrei (New Orleans, LA), 727
Parshall, Karen V. H. (Miami, FL), 99
Pavlovic, Natasa (Hoboken, NJ), 730
Penrose, Roger (New Brunswick, NJ), 1156
Peres, Yuval (San Francisco, CA), 105
Polishchuk, Alexander (Albuquerque, NM), 1156
Pop, Florian (Durham, NH), 104
Radford, David E. (Chicago, IL), 1156
Raines, Eric (Albuquerque, NM), 1156
Ram, Arun (Fayetteville, AR), 107
Ramachandran, Niranjan (Storrs, CT), 393
Reiner, Victor S. (New Orleans, LA), 727
Saari, Donald G. (Fayetteville, AR), 107
Savage, Carla D. (Murfreesboro, TN), 731
Skinner, Christopher M. (Notre Dame, IN), 102
Soudararajan, Kannan (Storrs, CT), 393
Stein, William A. (Albuquerque, NM), 1156
Straube, Emil J. (Oxford, OH), 729
Sudan, Madhu (Warsaw, Poland), 626
Tabachnikov, Sergei (Murfreesboro, TN), 731
Trivisa, Konstantina (Durham, NH), 104
van Maanen, Jan (New Orleans, LA), 1132
Vasy, Andras (Fayetteville, AR), 107; (New Orleans, LA), 727
Vatsal, Vinayak (Tucson, AZ), 730
Vogelius, Michael S. (Miami, FL), 99
Wang, Shouhong (Oxford, OH), 729
Wehrheim, Katrin (Storrs, CT), 305
Werner, Elisabeth (Hoboken, NJ), 730
Wolfson, Jon G. (Cincinnati, OH), 106
Wright, Margaret H. (New Orleans, LA), 727
Zdunek, Anna (Warsaw, Poland), 730

Letters to the Editor
Aczel, Janos D. (First, Last, and Other Names), 1302
Alperin, Jon (Winter Meeting Sites), 198
Aschbacher, Michael (Status of the Classification Proof), 406
Atiyah, Michael (Mathematics and Nobel Prizes), 406
Bharali, Gautam (Mathematics Is Better Off Without a Fellows Program), 1182
Breen, Mike (Mathematics in the Media), 527
Brown, Darin (Serge Lang and the HIV Consensus), 1006
Cohen, Michael P. (Some Thoughts on Fellows Program), 1182
Craddock, Mark (Serge Lang and the HIV Consensus), 1006
Culshaw, Rebecca (Serge Lang and the HIV Consensus), 1006
Daum, Frederick (Mathematics and Nobel Prizes), 406
Davies, E. B. (Response by Davies), 407
Davies, Chandler (Don’t Facilitate Military, Homeland Security Funding), 638
Emerson, Annette (Mathematics in the Media), 527
Fendel, Dan (Calculus Before College), 6; (Serge Lang and the HIV Consensus), 1006
Gauthier, Paul (A Conference in Gaza), 1182
Goodman, Jacob E. (Pure and Applied Mathematics), 198
Gray, Mary W. (Don’t Facilitate Military, Homeland Security Funding), 638
Helson, Henry (Don’t Facilitate Military, Homeland Security Funding), 638
Hirsch, Morris W. (Selected Reviews in the Bulletin), 527
Humphreys, James E. (Printing Duesberg’s Statement on AIDS Bad Decision), 862
Jenista, Michael (Don’t Come Between Mathematicians and Funding), 1006
Jensen, Gary R. (Definitions of Fractions as a Discriminato), 526
Kalka, Morris (New Orleans Update), 1006
Kazanjian, Michael M. (Molière and Mathematics), 526
Kellogg, Bruce (Short Story Set in Oberwolfach), 638
Kleinman, Steven (Resolution of Singularities), 6
Kruk, Serge (Another Textbook Policy), 198
Liptak, Laszlo (Another Textbook Policy), 198
Lorden, Gary (On Numb3rs), 1006
Lott, Johnny W. (Writing Numb3rs Activities), 1008
Lubin, Jonathan (Pure and Applied), 198
Lyons, Richard (Status of the Classification Proof), 406
McCorry, Raven (Response to Jensen), 526
Mityagin, Boris (Student Evaluations, Grades, and the Internet), 742
Mycielski, Jan (Correction), 1008
O’Neil, P. V. (Fecal Language), 742
Pancorbo, Fernando Gomez (Mathematics in Spain), 1302
Post, E. J. (Classical Truth), 638
Rao, Arni S. R. Srinivasa (Ramanujan and Religion), 1007
Rossello, Francesc (Another Nobel Prize Winning Mathematician), 742
Saifullah, Khalid (Names, Second Names, Family Names, Surnames), 862
Shub, Michael (Don’t Facilitate Military, Homeland Security Funding), 638
Singmaster, David (Mathematics and Nobel Prizes), 406
Smith, Stephen D. (Status of the Classification Proof), 406
Solomon, Ronald (Status of the Classification Proof), 406
Stewart, James (Textbook Auxiliaries), 1302
Strichartz, Robert S. (The Clash of Knowledge and Certainty), 406
Washburn, Sherwood (Mathematical Theory of Genetic Code Needed), 742
Waterhouse, William C. (Hardy, Ramanujan, and Interesting Numbers), 1007
Wildstrom, Steve (Ideals in Mathematics and Business), 862
Wu, Hung-Hsi (Serge Lang and the HIV Consensus), 1006
Yang, Deane (Chinese-American Mathematicians), 1183
Ziegler, Günter M. (Printing Duesberg’s Statement on AIDS Bad Decision), 862

Mathematicians
Adelman, Leonard (National Academy of Sciences Elections), 791
Adrian, Carmel Y. (Fulbright Award), 689
Akaike, Hirotugu (2006 Kyoto Prize), 1056
Apostol, Tom M. (EMS Article Competition), 1227
Aumann, Robert J. (2005 Nobel Prize), 44; (2005 John von Neumann Theory Prize), 790
Avila, Artur (Clay Research Fellow), 589
Bajunaïd, Ibtesam (MAA Lester R. Ford Award), 1226
Balas, Egon (National Academy of Engineering Elections), 590
Baranovsky, Vladimir (2006 Sloan Fellow), 688
Barenblatt, Grigory I. (Timoshenko Medal), 589
Ben-Sasson, Eli (Young Scholar’s Competition), 903
Benjamin, Arthur (MAA Beckenbach Book Prize), 586
Bendersky, Sidney (2006 Euler Lecture), 904
Bhargava, Manjul (2005 Clay Research Award), 51;
(2005 SASTRA Ramanujan Prize), 51
Blaszjó, Viktor (MAA Lester R. Ford Award), 1226
Blum, Manuel (National Academy of Engineering Elections), 590
Boersma, Stuart (MAA Trevor Evans Award), 1226
Bott, Raoul (The Life and Works of), 554
Boulding, Jenny (2006 Nobel Peace Prize), 792
Boulicaut, Philippe (2006 Abel Prize), 1062
Braun, Michael (2005 university of California, Berkeley, Academic Senate Distinguished Teaching Award), 1226
Breuer, Edward B. (MAA Lester R. Ford Award), 1226
Cahley, Brian (SIAM Award in the Mathematical Contest in Modeling), 1061
Campbell, Gerikai (MAA Henry L. Alder Award for Distinguished Teaching), 1226
Candès, Emmanuel (NSF Waterman Award), 902
Carleson, Lennart A. E. (2006 Abel Prize), 679; (National Academy of Sciences Elections), 791
Case, Brendan (B. H. Neumann Award), 1360
Chan, Tony (Named NSF Assistant Director), 1058
Chayes, Jennifer Tour (AAAS Fellow), 246
Cheeger, Jeff (American Academy Elections), 791
Chua, Simon (2006 Paul Erdős Award), 1062
Cobb, Paul (2005 Hans Freudenthal Medal), 792
Cohen, Joel M. (MAA Lester R. Ford Award), 1226
Colmez, Pierre (2005 Fermat Prize), 246
Colonna, Flavia (MAA Lester R. Ford Award), 1226
Conlee, Benjamin (SIAM Award in the Mathematical Contest in Modeling), 1061
Cook, Stephen A. (John L. Synge Award), 1359
Coons, Michael J. (Fulbright Award), 689
Coron, Jean-Michel (SIAM Outstanding Paper Prize), 1061
Coykendall, Jim (State Professor of the Year Award), 362
Crato, Nuno (European Mathematical Society Article Competition), 904
D’Ambrosio, Ubiratan (2005 Felix Klein Medal), 792
Daubechies, Ingrid (2007 ICIAM Prize), 1358
Davis, Paul (Jefferson Science Fellowship), 1061
De Araujo, Aloisio Pessoa (National Academy of Sciences Elections), 791
Demanet, Laurent (SIAM Student Paper Prize), 1061
Dencker, Nils (2005 Clay Research Award), 51
Denissov, Serguei (2006 Sloan Fellow), 688
Derzhanski, Ivan (European Mathematical Society Article Competition), 904
Deuffhard, Peter (2007 ICIAM Prize), 1358
Dewar, Jacqueline (2005 MAA Haimo Award for Teaching), 585
Dilcher, Karl (MAA Lester R. Ford Award), 1226
Donaldson, Simon (2006 King Faisal Prize), 347
Donnelly, Peter J. (Royal Society of London Elections), 905
Dunham, William (MAA Lester R. Ford Award), 1226
Eisenbud, David D. (American Academy Elections), 791
Ellenberg, Jordan (2006 NSF Career Award), 50
Eng, Heinz (2007 ICIAM Prize), 1358
Enneking, Marjorie (MAA Certificate of Meritorious Service), 586
Evans, Robin J. (SIAM Outstanding Paper Prize), 1061
Ferrara, Sergio (Dannie Heineman Prize for Mathematical Physics), 687
Fletcher, Roger (SIAM-MPS Lagrange Prize in Continuous Optimization), 1061
Fonseca, Irene (AWM-SIAM Sonia Kovalevsky Lecture), 1061
Fox, Jacob (2005 Morgan Prize), 479
Freedman, Daniel (Dannie Heineman Prize for Mathematical Physics), 687
Gardner, Clifford S. (2006 Steele Prize), 464
Gehring, Frederick W. (2006 Steele Prize), 464
Geiges, Hansjörg (EMS Article Competition), 1227
Gelfand, Alan E. (2006 Emanuel and Carol Parzen Prize for Mathematical Economics), 585
Godsil, Chris (2006 CRM-Fields-PIMS Prize), 1062
Gödel, Kurt (A Tribute to Kurt Gödel: A tribute in photographs), 412; (The Incompleteness Theorem), 414; (How Gödel Transformed Set Theory), 419; (Pictures at an Exhibition), 428; (The Impact of the Incompleteness Theorem on Mathematics), 434; (The Popular Impact of Gödel’s Incompleteness Theorem), 440; (In Quest of
2006 Index

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Award/Prize</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newman, Michael</td>
<td>2006</td>
<td>CMS Award</td>
<td>1359</td>
</tr>
<tr>
<td>Novik, Isabella</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Ogden, Raymond W.</td>
<td>2006</td>
<td>Royal Society of London Elections</td>
<td>905</td>
</tr>
<tr>
<td>Okounkov, Andrei</td>
<td>2006</td>
<td>Fields Medal</td>
<td>1037</td>
</tr>
<tr>
<td>Olsson, Martin</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Osoinach, John K., Jr.</td>
<td>2006</td>
<td>Carl B. Allendoerfer Award</td>
<td>1226</td>
</tr>
<tr>
<td>Otto, Felix</td>
<td>2006</td>
<td>Gottfried Wilhelm Leibniz Prize</td>
<td>361</td>
</tr>
<tr>
<td>Ovetsky, Alexandra</td>
<td>2006</td>
<td>AWM Schafer Prize</td>
<td>587</td>
</tr>
<tr>
<td>Palis, Jacob</td>
<td>2006</td>
<td>Trieste Science Prize</td>
<td>1060</td>
</tr>
<tr>
<td>Papanicolaou, George C.</td>
<td>2006</td>
<td>John von Neumann Lectureship</td>
<td>1061</td>
</tr>
<tr>
<td>Payne, Sam</td>
<td>2006</td>
<td>Clay Research Fellow</td>
<td>589</td>
</tr>
<tr>
<td>Penrose, Roger</td>
<td>2006</td>
<td>JPBM Award</td>
<td>583</td>
</tr>
<tr>
<td>Perelman, Grigory</td>
<td>2006</td>
<td>Fields Medal</td>
<td>1037</td>
</tr>
<tr>
<td>Petrovich, Isif</td>
<td>2006</td>
<td>André Aisenstadt Prize</td>
<td>361</td>
</tr>
<tr>
<td>Paul, Miheea</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Quinn, Jennifer</td>
<td>2006</td>
<td>Beckenbach Book Prize</td>
<td>586</td>
</tr>
<tr>
<td>Ramin, Parimala</td>
<td>2006</td>
<td>TWAS Prize</td>
<td>1364</td>
</tr>
<tr>
<td>Rasmussen, Chris</td>
<td>2006</td>
<td>Chauvenet Prize of the MAA</td>
<td>362</td>
</tr>
<tr>
<td>Pettiehammer, Friedrich</td>
<td>2005</td>
<td>Information-Based Complexity Young Researcher Award</td>
<td>361</td>
</tr>
<tr>
<td>Pixton, Aaron C.</td>
<td>2006</td>
<td>William Lowell Putnam Mathematical Competition</td>
<td>904</td>
</tr>
<tr>
<td>Plaskota, Leszek</td>
<td>2006</td>
<td>Information-Based Complexity Prize</td>
<td>790</td>
</tr>
<tr>
<td>Pollack, Robert</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Polterovich, Isif</td>
<td>2006</td>
<td>André Aisenstadt Prize</td>
<td>361</td>
</tr>
<tr>
<td>Popa, Miheea</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Quinn, Jennifer</td>
<td>2006</td>
<td>Beckenbach Book Prize</td>
<td>586</td>
</tr>
<tr>
<td>Raman, Parimala</td>
<td>2006</td>
<td>TWAS Prize</td>
<td>360</td>
</tr>
<tr>
<td>Rasmussen, Chris</td>
<td>2006</td>
<td>Annie and John Selden Prize for Research in Undergraduate Mathematics Education</td>
<td>1226</td>
</tr>
<tr>
<td>Reid, Miles</td>
<td>2006</td>
<td>Senior Berwick Prize</td>
<td>1062</td>
</tr>
<tr>
<td>Reid, Ali</td>
<td>2006</td>
<td>Paul Erdős Award</td>
<td>1062</td>
</tr>
<tr>
<td>Ross, Stephen A.</td>
<td>2006</td>
<td>CME-MSRI Prize</td>
<td>1359</td>
</tr>
<tr>
<td>Rouquier, Raphael</td>
<td>2006</td>
<td>SIAM Whitehead Prize</td>
<td>1062</td>
</tr>
<tr>
<td>Saloff-Coste, Laurent</td>
<td>2006</td>
<td>Guggenheim Fellowship</td>
<td>689</td>
</tr>
<tr>
<td>Sandefur, James</td>
<td>2006</td>
<td>SIAM George Pólya Award</td>
<td>1226</td>
</tr>
<tr>
<td>Sarig, Omri</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Scanlon, Thomas</td>
<td>2005</td>
<td>NSF Career Award</td>
<td>50</td>
</tr>
<tr>
<td>Schramm, Oded</td>
<td>2006</td>
<td>SIAM George Pólya Prize</td>
<td>1061</td>
</tr>
<tr>
<td>Sendova, Evgenia</td>
<td>2006</td>
<td>European Mathematical Society Article Competition</td>
<td>904</td>
</tr>
<tr>
<td>Seshadri, C. S.</td>
<td>2006</td>
<td>Trieste Science Prize</td>
<td>1060</td>
</tr>
<tr>
<td>Sheffield, Scott</td>
<td>2006</td>
<td>Rollo Davidson Prize</td>
<td>687</td>
</tr>
<tr>
<td>Shelley, Michael J.</td>
<td>2006</td>
<td>SIAM Julian Cole Lecture</td>
<td>861</td>
</tr>
<tr>
<td>Shepherd-Barron, Nicholas I.</td>
<td>2006</td>
<td>Royal Society of London Elections</td>
<td>905</td>
</tr>
<tr>
<td>Sherratt, Jonathan</td>
<td>2006</td>
<td>Adams Prize</td>
<td>903</td>
</tr>
<tr>
<td>Shiat, M. Vali</td>
<td>2006</td>
<td>State Professor of the Year Award</td>
<td>362</td>
</tr>
<tr>
<td>Singman, David</td>
<td>2006</td>
<td>MAA Lester R. Ford Award</td>
<td>1226</td>
</tr>
<tr>
<td>Smoktunowicz, Agata</td>
<td>2006</td>
<td>Whitehead Prize</td>
<td>1062</td>
</tr>
<tr>
<td>Soifer, Alexander</td>
<td>2006</td>
<td>Paul Erdős Award</td>
<td>1062</td>
</tr>
<tr>
<td>Solomon, Ronald M.</td>
<td>2006</td>
<td>Conant Prize</td>
<td>475</td>
</tr>
<tr>
<td>Solymosi, Jozsef</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Somers, Kay</td>
<td>2006</td>
<td>Certificate of Meritorious Service</td>
<td>586</td>
</tr>
<tr>
<td>Soundararajan, Kannan</td>
<td>2006</td>
<td>SASRA Ramanujan Prize</td>
<td>51</td>
</tr>
<tr>
<td>Stevens, T.</td>
<td>2006</td>
<td>Christine (AAAS Fellow)</td>
<td>246</td>
</tr>
<tr>
<td>Stolarsky, Kenneth B.</td>
<td>2006</td>
<td>Lester R. Ford Award</td>
<td>1226</td>
</tr>
<tr>
<td>Strang, Gilbert</td>
<td>2006</td>
<td>ICIAM Prize</td>
<td>1358</td>
</tr>
<tr>
<td>Stroyan, Keith</td>
<td>2005</td>
<td>Haimo Award for Teaching</td>
<td>585</td>
</tr>
<tr>
<td>Sullivan, Dennis P.</td>
<td>2004</td>
<td>National Medal of Science</td>
<td>346</td>
</tr>
<tr>
<td>Sussillo, David</td>
<td>2006</td>
<td>Fulbright Award</td>
<td>1359</td>
</tr>
<tr>
<td>Sutherland, Paul</td>
<td>2006</td>
<td>LMS Whitehead Prize</td>
<td>1062</td>
</tr>
<tr>
<td>Suzuki, Jeff</td>
<td>2006</td>
<td>Carl B. Allendoerfer Award</td>
<td>1226</td>
</tr>
<tr>
<td>Swanson, Christopher N.</td>
<td>2006</td>
<td>Henry L. Alder Award for Distinguished Teaching</td>
<td>1226</td>
</tr>
<tr>
<td>Swinnerton-Dyer, Henry Peter Francis</td>
<td>2006</td>
<td>LMS Polya Prize</td>
<td>1062</td>
</tr>
<tr>
<td>Swinnerton-Dyer, Peter</td>
<td>2006</td>
<td>Sylvester Medal</td>
<td>1062</td>
</tr>
<tr>
<td>Szpiro, George</td>
<td>2006</td>
<td>Descartes Prize finalist</td>
<td>362</td>
</tr>
<tr>
<td>Tanner, Jared</td>
<td>2006</td>
<td>Monroe H. Martin Prize</td>
<td>1060</td>
</tr>
<tr>
<td>Tao, Terence</td>
<td>2006</td>
<td>Fields Medal</td>
<td>1037</td>
</tr>
<tr>
<td>Taylor, Peter</td>
<td>2006</td>
<td>CMS Award</td>
<td>1359</td>
</tr>
<tr>
<td>Thompson, Mary E.</td>
<td>2006</td>
<td>Royal Society of Canada Elections</td>
<td>1063</td>
</tr>
<tr>
<td>Thurston, Dylan P.</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Toint, Philippe</td>
<td>2006</td>
<td>SIAM-MPS Lagrange Prize in Continuous Optimization</td>
<td>1061</td>
</tr>
<tr>
<td>Tomczak-Jaegermann, Nicole</td>
<td>2006</td>
<td>CRM-Fields-PIMS Prize</td>
<td>483</td>
</tr>
<tr>
<td>Tornberg, Anna-Karin</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Tracy, Craig</td>
<td>2006</td>
<td>American Academy Elections</td>
<td>791</td>
</tr>
<tr>
<td>Trelat, Emmanuel</td>
<td>2006</td>
<td>Outstanding Paper Prize</td>
<td>1061</td>
</tr>
<tr>
<td>Tsai, Tao-Peng</td>
<td>2006</td>
<td>André Aisenstadt Prize</td>
<td>361</td>
</tr>
<tr>
<td>Tsai, Yen-Hsi</td>
<td>2006</td>
<td>Sloan Fellow</td>
<td>688</td>
</tr>
<tr>
<td>Tucker, Alan</td>
<td>2006</td>
<td>Certificate of Meritorious Service</td>
<td>586</td>
</tr>
<tr>
<td>Vainchtein, Anna</td>
<td>2005</td>
<td>NSF Career Award</td>
<td>50</td>
</tr>
<tr>
<td>Van Atten, Mark</td>
<td>2006</td>
<td>Young Scholars’ Competition</td>
<td>903</td>
</tr>
<tr>
<td>van Nieuwenhuizen, Peter</td>
<td>2005</td>
<td>Dannie Heineman Prize for Mathematical Physics</td>
<td>687</td>
</tr>
<tr>
<td>Van Nieuwenhuizen, Peter</td>
<td>2006</td>
<td>Prize for Distinguished Teaching</td>
<td>1063</td>
</tr>
<tr>
<td>Vapnik, Vladimir N.</td>
<td>2006</td>
<td>Certificate of Meritorious Service</td>
<td>586</td>
</tr>
<tr>
<td>Vatsal, Vinayak</td>
<td>2006</td>
<td>Ribenboim Prize</td>
<td>688</td>
</tr>
<tr>
<td>Vélez, William Yslas</td>
<td>2006</td>
<td>Certificate of Meritorious Service</td>
<td>586</td>
</tr>
<tr>
<td>Viana, Marcelo</td>
<td>2006</td>
<td>ICTP/IMU Ramanujan Prize</td>
<td>51</td>
</tr>
<tr>
<td>Viola, Emanuele</td>
<td>2006</td>
<td>SIAM Student Paper Prize</td>
<td>1061</td>
</tr>
<tr>
<td>Voiculescu, Dan-Virgil</td>
<td>2006</td>
<td>National Academy of Sciences Elections</td>
<td>791</td>
</tr>
<tr>
<td>von Ahn, Luis</td>
<td>2006</td>
<td>MacArthur Fellowship</td>
<td>1356</td>
</tr>
<tr>
<td>Walker, Judy</td>
<td>2005</td>
<td>Haimo Award for Teaching</td>
<td>585</td>
</tr>
<tr>
<td>Ward, Lesley</td>
<td>2006</td>
<td>Henry L. Alder Award for Distinguished Teaching</td>
<td>1226</td>
</tr>
<tr>
<td>Watson, Rod</td>
<td>2006</td>
<td>H. Neumann Award</td>
<td>1360</td>
</tr>
<tr>
<td>Weiss, Michael</td>
<td>2006</td>
<td>LMS Fröhlich Prize</td>
<td>1062</td>
</tr>
<tr>
<td>Weissmann, Jeremy</td>
<td>2006</td>
<td>Fulbright Award</td>
<td>689</td>
</tr>
<tr>
<td>Wentsun, Wu</td>
<td>2006</td>
<td>Shaw Prize</td>
<td>1054</td>
</tr>
</tbody>
</table>
Werner, Wendelin (2006 Fields Medal), 1037; (SIAM George Pólya Prize), 1061
Widom, Harold (American Academy Elections), 791
Williams, Robert (AAAS Fellow), 246
Wilson, Alan G. (Royal Society of London Elections), 905
Wilson, Robin Todd (Ford Foundation Dissertation Fellowship), 905
Wu, Wei Biao (2005 NSF Career Award), 50
Yang, Yuhong (2005 NSF Career Award), 50
Yetter, Christopher (SIAM Award in the Mathematical Contest in Modeling), 1061
Yoshida, Hiroyuki (Algebra Prize of the MSJ), 1360
Yu, Bin (Guggenheim Fellowship), 689
Yu, Xinwei (SIAM Richard C. DiPrima Prize), 1061
Zhang, Hongchao (SIAM Student Paper Prize), 1061
Ziegler, Günter (2006 Chauvenet Prize of the MAA), 362, 586
Zinger, Aleksey (2006 Sloan Fellow), 688
Zoller, Peter (2006 Dirac Medal), 1227

Mathematics
Better Ways to Cut a Cake, 1314
Cells in Coxeter Groups, 528
Computing over the Reals: Foundations for Scientific Computing, 318
Conjectures No More? Consensus Forming on the Proof of the Poincaré and Geometrization Conjectures, 897
(The) Differential Geometry and Physical Basis for the Applications of Feynman Diagrams, 744
Find Me a Hash, 330
Gödel, Inconsistency, Provability, and Truth: An Exchange of Letters, 462
Honoring a Gift from Kumbakonam, 640
How Gödel Transformed Set Theory, 419
(The) Impact of Incompleteness Theorem on Mathematics, 434
Incompleteness: The Proof and Paradox of Kurt Gödel (A Book Review), 448
(The) Incompleteness Theorem, 414
Interview with Peter D. Lax, 223
(The) Life and Works of Raoul Bott, 554
Serge Lang (1927–2005), 536
(A) Tribute to Kurt Gödel, 412–455
Turing’s Thesis, 1200
What Symmetry Groups Are Present in the Alhambra?, 670

Mathematics Calendar
66, 284, 374, 494, 606, 705, 820, 944, 1088, 1252, 1373

Mathematics History
Dark Hero of the Information Age: In Search of Norbert Wiener, the Father of Cybernetics (A Book Review), 574
Gödel, Inconsistency, Provability, and Truth: An Exchange of Letters, 462
Hermann Weyl in Zurich 1950–1955, 1222
Honoring a Gift from Kumbakonam, 640
Interview with Peter D. Lax, 223
(The) Life and Works of Raoul Bott, 554
Mathematics Awareness Month, April 2006, 366
(The) Millennium Grand Challenge in Mathematics, 652
Mushroom Billiards, 334
Notes on the Deuring-Heilbronn Phenomenon, 864
Pictures of Hyperbolic Dynamical Systems, 8
(The) Popular Impact of Gödel's Incompleteness Theorem, 440
Probability Theory: The Logic of Science (A Book Review), 33
(The) Search for Simple Symmetric Venn Diagrams, 1304
Sir Michael Atiyah’s Einstein Lecture: “The Nature of Space”, 674
(A) System of Axioms of Set Theory for the Rationalists, 206
Turing and the Riemann Hypothesis, 1208
WHAT IS...a Bad End?, 1028
WHAT IS...a Coarse Space?, 668
WHAT IS...a Graph Minor?, 338
WHAT IS...Percolation?, 572
WHAT IS...a Quantum Group?, 30
WHAT IS...a Quasiconformal Mapping?, 1334
WHAT IS...a Quasicrystal?, 886
WHAT IS...a Strange Attractor?, 764
WHAT IS...a Syzygy?, 456
WHAT IS...Turing Reducibility?, 1218
What Symmetry Groups Are Present in the Alhambra?, 670
You Could Have Invented Spectral Sequences, 15

Meeting Announcements, Presenters of Papers, and Programs
Cincinnati, OH (announcement), 836
Durham, NH (announcement), 299
Fayetteville, AR (announcement), 987
Miami, FL (announcement), 99
New Orleans, LA (announcement and timetable), 1128, 1161
Notre Dame, IN (announcement), 102
Salt Lake City, UT (announcement), 834
San Antonio, TX (presenters and program), 111
San Francisco, CA (announcement), 302
Storrs, CT (announcement), 838

Meetings and Conferences
97, 297, 389, 509, 619, 724, 834, 985, 1125, 1281, 1407
General Information Regarding Meetings & Conferences of the AMS, 96, 296
Meetings and Conferences Table of Contents, 192, 311, 399, 519, 631, 735, 855, 999, 1175, 1295, 1438

2006 Meetings
San Antonio, TX, 97
Miami, FL, 99, 297, 389, 509, 619
Notre Dame, IN, 102, 298, 390, 510, 620
Durham, NH, 104, 299, 391, 511, 621
San Francisco, CA, 105, 302, 392, 511, 622
Salt Lake City, UT, 106, 304, 392, 512, 622, 724, 834, 985, 1125, 1281
2006 Index

Cincinnati, OH, 106, 305, 393, 513, 623, 725, 836, 986, 1126, 1282
Storrs, CT, 106, 305, 393, 513, 624, 725, 838, 986, 1126, 1282
Fayetteville, AR, 106, 306, 394, 514, 624, 726, 841, 987, 1127, 1283, 1407

2007 Meetings
New Orleans, LA, 107, 306, 394, 514, 625, 727, 841, 990, 1128, 1284, 1408
Davidson, NC, 107, 306, 394, 514, 625, 729, 848, 992, 1153, 1284, 1410
Warsaw, Poland, 395, 515, 626, 730, 850, 993, 1155, 1287, 1413
Chicago, IL, 850, 994, 1156, 1287, 1413
New Brunswick, NJ, 730, 850, 994, 1156, 1287, 1414
Albuquerque, NM, 307, 395, 515, 626, 731, 850, 994, 1156, 1288, 1414
Murfreesboro, TN, 396, 515, 626, 731, 851, 995, 1156, 1288, 1414
Wellington, New Zealand, 731, 851, 995, 1157, 1288, 1415

2008 Meetings
San Diego, CA, 108, 307, 396, 516, 626, 731, 851, 995, 1157, 1289, 1415
New York, NY, 516, 627, 732, 851, 995, 1157, 1289, 1415
Baton Rouge, LA, 396, 516, 627, 732, 851, 996, 1157, 1289, 1416
Bloomington, IN, 108, 307, 396, 516, 627, 732, 852, 996, 1158, 1289, 1416
Claremont, CA, 396, 516, 627, 732, 852, 996, 1158, 1289, 1416
Rio de Janeiro, Brazil, 108, 308, 397, 517, 627, 732, 852, 996, 1158, 1290, 1416
Vancouver, Canada, 108, 308, 397, 517, 628, 732, 852, 996, 1158, 1290, 1416
Middletown, CT, 997, 1158, 1290, 1417
Huntsville, AL, 397, 517, 628, 733, 852, 997, 1158, 1290, 1417
Shanghai, PRC, 109, 308, 397, 517, 628, 733, 853, 997, 1159, 1290, 1417

2009 Meetings
Washington, DC, 109, 308, 397, 517, 629, 733, 853, 997, 1159, 1291, 1417
Urbana, IL, 733, 853, 997, 1159, 1291, 1417
Raleigh, NC, 1159, 1291, 1418
San Francisco, CA, 1291, 1418

2010 Meetings
San Francisco, CA, 109, 309, 398, 518, 629, 734, 853, 998, 1159, 1291, 1418

2011 Meetings
New Orleans, LA, 109, 309, 398, 518, 630, 734, 854, 998, 1160, 1292, 1419

2012 Meetings
Boston, MA, 110, 309, 398, 518, 630, 734, 854, 998, 1160, 1292, 1419

2013 Meetings
San Diego, CA, 110, 309, 398, 518, 630, 734, 854, 998, 1160, 1292, 0000

Memorial Articles
Alfred W. Goldie (1920–2005), 52
(The) Life and Works of Raoul Bott, 554
Serge Lang (1927–2005), 536
Teruhisa Matsusaka (1926–2006), 766
Thomas P. Branson (1953–2006), 689

New Publications Offered by the AMS
71, 288, 381, 499, 613, 715, 825, 963, 1092, 1254, 0000

Officers of the Society
Officers and Committee Members, 1076
Officers of the Society 2005 and 2006 Updates, 604, 1076

Opinion
Letter from the Editor, 5, 405
Letters to the Editor, 6, 198, 406, 526, 638, 742, 862, 1006, 1182, 1302
My Summer at National Public Radio, 56
Opinion, 197, 317, 525, 637, 741, 861, 1005, 1181, 1301

Opportunities
AAUW Educational Foundation Fellowships and Grants, 1229
American Mathematical Society Centennial Fellowships, 906, 1228
AMS-AAAAS Mass Media Summer Fellowships, 54, 1064
AMS Conference on Undergraduate Research, 694
AMS Congressional Fellowship, 363, 1228
AMS Department Chairs Workshop, 1064
AMS Epsilon Fund, 1064
AMS Establishes Eisenbud Prize for Mathematics and Physics, 694
AMS Fellowships for “Math in Moscow”, 907
AP Calculus Readers Sought, 484
AWM Essay Contest, 1066
AWM Travel Grants for Women, 908
Call for Contributions for ICMI Study, 55
Call for Entries for Pirelli INTERNETional Award, 691
Call for Nominations for 2006 AMS-MAA-SIAM Frank and Brennie Morgan Prize, 493
Call for Nominations for 2006 Information-Based Complexity Award, 793
Call for Nominations for Aisenstadt Prize, 690
Call for Nominations for David P. Robbins Prize, 700
Call for Nominations for E. H. Moore Research Article Prize, 492
Call for Nominations for Heineman Prize, 691
Call for Nominations for the ICTP/IMU Ramanujan Prize, 591
Call for Nominations for Information-Based Complexity Prize, 364
Call for Nominations for Levi L. Conant, Ruth Lyttle Satter, Oswald Veblen, and Norbert Wiener Prizes, 491
Call for Nominations for SASTRA Ramanujan Prize, 690
Call for Nominations for Sloan Fellowships, 690
Call for Nominations for Vasil Popov Prize, 691
Call for Nominations for Waterman Award, 1363
Call for Proposals for 2007 NSF-CBMS Regional Conferences, 248
Call for Proposals for NSF Program in Mathematical, Social, and Behavioral Sciences, 484
Call for Submissions for Sunyer i Balaguer Prize, 793
Clay Mathematics Institute 2006 Summer School, 250
Clay Research Fellow Nominations, 1065
CMI Liftoff Program for Summer 2006, 54
CMI Liftoff Program for Summer 2007, 1363
Computational Science Training for Undergraduates in the Mathematical Sciences, 690
Departments Coordinate Job Offer Deadlines, 55
DMS/NIGMS Initiative in Mathematical Biology, 1362
Early Career Profile Network, 486
Enhancing the Mathematical Sciences Workforce in the Twenty-First Century, 591, 1064
Fermat Prize 2007, 1066
International Mathematics Competition for University Students, 364
Jefferson Science Fellows Program, 1066
Mathematics Awareness Month, April 2006, 366
National Academies Graduate Fellowship Program, 249
National Academies Mirzayan Graduate Fellowship Program, 1362
National Academies Research Associateship Programs, 249
NDSEG Fellowships, 53
News from AIM, 908, 1066
News from the CRM Montreal, 691
News from the Fields Institute, 692
News from IMA, 1066
News from the Institut Mittag-Leffler, 1230
News from the Mathematical Biosciences Institute, 1230
News from Oberwolfach, 908
News from PIMS, 1067
Newton Fellowship Program, 1363
NRC-Ford Foundation Diversity Fellowships, 1229
NSA Grant and Sabbatical Programs, 906, 1065
NSF CAREER Program Guidelines Available, 690
NSF-CBMS Regional Conferences, 2006, 248
NSF Computing Equipment and Instrumentation Programs, 55, 1362
NSF Distinguished International Postdoctoral Research Fellowships, 907
NSF Mathematical Sciences Postdoctoral Research Fellowships, 793
NSF Postdoctoral Research Fellowships, 591
NSF Program in Informal Science Education, 484
NSF Support for Interactions with Physical and Computer Sciences and Engineering, 55
ONR Young Investigator Program, 249
Program Director Positions at NSF, 363
Project NExT: New Experiences in Teaching, 364
Proposal Due Dates at the DMS, 53
Research Opportunities for U.S. Graduate Students in Asia and Australia, 1229
Summer Program for Women Undergraduates, 364

Prizes and Awards
2004 National Medal of Science (Dennis Sullivan), 346
2005 A. M. Turing Award (Peter Naur), 790
2005 ASL Sacks Prize (Antonio Montalbán), 361
2005 Clay Research Awards (Manjul Bhargava, Nils Dencker), 51
2005 Fermat Prize (Pierre Colmez, Jean-François Le Gall), 246
2005 Ford Foundation Diversity Fellowship (Robin Todd Wilson), 905
2005 Haimo Awards for Teaching (Jacqueline Dewar, Keith Stroyan, Judy Leavitt Walker), 585
2005 Information-Based Complexity Young Researcher Award (Friedrich Pillichshammer), 361
2005 John von Neumann Theory Prize (Robert J. Aumann), 790
2005 MacArthur Foundation Fellowship (Jon Kleinberg), 50
2005 Morgan Prize (Jacob Fox), 479
2005 Nobel Prize in Economics (Robert J. Aumann), 44
2005 PECASE Awards (Jonathan C. Mattingly), 1226
2005 SASTRA Ramanujan Prize (Manjul Bhargava, Kannan Soundararajan), 51
2005 Siemens-Westinghouse Competition (Michael Viscardi), 359
2006 Abel Prize (Lennart Carleson), 679
2006 Adams Prize (Jonathan Sherratt), 903
2006 André Aisenstadt Prize (Isosif Polterovich, Tai-Peng Tsai), 361
2006 Award for an Exemplary Program or Achievement in a Mathematics Department (Mathematics Department at Harvey Mudd College), 481
2006 Birkhoff Prize (Cathleen S. Morawetz), 474
2006 Blackwell-Tapia Award (William A. Massey), 791
2006 Chauvenet Prize of the MAA (Günter Ziegler, Florian Pfender), 362, 586
2006 CMS Awards (Peter Taylor, Michael Newman, Malcolm Harper), 1359
2006 Cole Prize in Algebra (János Kollár), 472
2006 Conant Prize (Ronald M. Solomon), 475
2006 d’Alembert and DeCerf Prizes (Philippe Boulanger), 1062
2006 Dirac Medal (Peter Zoller), 1227
2006 Emanuel and Carol Parzen Prize for Statistical Innovation (Alan E. Gelfand), 687
2006 Ferran Sunyer i Balaguer Prize (Xiaonan Ma, George Marinescu), 790
2006 Gauss Prize (Kiyoshi Itô), 1224
2006 Gottfried Wilhelm Leibniz Prize (Felix Otto), 361
2006 Information-Based Complexity Prize (Leszek Plaskota), 790
2006 International Mathematical Olympiad, 1063
2006 JPB Communications Award (Roger Penrose), 583
2006 King Faisal Prize (Simon Donaldson and M.S. Karasimhan), 347
2006 Kyoto Prize (Hirotugu Akaike), 1056
2006 London Mathematical Society Prizes (Pólya Prize—Henry Peter Francis Swinnerton-Dyer; Senior Berwick Prize—Miles Reid; Fröhlich Prize—Michael Weiss; Whitehead Prizes—Raphael Rouquier, Jonathan Sherratt, Agata Smoktunowicz, Paul Sutcliffe), 1062
2006 MAA Gung and Hu Award for Distinguished Service (Hyman Bass), 585
2006 Paul Erdős Awards (Simon Chua, Ali Rejali, Alexander Soifer), 1062
2006 Rollo Davidson Prize (Scott Sheffield), 687
2006 Shaw Prize (David Mumford, Wu Wentsun), 1054
2006 Steele Prizes (Lars V. Hörmander—Mathematical Exposition; Clifford S. Gardner, John M. Greene, Martin D. Kruskal, Robert M. Miura—Seminal Contribution to Research; Frederick W. Gehring, Dennis P. Sullivan—Lifetime Achievement), 464
2006 Stefan Bergman Prize (Kengo Hirachi), 358
2006 Sylvester Medal (Peter Swinnerton-Dyer), 1062
2006 Templeton Prize (John D. Barrow), 686
2006 Trieste Science Prize (Jacob Palis, C. S. Seshadri), 1060
2006 TWAS Prize (Parimala Raman), 360; (Claudio Landim), 1360
2006–2007 AMS Centennial Fellowships (Christopher Hacon, Bryna Kra), 686
2006–2007 Jefferson Science Fellowship (Paul Davis), 1061
2007 ICIAM Prizes (Ingrid Daubechies, Heinz Engl, Felix Otto, Joseph Keller, Peter Deuflhard, Gilbert Strang), 1358
AAAS Fellows (Jennifer Tour Chayes, Robert M. Miura, Linda R. Petzold, T. Christine Stevens, Robert Williams), 246
AIM Five-Year Fellowship (Elizabeth Meckes; runners-up: Alireza Golsefidy, Richard Kent, Abhinav Kumar, Benjamin Schmidt), 589
American Academy Elections (Jeff Cheeger, David D. Eisenbud, Martin Golubitsky, Robert K. Lazarsfeld, Charles M. Newman, Craig Tracy, Harold Widom), 791
AMS Menger Awards at the 2006 ISEF, 904
AWM Essay Contest, 483
AWM Louise Hay Award (Patricia Clark Kenshaut), 597
AWM Schafer Prize (Alexandra Ovetsky; Allison Bishop, runner-up; Ellen Gasparovic, honorable mention), 587
B. H. Neumann Awards (Brendan Case, Tan Mui Hing, Rod Watson), 1358
Beckenbach Book Prize (Arthur Benjamin), 586
Clay Research Fellowships (Artur Avila, Sophie Morel, Sam Payne), 589
CME-MSRI Prize (Stephen A. Ross), 1359
CRM-Fields-PIMS Prize (Nicole Tomczak-Jaegermann), 483
Dannie Heineman Prize for Mathematical Physics (Sergio Ferrara, Daniel Freedman, Peter van Nieuwhuizen), 687
Descartes Prize (George Szpiro), 362
Elizabeth Lowell Putnam Prize (Alison B. Miller), 904
European Mathematical Society Article Competition (Nuno Crato, F. Thomas Bruss, Sava Grozdev, Ivan Derzhanski, Evgenia Sendova), 904; (F. Thomas Bruss, Tom M. Apostol, Hansjörg Geiges), 1227
Eva and Lars Gårding Prize in Mathematics (Dennis Hejhal), 687
Fulbright Scholarships (Gwyneth F. Harrison-Shermone, Jeffrey Weissmann, Carmel Y. Adrian, Stephanie J. Jakus, Jennifer L. Losaw, Michael J. Coons, David Sussillo, Carl S. McTague), 689
Guggenheim Fellowships (L. Mahadevan, Joseph Mazur, William H. Meeks III, Laurent Saloff-Coste, Bin Yu), 869
ICM Felix Klein Medal for 2005 (Ubiratan D’Ambrosio), 792
ICM Hans Freudenthal Medal for 2005 (Paul Cobb), 792
ICTP/IMU Ramanujan Prize (Marcelo Viana), 51
Intel Science Talent Search Scholarships (Yi Sun, Nicholas M. Wage, Kimberly M. Scott), 689
John L. Synge Award of the Royal Society of Canada (Stephen A. Cook), 1359
MAA Annie and John Selden Prize for Research in Undergraduate Mathematics Education (Chris Rasmussen), 1226
MAA Carl B. Allendoerfer Award (Robb T. Koether, John K. Osinovich Jr., Jeff Suzuki), 1226
MAA Certificates of Meritorious Service (Kay Somers, Calvin Van Niewaal, Alan Tucker, Ivy Knoshaug, Marjorie Enneking, William Yslas Vélez), 586
MAA George Pólya Award (Ezra Brown, James Sandefur), 1226
MAA Harry L. Alder Award for Distinguished Teaching (Gerikai (Kai) Campbell, Christopher N. Swanson, Leslie Ward), 1226
MAA Lester R. Ford Award (Ibtesam Bajunaid, Joel M. Cohen, Flavia Colonna, David Singman, Viktor Blåsjö, Edward B. Burger, Karl Dilcher, Kenneth B. Stolarsky, William Dunham), 1226
MAA Trevor Evans Award (Ronald Barnes, Linda Becerra, Stuart Boersma), 1226
MacArthur Fellowships (Terence Tao, Luis von Ahn), 1356
Mega Math Challenge 2006, 905
Monroe H. Martin Prize (C. Sinan Gunturk, Jared Tanner), 1060
National Academy of Engineering Elections (Leonard Adelman, Leslie Greengard, Henryk Iwaniec, Dan-Virgil Voiculescu, Lennart A. E. Carleson, Aloisio Pessoa De Araujo), 791
NDSEG Fellowships (Jennifer Balakrishnan, Douglas Baldwin, Elizabeth Beer, David Brown, Andrew Dittmer, David Goldberg, Andrew Obus, Alexandra Ovetsky, David Roe, Steven Sivek, Mayank Varia, Daniela Witten), 1360
Nemmers Prize (Robert P. Langlands), 681
NSF Alan T. Waterman Award (Emmanuel Candès), 902
NSF Graduate Research Fellowships Announced (Jennifer S. Balakrishnan, Laura S. Baron, Adam D. Chandler, Lauren M. Childs, Ivan Z. Corwin, Jacob Fox, Sheel C. Ganatra, Thomas A. Goldstein, Jeffrey L. Jauregui, Benjamin S. Kunsberg, Ricky I. Liu, Stephanie M. Moyerman, Ronen E. Mukamel, Emily E. Riehl, David L. Roe, Nikita Rozenblyum, Michael D. Sekora, Josef A. Sifuentes, Steven W. Sivek, Benjamin E. Sunday, Matthew J. Thibault, Hem H. Wadhwa, Phillip D. Whitman, Trevor M. Wilson), 688
NSF Postdoctoral Fellowships Awarded, 1226
Palis and Seshadri Awarded 2006 Trieste Science Prize, 1060
Paper of the Year Prize (Karl Mahlburg), 687
Pi Mu Epsilon Student Paper Presentation Awards (Tara Cruickshank, David Gohike, Sara Jensen, Lee Kennard, David Martin, William Stanton, Jeffrey Ward), 1360
Prizes of the Mathematical Society of Japan (Spring Prize—Takuro Mochizuki; Algebra Prizes—Masaki Hanamura, Hiroyuki Yoshida; Seki-Takakazu Prize—Japan-U.S. Mathematics Institute), 1360
Putnam Prizes (Oleg I. Golberg, Matthew M. Ince, Daniel M. Kane, Ricky I. Liu, Tiankai Liu, Aaron C. Pixton), 903
Rhodes Scholarships Awarded (Alison Crocker, Adam D. Chandler, Rahul Satija, Eliana Hechter), 362
Ribenboim Prize (Vinayak Vatsal), 688
Royal Society of Canada Elections (Andrew Granville, Ming Li, Mary E. Thompson), 1063
Royal Society of London Elections (Peter J. Donnelly, Raymond W. Ogden, Nicholas I. Shepherd-Barron, Jerrold E. Marsden, Alan G. Wilson), 905
SIAM Prizes (George B. Dantzig Prize—Éva Tardos; Richard C. DiPrima Prize—Xinwei Yu; George Pólya Prize—Gregory F. Lawler, Oded Schramm, Wendelin Werner; W. T. and Idalia Reid Prize in Mathematics—Peter Kloeden; Distinguished Service to the Profession—Peter Lax; John von Neumann Lectureship—George C. Papanicolaou; I. E. Block Community Lecture—Simon Levin; Julian Cole Lecture—Michael J. Shelley; AWM-SIAM Sonia Kovalevsky Lecture—Irene Fonseca; SIAM Activity Group on Analysis of Partial Differential Equations Prize Lecture—François Golse; Lagrange Prize in Continuous Optimization—Roger Fletcher, Sven Leyffer, Philippe Toint; Mathematical Contest in Modeling—Brian Camley, Pascal Getreuer, Bradley Klingenberg, Benjamin Conlee, Neal Gupta, Christopher Yetter; Outstanding Paper Prizes—Girish N. Nair, Robin J. Evans, Jean-Michel Coron, Emmanuel Trelat, Michael Hintermueller, Karl Kunisch, Kazufumi Ito; Student Paper Prize—Laurent Demanet, Emanuele Viola, Hongchao Zhang), 1061
State Professor of the Year Award (M. Vali Siadat, Jim Cloykendall), 362
Timoshenko Medal (Grigory I. Barenblatt), 589
Trjitzinsky Memorial Awards (Carissa Joy Strawn, Jennifer A. Roberge, Yukiko Kozakai, Melanie Marie Meyer, Christian Sykes, Christopher Piecuch, Sophia Leibman, Gabor Revesz), 59; (Elizabeth Rini, Kadijah Shadeed, Lorena Pulido, Jennifer Winter, Elizabeth R. Morra, John R. Quinn, Sean M. Eagan), 1365
Young Scholars’ Competition Prizes (Justin Moore, Mark Van Atten, Eli Ben-Sasson), 903

The Profession
2005 Annual Survey of the Mathematical Sciences (First Report), 230
Business Week Looks at Mathematics (Allyn Jackson), 637
Doctoral Degrees Conferred 2004–2005, 258
Early Career Profile Network, 486
Editor’s Log, AMSY 2005, 405
(A) Fellows Program for the AMS, 754
Impact Factor and How It Relates to Quality of Journals (Vitali Milman), 351
In High Gear: Spanish Mathematics Looks to the Future—and to ICM2006 (Allyn Jackson), 218
(An) Invisible Minority: Asian Americans in Mathematics (Sharad Goel), 878
Math Jobs: Job Application Database (Allyn Jackson), 895
Mathematical Sciences in the FY 2007 Budget (Samuel M. Rankin III), 682
Mathematics Awareness Month 2006, 366
Mathematics Institutes Informational Website (Allyn Jackson), 795
Measuring Journals (John Ewing), 1049
(The) Media and Mathematics Look at Each Other (Philip J. Davis), 317
Moment of Proof (Jonathan David Farley), 348
NFY Fiscal Year 2007 Budget Request, 580
Statistics on Women Mathematicians Compiled by the AMS, 1087
Technology, Education, and the Single Salary Schedule (C. E. Larson), 525
Tips for the Job Search: Applying for Academic and Postdoctoral Positions (Heather A. Lewis and John S. Coughanou), 1021
What Is the BMSA and What Does It Do? (Scott Weidman), 890

Reference and Book List
61, 254, 368, 487, 593, 695, 797, 910, 1071, 1233, 1368
The University of Hong Kong is at the international forefront of higher learning and research, with more than 100 teaching departments and sub-divisions of studies, and more than 60 research institutes and centres. It has over 20,000 undergraduate and postgraduate students from 48 countries. English is the medium of instruction. The University is committed to international standards for excellence in scholarship and research.

**Associate Professors/Assistant Professors in the Department of Mathematics**  
(Ref.: RF-2006/2007-198)

Applications are invited for appointments as Associate Professor/Assistant Professor in the Department of Mathematics, tenable from September 1, 2007 or as soon as possible thereafter, on a three-year fixed-term basis and with the possibility of renewal. The appointees will be considered for tenure during the second three-year contract.

The Department of Mathematics provides a solid general undergraduate education in mathematics, offers supervision in graduate study for students with a strong interest in and a capacity for mathematics, and engages in research aiming at a high international standing. Information about the Department can be obtained at http://www.hku.hk/math/.

Candidates in all areas of mathematics will be considered. Preference will be given to those working in an area of Applied Mathematics or Mathematical Sciences. Appointment at a higher rank is also possible for exceptionally strong candidates.

**Starting annual salaries** are as follows (subject to review from time to time at the entire discretion of the University):

- **Associate Professor**: around HK$593,100
- **Assistant Professor**: around HK$451,980

(approximately US$1 = HK$7.8)

The appointments will attract a contract-end gratuity and University contribution to a retirement benefits scheme, totalling up to 15% of basic salary, as well as leave, and medical/dental benefits. At current rates, salaries tax does not exceed 16% of gross income. Housing benefits will be provided as applicable.

For enquiries of the existing research activities and the specific job requirements, please write to Dr. W.S. Cheung, Head of the Department of Mathematics (e-mail: wscheung@hku.hk). Further particulars and application forms (272/302 amended) can be obtained at https://extranet.hku.hk/apptunit/; or from the Appointments Unit (Senior), Human Resource Section, Registry, The University of Hong Kong, Hong Kong (fax: (852) 2540 6735 or 2559 2058; e-mail: apptunit@hkcc.hku.hk). Closes January 15, 2007.

The University is an equal opportunity employer and is committed to a No-Smoking Policy.
Finite Math for Windows®

Make your Finite Mathematics course more effective and more dynamic while transitioning your students from using calculators to using software to better prepare them for their future courses and careers.

Finite Math for Windows is a user-friendly software package that enables students to easily solve problems and/or check their work in Finite Mathematics.

The 17 modules below correspond to the chapters found in most Finite Mathematics books.

- Binomial and Normal Distribution
- Counting Calculator
- Critical Path Analysis
- Difference Equations
- Finance
- Games
- Graphing Linear Inequalities
- Graphing Lines
- Graph Theory
- Least Squares Regression
- Linear Programming
- Markov Chains
- Matrices
- Probability Simulator
- Statistics
- Systems of Linear Equations
- Truth Tables

For more information and a free, full-functioning demonstration version, please visit:

www.weissSoftware.com
Meetings and Conferences of the AMS

<table>
<thead>
<tr>
<th>Associate Secretaries of the AMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Section: Michel L. Lapidus, Department of Mathematics, University of California, Sproul Hall, Riverside, CA 92521-0135; e-mail: <a href="mailto:lapidus@math.ucr.edu">lapidus@math.ucr.edu</a>; telephone: 951-827-5910.</td>
</tr>
<tr>
<td>Central Section: Susan J. Friedlander, Department of Mathematics, University of Illinois at Chicago, 851 S. Morgan (M/C 249), Chicago, IL 60607-7045; e-mail: <a href="mailto:susan@math.nwu.edu">susan@math.nwu.edu</a>; telephone: 312-996-3041.</td>
</tr>
<tr>
<td>Eastern Section: Lesley M. Sibner, Department of Mathematics, Polytechnic University, Brooklyn, NY 11201-2990; e-mail: <a href="mailto:lsibner@duke.poly.edu">lsibner@duke.poly.edu</a>; telephone: 718-260-3505.</td>
</tr>
<tr>
<td>Southeastern Section: Matthew Miller, Department of Mathematics, University of South Carolina, Columbia, SC 29208-0001, e-mail: <a href="mailto:miller@math.sc.edu">miller@math.sc.edu</a>; telephone: 803-777-3690.</td>
</tr>
</tbody>
</table>

The Meetings and Conferences section of the Notices gives information on all AMS meetings and conferences approved by press time for this issue. Please refer to the page numbers cited in the table of contents on this page for more detailed information on each event. Invited Speakers and Special Sessions are listed as soon as they are approved by the cognizant program committee; the codes listed are needed for electronic abstract submission. For some meetings the list may be incomplete. Information in this issue may be dated. Up-to-date meeting and conference information can be found at www.ams.org/meetings/.

### Meetings:

#### 2006
- **November 3–4**: Fayetteville, Arkansas p. 1407

#### 2007
- **January 5–8**: New Orleans, Louisiana Annual Meeting
- **March 3–4**: Davidson, North Carolina
- **March 16–17**: Oxford, Ohio
- **April 14–15**: Hoboken, New Jersey
- **April 21–22**: Tucson, Arizona
- **May 23–26**: Zacatecas, Mexico
- **July 31–August 3**: Warsaw, Poland
- **October 5–6**: Chicago, Illinois
- **October 6–7**: New Brunswick, New Jersey
- **October 13–14**: Albuquerque, New Mexico
- **November 3–4**: Murfreesboro, Tennessee
- **December 12–15**: Wellington, New Zealand

#### 2008
- **January 6–9**: San Diego, California Annual Meeting
- **March 22–23**: New York, NY
- **March 28–30**: Baton Rouge, Louisiana
- **April 4–6**: Bloomington, Indiana
- **May 3–4**: Claremont, California
- **June 4–7**: Rio de Janeiro, Brazil
- **October 4–5**: Vancouver, Canada
- **October 11–12**: Middletown, Connecticut
- **October 24–26**: Huntsville, Alabama

#### December 17–21
- **Shanghai, People’s Republic of China**

#### 2009
- **January 7–10**: Washington, DC Annual Meeting
- **March 27–29**: Urbana, Illinois
- **April 4–5**: Raleigh, North Carolina
- **April 25–26**: San Francisco, California

#### 2010
- **January 6–9**: San Francisco, California Annual Meeting

#### 2011
- **January 5–8**: New Orleans, Louisiana Annual Meeting

#### 2012
- **January 4–7**: Boston, Massachusetts Annual Meeting

#### 2013
- **January 9–12**: San Diego, California Annual Meeting

### Important Information Regarding AMS Meetings
Potential organizers, speakers, and hosts should refer to page 296 in the February 2006 issue of the Notices for general information regarding participation in AMS meetings and conferences.

### Abstracts
Speakers should submit abstracts on the easy-to-use interactive Web form. No knowledge of \LaTeX{} is necessary to submit an electronic form, although those who use \LaTeX{} may submit abstracts with such coding, and all math displays and similarly coded material (such as accent marks in text) must be typeset in \LaTeX{}. Visit http://www.ams.org/cgi-bin/abstracts/abstract.pl. Questions about abstracts may be sent to abs-info@ams.org. Close attention should be paid to specified deadlines in this issue. Unfortunately, late abstracts cannot be accommodated.

**Conferences:** (see http://www.ams.org/meetings/ for the most up-to-date information on these conferences.)

- June 16–July 6, 2007: Joint Summer Research Conferences, Snowbird, Utah.
# Joint Meetings Advance Registration/Housing Form

**Name**

(please write name as you would like it to appear on your badge)

**Mailing Address**


**Telephone**

Fax:

**In case of emergency (for you) at the meeting, call:** Day # __________________ Evening #: __________________

**Email Address**

(Acknowledgment of this registration will be sent to the email address given here, unless you check this box: Send by U.S. Mail)

**Badge Information:**

Affiliation for badge __________

Nonmathematician guest badge name ____________________________

(please note charge below)

☐ I DO NOT want my program and badge to be mailed to me on 12/08/06.

## Registration Fees

<table>
<thead>
<tr>
<th>Joint Meetings</th>
<th>by Dec 13</th>
<th>at mtg</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member AMS, ASL, CMS, MAA, SIAM</td>
<td>US $208</td>
<td>US $271</td>
<td></td>
</tr>
<tr>
<td>Nonmember</td>
<td>US $323</td>
<td>US $419</td>
<td></td>
</tr>
<tr>
<td>Graduate Student</td>
<td>US $42</td>
<td>US $52</td>
<td></td>
</tr>
<tr>
<td>Undergraduate Student</td>
<td>US $21</td>
<td>US $27</td>
<td></td>
</tr>
<tr>
<td>High School Student</td>
<td>US $3</td>
<td>US $6</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>US $42</td>
<td>US $52</td>
<td></td>
</tr>
<tr>
<td>Temporarily Employed</td>
<td>US $167</td>
<td>US $194</td>
<td></td>
</tr>
<tr>
<td>Developing Countries Special Rate</td>
<td>US $42</td>
<td>US $52</td>
<td></td>
</tr>
<tr>
<td>Emeritus Member of AMS or MAA</td>
<td>US $42</td>
<td>US $52</td>
<td></td>
</tr>
<tr>
<td>High School Teacher</td>
<td>US $42</td>
<td>US $52</td>
<td></td>
</tr>
<tr>
<td>Librarian</td>
<td>US $42</td>
<td>US $52</td>
<td></td>
</tr>
<tr>
<td>Nonmathematician Guest</td>
<td>US $15</td>
<td>US $15</td>
<td></td>
</tr>
</tbody>
</table>

**AMS Short Course: Aspects of Statistical Learning (1/3–1/4)**

| Member of AMS or MAA                                 | US $90    | US $120|
| Nonmember                                           | US $120   | US $151|
| Student, Unemployed, Emeritus                        | US $40    | US $60 |

**MMA Short Course: Leonhard Euler—Looking back after 300 Years. (1/3–1/4)**

| Member of MAA or AMS                                  | US $125   | US $140|
| Nonmember                                           | US $175   | US $190|
| Student, Unemployed, Emeritus                        | US $50    | US $60 |

**MAA Minicourses (see listing in text)**

I would like to attend: ☐ One Minicourse ☐ Two Minicourses

Please enroll me in MAA Minicourse(s) #_______ and/or #_______

In order of preference, my alternatives are: #_______ and/or #_______

Prices: US $95 for Minicourses #1–6; US $60 for #7–10 and #12–16, $70 for #11

**Employment Center**

Applicant résumé forms and employer job listing forms will be on the AMS website and in Notices in September and October.

Employer—First Table

☐ Regular ☐ Self-scheduled

Employer—Each Additional Table

☐ Regular ☐ Self-scheduled

Employer—Posting Only

US $50 N/A

☐ Applicant (all services) US $44 US $82

☐ Applicant (Winter List & Message Ctr only) US $22 US $22

**Events with Tickets**

| MER Banquet (16)                                      | US $46.00 | #____Regular #____Veg #____Kosher |
| NAM Banquet (17)                                      | US $46.00 | #____Regular #____Veg #____Kosher |
| AMS Banquet (18)                                      | US $49.50 | #____Regular #____Veg #____Kosher |

$ ______

**Other Events**

☐ Graduate Student/First Time Attendee Reception (1/5) (no charge)

$ ______

**Total for Registrations and Events**

$ ______

Registration for the Joint Meetings is not required for the Short Courses, but it is required for the Minicourses and the Employment Center

---

## Payment

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration &amp; Event Total (total from column on left)</td>
<td>$ ______</td>
</tr>
<tr>
<td>Hotel Deposit (only if paying by check)</td>
<td>$ ______</td>
</tr>
<tr>
<td><strong>Total Amount To Be Paid</strong></td>
<td>$ ______</td>
</tr>
</tbody>
</table>

(Note: A US $5 processing fee will be charged for each returned check or invalid credit card. Debit cards are not accepted.)

**Method of Payment**

☐ Check. Make checks payable to the AMS. Checks drawn on foreign banks must be in equivalent foreign currency at current exchange rates.

☐ Credit Card. VISA, MasterCard, AMEX, Discover (no others accepted)

Card number: __________

Exp. date: _________

Zipcode of credit card billing address: __________

Signature: __________

Name on card: __________

**Mail to:**

Mathematics Meetings Service Bureau (MMSB)

P. O. Box 6887

Providence, RI 02940-6887

Fax: 401-455-4004

Questions/changes call: 401-455-4143 or 1-800-321-4267 x4143; mmsb@ams.org

**Deadlines**

**Please register by the following dates for:**

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resumes/job descriptions printed in the Winter Lists</td>
<td>Oct. 27, 2006</td>
</tr>
<tr>
<td>To be eligible for the room lottery and all raffles</td>
<td>Oct. 31, 2006</td>
</tr>
<tr>
<td>For housing reservations, badges/programs mailed</td>
<td>Nov. 14, 2006</td>
</tr>
<tr>
<td>For housing changes/cancellations through MMSB</td>
<td>Dec. 4, 2006</td>
</tr>
<tr>
<td>For advance registration for the Joint Meetings, Employment Center, Short Courses, MAA Minicourses, &amp; Tickets:</td>
<td>Dec. 13, 2006</td>
</tr>
<tr>
<td>For 50% refund on banquets, cancel by:</td>
<td>Dec. 22, 2006*</td>
</tr>
<tr>
<td>For 50% refund on advance registration, Minicourses &amp; Short Courses, cancel by:</td>
<td>Dec. 29, 2006*</td>
</tr>
</tbody>
</table>

*no refunds after this date

---

**Other Information**

Mathematical Reviews field of interest # _______

How did you hear about this meeting? Check one: ☐ Colleague(s) ☐ Notices ☐ Focus ☐ Internet

☐ This is my first Joint Mathematics Meeting.

☐ I am a mathematics department chair.

☐ For planning purposes for the MAA Two-year College Reception, please check if you are a faculty member at a two-year college.

☐ Please do not include my name on any promotional mailing list.

☐ I would like to receive promotions for future JMM meetings.

☑ Please ☐ this box if you have a disability requiring special services.

---

**Membership**

☑ all that apply. First column is eligible for member registration fee

☐ AMS ☐ ASA ☐

☐ MAA ☐ AWM ☐

☐ ASL ☐ NAM ☐

☐ CMS ☐ YMN ☐

☐ SIAM ☐

---

**Questions/changes call:** 401-455-4143 or 1-800-321-4267 x4143; mmsb@ams.org
New Orleans Joint Meetings Hotel Reservations

To ensure accurate assignments, please rank hotels in order of preference by writing 1, 2, 3, etc., in the column on the left and by circling the requested room type and rate. If the rate or the hotel requested is no longer available, you will be assigned a room at a ranked or unranked hotel at a comparable rate. Participants are urged to call the hotels directly for details on suite configurations, sizes, and availability; however, suite reservations can be made only through the MMSB to receive the convention rates listed. Reservations made directly with the hotels may be changed to a higher rate. All rates are subject to a 13% sales tax plus a small ($1–$3 per night) occupancy tax. Guarantee requirements: First night deposit by check (add to payment on reverse of form) or a credit card guarantee.

Date and Time of Arrival ___________________________ Date and Time of Departure ___________________________

Name of Other Room Occupant ___________________________ Arrival Date ____________ Departure Date ____________ Child (give age(s)) ____________

<table>
<thead>
<tr>
<th>Order of choice</th>
<th>Hotel</th>
<th>Single</th>
<th>Double 1 bed</th>
<th>Double 2 beds</th>
<th>Triple 2 beds</th>
<th>Triple 2 beds w/cot</th>
<th>Triple - king or queen w/cot</th>
<th>Quad 2 beds</th>
<th>Quad 2 beds w/cot</th>
<th>Suites</th>
<th>Starting rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Student</td>
<td>US $108</td>
<td>US $108</td>
<td>US $108</td>
<td>US $128</td>
<td>N/A</td>
<td>US $128</td>
<td>US $148</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>US $108</td>
<td>US $108</td>
<td>US $108</td>
<td>US $128</td>
<td>N/A</td>
<td>US $128</td>
<td>US $128</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Omni Royal Orleans</td>
<td>US $104</td>
<td>US $104</td>
<td>US $104</td>
<td>US $124</td>
<td>N/A</td>
<td>US $144</td>
<td>US $144</td>
<td>N/A</td>
<td>US $180</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>US $89</td>
<td>US $89</td>
<td>US $89</td>
<td>US $114</td>
<td>N/A</td>
<td>US $124</td>
<td>US $139</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Special Housing Requests:
- I have disabilities as defined by the ADA that require a sleeping room that is accessible to the physically challenged. My needs are: ____________________________
- Other requests: ____________________________
- I am a member of a hotel frequent-travel club and would like to receive appropriate credit. The hotel chain and card number are: ____________________________

If you are not making a reservation, please check off one of the following:
- I plan to make a reservation at a later date.
- I will be making my own reservations at a hotel not listed. Name of hotel: ____________________________
- I live in the area or will be staying privately with family or friends.
- I plan to share a room with: ____________________________, who is making the reservations.

Email address for Marriott & Omni hotel confirmations: ____________________________