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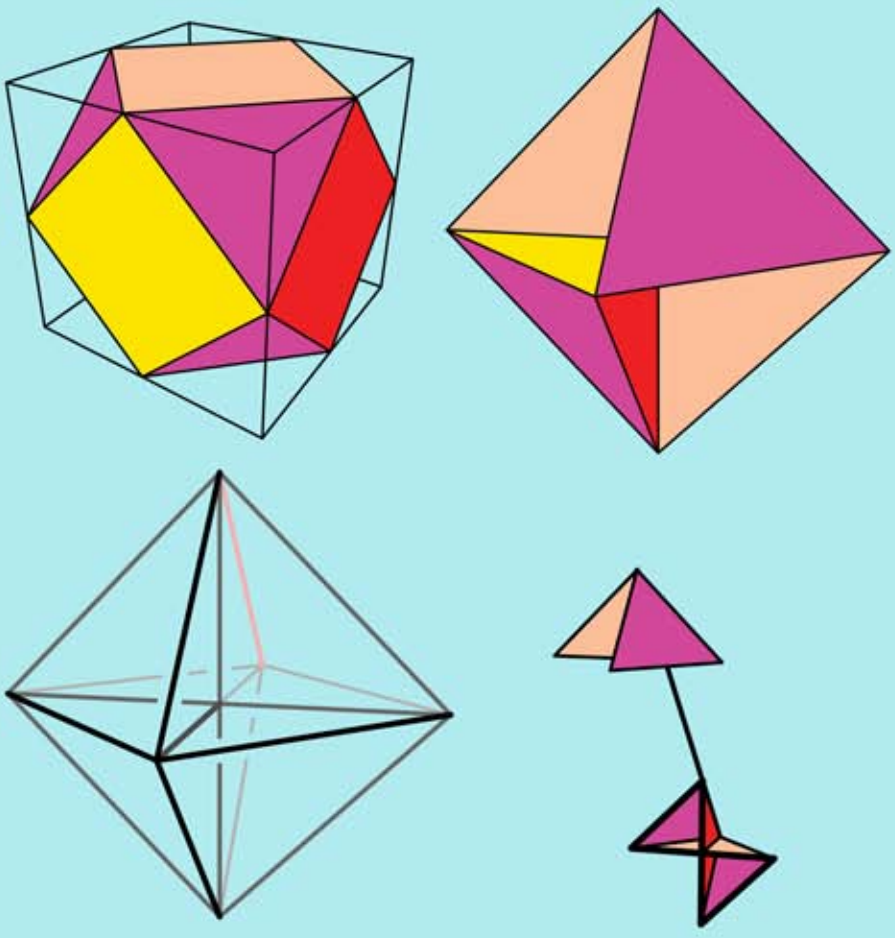
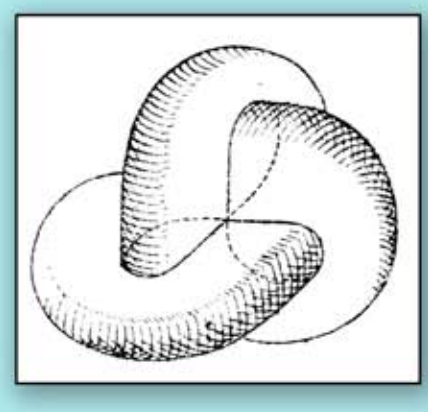
Notices

of the American Mathematical Society

November 2007 Volume 54, Number 10





Collapsing Boy's umbrellas (see page 1356)

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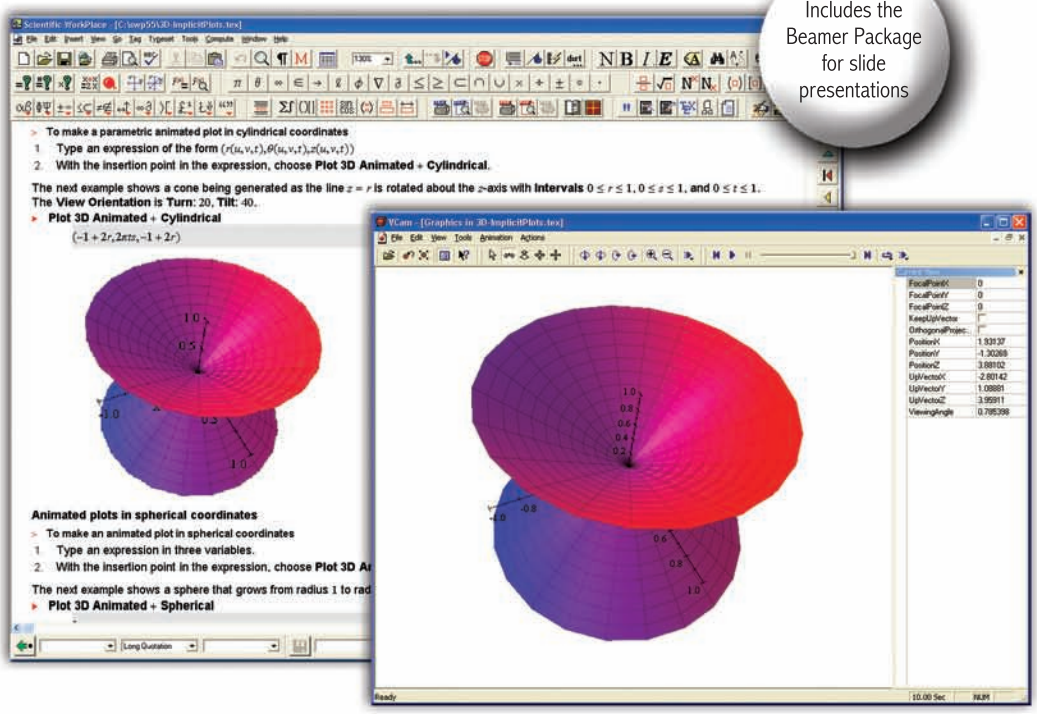

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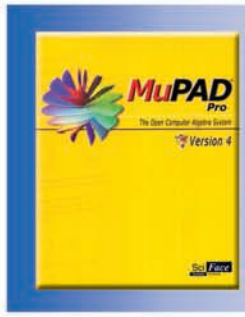

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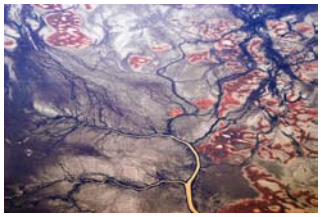

OPTIMAL TRANSPORT

March 10 – June 13, 2008

ORGANIZING COMMITTEE: **ANDREA BERTOZZI** (UCLA), **YANN BRENIER** (UNIVERSITÉ DE NICE SOPHIA ANTIPOLIS), **WILFRID GANGBO** (GEORGIA INSTITUTE OF TECHNOLOGY), **PETER MARKOWICH** (UNIVERSITÄT WIEN), **JEAN-MICHEL MOREL** (ÉCOLE NORMALE SUPÉRIEURE DE CACHAN)

Scientific Overview

The general problem of irrigation and transportation in physics and biology is to transport in the most economical way a source mass distribution onto a fixed well distribution. Both source and wells distributions are usually modeled as positive measures in a Cartesian space or in a metric space. This problem can be looked at as a generalization of the optimal assignment or the optimal flow problem in operational research, in which case the subjacent space is a fixed graph. In the new more general setting, the irrigation network is itself an unknown of the problem. The examples are manifold: lungs, blood vessels, irrigation or draining networks, natural or artificial. On the side of urban optimization, the question ranges from the optimization of the supply networks (power, water, wires) to the public transportation and traffic optimization problem. One of the simplest versions of the problem is the Monge-Kantorovich problem, where the cost assigned to transportation is just a convex increasing function of distance. Fluid mechanics arguments have to be added as soon as the transportation network is optimized with a flow-dependent cost as is natural in most of the above mentioned situation: the thicker the vessel, the road, the channel, the wire etc., the cheaper the transportation. The aim of the workshop is to put together physicists, biologists, mathematicians working on the optimization of transportation networks.

Workshop Schedule

- Tutorials, March 10-14, 2008
- Workshop 1: Aspects of Optimal Transport in Geometry and Calculus of Variations, March 31 – April 4, 2008
- Workshop 2: Numerics and Dynamics for Optimal Transport, April 14 – 18, 2008
- Workshop 3: Transport Systems in Geography, Geosciences, and Networks, May 5 – 9, 2008
- Workshop 4: Optimal Transport in the Human Body: Lungs and Blood, May 19 – 23, 2008
- Mini Workshop: Entropies and Optimal Transport in Quantum Mechanics, June 5 – 6, 2008
- Culminating Workshop at Lake Arrowhead Conference Center, June 8 – 13, 2008

Participation

This long program will involve a community of senior and junior researchers. The intent is for participants to have an opportunity to learn about the mathematics of optimal transport from the perspective of multiple fields and to meet a diverse group of people and have an opportunity and to meet a diverse group of people and have an opportunity to form new collaborations.

Full and partial support for long-term participants is available. We are especially interested in applicants who intend to participate in the entire program (March 10 – June 13, 2008), but will consider applications for shorter periods. Funding is available for participants at all academic levels, though recent PhDs, graduate students, and researchers in the early stages of their careers are especially encouraged to apply. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications. More information and an application is available online.

www.ipam.ucla.edu/programs/ot2008

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NEW & FORTHCOMING *from Birkhäuser*

Vortices in the Magnetic Ginzburg–Landau Model

ETIENNE SANDIER, *Université Paris-XII Val-de-Marne, Créteil, France;* **SYLVIA SERFATY***, *Courant Institute of Mathematical Sciences, New York, NY, USA*

***Winner of the European Young Investigator Award (EURYI) 2007**

"All parts of this interesting book are clearly and rigorously written. A consistent bibliography is given and several open problems are detailed. This work has to be recommended."

—ZENTRALBLATT MATH

This book presents the mathematical study of vortices of the two-dimensional Ginzburg–Landau model, both with and without a magnetic field, which is an important phenomenological model used to describe superconductivity. The vortices, identified as quantized amounts of vorticity of the superconducting current localized near points, are the objects of many observational and experimental studies, both past and present. The book acts a guide to the various branches of Ginzburg–Landau studies, provides context for the study of vortices, and presents a list of open problems in the field.

2007/XII, 322 PP., 13 ILLUS./HARDCOVER
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PROGRESS IN NONLINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS, VOL. 70

Fuchsian Reduction

Applications to Geometry, Cosmology and Mathematical Physics

SATYANAD KICHENASSAMY, *Université de Reims Champagne-Ardenne, Reims, France*

Fuchsian reduction is a method for representing solutions of nonlinear PDEs near singularities and has grown in response to those problems in pure and applied mathematics where numerical computations fail. The technique has multiple applications including soliton theory, Einstein's equations and cosmology, stellar models, laser collapse, conformal geometry and combustion. This work unfolds systematically in four parts, interweaving theory and applications. The case studies examined in Part III illustrate the impact of reduction techniques, and may serve as prototypes for future new applications. In the same spirit, most chapters include a problem section. Background results and solutions to selected problems close the volume.

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Self-Dual Gauge Field Vortices

An Analytical Approach

GABRIELLA TARANTELLO, *Università di Roma 'Tor Vergata', Italy*

The goal of this text is to form an understanding of self-dual solutions and gauge field theories which are of great importance since they keep internal symmetries and account for phenomena such as spontaneous symmetry breaking, the quantum Hall effect, charge fractionalization, superconductivity and supergravity. The work presents specific examples of self-dual gauge field structures, including the Chern–Simons model, the abelian-Higgs model, and Yang–Mills gauge field theory as well as open problems in the field.

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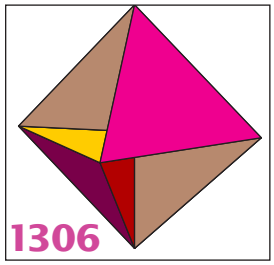
Notices

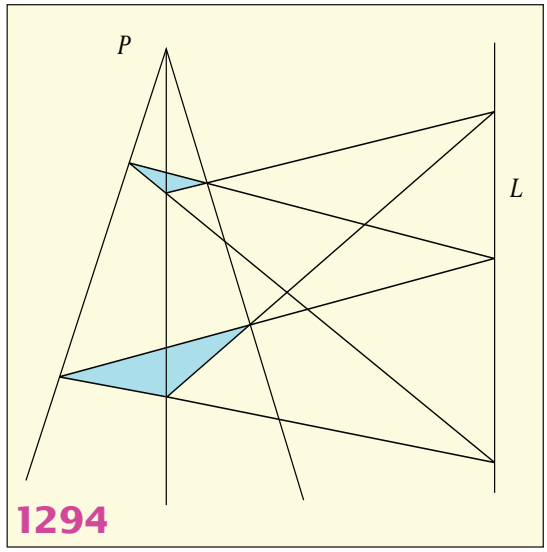
of the American Mathematical Society

November 2007

Communications

Commentary





Features

Notices

of the American Mathematical Society

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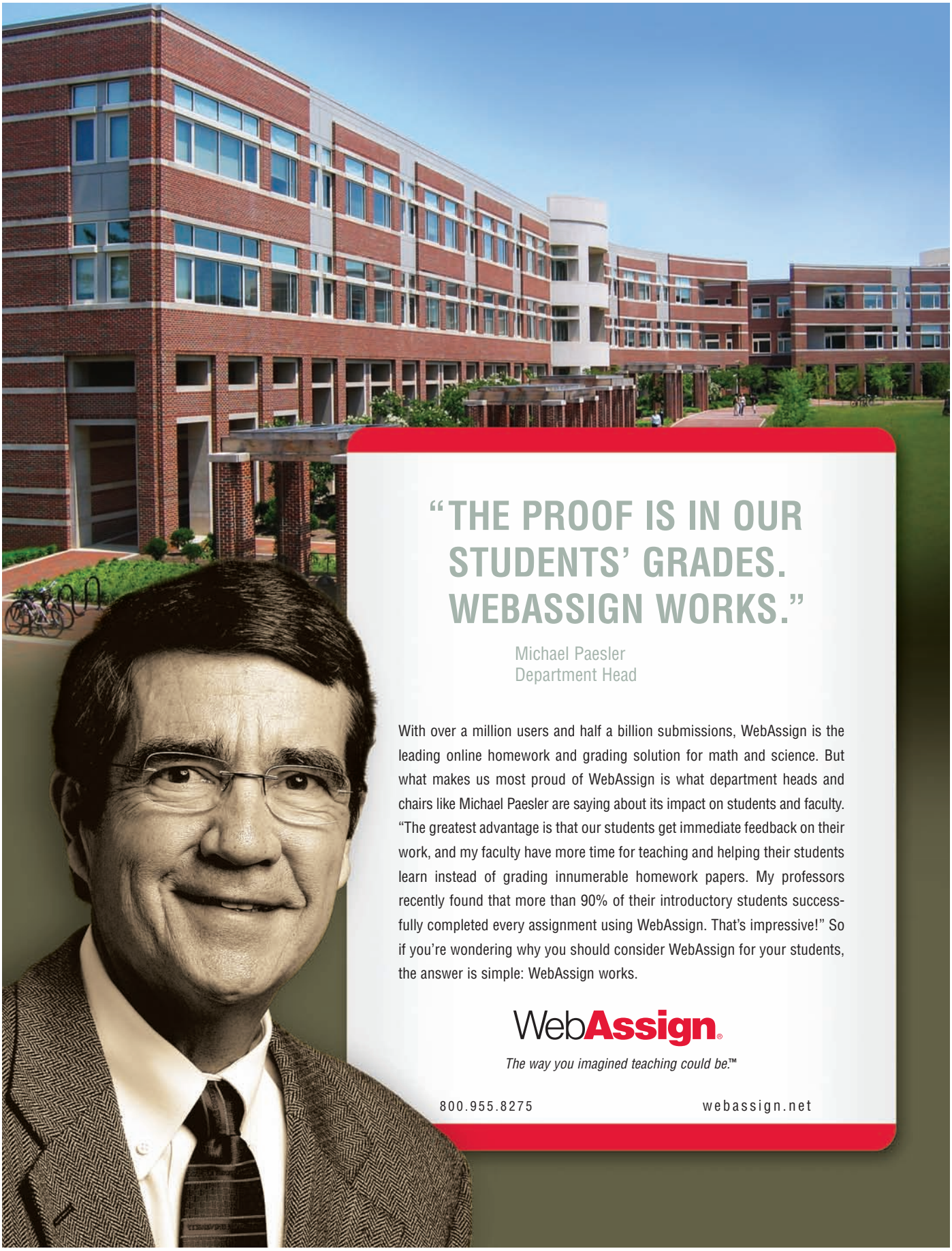
From the AMS Secretary



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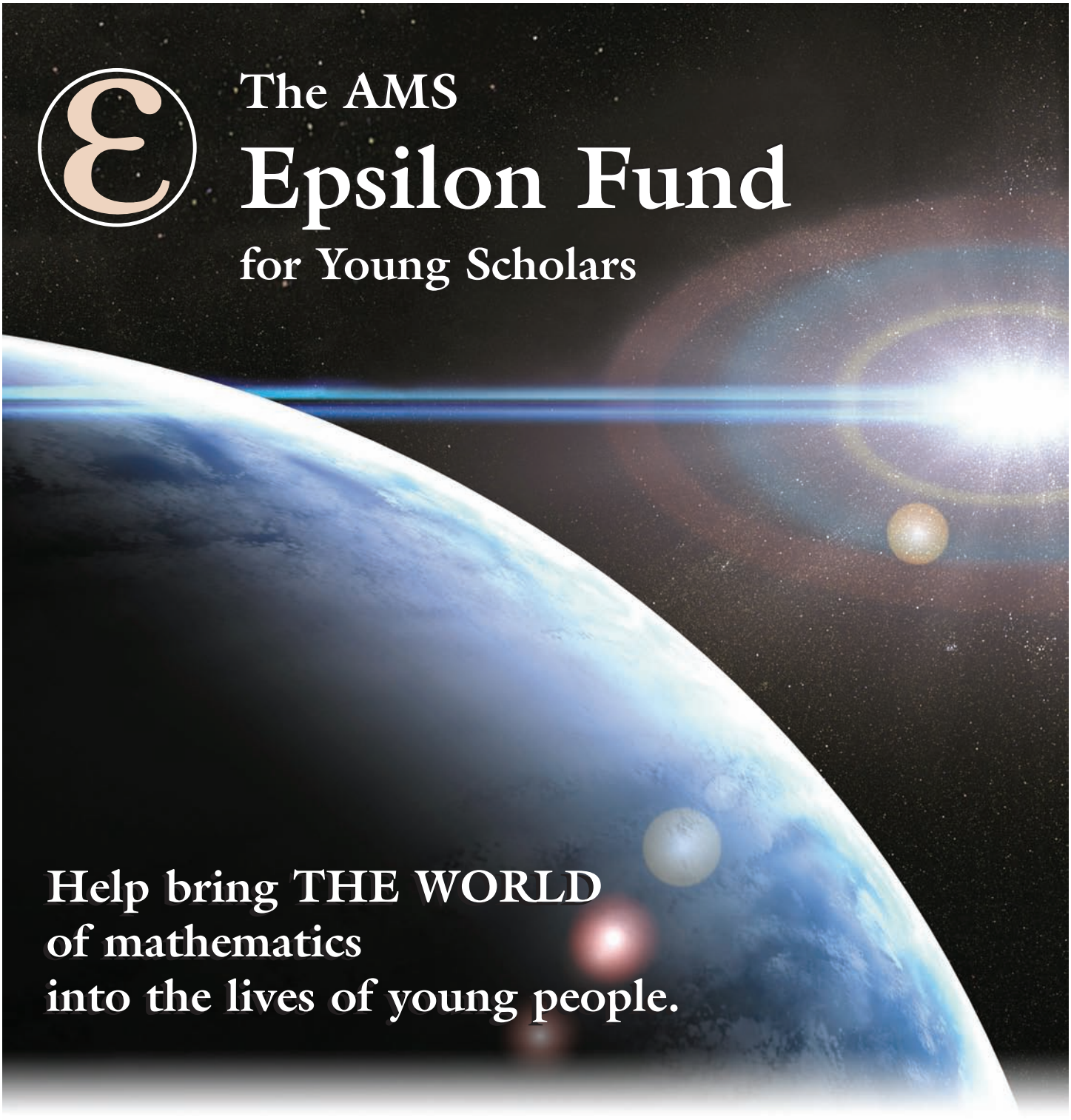

Whether they become scientists, engineers, or entrepreneurs, young people with mathematical talent need to be nurtured. Income from this fund supports the Young Scholars Program, which provides grants to summer programs for talented high school students.

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09/04

Open Source Mathematical Software

Mathematical software has greatly contributed to mathematical research, enabling exciting advances in mathematics and providing extensive data for conjectures. Perhaps three of the most well-known applications of computation to mathematical research are the resolution of the *four-color conjecture* by Appel and Haken in 1976 (though it is now reproven with less need for computer verification by N. Robertson, D. P. Sanders, P. D. Seymour and R. Thomas), Thomas Hales's proof of *Kepler's conjecture*, and the formulation of the *Birch and Swinnerton-Dyer conjecture*, which grew out of extensive numerical computation.

Open source software, such as TEX, Mozilla Firefox, and Linux has had a profound effect on computing during the last decade, and we hope that open source mathematical software will have a similar positive impact on mathematics.

> I think we need a symbolic standard to make computer manipulations easier to document and verify. And with all due respect to the free market, perhaps we should not be dependent on commercial software here. An open source project could, perhaps, find better answers to the obvious problems such as availability, bugs, backward compatibility, platform independence, standard libraries, etc. One can learn from the success of TEX and more specialized software like Macaulay2. I do hope that funding agencies are looking into this.
>
> —*Andrei Okounkov, 2006 Fields medalist* (see "Interviews with three Fields medalists" *Notices of the AMS*, **54**(3) (2007), 405–410).

The term *open source* is defined at `http://www.opensource.org/`, but basically it means anyone (including commercial companies or the defense department) should be able to inspect open source software, modify it, and share it with others.

One key difference between mathematical theorems and software is that theorems require little maintenance, whereas *mathematical software requires substantial and potentially expensive maintenance* (bug fixes, updates when algorithms or languages change, etc.). Mathematical research usually generates no direct revenue for researchers, and likewise open source mathematical software is free to share and extend, so it rarely generates revenue. Volunteer effort, donations, and financial support from the NSF and other organizations is thus critical to the success of open source mathematical software.

There is a proof in the article by Campbell et al. in *The Atlas of Finite Groups—Ten Years On* (1998) that describes how many separate software packages were "easily used" to deduce various mathematical facts—no code is given, and some of the programs are proprietary software that runs only on hardware many years out of date. Such proofs may become increasingly common in mathematics if something isn't done to reverse this trend.

Suppose Jane is a well-known mathematician who announces she has proved a theorem. We probably will believe her, but she knows that she will be required to produce a proof if requested. However, suppose now Jane says a theorem is true based partly on the results of software. The closest we can reasonably hope to get to a rigorous proof (without new ideas) is the open inspection and ability to use all the computer code on which the result depends. If the program is proprietary, this is not possible. We have every right to be distrustful, not only due to a vague distrust of computers but because even the best programmers regularly make mistakes.

If one reads the proof of Jane's theorem in hopes of extending her ideas or applying them in a new context, it is limiting to not have access to the inner workings of the software on which Jane's result builds. For example, consider the following quote from the Mathematica tutorial[1]:

> Particularly in more advanced applications of Mathematica, it may sometimes seem worthwhile to try to analyze internal algorithms in order to predict which way of doing a given computation will be the most efficient. […] But most often the analyses will not be worthwhile. For the internals of Mathematica are quite complicated, and even given a basic description of the algorithm used for a particular purpose, it is usually extremely difficult to reach a reliable conclusion about how the detailed implementation of this algorithm will actually behave in particular circumstances.

No journal would make a statement like the above about the proofs of the theorems they publish. Increasingly, proprietary software and the algorithms used are an essential part of mathematical proofs. To quote J. Neubüser, "*with this situation two of the most basic rules of conduct in mathematics are violated: In mathematics information is passed on free of charge and everything is laid open for checking.*"

Full disclosure: The second author started a new mathematics software system in 2005 called SAGE (see `www.sagemath.org`), which combines Python, GAP, Singular, PARI, Maxima, SciPy, etc. with several hundred thousand lines of new code. SAGE receives contributions from many mathematicians worldwide that synthesize the latest algorithms from a broad range of topics into a comprehensive toolkit for mathematical research.

—*David Joyner*
U. S. Naval Academy, Annapolis
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—*William Stein*
University of Washington, Seattle
`wstein@u.washington.edu`

[1] `http://reference.wolfram.com/mathematica/tutorial/WhyYouDoNotUsuallyNeedToKnowAboutInternals.html`

Letters to the Editor

The "Pythagoras" Game

In March 1997, the *Notices* carried an interview with B. L. van der Waerden conducted by Yvonne Dold-Samplonius on May 4, 1993. In the interview, van der Waerden says the following:

"I had a game called 'Pythagoras'. It consisted of pieces which could be moved around freely and with which it was possible to construct a square or rectangle or a triangle by combining them in a variety of ways. I received it as a present, and I played with it most happily."

I would like to know the details of the game. I wrote to Yvonne Dold, who replied that:

"At the time of the interview with van der Waerden I vividly imagined this game, called Pythagoras, to consist of geometrical shapes with the same unit of measure executed in Mondrian colors, like the toy building blocks. So I never questioned him about it. I called his eldest daughter, Helga Habicht, and asked her about the game. However, the game is not part of family history, it is completely unknown to her."

I wonder if any *Notices* readers are familiar with the game. I understand that *Notices* Editor Magid would welcome a letter to the editor explaining "Pythagoras".

—John Bonaccorsi
Philadelphia, PA
johnbonaccorsi1@verizon.net

(Received July 11, 2007)

Remembering George Mackey

In response to the reports on George W. Mackey in the *Notices*, I would like to say how he decisively influenced my research for four decades.

In April 1967, I gave an invited talk to the British Mathematical Colloquium (Swansea) on a new groupoid version of the traditional van Kampen theorem for the fundamental group of a pointed space. At tea time, I was told: "That was very interesting. I have been using groupoids for years. My name is Mackey."

He then told me of his work on groupoids and ergodic theory. It occurred to me that if people from two or three different areas found the idea of groupoid significant, then there was probably much more in this than I had previously thought.

An immediate effect was for me to add a chapter on covering spaces to the book on topology which I was writing, since Mackey used strongly the action groupoid of a group action.

When I came to Bangor in 1970, I set students to work on topological groupoids (Lew Hardy) and measured groupoids (Tony Seda). Eventually, Tony's thesis was on Haar measure for groupoids, and later Mackey told me he also had a student working on this!

The replacement of groups by groupoids allowed for higher homotopy groupoids, and their applications, as structures in some sense "more noncommutative" than groups (or groupoids).

It was only in 1981 that I learned from Jean Pradines, and began to understand, Charles Ehresmann's extensive work on Lie groupoids, and their applications to local-to-global problems.

Though we met only a few further times, Mackey's conceptual approach to mathematics was an encouraging example in all this. He made his own evaluations of potential importance. In his field, he followed Dirac's dictum: "You should follow a mathematical idea wherever it leads…", and was undistracted from this by what is called "the mainstream". He was truly a professional.

—Ronnie Brown
Emeritus Professor
University of Wales, Bangor
www.bangor.ac.uk/r.brown

(Received July 12, 2007)

Promoting Mathematics to the Public

My take on the "applications" issue is this. I have my students ask strangers questions like "What's the quadratic formula?" and "If a train leaves New York doing 50 mph and another…". First, they're strangers. And second, when the person gets home, they'll say to themselves "Holy cow, I've actually been asked these questions in real life!"

—Dr. Mark Lynch
Millsaps College
lynchmj@millsaps.edu

(Received July 18, 2007)

Machine-checkable Proofs

Bryan Cain voices concerns about the reliability of the research literature ["Letters", August 2007]. One way to address these concerns is to build a public database of machine-checkable proofs of published theorems. Such a database would exist alongside the human-readable literature; the literature would be consulted for insight and understanding, while the database would be consulted to settle disputes about correctness.

We are not yet at the point where producing a machine-checkable version of one's theorems is as easy as producing a TEX document or a C program of comparable length, but we are closer to that point than many might think. There already exist fully machine-checkable proofs of the prime number theorem, the Jordan curve theorem, the Goedel-Rosser incompleteness theorem, and the four-color theorem. Producing machine-checkable proofs is becoming easier and easier. Every mathematician, and the AMS in particular, should seriously think about how to hasten the day when proof-checking can be safely delegated to the computer, freeing humans to spend more time thinking creatively.

—Timothy Chow
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tchow@alum.mit.edu

(Received July 21, 2007)

Kramer vs. Cremer

With reference to the very interesting "Memories of Prague" by Lipman Bers,

Bers refers to a paper that Loewner asked him to discuss, the author of said paper also being a "mathematical poet who was also a very talented rhymester". I am wondering whether the person intended to be described thusly was not Cremer, rather than Kramer. Hubert Cremer (1897–1983) did some well-received work in what today is referred to as complex analysis. In Milnor's 1999 notes on complex dynamics, he is, in fact, listed among the founders of complex dynamics. Cremer's book of mathematical poems, *Carmina Mathematica* is famous. The first edition appeared in 1927. I am the happy owner of the 4th printing (Aachen, 1977). Here is an example of the second stanza of a four-stanza poem celebrating the complex variable. This stanza tells how terribly hemmed in the life of a real variable is:

Reelle Variable, wie bist Du beschränkt!
Du kennst keine Sprünge zur Seite,
Und wirst Du mal vorwärts und rückwärts beengt,
Gleich bist Du k. o. dann und pleite!
Du ächzt auf der Achse, Du stirbst auf der Stell,
Must elend versauern—reell, reell.

The joke in the second line, referring to the inability of real numbers to "jump to the side", i.e., off the real axis, is that in colloquial German, "Seitensprung" refers to a short marital infidelity. A real variable is denied even that possibility.

The author of this letter had the privilege of knowing both Bers and Loewner. In a response to a letter that I wrote to Loewner in about 1965 asking him how he liked his new office at Stanford, he answered, "Es kommt nicht auf den Käfig an ob der Vogel singen kann" (Whether or not the bird can sing does not depend on the cage.) How true and how typical of Loewner!

—Edgar Reich
University of Minnesota
reich@math.umn.edu

(Received July 21, 2007)

Review of "A World Without Time"

In his review of my book, *A World Without Time: The Forgotten Legacy of Gödel and Einstein*, John Stachel claims that:

1) In the theory of relativity, time is essentially local, with so-called "proper time" the fundamental concept, and that

a) this conception of time does not clash with pre-relativistic intuitions of time, and that

b) the crucial aspect of local time in relativity is that of process.

2) He also maintains that Gödel fails to advance reasons as to why his cosmological models have physical significance and thus speak to the nature of time in the actual world.

My response is as follows:

3) a) Even if one grants the premise of 1), Stachel gets things precisely backwards in 1) a). Who would deny that if it is 4 p.m. by your watch, it is the same time down the street? And who, absent knowledge of relativity, thinks this question becomes meaningless if it turns out to be a really, really long street?

b) To accept 1) b), one needs to believe in the idea of a process, a progression or lapse of time, that is merely relative. "A relative lapse of time", however, Gödel notes, would mean "a relative change in the existing", whereas, as he puts it, with great force, "the concept of existence…cannot be relativized without destroying its meaning completely."

4) In 2), Stachel ignores the discussion in my book of the "modal" aspect of Gödel's argument. Gödel's point is not that his models apply to the actual world, but rather that:

a) They describe relativistically possible worlds that differ, at most, from our own in the global distribution of matter and motion, and

b) It is conceivable that in such worlds—where time in the intuitive sense is provably absent—people would experience time much as we do.

For Gödel, continued belief in the existence of intuitive time in the actual world is "…not a straightforward contradiction; nevertheless, a philosophical view leading to such consequences can hardly be considered satisfactory."

One can take issue with Gödel's argument, but one cannot, in good conscience, agree with Stachel that Gödel has advanced "not a shred of evidence" concerning the physical and philosophical significance of his cosmology, nor that his reasoning is simply "an example of that fetishism of mathematics, to which some Platonists are so prone."

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Correction

The September 2007 issue of the *Notices* carried an article about the Mathematics Geneaology Project (http://www.geneaology.math.ndsu.edu/), an Internet database of mathematics doctorate recipients and their advisors. The article mistakenly said that David Hilbert was a student of Felix Klein. In fact, Hilbert was a "grandstudent" of Klein: Ferdinand von Lindemann was a student of Klein, and Hilbert was a student of Lindemann. The *Notices* thanks Jan R. Strooker of the Universität Utrecht for pointing out this error.

—Allyn Jackson

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Doctoral Programs in Mathematics Education in the United States: 2007 Status Report

Robert Reys, Robert Glasgow, Dawn Teuscher, and Nevels Nevels

Doctoral programs in mathematics education vary greatly, some focus on preparing collegiate teachers of mathematics and others focus on K–12 mathematics education. Individuals with doctorates in mathematics education have many different career options, including positions in higher education, K–12 mathematics supervisors, state departments of education, and the publishing industry [1]. In higher education, the positions are about equally split between mathematics departments and colleges/schools of education. In either case, the supply of mathematics educators with doctorates continues to fall short of the demand for such individuals [2, 3]. For example, over 40% of institutions of higher education searching for mathematics education faculty in 2005–06 were unsuccessful in filling those positions [4].

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Doctoral programs in mathematics education have the responsibility of preparing students to enter any of these positions, and this need to prepare graduates for such a wide range of career choices makes designing and implementing a doctoral program in mathematics education challenging. Although the number of programs that award doctorates in mathematics education has grown over the past four decades, the production of doctorates in mathematics education has not increased significantly [5]. So what do we know about the nature of doctoral programs in mathematics education? This paper addresses that question and provides a summary of the current status of doctoral programs in the United States. It is based on a national survey of doctoral programs in mathematics education conducted in early 2007 in preparation for a National Conference on Doctoral Programs in Mathematics Education.

For this report, we contacted a representative from each institution whose doctoral program was listed on the Association of Mathematics Teacher Educators (AMTE) website of doctoral programs (See http://www.amte.net). In addition, institutions that graduated at least three doctorates during each of the last two decades and institutions with recently initiated doctoral programs in mathematics education were contacted. The union of these groups produced an initial list of ninety-five different institutions. An email was sent to one faculty member in mathematics education at each institution asking her/him to complete an online survey (See the survey at http://matheddb.missouri.edu/surveys/dpsurvey/start.php). In response to the email, eight institutional representatives reported their universities did not have a doctoral program in mathematics education. (e.g., American University, University of Chicago,

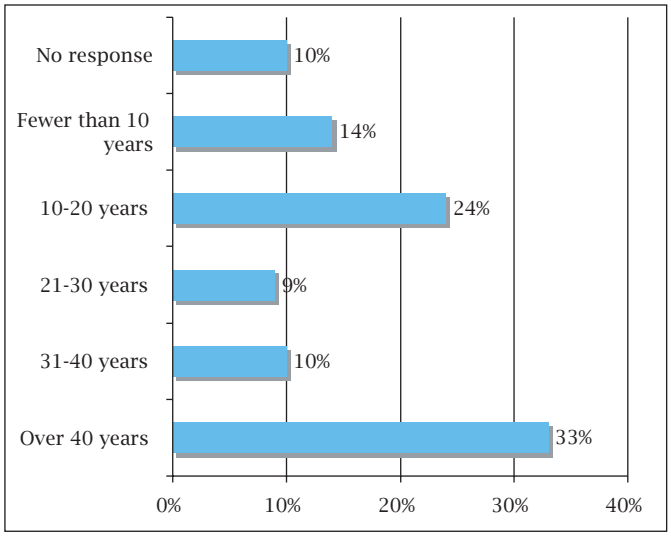

Figure 1. Number of institutions reporting the number of years their doctoral program in mathematics education program has existed (N=70).

Harvard University, University of South Dakota). The initial email together with a follow-up to those not responding to the initial request produced information on seventy of the eighty-seven remaining institutions for an 80% return rate. All results reported are based on the information self-reported by these institutional representatives. Taken collectively, the seventy institutions responding account for over 80% of doctorates in mathematics education in the United States from 1990 to 2005.

Doctoral Programs within Institutions

Institutions award different doctoral degrees in mathematics education with over two-thirds awarding only a Ph.D. Thirteen percent award only the Ed.D. and about 15% award both the Ed.D. or Ph.D.

Doctoral programs in mathematics education are housed within different colleges and departments across institutions. The overwhelming majority (76%) of institutions report their doctoral program in mathematics education resides in a College/School of Education. Twelve programs (17%) are located in other colleges, such as the College of Arts and Sciences or Natural and Health Sciences, including four programs that are jointly administered by College/School of Education and Arts and Sciences.

Each institution reported how long its doctoral program in mathematics education had been in existence (see Figure 1). As noted, one-third of the institutions have had a program for over forty years. On the other hand, 14% of institutions started new programs in the last ten years.

Doctoral Program Faculty

As noted earlier, a shortage of doctorates in mathematics education exists [2, 3, 4]. In addition, previous surveys have indicated a large percentage of current faculty members in the area are approaching retirement age [5]. We are reporting data collected in 2007 on current faculty serving seventy doctoral programs in mathematics education.

Faculty size. The seventy institutions had a total of 366 full-time faculty members, of which 201 (55%) were tenured. The number of mathematics education faculty at an institution ranged from two to nineteen, with the mode being four. Faculty members were predominately in the College of Education, but twenty-five institutions had at least one member of their faculty in the mathematics department. In fact, all or nearly all of the mathematics education faculty members at six institutions (Illinois State University, Montclair State University, Portland State University, Texas State University, University of Northern Colorado, and Western Michigan University) have an academic home in the mathematics department.

Sixteen institutions reported a postdoc position in mathematics education at their institution, and six of them reported having more than one postdoc. The majority of these postdoc positions are funded externally, but five institutions reported that internal funds are available to support postdoc appointments.

Faculty turnover. Fifty-six institutions reported 115 faculty members either moved from their institution or retired during the last five years. Thirty-four institutions reported faculty members moving from their institutions. A total of sixty retirements from thirty-eight different institutions were reported. While the majority of institutions reported one retirement, ten institutions reported two retirements, one institution reported four, and another reported five.

Projected retirements. In order to gather data about possible retirements, respondents were asked "How many of your faculty members are eligible for retirement in 1 or 2 years?" Twenty-eight institutions reported that collectively forty-two faculty members were eligible for retirement within two years and an additional thirty-four more faculty members would be eligible for retirement within five years. These numbers reflect a combined projected loss of about 20% of current mathematics education faculty in doctoral programs over the next five years. Although the projected retirement rate is high, it is not as dramatic as the data reported in the 1999 survey. In the earlier survey, institutions were asked to make the same predictions of faculty eligible to retire. One of the stunning findings was that two-thirds of the faculty members in mathematics education in 1999 were eligible to retire by 2004 [5]. A comparison of retirement information from thirty-nine institutions that participated in the 1999 and 2007 surveys confirms that for the last five years

mathematics education faculty have been retiring steadily as they become eligible to retire or perhaps a few years after they are eligible. Thus, the prediction from the 1999 survey for a large number of retirements appears to be coming to fruition, even if a few years delayed.

Hiring faculty. Given the faculty turnover in higher education mathematics education positions, one would suspect that most institutions would be regularly searching for and hiring new faculty. In fact, over 90% (64/70) of institutions reported making at least one hire in mathematics education during the last five years. Eighteen institutions made one hire, twenty-four made two hires, nine made three hires, eight made four hires, four made five hires and one institution made six hires. The latter institution is in the process of establishing a new doctoral program in mathematics education.

Respondents were asked, "Do you have any unfilled positions in mathematics education for 2006-07?" About one-third of the institutional representatives reported that they had at least one unfilled position. In response to a question that asked respondents to "rate the current supply and demand for faculty with doctorates in mathematics education," over 95% said there would be "more or many more mathematics education jobs than qualified applicants." When asked to rate the future supply (in five to ten years), almost 95% provided a similar response. It seems clear that the shortage of doctorates in mathematics education is recognized in the mathematics education community and that the shortage is likely to continue, given current graduation rates.

Over 80% of the institutional representatives reported they would be searching for one or more positions in 2007, and fifty reported they would be searching for new faculty members in mathematics education in 2008. Of these institutions, over one-half reported searching for one position and another twenty said they will be searching for two or more positions.

Admission Requirements

Admission requirements for entering a doctoral program in mathematics education vary depending on program emphasis and career goals of the candidates. For example, some institutions differentiate requirements according to whether the candidate seeks an elementary (K–8) or secondary (7–12) emphasis. The survey sought to collect information on all programs related to prerequisite mathematics content background and K–12 teaching experience.

Figure 2 displays the prerequisite mathematics content background for doctoral applicants who wish to pursue an elementary emphasis in mathematics education. Just over one-half of the institutions require or strongly encourage students to enter their program with a BS/BA in mathematics or mathematics education, and about the same number of institutions require or strongly encourage students to enter the program with a MS/MA/MEd in education.

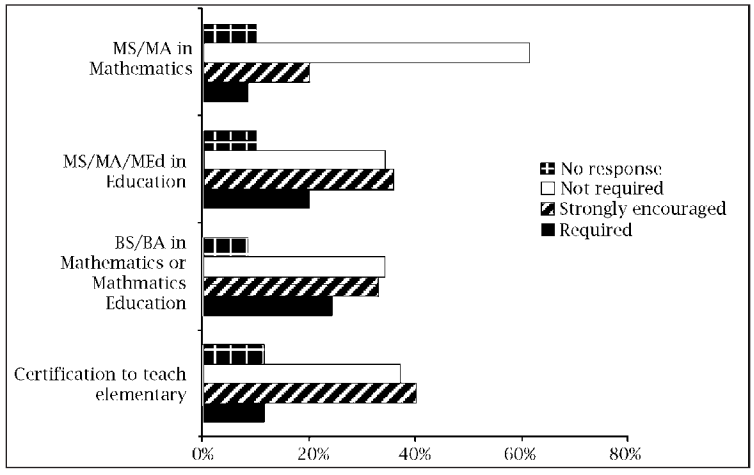

Figure 2. Levels of mathematics background for admittance to programs with an elementary mathematics education emphasis (N=70).

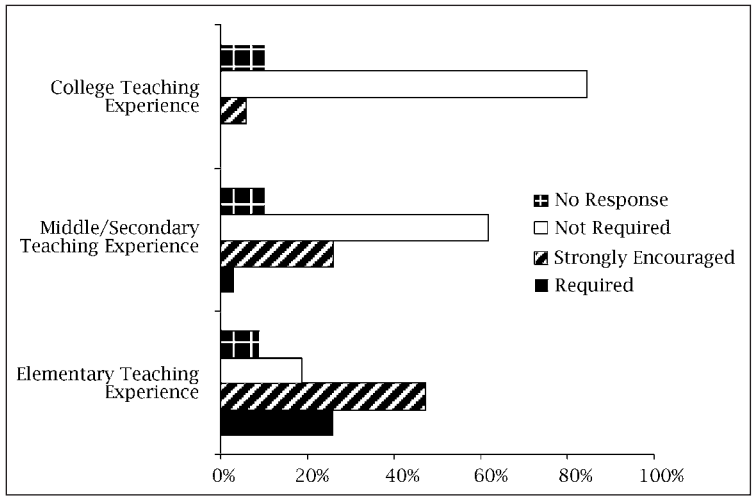

Figure 3. Levels of teaching experience for elementary emphasis (N=70).

Figure 3 displays the levels of teaching experience for doctoral applicants who wish to pursue an elementary emphasis in mathematics education. About one quarter of the institutions reported a requirement for elementary teaching experience and about one-half (47%) reported they strongly encourage students to have this experience. Although middle, secondary, and college teaching experience were not required, about one-third of the institutions strongly encouraged doctoral applicants to gain such experience. Only 11% of the institutions require doctoral students seeking an elementary emphasis to have an elementary teaching certificate; however, 40% strongly encourage students to have this certificate.

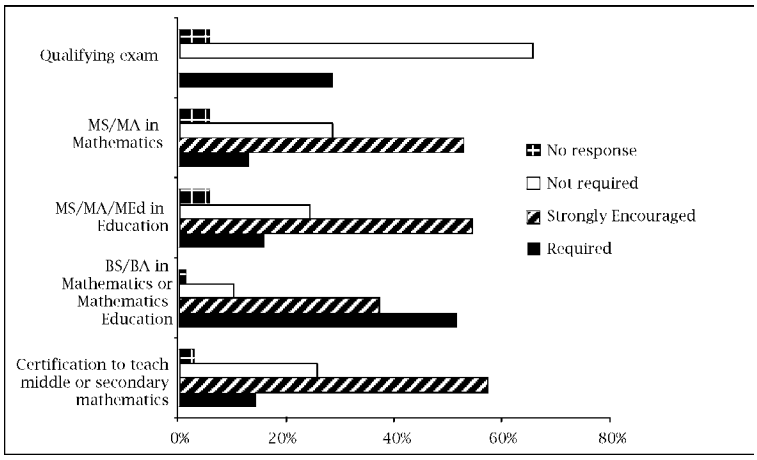

Figure 4. Levels of mathematics background for applicants seeking a secondary or K–12 emphasis in mathematics education (N=70).

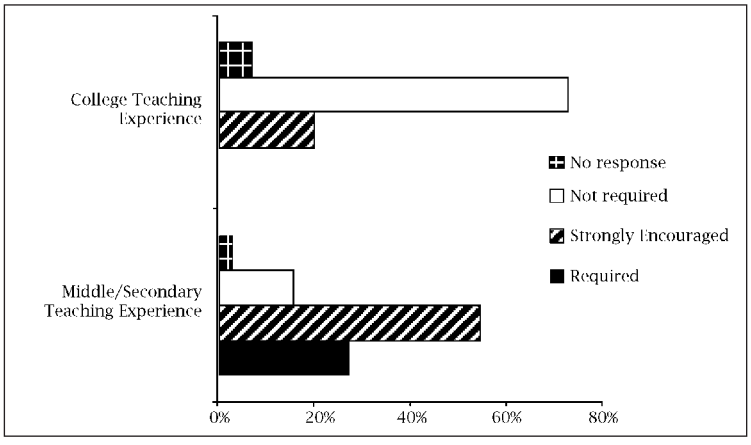

Figure 5. Levels of teaching experience for applicants seeking a secondary or K–12 emphasis in mathematics education (N=70).

As one would suspect, a different level of mathematics knowledge is required for students who wish to pursue an emphasis in secondary or K–12 mathematics education. Figure 4 shows that over half of the institutions require entering students to have a BS/BA in mathematics or mathematics education, and over half of the institutions strongly encourage students to have either an MS/MA/MEd in mathematics education or an MS/MA in mathematics before entering the program.

In contrast to admittance requirements for applicants seeking an elementary emphasis, nearly three-fourths of institutions require or strongly encourage entering students seeking a secondary emphasis to have a teaching certificate at the middle or secondary level. A little over a quarter of the institutions require entering students to take a qualifying exam, although no details were gathered regarding the nature and scope of this exam.

Figure 5 displays information about teaching experience for doctoral students wishing to pursue a secondary or K–12 emphasis in mathematics education. Twenty-seven percent of the institutions require middle or secondary teaching experience prior to entering their doctoral program, and over half (54%) report they strongly encourage students to have this experience.

In addition to reviewing academic backgrounds and teaching experiences, most institutions (87%) require applicants to take the Graduate Record Examination (GRE). Additional requirements for entering doctoral students in mathematics education include letters of recommendation, writing samples, statement of purpose, TOEFL score for international students, and faculty interviews. Other considerations noted in the selection process are depth of mathematics content knowledge, evidence of research experience, and determination of whether the goals and interests of the applicant align with the institution's doctoral program in mathematics education.

Recruitment Strategies

Institutions differ greatly in the intensity of their recruitment efforts for doctoral students in mathematics education. Some institutions rely completely on "walk-in" graduate students to enter their doctoral programs. Other institutions cast a wide net to attract potential doctoral students by recruiting nationally. Among the most cited local recruitment strategies is communication with former masters' students and local/regional teachers with encouragement to consider a doctoral degree.

Other strategies cited by respondents include posting information about doctoral programs on websites of professional organizations, such as AMTE, and also by being visible at conferences or professional meetings. Dedicating a webpage to doctoral programs is also a commonly cited way to attract students. Advertising in professional journals was not generally cited as a common recruitment strategy.

The single most often mentioned recruitment strategy cited was word of mouth. That is, current doctoral students and past graduates were recognized as ambassadors for recruiting new students into a doctoral program. Therefore, institutions producing more graduates are also producing more ambassadors. These ambassadors may contribute to the success of large established doctoral programs continuing to attract large numbers of doctoral students in mathematics education.

When a student expresses interest in a doctoral program, personal follow-up from a faculty member was frequently cited as valuable in establishing an ongoing line of communication. Delegating one faculty member to provide continuous communication with potential graduate students appears to be an effective strategy. This arrangement places a heavier responsibility on one faculty member but it also insures a common source of information is provided to each student, and that students have

individual questions answered in a prompt and consistent manner. Furthermore, the potential students know whom to contact when new questions arise.

Institutions serving full-time doctoral students listed the ability to offer substantial funding to their students as the single most effective recruitment strategy, while others indicated the lack of available funding as detrimental to their recruitment efforts. Institutions reported that financial support was about equally split among doctoral students for teaching assistantships and research assistantships. Teaching assistantships ranged from $11,000 to about $15,000 (median of $13,000) for the academic year, while research assistantships were slightly more, ranging from $11,900 to about $16,000 (median of $13,500). In addition to assistantships, about one-third of doctoral students receive additional fellowships/scholarships. These fellowships/scholarships ranged from $300 upward to $10,000. In addition, 86% of the institutions reported a full-tuition waiver for students receiving a teaching or research assistantship. Two-thirds of the institutions also provided health insurance for full time graduate students.

Demographics of Current Doctoral Students

Institutions reported that 60% of the current doctoral students in mathematics education are female and a majority (56%) are full-time doctoral students. This dominance of females continues the two decades trend of more females graduating with doctorates in mathematics education than males. Ethnicity of current doctoral students includes American Indian or Native Alaskan (0.6%), Hispanic Americans (3.0%), African Americans (8.4%), White (non-Hispanic) Americans (61%), and Asian Americans or Pacific Islanders (8.0%). Nearly one-fifth of the current doctoral students in mathematics education were international students (19%). Figure 6 provides information on both ethnicity and gender for all groups of doctoral students.

Employment their graduates pursue. Respondents were asked to rank order positions taken by their students upon completion of a doctorate in mathematics education. Positions in higher education, either colleges/schools/departments of education or mathematics departments were the two most often cited positions. Joint appointments in education and mathematics were also ranked high. Over 85% of the respondents ranked a position in higher education as the number one type of position taken by their mathematics education doctoral program graduates. The popularity of jobs in higher education for graduates with doctorates in mathematics education reported here is consistent with earlier research done by Glasgow [1]. While doctorates in mathematics education have many different job opportunities outside of academia,

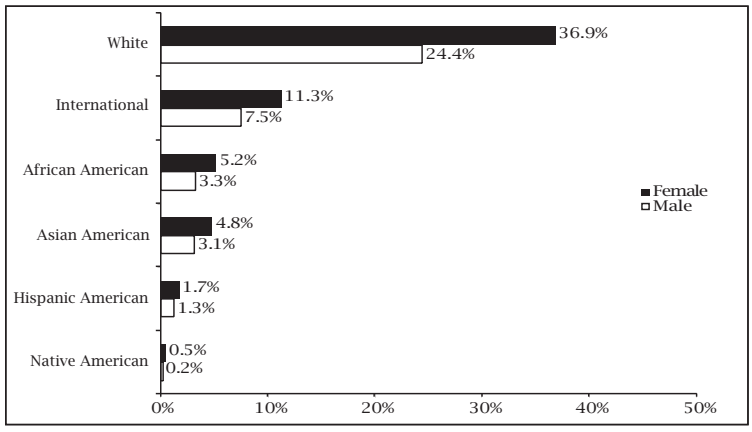

Figure 6. Gender and ethnicity of current mathematics education doctoral students.

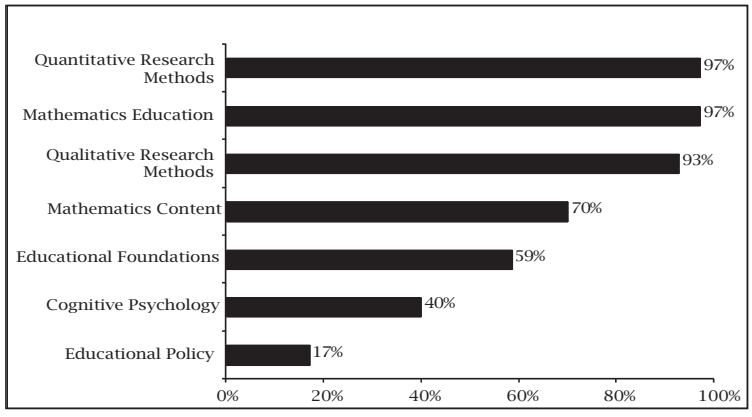

Figure 7. Percent of institutions reporting required courses in specific disciplines (N=70).

the overwhelming majority of doctorates are employed in higher education. Another 13% of respondents ranked positions as K–12 classroom teachers or mathematics coordinators as the top position taken by their graduates. About 2% indicated some other type of position as their graduates' top ranked employment. When asked in the survey to describe these other job opportunities for graduates, employment at junior/community colleges was the most frequently mentioned.

Program Requirements

About one-half the institutions reported a requirement of 81–100 graduate semester hours (post bachelors degree) to complete a doctorate, with more than one-third of the institutions requiring fewer than 81 semester hours. In an effort to determine how these hours were distributed across different areas, a question was asked about course requirements in different areas. Responses are reported in Figure 7.

Figure 7 confirms that required courses are distributed across different areas, with only two areas (Education Policy and Cognitive Psychology) below the 50% level. Note that most, but not all of the programs require coursework in mathematics.

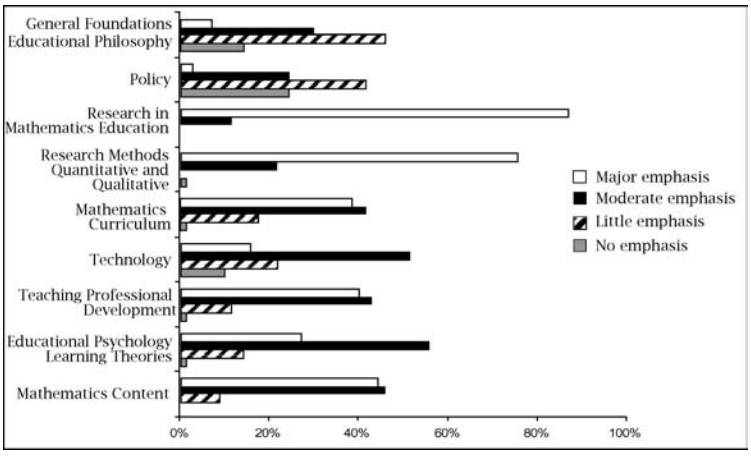

Figure 8. Percent of institutions reporting emphasis given to different content areas (N=70).

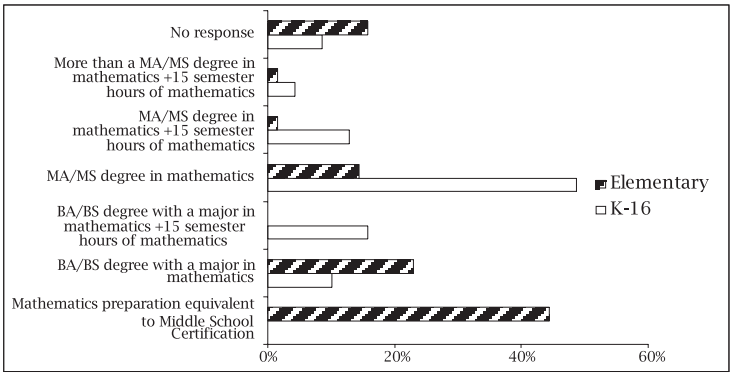

Figure 9. Percent of institutions reporting the level of mathematics course work generally attained by doctoral students focusing on elementary or a broader K–16. (N=70)

In an effort to get another perspective of the emphasis placed on coursework, respondents were asked to rate the attention given to courses in different areas. Responses are summarized in Figure 8.

Figure 8 shows the two areas with the strongest emphasis (major or moderate) in doctoral programs are Research in Mathematics Education (98%) and Research Methods (Quantitative and Qualitative) (97%), followed by Mathematics Content (90%), Learning Theories (83%), Teaching/Professional Development (83%) and Mathematics Curriculum (80%). In addition, a few institutions identified other program areas, such as Diversity/Multiculturalism, Equity and Cognitive Science as receiving moderate or major emphasis in their doctoral program.

In addition to course work, most institutions require comprehensive examinations (89%) and residency (76%), although how residency is satisfied varies across institutions. Several "beyond course" experiences were reported as required, with internships in research (31%) and college teaching (21%) being the most frequently cited. In addition, 16% of institutions required at least one presentation at professional meetings, and three institutions required a published article as part of their program expectations.

As noted earlier, the emphasis on college mathematics within a doctoral program in mathematics education varies across institutions. Dossey and Lappan [6] offered proposals to reflect different depths of mathematical knowledge for doctoral students seeking emphasis in elementary, middle, and secondary school mathematics education. Figure 9 summarizes the level of mathematics content that would generally be attained as reported by institutions in this survey for elementary and K–16 emphasis.

Nearly one-half of the doctoral students who have an elementary focus graduate with a mathematics content background similar to a middle school teacher and the others have at least the equivalent of a major in mathematics. Whereas, upon completion of their doctoral program, students with a K–16 focus graduate with a mathematics content background equivalent to an MA/MS in mathematics. The data in Figure 9 are generally consistent with the "plus six" criterion offered by Dossey and Lappan, namely that graduates have at least six educational grade levels above their teaching assignment.

Changing Nature of Doctoral Programs

As a result of the 1999 Conference on Doctoral Programs in Mathematics Education, the Association of Mathematics Teacher Educators (AMTE) established a task force to develop guidelines for doctoral programs in mathematics education. The task force produced "Principles to Guide the Design and Implementation of Doctoral Programs in Mathematics Education" [7]. This document was endorsed by the AMTE and the National Council of Teachers of Mathematics (NCTM) in 2002.

In an effort to determine the extent to which this document was known and to examine its impact among institutions with doctoral programs in mathematics education, the following question was asked: "How familiar are you with 'Principles to Guide the Design and Implementation of Doctoral Programs in Mathematics Education?'" Twenty-eight percent of respondents were unaware of the document. On the other hand, 72% of these respondents were either Somewhat Familiar (41%) or Very Familiar (31%) with the document. This latter group reported using the AMTE "Principles" to guide the development of a review or reshaping of their doctoral program or in the development of a new program. For example, one respondent said: "It served as a framework for us to develop new courses to provide a broader and deeper preparation of doctoral students." Another indicated, "We used the suggested guidelines for establishing requirements for the Ed.D, in Pedagogy with a Specialization in Mathematics Education." In addition, several respondents commented that they

used the recommendations provided in the section "Institutional Capacity Needed to Support Quality Doctoral Programs" to garner more institutional resources to support their doctoral program in mathematics education.

The 1999 conference resulted in the publication of "One Field, Many Paths: U. S. Doctoral Programs in Mathematics Education" [8]. This document provided a number of ideas and suggestions regarding doctoral programs. One survey question asked: "How familiar are you with 'One Field, Many Paths: U. S. Doctoral Programs in Mathematics Education' (2001)?"

Over three-fourths of the respondents were either Somewhat or Very Familiar with "One Field, Many Paths". Respondents reported using this document to shape their doctoral program. For example, "We used the information about shortages as a resource to the task force that recently wrote a paper for departmental discussion related to hiring a mathematics educator." Another said "It helped us implement internships and also led to annual progress reviews of our doctoral students that we designed to simulate what our graduates will experience if they pursue a tenure-track position in higher education."

These two documents were developed to share with others involved in doctoral programs in mathematics education. The survey results underscore the impact of these documents on the field. The fact that one-quarter of the respondents was not aware of either of these documents suggests there is a continuing need to spread the word about these materials and their potential for informing and stimulating discussion about doctoral preparation in mathematics education.

Two survey questions were provided to gain information about the status of doctoral programs in mathematics education. One question asked about changes in the last five years, and another asked respondents to speculate on changes for the next five years.

In response to the question "Have the requirements in your doctoral programs changed in the last five years?", institutions were about evenly split. Slightly over half of the institutions (36/70) reported no programmatic changes. Of the other institutions, the common theme was that their doctoral program in mathematics education is "constantly evolving". Large established doctoral programs were represented in each group; whereas smaller and newly established programs dominated the institutions reporting change. The changes reported were diverse, ranging from establishing a new doctoral program (three institutions) to replacing one doctoral program with another. For example, one institution reported replacing their Ed.D. program with a Ph.D., while another institution reported their Ph.D. program had been shifted from the Department of Mathematics to their College of Education.

While changes in entrance requirements were reported, the most frequently cited changes reflected expanding course offerings in mathematics education, or providing for internship opportunities. There was a trend to expand or refocus course offerings to better serve doctoral students. Institutions reported developing specific courses for doctoral students in mathematics education in a range of areas, including foundations of mathematics education, equity, curriculum, learning, policy, technology, and professional development. Although mathematics content courses provide a common foundation for nearly all doctoral students in mathematics education, no institution reported making any substantial changes in mathematics content courses targeted toward graduate students in mathematics education.

In addition to creating specific courses, research was the area most singled out for change. More emphasis was given to strengthening research preparation. This was reflected in different statements such as:

"Additional research methods are now required."

"Increased research methodology requirements, to better prepare students to understand and use a variety of research methods."

"Requiring a research apprenticeship."

"We are moving from a program for practitioners to one that promotes high professional engagement in research and scholarship."

"More emphasis on research, flexibility in core foundation courses, emphasis on presentations and publications."

High-quality preparation of doctoral students in mathematics education must go beyond coursework [9, 10, 11]. There was evidence that a number of institutions have initiated multiple "beyond coursework" experiences for their doctoral students in mathematics education. This idea was clearly captured by one institutional response that stated "We have completely redeveloped our program to emphasize a graduated series of research apprenticeship experiences that extends beyond formal courses." While this response focused on research apprenticeships, other institutions echoed a similar approach by providing teaching internships (where doctoral students co-teach undergraduate methods courses with regular faculty). Other internships cited included the art of editing, proposal writing, and co-authoring manuscripts for publication. All of these internships reflect an effort to provide opportunities for increased mentoring and closer working relationships with faculty members in mathematics education.

In looking to the future, over one-half of the institutions reported their doctoral program will be changing in the next five years. A central issue

for eight of these institutions was related to the degree designation. Institutions offering both the Ph.D. and Ed.D. were reviewing the nature of these degrees to determine if they are significantly different to justify offering separate degrees. Two institutions that offer the Ed.D. reported they were reshaping their program to offer the Ph.D. in lieu of the Ed.D. Several existing doctoral programs (whether Ph.D. or Ed.D.) were revising their program to better serve students. For example, one urban institution reported developing a doctoral program for part-time students who have a school-centered focus. Several institutions reported a change from a strong emphasis in mathematics content to more rigorous preparation in mathematics education.

The majority of changes described were specific with respect to an institution. However, among the litany of challenges being addressed by more than one institution were better accommodation of international students; strategies for preparing doctoral students who have little/no teaching experience in U.S. schools; reviewing residency requirements; developing graduate courses in mathematics to better serve doctoral students in mathematics education; establishing teams of doctoral students to work closely with individual faculty members; and providing an option of journal articles in lieu of a dissertation. These were offered as issues that are currently being discussed along with the realization that they are complex and their resolution remains a challenge.

Increasing course offerings by adding new required courses for doctorates in mathematics education was reported by many institutions. These course changes were similar to those mentioned earlier by institutions that have been changing their programs over the last five years. In addition to the wave of expanding beyond course experiences (such as co-teaching, research, and grant writing), some institutions were specifically expanding requirements to have students take courses in other disciplines, such as cognitive science and learning theories, as well as sociology and urban studies.

Taking these two questions together (i.e., Has your program changed in the last five years? Do you anticipate changes in the next five years?) it is clear that doctoral programs in mathematics education are changing. Nearly 80% of the institutions reported change has been or will be taking place in their doctoral programs in mathematics education. Given the rapid changes in society and demands for leadership in mathematics education, such ongoing program review and changes are critical to the continued growth and strengthening of doctoral programs in mathematics education.

It is surprising that no institution identified the time required to complete a doctorate in mathematics education as an issue being considered among the many program changes that have been implemented or are being considered for the future. This is in contrast to the discussions reported by Golde & Walker [10] where concern about shortening the time required to complete a doctorate was a common theme among many different disciplines.

In mathematics education, the majority of doctoral students acquire teaching experience prior to entering doctoral programs. That means these students must make significant financial sacrifices in their income to return as full-time graduate students. Every year spent as a full-time graduate student multiplies this financial sacrifice. Glasgow [1] reported that doctorates in mathematics education average eighteen years between earning their bachelor's and doctoral degrees. This means that generally they are near forty years of age before they earn a doctorate in mathematics education. This is in comparison to many fields, such as mathematics, where doctorates are usually earned while a person is still in their twenties. For doctoral students in mathematics education, this translates into less time in their career prior to retirement. Given these situations and the shortage of doctorates in mathematics education, it seems reasonable that exploring ways of shortening the time to complete a doctorate in mathematics education should at least be on the radar screen for discussion.

How changes are initiated and implemented is unique to each institution. Learning from others can be a valuable teacher. Along that line, it is said imitation is the greatest form of flattery. Several institutions reported faculty members visiting other campuses with the specific purpose of learning more about their doctoral program in mathematics education. These experiences have been used to revise and strengthen their doctoral programs. One institution reported it made "changes to reflect ideas…from other strong doctoral programs in mathematics education." Since every institution is different, there is no single approach to strengthening or revitalizing a doctoral program. Nevertheless, it seems reasonable that faculty at each institution have a responsibility to be vigilant of their doctoral program, the faculty and resources available, and factor in the students being served to ask "Are we doing the best that we can with what we have?"

"Particularly Strong" Doctoral Programs in Mathematics Education

In 2001, the AMTE created a website to allow institutions with doctoral programs in mathematics education to share common information. This resource remains available at `http://www.amte.net`. The institutional information is self reported and no effort is made to verify the information or to analyze the data in order to examine different qualities of doctoral programs. Some publications,

Rank (By # of nominations)	Institution	Number of Nomination	Rank (By # of doctorates awarded[1])
1	University of Georgia	50	2
2	Michigan State	37	20
3	University of Michigan	33	15
4	University of Missouri	29	28
5	University of Wisconsin	20	14
6	University of Maryland	18	9
7	San Diego State University/UCSD	17	80
8	Pennsylvania State University	15	24
8	University of California-Berkeley	15	32
10	Indiana University	12	7
11	Vanderbilt University	10	19
12	Stanford University	8	38
12	University of Delaware	8	62
14	Arizona State University	6	50
15	Illinois State University	5	28
16	Ohio State University	4	3
16	University of Louisville	4	New Program
16	University of New Hampshire	4	54
19	North Carolina State University	3	22
19	Texas A & M University	3	55
19	UCLA	3	73
19	University of Texas	3	4
23	Florida State University	2	5
23	Portland State University	2	98
23	Teachers College, Columbia University	2	1
23	University of Tennessee	2	39

Table 1. Institutions that were identified by at least two institutional representatives as being a "particularly strong doctoral program and one you would recommend".

[1]*Based on production of doctorates in mathematics education from 1960–2005 as reported in the* Summary Reports: Doctoral recipients from United States universities *prepared by the National Opinion Research Center, Chicago, IL.*

such as the *U.S. News and World Reports*, provide annual rankings of undergraduate and graduate programs. Although some rankings are based on quantitative data, such as the number of scholarly papers published, often rankings are based on perceptions that have been established. In such cases, the beauty of a doctoral program is in the eye of the beholder.

We report here a slightly different approach. Respondents were asked to identify "particularly strong" doctoral programs in mathematics education. The assumption in this effort is that faculty members involved in a doctoral program in mathematics education are aware of different programs around the country. Their familiarity may result from a variety of experiences, ranging from being a graduate of a program, working with colleagues in other programs, and knowing graduates of certain programs. It may also be influenced by the visibility of faculty members from specific institutions during professional meetings and via scholarly publications. Any and all of these factors are likely to influence the perception of a program.

This was the philosophy used in ratings of graduate programs generated by the National Research Council in its first report on the status of research-doctorate programs in the sciences (including the broad fields of biological sciences, physical sciences and mathematics, and social and behavioral sciences), engineering, and arts and humanities in the United States [12]. The ratings were updated in a second report published in 1995 [13]. The process used to form ratings of graduate programs in various fields involved asking faculty members of other programs to rate an institution's program based on two criteria. The criteria were: 1) scholarly quality of program faculty, and (2) effectiveness in educating research scholars/scientists. To facilitate the raters' decisions, a list of faculty for a particular program was provided. The NRC ratings have been used by other organizations, such as the American Mathematical Society, to group graduate programs in particular academic disciplines. There has been no similar effort done with regard to identifying nationally recognized doctoral programs in mathematics education. And given the grain size of doctoral programs in mathematics education, this type of reporting is unlikely by national media.

The current survey collected data from representatives of seventy institutions with doctoral programs in mathematics education, and as mentioned earlier, these institutions account for more than 80% of doctorates in mathematics education.

The programs range in size of faculty and the production of doctoral students. Some produce two to ten doctoral students each year, but the majority graduate one to two doctoral students in mathematics education over several years. One respondent from each of these institutions was asked to respond to the following question:

"Identify six institutions that you think are particularly strong and that you would currently recommend to a potential doctoral student in mathematics education (other than your own institution)."

Seven respondents did not identify any institutions. An examination of the data revealed that all of the respondents honored the request to not make a self-nomination. About half the institutions listed six institutions, and the remaining nominated from one to five institutions. The data in Table 1 were compiled by tallying the number of times an institution was listed, and all institutions identified by at least two respondents are reported. Forty different institutions were nominated by sixty-three respondents, but only three institutions (University of Georgia, Michigan State University, and University of Michigan) were named by a majority of institutions. The University of Georgia is also the only institution among the top five producers of doctorates in mathematics education to be named by a majority of institutions. In fact a number of the large producers of doctorates, such as Teachers College and Florida State University received only two nominations.

It is recognized that as faculty and resources come and go, programs change. This survey provides a current perspective of program visibility from one's peers. Hopefully, these data will be useful as institutions reflect on how their doctoral program in mathematics is perceived by others.

One limitation of this survey is that only one representative from each institution provided information. It is not known whether their selection of institutions was based solely on their own opinion or reflected discussions with other colleagues. Despite whatever limitations are associated with this effort, Table 1 provides a unique view of "particularly strong" doctoral programs in mathematics education.

Summary

The information reported here has been gathered from representatives of seventy institutions in the United States with doctoral programs in mathematics education. It provides current information on faculty and institutional program characteristics.

Both the Ph.D. and Ed.D. degrees are available, but the Ph.D. is offered by over 80% of the institutions, and exclusively by two-thirds of the institutions. Nearly 90% of the doctoral programs in mathematics education reside in the College/School of Education.

The majority of institutions offering doctoral programs in mathematics education have been established for over thirty years, while about 15% of the programs are less than ten years old. Regardless of the duration of their program, nearly four-fifths of the institutions reported that their doctoral program in mathematics education is undergoing constant review and experiencing frequent changes. One of the most frequently cited changes from the program descriptions provided in the 1999 survey was the initiation of beyond-course experiences (such as co-teaching, research, and grant writing) into many doctoral programs.

Over half of the current full-time faculty members in mathematics education were tenured, and over 80% of them are in Colleges/Schools of Education. In some institutions, all of the mathematics education faculty members are in the mathematics department, yet over one-third of the institutions reported having at least one mathematics educator in the mathematics department.

All institutions were aware of the shortage of doctorates in mathematics education. Consequently, recruiting new faculty and retaining current faculty was recognized as a continuing challenge. During the last five years, four-fifths of the institutions reported losing one or more faculty members to either retirement or being hired by another institution.

As the need for more doctorates in mathematics education increases, the recruitment of doctoral students has become more intense. Word of mouth from prior graduates of doctoral programs was identified as one of the most effective means of recruiting new students. Support (financial, tuition waivers, health insurance) for full-time doctoral students varied among institutions, but the largest variance was in the number of scholarships/fellowships available and their range of financial support.

In addition to recruiting doctoral students in mathematics education, students pursuing a Ph.D. in mathematics might consider pursuing a support area or a collateral field in mathematics education. Taking courses in mathematics education as part of a program in mathematics is consistent with recent calls for change in doctoral programs made by Hyman Bass [14] and Tony Chan [15]. For example, Chan argues that students in Ph.D. programs in mathematics "should learn about different subfields within mathematics and interact with disciplines outside of mathematics." Developing a knowledge base in mathematics education would be in that spirit, and would also likely enhance the marketability of a new Ph.D. in mathematics for a position in higher education.

This survey provides some information on doctoral programs perceived as "particularly strong" by faculty at peer institutions. These results suggest that some of the larger producers of

doctorates are perceived as "particularly strong" but other large producers were not frequently nominated. It is a reminder that doctoral programs in mathematics education are constantly changing, and as these changes occur, perceptions of these programs by their peers change.

Our hope is that this survey provides information about the opportunities that exist in mathematics education, and these data will be useful in reflecting on the nature of doctoral programs in mathematics education. It is only a snapshot, and it only reflects information gathered from seventy institutions. Nevertheless, it provides a current set of benchmarks to use for thoughtful discussion, and ultimately, action as our mathematics education community continues to work toward the never-ending task of improving doctoral programs in mathematics education. We are in agreement with Lee Shulman who said, "The Ph.D. is expected to serve as a steward of her discipline or profession, dedicated to the integrity of its work in the generation, critique, transformation, transmission, and use of its knowledge." [10, p. 122]

Our hope is that information reported here will facilitate institutional efforts to strengthen their doctoral programs in mathematics education and thereby prepare future stewards of our discipline.

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Survey of Non-Desarguesian Planes

Charles Weibel

The abstract study of projective geometry first arose in the work of J.-V. Poncelet (1822) and K. von Staudt (1847). About 100 years ago, axiomatic frameworks were developed by several people, including G. Fano, D. Hilbert, E. H. Moore, I. Schur, and O. Veblen. It was a very active branch of mathematics during 1900–1935, and a partial list of people then in this field reads like a "Who's Who of Mathematics": A. Albert, E. Artin, Dickson, Jacobson, Jordan, Moufang, Wedderburn, Zassenhaus, and Zorn. It was reinvigorated by R. Baer and M. Hall about 50 years ago. To my delight, it has many connections to modern mathematics.

Definition. By a *projective plane* we mean a set, whose elements are called *points*, together with a family of subsets called *lines*, satisfying the following axioms:

(P1) Any two distinct points belong to exactly one line;
(P2) Any two distinct lines meet in exactly one point;
(P3) There exists a *quadrilateral*: a set of four points, no three on any line.

Perhaps the most familiar example is the real projective plane $\mathbb{P}^2(\mathbb{R})$, whose "points" are the lines through the origin in Euclidean 3-space and whose "lines" are planes in 3-space. Of course the projective plane $\mathbb{P}^2(F)$ over any field F will also be a projective plane. The smallest projective plane is $\mathbb{P}^2(\mathbb{F}_2)$, where $\mathbb{F}_2$ is the field of 2 elements. It has 7 points and 7 lines, and is often called the *Fano plane*, having been discovered in 1892 by Gino Fano [Fano].

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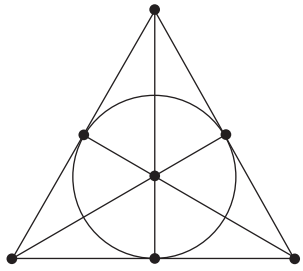
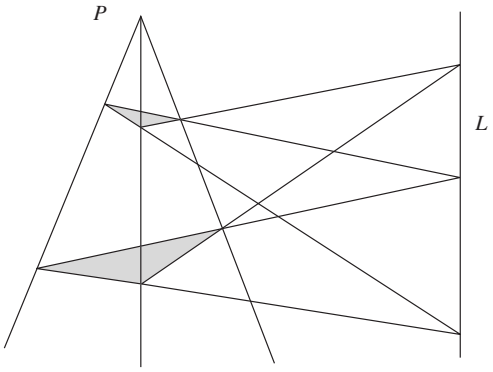


The Fano plane of 7 points.

If there are exactly $q+1$ points on any (hence every) line, we say that the plane has *order* q. A plane of order q has q^2+q+1 points, and also q^2+q+1 lines. Of course, $\mathbb{P}^2(\mathbb{F}_q)$ has order q. It is conjectured that the order q of a finite projective plane must be a prime power; this is known only for $q \le 11$. (Tarry proved in 1901 that $q \neq 6$; $q \neq 10$ was only proven in 1988 by a computer search [Lam] and even the case $q = 12$ is still open.)

A projective plane is the same as a 2-dimensional projective geometry. By a d-dimensional *projective geometry*, we mean a set (of points), together with a family of subsets (lines) satisfying the following axioms, taken from the 1910 book by Veblen and Young [VY]:

(PG1) Two distinct points lie on exactly one line;
(PG2) If a line meets two sides of a triangle, not at their intersection, then it also meets the third side;
(PG3) Every line contains at least 3 points;
(PG4) The set of all points is spanned by $d+1$ points, and no fewer.



Desargues' Theorem.

The feature that makes projective planes more complicated than higher dimensional projective geometries is that Desargues' Theorem need not hold, an observation made by Hilbert in [Hi]. We say that two triangles are *perspective* from a point P (resp., from a line L) if their corresponding vertices are on lines through P (resp., edges meet on L).

Desargues' Theorem.[1] *Let F be any field (or division ring). Two triangles in $\mathbb{P}^d(F)$ are perspective from a point if and only if they are perspective from a line.*

Definition. A projective geometry is said to be *Desarguesian* if whenever two triangles are perspective from a point, they are perspective from a line, and vice versa. If this property fails, it is said to be *non-Desarguesian*.

This terminology is due to Hilbert [Hi], who proved (see [VB]) that any Desarguesian projective geometry is just a projective space $\mathbb{P}^d(F)$ over a field (or division ring) F. If $d \geq 3$, every d-dimensional projective geometry is Desarguesian. The projective plane over Cayley's Octonions (see below) is non-Desarguesian.

Every finite projective plane of order $q \leq 8$ is Desarguesian, and hence is isomorphic to the plane $\mathbb{P}^2(\mathbb{F}_q)$. There are three distinct non-Desarguesian planes of order 9, each consisting of 91 points. We will describe them below; the first of these was constructed by Veblen and Wedderburn in [VW]; it is coordinatized by the Quaternionic near-field (see below).

Collineations

Automorphisms of a projective plane must preserve lines, so they are called *collineations*. The collineations form a group, and the geometry of the plane is reflected by the structure of this group.

A collineation $\alpha \neq 1$ is called a *perspective* if it fixes every point on a line L (the *axis* of α). Every perspective has a unique fixed point C (the *center* of α) such that α fixes every line through C [Hall, 20.4.1]; α is called a *C-L collineation* and has no fixed points other than C and the points of L. If $C \in L$, α is also called a *translation* with axis L; there are no fixed points except those on L.

Not every collineation fixes the points on a line. For example, if α is an automorphism of a field F then $(x:y:z) \mapsto (\alpha x:\alpha y:\alpha z)$ is a collineation of $\mathbb{P}^2(F)$ whose fixed points form the sub-plane $\mathbb{P}^2(F^\alpha)$. If $a, b, c \in F$ are distinct, the collineation $(x:y:z) \mapsto (ax:by:cz)$ fixes only $(0:0:1)$, $(0:1:0)$ and $(1:0:0)$.

The collineation group of $\mathbb{P}^2(F)$ is the semi-direct product of $PGL_2(F)$ and $\mathrm{Aut}(F)$. (Cf. [Hall, 20.9.4].) If L_∞ is the line at infinity in $\mathbb{P}^2(F)$, and O is the origin, the O-L_∞ collineations are the dilations $(x, y) \mapsto (mx, my)$ in $PGL_2(F)$. If $C \in L_\infty$, the C-L_∞ collineations are just the translations $(x, y) \mapsto (x + a, y + b)$ such that (a, b) is on the line OC.

A plane is said to be *(P, Q)-transitive* if it is (P, L)-transitive for every line L through Q. This condition is related to near-fields, as we shall see below.

The following conditions, due to Baer [Baer], are related to the linearity and distributivity of the corresponding ternary rings.

Definition. The plane is said to be *C-L transitive* if, for every line $L' \neq L$ through C, the group of C-L collineations acts transitively on the points of L' (with the obvious exception of C and $L \cap L'$). This condition is equivalent to the "little Desargues property", also called the (C, L)-Desarguesian condition, that two triangles that are perspective from C are perspective from L.

We say that a projective plane is a *translation plane* with respect to a line L if it is C-L transitive for every $C \in L$. That is, for every $C \in L$ the group of C-L collineations acts transitively on the points (other than C) on every line L' through C. Instead of "for every $C \in L$", it suffices to check two points on L; see [Hall, 20.4.4]. Translation planes are related to quasi-fields, as we shall see below.

Example. The Quaternionic non-Desarguesian plane of order 9, described on page 1298, is a translation plane with respect to a distinguished line L, which is fixed (as a set) by every collineation. The collineation group of this plane has order 311,040, far less than the order (42,456,960) of $PGL_2(\mathbb{F}_9)$. See [Ha43].

[1] *Girard Desargues (1591–1661) discovered this property for projective spaces over $\mathbb{R}$.*

Modular lattices

We briefly mention the connection between projective geometry and modular lattices. Readers interested in this connection may want to read the recent article [Gr] by G. Grätzer in the *Notices*.

A lattice is said to be *modular* if $x \vee (y \wedge z) = (x \vee y) \wedge z$ for every x, y, z with $x \leq z$. Finite-dimensional modular lattices are graded by height; height-one elements are called *points*, and height-two elements are called *lines*. A lattice is *complemented* if for every x there is an x' so that $x \vee x' = 1$, $x \wedge x' = 0$. In a finite-dimensional complemented modular lattice, every element is a $\vee$ of points. A lattice is *simple* if it has no quotient lattices. The following result is proven in IV of Birkhoff's 1940 book [Bff].

Theorem. *There is a 1–1 correspondence between d-dimensional projective geometries and simple complemented modular lattices of dimension $d+1$, $d \neq 0$. Under this correspondence, the projective geometry is the set of points and lines of the lattice.*

One of Dilworth's theorems states that every finite-dimensional complemented modular lattice is a product of a Boolean algebra and projective geometries.

The Lenz-Barlotti classification

There is a classification of projective planes by Lenz [Lenz], refined by Barlotti, according to the possible central collineation groups. This classification contains 53 possible classes, all but one of which exists as a group; 36 of them exist as finite groups. Between 7 and 12 exist as finite projective planes, and either 14 or 15 exist as infinite projective planes. The list is given on pp. 123–126 of [Dem]. Rather than attempt any kind of exhaustive description of this incomplete listing, I shall focus on the classes of projective planes that I find most interesting.

Moufang Planes and Alternative Division Rings

I shall begin with Moufang planes, a class of (infinite) projective planes with many collineations that was studied in the 1930s by Ruth Moufang [Mou].

Definition. A *Moufang plane* is a projective plane Π with the property that, for every line L, the group of automorphisms fixing L pointwise acts transitively on the "affine plane" $\Pi - L$. In other words, Π is a translation plane for every line.

Moufang related these planes to alternative algebras; the algebra allows us to give a complete classification. In particular, every finite Moufang plane is a classical plane $\mathbb{P}^2(\mathbb{F})$ over some finite field $\mathbb{F}$. To explain this, we need some algebraic definitions.

An *alternative ring* A is an abelian group equipped with a multiplication that is left and right distributive and that satisfies the two laws $(xx)y = x(xy)$, $y(xx) = (yx)x$. This implies that the symmetric group Σ_3 acts on the associator $\langle x, y, z\rangle = (xy)z - x(yz)$ via the sign representation; the name (due to Zorn) comes from the fact that the alternating group A_3 acts trivially on the associator.

Definition. An *alternative division ring* A is an alternative ring with a 2-sided identity 1, such that every $a \neq 0$ has a two-sided inverse a^{-1}. (It follows that the nonzero elements form a "loop," i.e., $a^{-1}(ab) = b = (ba)a^{-1}$ for all b.) Of course, an associative alternative division ring is just an (associative) division ring.

If A is an alternative division ring, we can form a projective plane $\mathbb{P}^2(A)$ following the classical formulas: points are lines through the origin in A^3, and lines are planes through the origin.

Theorem. ([Hall, 20.5.3]) *There is a 1–1 correspondence between alternative division rings and Moufang planes, with A corresponding to $\mathbb{P}^2(A)$.*

Example. The classical Octonions form an 8-dimensional alternative division algebra over $\mathbb{R}$ (the reals). This gives a very interesting non-Desarguesian plane.

The Artin-Zorn theorem ([Z]) states that every finite alternative division ring is a field; it follows that every finite Moufang plane is just the classical $\mathbb{P}^2(\mathbb{F}_q)$.

The Octonions are an example of a *Cayley-Dickson algebra*. A Cayley-Dickson algebra is an 8-dimensional algebra A whose maximal subfields are quadratic over F, with any two elements not in a subfield generating a quaternion algebra.

Remark. Cayley-Dickson algebras over F are classified by the étale cohomology group $H^3_{et}(F, \mathbb{Z}/2)$; the Cayley-Dickson division algebras over F correspond to the nonzero elements; the Cayley-Dickson algebra corresponding to zero is "split".

This follows from the fact that the split Cayley-Dickson algebra contains the matrix algebra $M_2(F)$ as a quaternion subalgebra, and its automorphism group is the algebraic group G_2. Thus the set of isomorphism classes of Cayley-Dickson algebras over F is the same as the nonabelian cohomology set $H^1(F, G_2)$. It is a deep theorem that $H^1(F, G_2) \cong H^3_{et}(F, \mathbb{Z}/2)$.

In fact (see [SpV, 1.7]) the norm form of a Cayley-Dickson algebra A is a Pfister form $\langle\langle a, b, c\rangle\rangle$. Now 3-Pfister forms are a special class of 8-dimensional quadratic forms and are also classified by $H^1(F, G_2)$. Thus there is a 1–1 correspondence between Cayley-Dickson algebras, elements of $H^3_{et}(F, \mathbb{Z}/2)$, and 3-Pfister forms.

Theorem. *Every nonassociative alternative division ring is a Cayley-Dickson algebra over an infinite field F. Moreover, if $\frac{1}{2} \in F$ then Cayley-Dickson algebras over F are in 1–1 correspondence with the elements of $H^3_{et}(F, \mathbb{Z}/2)$.*

The first part of this theorem was proven by Bruck and Kleinfield [BK] and Skornyakov in 1950. The second part follows easily from the above remark. Note that $H^3_{et}(\mathbb{F}_q, \mathbb{Z}/2) = 0$ for every finite field, which provides another proof of the Artin-Zorn theorem.

Remark. P. Jordan [J49] and Freudenthal [Fr51] gave a "projective" description of the projective plane $\mathbb{P}^2(A)$ over any Cayley-Dickson algebra A (they used the Octonions). Their construction uses the exceptional simple Jordan algebra J over A. The points of $\mathbb{P}^2(A)$ are the irreducible idempotents in J, and the lines are the annihilators of these idempotents. Note that J is the 27-dimensional algebra of Hermitian 3×3 matrices over A with multiplication $X \circ Y = (XY + YX)/2$.

Ternary Rings

Any field (or division ring, or alternative division ring) F has a ternary operation $T(a, b, c) = ab + c$, making it a "ring" in the following sense.

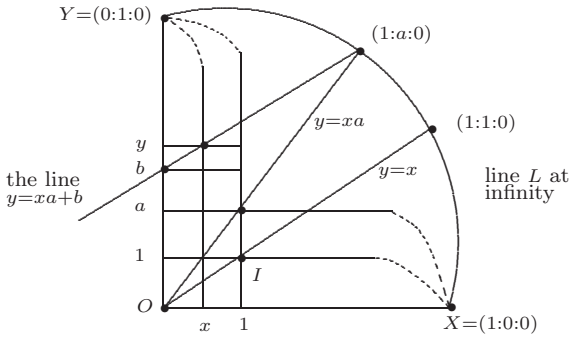
Definition. A *ternary ring* R is a set R with two distinguished elements $0, 1$ and a ternary operation $T : R^3 \to R$ satisfying the following conditions:

- (T1) $T(1, a, 0) = T(a, 1, 0) = a$ for all $a \in R$;
- (T2) $T(a, 0, c) = T(0, a, c) = c$ for all $a, c \in R$;
- (T3) If $a, b, c \in R$, the equation $T(a, b, y) = c$ has a unique solution y;
- (T4) If $a, a', b, b' \in R$ and $a \neq a'$, the equations $T(x, a, b) = T(x, a', b')$ have a unique solution x in R;
- (T5) If $a, a', b, b' \in R$ and $a \neq a'$, the equations $T(a, x, y) = b$, $T(a', x, y) = b'$ have a unique solution x, y in R.

If R is finite, the condition (T5) is redundant, since it can fail only if the evident self-map of R^2, $(x, y) \mapsto (b, b')$, is not a bijection, i.e., if $T(a, x, y) = T(a, x', y')$ and $T(a', x, y) = T(a', x', y')$ for some $(x, y) \neq (x', y')$—and this contradicts either (T3) if $x = x'$ or (T4) if $x \neq x'$.

Theorem. ([AS, 4.2]) *Every ternary ring R determines a projective plane $\mathbb{P}^2(R)$ and a distinguished quadrilateral $Q = (X, Y, O, I)$ in that plane.*

The construction of $\mathbb{P}^2(R)$ follows a familiar construction of $\mathbb{P}^2(F)$. There is one line L "at infinity" consisting of $Y = (0 : 1 : 0)$ together with special points $(1 : a : 0)$, $a \in R$; we set $X = (1 : 0 : 0)$. The other points are the elements in R^2, with $O = (0, 0)$ and $I = (1, 1)$. For each x, there is a "vertical" line consisting of Y together with the points (x, y). For each (a, b) there is a line consisting of $(1 : a : 0)$ and the set of solutions (x, y) to $y = T(x, a, b)$; in slope-intercept form, this is the line $y = xa + b$.



The ternary operation $y = T(x, a, b) = xa + b$.

Example. Let F be a field, or a division ring, or an alternative division ring. The projective plane determined by its associated ternary ring is just $\mathbb{P}^2(F)$.

Plane coordinates. Conversely, any quadrilateral (X, Y, O, I) in a projective plane gives rise to a ternary ring R, via a coordinate system. Here is a sketch of the construction, due to Von Staudt (1856-1860 for $\mathbb{R}$) and Hilbert (1899).

If R denotes the set of points on the line OI, except the intersection $(1 : 1 : 0)$ of OI with $L = XY$, then there is a standard labeling of the points not on L (the "affine points") by the set R^2; O is $(0, 0)$ and I is $(1, 1)$. (It is useful to think of $L = XY$ as the line "at infinity", the line OX as the X-axis and the line OY as the Y-axis.) We say that a line has slope m if it meets L in the same point as the line through $(0, 0)$ and $(1, m)$. Each line not through Y has a standard slope-intercept description, which we may symbolically write as $y = xm + b$. The formula $y = T(x, m, b)$ makes R into a ternary ring.

It is clear that ternary rings are in 1–1 correspondence with isomorphism classes of projective planes and distinguished quadrilaterals.

Theorem. ([AS, 4.4]) *If R and R' are two ternary rings for the same projective plane, arising from quadrilaterals Q and Q', then $R \cong R'$ if and only if there is an automorphism of the plane sending Q to Q'.*

Corollary. *Every Desarguesian plane has a unique associated ternary ring, which is an associative division ring.*

Indeed, $PGL_2(F)$ acts transitively on quadrilaterals in $\mathbb{P}^2(F)$.

Isotopisms. An *isotopism* between ternary rings (R, T) and (R', T') is a set of three bijections (F, G, H) from R to R' such that $H(0) = 0$ and $HT(a, b, c) = T'(Fa, Gb, Hc)$. It defines an isomorphism $\alpha : \mathbb{P}^2(R) \cong \mathbb{P}^2(R')$ fixing O, X, and Y by $\alpha(x, y) = (F(x), H(y))$; lines of slope m

map to lines of slope $G(m)$. Conversely, every isomorphism of projective planes fixing O, X, and Y comes from an isotopism of the coordinate ternary rings. (See [Kn65].)

Near-fields

Near-fields constitute a beautiful class of ternary rings with $T(a,b,c) = ab + c$. They were introduced in 1905 by Dickson [D05] and named in [Z36]. Although Dickson found all finite near-fields in [D05], his list was shown to be exhaustive only in Zassenhaus' 1936 thesis [Z36]. We describe them now, as motivation for linear ternary rings.

Definition. A (right) *near-field* is an associative ring K with 1 whose non-zero elements $K^\times = K - \{0\}$ form a group under multiplication, such that:

(a) multiplication is right distributive: $(a + b)c = ab + ac$; and
(b) If $a, a', b \in K$ and $a \neq a'$, the equation $xa - xa' = b$ has a (unique) solution x. Uniqueness in (b) is automatic; if K is finite, all of axiom (b) is redundant.

Clearly, the center F of a near-field K is a field, and (by right distributivity) K is a subalgebra of $\mathrm{End}_F(K)$; a finite near-field is an algebra over a finite field $\mathbb{F}_q$.

Geometric interpretation. A ternary ring R is a near-field if and only if it is (X, Y)-transitive. Associativity is equivalent to being X-OY transitive; in this case the map $(x, y) \mapsto (ax, y)$ is a collineation sending the line $y = xm+b$ to the line $y = (ma)x+b$. (See [St, 12.3.3].)

The quaternionic near-field J_9. Additively, J_9 is a vector space over $\mathbb{F}_3$ on basis $\{1, i\}$. Multiplicatively J_9 is the subset $J = \{0, \pm 1, \pm i, \pm j, \pm k\}$ of the quaternions, and $(J_9 - \{0\}, \cdot)$ is the quaternionic group of order 8. The identification between the additive and multiplicative descriptions is given by setting $j = 1 + i$ and $k = 1 - i$. (See the addition table below.) The verification that J_9 is a near-field is an easy exercise.

Veblen and Wedderburn observed in 1907 that the projective plane $\mathbb{P}^2(J_9)$ cannot be Desarguesian since J_9 is not a division ring.

+	0	1	-1
0	0	1	-1
i	i	j	-k
-i	-i	k	-j

Addition table for the quaternionic near-field.

Dickson near-fields. Here is Dickson's construction of a finite near-field K with center $\mathbb{F}_q$; see [Hall, 20.7.2]. Let ν be an integer whose prime factors all divide $q - 1$; if $q \equiv 3 \pmod 4$ we require $4 \nmid \nu$. The abelian group underlying K will be $\mathbb{F}_{q^\nu}$ but the product $\circ$ in K is defined by $w \circ u = u \cdot w^{q^i}$, where $q^i = 1 + j(q-1) \mod \nu(q-1)$, and $u = \zeta^{k\nu+j}$ for a fixed primitive root of unity $\zeta \in \mathbb{F}_{q^\nu}$. It is a subalgebra of $M_\nu(\mathbb{F}_q)$; if $\nu = 1$ then $K = \mathbb{F}_q$.

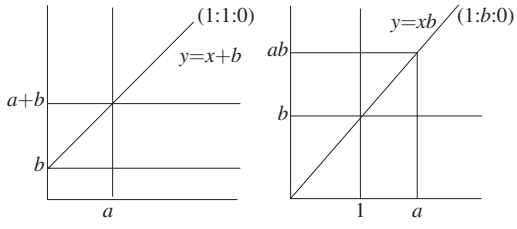
To illustrate, note that $w \circ \zeta = \zeta w^q$, and $\zeta \circ \zeta = \zeta^{q+1}$. If $\nu = 2$, ζ generates a cyclic subgroup of $K^\times$ of order $2(q-1)$ containing $\mathbb{F}_q^\times$. When $q = 3$ and $\nu = 2$, K is J_9, the unique near-field of order 9 described above.

Exceptional near-fields. Zassenhaus [Z36] classified all finite near-fields in 1936; in addition to the Dickson near-fields described above, there are exactly 7 exceptional near-fields—of orders 5^2, 7^2, 11^2, 11^2, 23^2, 29^2 and 59^2. They are described on page 391 of [Hall]. For example, the multiplicative group of the exceptional 25-element near-field is $SL_2(\mathbb{F}_3)$, embedded in $GL_2(\mathbb{F}_5)$ with generators the two matrices of order 4 and 3, $A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & -2 \\ -1 & -2 \end{pmatrix}$. The two 11-element exceptional near-fields have multiplicative groups $SL_2(\mathbb{F}_5)$ and $SL_2(\mathbb{F}_3) \times C_5$.

Zassenhaus' classification is related to some interesting group theory that lurks behind the structure of near-fields. A *Frobenius group* is a semidirect product $G = K \rtimes H$ such that $H \cap gHg^{-1} = 1$ for every $g \notin H$. Elementary considerations (see [AB], pp. 172–174) show that G acts 2-transitively on $K \cong G/H$, with K acting freely, and that only the identity fixes two elements.

For example, if K is a near-field then the group G of "affine" transformations $g(x) = xm + b$ is such a Frobenius group with $H = K^\times$. The following result was proven in [Ha43]; see [Hall, 20.7.1].

Theorem. (Hall) *Let $G = K \rtimes H$ be a Frobenius group. If H acts transitively on K then K has the structure of a near-field and G is the group of affine transformations $g(x) = xm + b$ of K.*



Addition and multiplication in R. Horizontal lines meet in X, and vertical lines meet in Y.

Linear Ternary Rings

In a ternary ring R, it is convenient to write $a + b$ and ab for $T(a,1,b)$ and $T(a,b,0)$, respectively. Axioms (T1) and (T2) imply the familiar identities $a+0 = a = 0+a$, $1a = a = a1$ and $a0 = 0 = 0a$ for all a. We may think of $(R,+,\cdot)$ as the underlying binary ring of R.

In fact, both $(R,+,0)$ and $(R-\{0\},\cdot,1)$ are *loops*, or nonassociative groups, meaning that there is a unique solution x to each equation $xa = b$, and also to each equation $ax = b$. This follows from (T4) and (T5), by setting $a' = 0$.

Definition. A ternary ring is called *linear* if $T(a,b,c) = ab + c$ and $(R,+,0)$ is a group. We can also describe a linear ternary ring as a group $(R,+,0)$ equipped with a multiplication and an identity 1, satisfying $a0 = 0 = 0a$, and such that both $xa = xa' + b$ and $ay = a'y + b$ have unique solutions for every $a \neq a'$ and b.

Clearly, if R is a linear ternary ring then so is the opposite ring R^{op}. Any near-field K is a linear ternary ring, and if K is not a division ring then K^{op} cannot be a near-field because it is left distributive but not right distributive. In particular, J_9 and J_9^{op} are distinct linear ternary rings (and yield non-isomorphic projective planes of order 9).

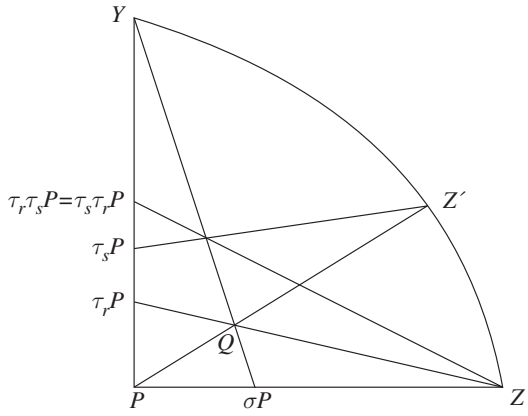
Theorem. *A ternary ring R is linear if and only if its projective plane is Y-L transitive. That is, if and only if the group of Y-L collineations acts transitively on the affine points on any vertical line in the plane.*

This is proven in [Hall, 20.4.5]. The constructive half of the proof is elementary: for each $r \in R$, the mapping $\tau_r : (x,y) \mapsto (x, y+r)$ determines a collineation of the corresponding plane, with center Y and axis L. Hence the group $G(Y,L)$ of Y-L collineations acts transitively on the set $\{(a,y) : y \in R\}$ of affine points on any vertical line in the plane, and we may identify $G(Y,L)$ with $(R,+)$.

Examples exist showing that $(R,+)$ need not be abelian; in this case, every collineation with axis L has center Y; see [Hall, p. 359].

Lemma. *Let R be a ternary ring, and let V be the y-axis OY. Then the plane $\mathbb{P}(R)$ is X-V transitive if and only if (a) $T(x,m,b) = xm + b$, and (b) $(R - \{0\},\cdot)$ is a group.*

Proof. If multiplication is a group then each $(x,y) \mapsto (xm,y)$ is a collineation fixing the y-axis, the point X, and the lines $y = b$; these are enough to make the plane (X,V) transitive. Conversely, the X-V collineation σ_m sending $(1:m:0)$ to $(1:1:0)$ on L must map the line $y = T(x,m,b)$ to $y = T(x,1,b)$ and map (x,y) to (xm,y). Hence if $y = T(x,m,b)$ then $y = T(mx,1,b) = xm + b$. Now $\sigma_n\sigma_m$ and σ_{mn} send $(x,1)$ to $((xm)n,1)$ and $(x(mn),1)$; as both send $(1,1)$ to $(mn,1)$ they must agree and hence $(xm)n = x(mn)$. □



Proof that addition is commutative, using σ.

Proposition. (Baer) *Let R be a linear ternary ring. If there is a nontrivial Z-L collation σ for some point $Z \neq Y$ on L, then $(R,+)$ is abelian. Also, the abelian group R is either torsion-free or an elementary p-group for some prime p.*

Proof. (See figure.) For $r \in R$, let τ_r be the vertical translation $\tau_r(x,y) = (x, y+r)$. If P is any point not on L, we must have $\sigma\tau_r(P) = \tau_r\sigma(P)$ because both operations take P to the intersection Q of the lines $\sigma(PY)$ and $\tau(PZ)$. Hence σ commutes with every τ_r. Since $\sigma\tau_r$ fixes L and no point off L, it must be a Z'-L collineation for some Z' distinct from Y and Z. Hence $\sigma\tau_r$ and σ must both commute with τ_s for every $s \in R$, which implies that τ_r and τ_s commute, i.e., $r + s = s + r$.

If $(R,+)$ has torsion, there is an element r with $pr = 0$ for some prime p. But then $(\sigma\tau_r)^p = \sigma^p$; this collineation must be the identity because it fixes the distinct lines PZ and PZ'. In turn this yields $\tau_s^p = (\sigma\tau_s)^p$ and hence $\tau_s^p = 1$ for all $s \in R$. □

Hughes planes. (See [Hu] [Hall, 20.9.13].) This is an infinite family of projective planes that are not transitive; their ternary rings are not quasi-fields (see below). Let K be a near-field of odd order q^2 whose center is $\mathbb{F}_q$. There is a 3×3 matrix α over $\mathbb{F}_q$ of order $q^2 + q + 1$ that cyclically permutes the points and also the lines of $\mathbb{P}^2(\mathbb{F}_q)$, when regarded as a collineation. The Hughes plane is given by extending α to a collineation of the plane coordinatized by K. The lines in the Hughes plane are just the iterates under α of the $q^2 - q + 1$ lines $y = xm + b$, where $b = 1$ or $b \notin \mathbb{F}_q$.

Hughes has shown in [Hu] that the ternary ring R associated to this plane has the opposite near-field K^{op} as its underlying binary ring, but that R is not a linear ternary ring.

Quasi-fields and Translation Planes

Definition. A (right) *quasi-field* R is a linear ternary ring in which $+$ is abelian and multiplication is right distributive: $(a+b)c = ac + bc$.

In other words, a quasi-field is an abelian group $(R, +, 0)$, with a right distributive multiplication (with 1) forming a loop on $R - \{0\}$, with the additional condition that, for every $a \neq a'$ and b, there is a unique solution x to $xa - xa' = b$.

Quasi-fields were called *Veblen-Wedderburn systems* in the literature before 1975, since they were first studied in the 1907 paper [VW]. A quasi-field R with associative multiplication is just a (right) *near-field*.

Although we do not yet have a satisfactory classification of quasi-fields, their importance stems from their geometric interpretation as the coordinate rings of translation planes. This interpretation was given in [VW].

Veblen-Wedderburn Theorem. *A ternary ring is a quasi-field if and only if its projective plane is a translation plane with respect to the line L at infinity.*

The required C-L collineations with center $C = (1 : m : 0)$ are just the translation operations $(x, y) \mapsto (x + a, y + am)$; the group of these acts transitively on every line through C.

Warning. Different quadrilaterals in a translation plane may induce non-isomorphic quasi-fields. For example, different quadrilaterals in the unique non-Desarguesian translation plane of order 9 induce four non-isomorphic quasi-fields of order 9. Given nonzero $r_1, r_2 \in R$, we can form a new quasi-field $(R, +, \circ)$ by defining $u = x \circ y$ when there is a z so that $ur_1 = xz$ and $yr_2 = r_1 z$; see [Ha43].

9-element ternary rings. There are five non-isomorphic quasi-fields of order 9, all linear. Two of course are $\mathbb{F}_9$ and J_9. Two others are Hall algebras associated to the polynomials $z^2 \pm z - 1$ (see below). The last one is the strange quasi-field U in our next example. Except for $\mathbb{F}_9$, all of them arise from systems of coordinates in the unique non-Desarguesian translation plane of order 9, and are described in the Appendix to [Ha43].

Example. (Hall [Ha43, p. 274].) Here is a strange quasi-field of order 9. Its center is $\{0, 1\}$ instead of $\mathbb{F}_3$. Let U be a 2-dimensional left vector space over $\mathbb{F}_3$ on basis $\{1, a\}$ equipped with right action $(a + i)(-1) = -a + (-i + 1)$, $(-a + i)(-1) = -a + (-i - 1)$, $i \in \mathbb{F}_3$. Since we have $(-x)y = -(xy)$, the multiplication is given by the table:

row· col	-1	a	a+1	a-1	-a	-a+1	-a-1
a	-a+1	a-1	1	-a	a+1	-a-1	-1
a+1	-a	-a-1	a-1	-1	1	a	-a+1
a-1	-a+1	-1	-a	a+1	-a+1	1	a

The abelian group $(R, +)$ underlying a quasi-field is a vector space over a division ring F. Thus if R is finite its order must be p^n for some prime p. To see this, let E denote the ring of endomorphisms of the abelian group $(R, +)$, and let Σ denote the set of all nonzero automorphisms $x \mapsto xa$ in E. Since Σ operates irreducibly on $(R, +)$, Schur's lemma implies that $F = \mathrm{End}_E(\Sigma)$ is a division ring and that R is a vector space over F.

Left quasi-fields. A *left quasi-field* R is a linear ternary ring that is left distributive. That is, R^{op} is a right quasi-field.

Pickert proved that the plane $\Pi = \mathbb{P}^2(R)$ associated to a left quasi-field R is the dual plane of the plane associated to R^{op}. (The point (a, b) of $\mathbb{P}^2(R)$ corresponds to the line $y = ax - b$ of $\mathbb{P}^2(R^{op})$, Y corresponds to L_∞, and the point $(1 : b : 0)$ at infinity corresponds to the vertical line $x = b$; see [St, 11.2.4].)

It follows that Π is the dual of a translation plane (with respect to Y): for every line L through Y, the group of Y-L collineations acts transitively on the lines (other than L) through every point on L (except Y). (See [Dem, 3.1.36].) These planes are sometimes called *shear planes*.

Semi-fields

We now turn to semi-fields, a class of linear ternary rings that complements near-fields, first studied by Dickson in 1906. The name dates to 1965 and is due to Knuth (see [Kn65]); they are sometimes called "nonassociative division rings" or "distributive quasi-fields".

Definition. A *semi-field* S is an abelian group $(S, +, 0)$, with a bilinear multiplication (with 1) with the additional condition that for every a and b there are unique solutions x, y to $xa = b$, $ay = b$. That is, S is a linear ternary ring in which $+$ is abelian and multiplication is left and right distributive.

It is easy to see that a semi-field contains a field. There are non-associative semi-fields of every prime power order p^n with $n \geq 3$, $n \neq 8$. None are alternative.

I believe that it is possible to give a classification of all finite semi-fields in terms of descent data. The families of semi-fields in this section provide supporting evidence for this belief. We have already encountered two classes of semi-fields: associative division algebras and alternative algebras (Cayley-Dickson algebras).

Example. The smallest non-associative semi-fields have order 16; there are 23 of these, 18 isotopic to S_0 and 5 isotopic to S_ω; see [Kn65]. Here S_0 is the 2-dimensional algebra over $\mathbb{F}_4$ on generator λ with multiplication $(a + \lambda b)(c + \lambda d) = (ac + b^2 d) + \lambda(bc + a^2 d + b^2 d^2)$. This is a semi-field with 6 automorphisms.

Another 16-element semi-field S_ω is defined by the product $(a+\lambda b)(c+\lambda d) = (ac+\omega b^2 d) + \lambda(bc+a^2 d)$, where $\omega \in \mathbb{F}_4 - \{0,1\}$. It has only 3 automorphisms.

Example. More generally, suppose that $q = p^n$ and $q > p$ (if $p = 2$ we also require n even). Then there exists an $\omega \in \mathbb{F}_q$ that is not a $(p+1)^{st}$ power. We define S_ω to be the 2-dimensional ring over $\mathbb{F}_q^2$ with basis $\{1,\lambda\}$, and product

$$(a+\lambda b)\circ(c+\lambda d) = (ac+\omega b^p d) + \lambda(bc+a^p d).$$

This is a semi-field of order q^2 with exactly $p+1$ automorphisms: $\lambda \mapsto \zeta\lambda$, $\zeta^{p+1} = 1$; see [AS, 7.2]. S_ω is a twisted form of the algebra S_1, and the forms of S_1 over $\mathbb{F}_q$ are classified by $\mathbb{F}_q^\times/\mathbb{F}_q^{\times(p+1)}$.

Jordan division algebras. Let A be an alternative division algebra over an (infinite) field F. Then not only is A a semi-field, but it has a canonical involution. Consequently, we can form the 27-dimensional exceptional Jordan algebra J of Hermitian 3×3 matrices over A. It is known [P81] that J is a semi-field.

Similarly, if D is any division algebra then the associated Jordan algebra (i.e., D with product $(xy+yx)/2$) is a semi-field if and only if no subfield E of D has a Galois group of order 2. This is the case, for example, when $\dim D$ is odd.

Non-unital trick. A *non-unital semi-field* S is a ring with bilinear product for which the equations $xa = b$, $ay = b$ have unique solutions (if it had a unit it would be a semi-field). For each $0 \neq u \in S$, the following trick produces a product $\circ$ with unit u^2, making S into a unital semi-field. The maps $s \mapsto su$ and $t \mapsto ut$ are linear automorphisms of S, so $\circ$ is determined by the formula $(su)\circ(ut) = st$.

Albert's twisted semi-fields. (See [AA][Kn65].) Let p be a prime and $q = p^m$ with $q > 2$. Then from $\mathbb{F}_{q^n}$ we may construct a semi-field S with q^n elements, depending on an element c not a $(q-1)^{\text{st}}$ power in $\mathbb{F}_{q^n}$; c exists because $q > 2$.

The ($\mathbb{F}_q$-bilinear) product $\langle x,y\rangle = xy^q - cx^q y$ on $S = \mathbb{F}_{q^n}$ makes S into a non-unital semi-field. The non-unital trick above (for $u = 1$) turns S into a semi-field.

It is easy to see that $x\circ y = xy$ for $x \in \mathbb{F}_q$, and that S is a commutative $\mathbb{F}_p$-algebra. If $n > 2$, Albert has shown that the powers of any element not in $\mathbb{F}_p$ do not associate; this also implies that S is not an alternative algebra.

Cubic semi-fields. Dickson discovered the following class of 3-dimensional commutative semi-fields in [D06]. Suppose that $1/2 \in F$ and that $x^3 + ax^2 + bx + c$ is an irreducible cubic over F. Then the vector space S with basis $\{1,i,j\}$ and commutative product $i^2 = j$, $ij = c + bi + aj$, $j^2 = (4ac - b^2) - 8ci - 2bj$ is a semi-field.

Kaplansky studied these algebras in [Kap], showing that they all arise as irreducible twisted forms of the algebra D presented with basis $\{u_1,u_2,u_3\}$ and multiplication $u_i^2 = 0$, $u_iu_j = (u_i + u_j - u_k)/2$; $1 = \sum u_i$.

These cubic semi-fields over F are classified by the irreducible cubic extension fields of F (up to conjugacy). Since $\mathrm{Aut}(D)$ is the symmetric group Σ_3 (permuting the u_i), the claim follows from an analysis of the nonabelian cohomology calculation that $H^1(F,\Sigma_3) = \mathrm{Hom}(\mathrm{Gal}(\overline{F}/F),\Sigma_3)$.

We now turn to the geometric interpretation of semi-fields. The following result characterizes them as being simultaneously shear planes and translation planes.

Theorem (Albert). *Every ternary ring isotopic to a semi-field S is a semi-field, and two semi-fields are isotopic if and only if they coordinatize the same plane. Moreover, S is a semi-field if and only if:*

(1) *$\mathbb{P}^2(S)$ is C-L_∞ transitive for every point C on the line L_∞ at infinity, and*
(2) *for every line L through Y, and every P on L ($P \neq Y$), the group of Y-L collineations acts transitively on the lines though P (excluding L).*

Standard collineations of a semi-field plane. A semi-field plane has lots of collineations. Translation by any pair (h,k) in S^2 is a collineation fixing X and Y, acting on affine points by $(x,y) \mapsto (x+h, y+k)$. For $r \in S$, the *shear* translation $(x,y) \mapsto (x, y+xr)$ fixes the y-axis OY but does not fix the point X.

These standard collineations form a normal subgroup of all collineations. The quotient is the group of collineations fixing O, X and Y—and we have seen that this is isomorphic to the group of autotopisms of S. (See [Kn65].)

Classification of Translation Planes

We conclude our survey by returning to translation planes (and quasi-fields). We have described several types of quasi-fields: division rings, alternative algebras, near-fields, and semi-fields. Each characterizes something about the geometry of its translation plane, so it is not surprising that a geometric taxonomy exists.

A classification of translation planes (with respect to a line L) was given by André in [And], using the set Z of admissible pairs (p,q) of points on the line L. We say that (p,q) is *admissible* if for each line H through q, other than L, the group of p-H collineations acts transitively on the points of $L - \{p,q\}$.

Classification of Translation Planes. *Every translation plane belongs to exactly one of the following 6 classes.*

(1) *$Z = \emptyset$; the quasi-field R is not a left quasi-field.*
(2) *$Z = \{(p,p)\}$ for one p; R is a semi-field but is not alternative.*
(3) *Z consists of all pairs (p,p); R is a Cayley-Dickson alternative algebra.*
(4) *$Z = \{(p,q),(q,p)\}$; R is a near-field but not a division ring, and $|R| > 9$.* [2]
(5) *Z contains exactly one pair (p,q) for each $p \in L$, and also contains (q,p); R is the unique near-field J_9 of order 9 (other than $\mathbb{F}_9$).*
(6) *Z is all pairs; R is a division ring (or a field) and the plane is $\mathbb{P}^2(R)$.*

Example. If a plane is a translation plane for two lines, then it is a translation plane for every line through their intersection; see [Hall, 20.5.1]. If the intersection is the distinguished point Y, this implies that (Y,Y) is admissible, so we are in cases (2), (3) or (6) of the classification theorem. In this case, R is a semi-field in which every element $a \neq 0$ has a two-sided inverse a^{-1}, and $a^{-1}(ab) = b$. See [Hall, 20.5.2].

Hall algebras. Here is a family of quasi-fields introduced in [Ha43]. Suppose that $f(x) = x^2 - rx - s$ is an irreducible polynomial (in x) over a field F. Let R denote the vector space F^2 with $(a,b)c = (ac,bc)$ and the following multiplication:

$$(a,b)(c,0) = (a,b)c = (ac,bc);$$

$$(a,b)(c,d) = (ac + d^{-1}b(rc + s - c^2), ad - bc + rb) \quad \text{if } d \neq 0$$

$$= (sv,0) + (c,d)(u + rv), \quad \text{if } (a,b) = u + (c,d)v,\ u,v \in F.$$

This is a quasi-field in which every $x \neq F$ satisfies the equation $f(x) = 0$. It is also an algebra over F. If $F = \mathbb{F}_2$ then $R = \mathbb{F}_4$; if $|F| > 2$, then R is not a division ring, because $x^2 - rx - s = 0$ has at least three solutions.

If $F = \mathbb{F}_3$, then $f(x) = x^2 + 1$ yields the unique near-field J_9 of order 9, described above. The choices $f(x) = x^2 \pm x - 1$ yield two of the other quasi-fields of order 9. (There is another strange quasi-field of order 9 in which the center is $\{0,1\}$ instead of $\mathbb{F}_3$. It is described on page 1300 above.)

André planes. Let Γ be a finite group of automorphisms of a field L with fixed subfield K, and $\beta : L^\times/K^\times \to \Gamma$ a function with $\beta(1) = 1$. For $a,b \neq 0$ in L, define $a \circ b = a^{\beta(b)}b$. Then $(L,+,\circ)$ is a quasi-field. If $\beta(a) = \beta(xa)$ for all x of norm 1, the associated translation plane is called an *André plane*. Lüneburg has proven that André planes are characterized by the fact that there is an abelian collineation group A that fixes two vertical lines L_1, L_2 such that, for any other vertical line H, its stabilizer subgroup A_H acts transitively on $H - \{Y\}$. (See [Lü, II.12].) Little is known about André planes. A typical result is that there are only 3 non-Desarguesian André planes of order 25 [Chen].

[2] *Such a plane may also be coordinatized by quasi-fields that are not near-fields, but all of its coordinatizing near-fields are isomorphic.*

Acknowledgments

This survey was written at the request of Israel Gelfand, who taught me the importance of ternary rings. I am also grateful to Dan Krashen, who showed me the connection to cohomology sets, Pfister forms, and Jordan algebras. Finally, the research for this article was supported by NSA grants and the Oswald Veblen Fund at the Institute for Advanced Study.

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WHAT IS . . .

Boy's Surface

Rob Kirby

Boy's surface is an immersion of the real projective plane in 3-dimensional space found by Werner Boy in 1901 (he discovered it on assignment from Hilbert to prove that the projective plane could not be immersed in 3-space) [1]. Many beautiful pictures of it can be found on the Internet, but here we will build it from the inside out, so as to see clearly the features of Boy's surface.

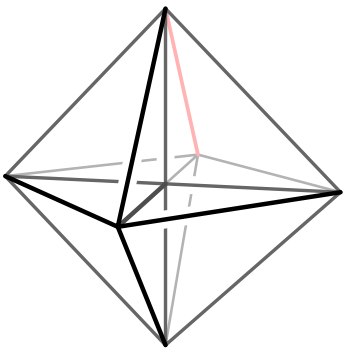

Figure 1.

To begin, there must be a triple point where three planes intersect as with the coordinate planes in R^3. In fact, the number of triple points of an immersed surface S in R^3 must be congruent, modulo 2, to the square of the first Stiefel-Whitney class of S in $H^2(S; Z/2)$.

Take a square in the xy-plane with vertexes at $(\pm 1, 0, 0)$ and $(0, \pm 1, 0)$, and similar squares in the xz-plane and yz-plane, as drawn in Figure 1. The 1-skeleton of this polyhedron is the logo for the Park City Mathematics Institute; the logo inspired a general-audience talk I gave on this subject in July 2006 at Park City. The construction given here is not original, though I know of no written account. I learned about it at the PCMI from Bob Edwards, whose memory of the construction was triggered by the logo.

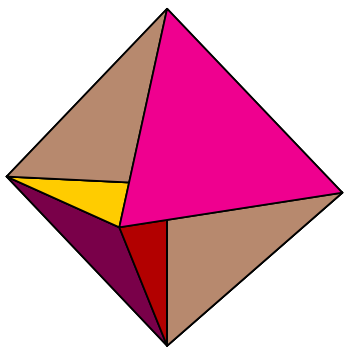

Figure 2.

Now add to Figure 1 four 2-simplexes to "opposite" triangles; two, dark pink and purple, are drawn in Figure 2. "Opposite" means that no two of the four 2-simplexes have an edge in common. This polyhedron P is a 2-manifold, for each edge lies on the boundary of a square and a triangle; at any of the six symmetric vertexes we have the cone on a figure-8 (a circle immersed in the plane with a double point), which is abstractly a 2-disk. The squares and triangles form RP^2 because their Euler characteristic is $1 = 6 - 12 + 7$.

Note that if we take a cube and cut off each of its vertexes in a maximal way, then we have a solid with 8 triangular faces (corresponding to the original 8 vertexes) and 6 squares, one each in the middle of an original side. If antipodal points are identified, then we get RP^2 and the polyhedron P constructed above. Note also the symmetries of this object.

The defect in P is that this polyhedron is not smoothly immersed. The edges can be rounded, but the 6 cone points cannot. To remedy this, pair off the 6 cone points by 3 "opposite" edges, (in Figure 1 the red edge is such an edge). Each edge may be used to "cancel" the figure-8 cones at the ends of the edge, as illustrated in Figures 3-7.

A neighborhood of the top vertex is drawn in Figure 3. This neighborhood can be flattened out to look like the polyhedron in Figure 4; it is still a cone on a figure-8. A neighborhood of the red edge is homeomorphic to the polyhedron in Figure 5, having cones at both ends. Flattening then gives the polyhedron Q in Figure 6. Q is the image of a rectangle, immersed except at the cone points. This can be changed, relative to the boundary, to the immersed image of a rectangle as in Figure 7, where the two cone points have been canceled.

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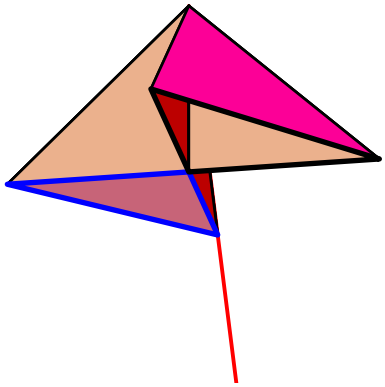
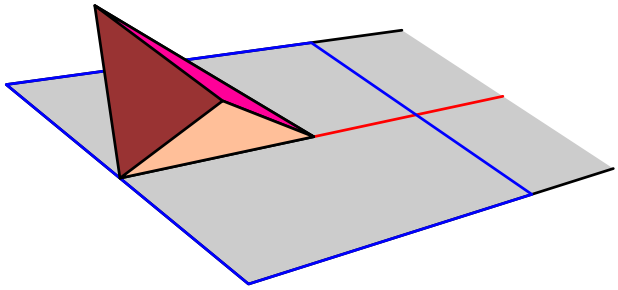
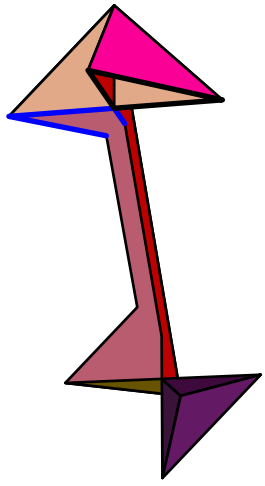
Bill Casselman provided the graphics for the article. He is professor of mathematics at the University of British Columbia and graphics editor for the Notices. *His email address is* cass@math.ubc.ca.







Figures 3 (left), 4 (above), and 5 (right).

When this process is done to each of the three pairs of vertexes (cone points), then we have obtained Boy's surface, an immersion of the projective plane. It is a piecewise linear immersion, but its edges and corners can easily be rounded to get a smooth immersion.

Note that there is an immersed circle of double points that passes through the triple point three times. This immersed circle consists of the original coordinate axes in R^3 together with the three edges that were used in canceling pairs of cone points. A neighborhood of that circle in RP^2 is of course a Möbius band, and its complement a disk that is embedded.

This smooth immersion (or any other) may be used to see Smale's eversion of the 2-sphere [3]. This is an arc of immersions that turns the 2-sphere inside out; its existence was proved by Smale and various constructions ([2]) have been carried out since. The normal 0-sphere bundle (the endpoints of the normal $[-1,1]$-bundle) is an immersed 2-sphere, and it may be turned inside out by taking the endpoints and moving them through each other to their opposites along $[-1,1]$. This is not generic, for at half time, the 2-sphere is immersed as Boy's surface, whereas a generic arc of immersions will not have a 2-dimensional multiple point set.

To evert a round 2-sphere, one has to see how to move the round 2-sphere through immersions to the 0-sphere bundle, then pass it through itself, and then go back to the round 2-sphere by the inverse of the first step.

The first (and third) step is known to be possible. An immersed 2-sphere has a Gauss map defined by taking a point on the 2-sphere to a point on the standard unit 2-sphere in R^3 that is the end point of a unit normal vector pointing out of the immersed 2-sphere. (This requires orienting the 2-sphere, and then everting will move the outward normal to the inward normal.) The normal 0-sphere bundle to Boy's surface has a degree-one Gauss map because the outward normal on one of the triangular faces (bowed slightly out) is the only one to hit that point on the round 2-sphere.

Smale's classification of immersions in this dimension states that, if two immersed 2-spheres have Gauss maps with the same degree, then they are connected through an arc of immersions. Thus the eversion exists, although Boy's surface only shows how to turn the immersed 0-sphere bundle inside out.

Acknowledgments: I thank Bill Casselman for his excellent figures, and the Clay Mathematics Institute for its support during the 2006 Park City Mathematics Institute.

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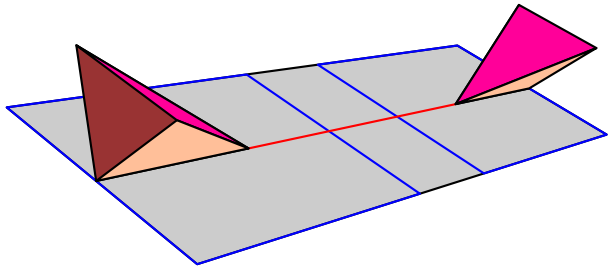

Figure 6.

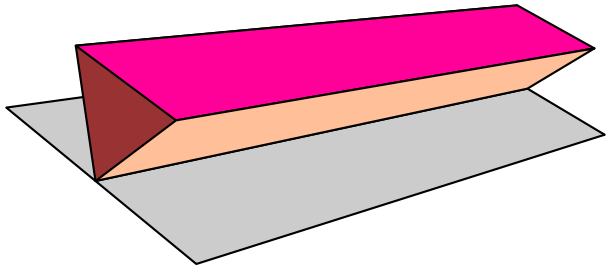

Figure 7.

Valuing and Evaluating Teaching in the Mathematics Faculty Hiring Process

Derek Bruff

Introduction

A number of articles have been published online and in the *Notices* offering advice for graduate students and others seeking faculty positions in mathematics departments.[1] Although the advice shared in these articles is undoubtedly useful, much of it is based on the authors' anecdotal experiences applying for jobs or hiring new faculty members. Motivated by my interest in preparing graduate students to communicate clearly about their teaching effectiveness while on the job market, I decided to pursue some more-systematic research into the academic hiring process in mathematics.[2] To that end, I conducted a survey of hiring committees during the summer of 2006. The survey was designed to determine (a) how these search committees valued the teaching effectiveness of applicants, especially in comparison with the applicants' potential for research, and (b) how the committees evaluated the teaching effectiveness of applicants in initial application materials, especially teaching statements, and in later interviews and other interactions. The survey replicated and extended the work of Meizlish and Kaplan, who surveyed faculty hiring committees in six other disciplines and encouraged me to build on their work by conducting a similar survey in mathematics. Results of the Meizlish and Kaplan survey are available in [9] and [4].

Methods

Potential survey respondents were determined by analyzing job advertisements on the American Mathematical Society's Employment Information in the Mathematical Sciences website, `http://www.ams.org/eims`. All such advertisements available on November 17, 2005, were collected. Of these 563 advertisements, 270 were found to be ones made by departments of mathematics at colleges and universities in the United States that could result in the hiring of tenure-track assistant professors.

During the summer of 2006, these 270 job advertisements were analyzed to determine the kinds of application materials requested by hiring committees. At this time, 19 advertisements were discarded because of insufficient information about requested application materials. Then the survey mentioned above, a 16-question online survey, was sent to the chairs of the search committees associated with the remaining 251 job advertisements.[3] A total of 156 surveys were completed, yielding an overall response rate of 62%.[4]

As the survey data made clear, departments at different types of institutions value and evaluate teaching effectiveness differently. Thus, many of the results presented here are categorized using the groups used to classify departments in the AMS Annual Survey. Departmental Groups I, II, and III are composed of doctoral-granting departments, ranked by "scholarly quality of program faculty" [6]. Group M contains departments granting a master's degree as the highest degree. Group B contains departments granting a baccalaureate degree only. Since job advertisements from statistics and applied mathematics departments were not included, Groups IV and V are not used.

Figure 1 shows the proportion by departmental group of tenure and tenure-track hires made by mathematics departments during the 2004–05 hiring season [6], as well as the proportion by

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[1] *Examples of such articles include [8] and [3], and further examples can be found in the references of [8].*

[2] *See [9] for a review of the literature exploring the academic hiring process in other disciplines.*

[3] *See* `http://www.derekbruff.com/research/hiring_study.htm` *for a copy of the survey.*

[4] *This response rate is similar to that of the Meizlish and Kaplan study [9], 61%. As they point out, this response rate exceeds the response rates in other, similar studies as well as the response rates typical of online surveys.*

departmental group of the job advertisements and survey responses included in this study. Although this study concerns the 2005–06 hiring season, not the 2004–05 hiring season, Figure 1 provides some evidence that the results of this study are reflective of the overall job market. For instance, the proportions of Group B job advertisements analyzed (39%) and Group B survey responses collected (42%) in this study are consistent with the proportion of tenure and tenure-track hires made by Group B schools during the 2004-05 hiring season (38%). Thus, Group B departments are not over-represented in the results presented here. Similar arguments can be made for the other departmental groups.

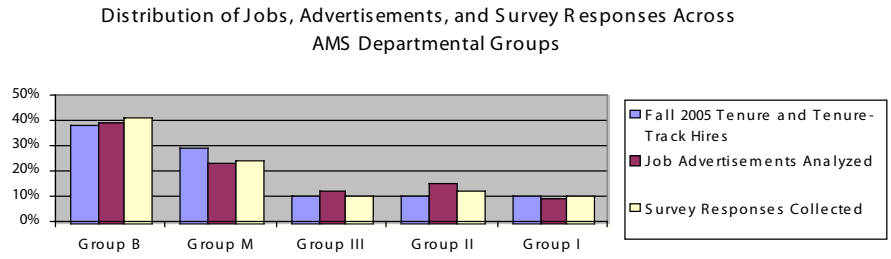

Figure 1.

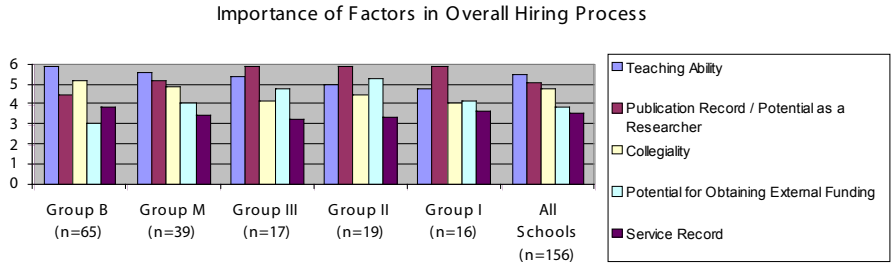

Figure 2.

Results

Application Materials

Job advertisements were analyzed to determine the nature of application materials requested by search committees, as mentioned above. Of these initial application materials, letters of recommendation and curriculum vitae (CVs) were requested in almost all of the job advertisements (100% and 99%, respectively). Other commonly requested application materials included cover letters (60%), research statements (58%), teaching statements (54%), transcripts (42%), and letters of recommendation addressing the applicant's teaching (40%). Less commonly requested were AMS cover sheets (23%) and requests to submit materials via `MathJobs.Org` (10%).

The kinds of application materials requested varied by department type. For instance, teaching statements were requested by 69% of Group B schools, but only about 35% of Group I, II, and III schools. Similarly, research statements were requested by about 72% of Group I and II schools, but only 51% of Group B schools. This is consistent with differences in how these departments reported valuing teaching and research in survey responses.

Valuing Teaching

One survey question[5] was designed to determine how teaching ability is valued by search committees in comparison to other potential factors. Among the set of all survey respondents, teaching ability was rated as a more important factor in the overall hiring process than research potential. On a scale of 1 to 6, teaching ability was rated at 5.56, while research potential was rated at 5.15, a statistically significant difference ($p < 0.001$). Collegiality was the next most important factor in the overall hiring process with a rating of 4.84. Not surprisingly, different institution types valued these and other factors differently. See Figure 2.

Survey results also indicate that teaching effectiveness is valued more by search committees as the hiring process continues.[6] Using the same 6-point scale, survey respondents gave teaching a 5.13 rating of importance in deciding whom to invite for first-round interviews (telephone or conference interviews), a 5.26 rating in deciding whom to invite for campus interviews, and a 5.46 rating in deciding to whom to offer positions. These differences are statistically significant ($p < .0001$). Survey respondents were not asked to rate the importance of other factors (e.g., research potential) at various stages of the hiring process, so it is unclear if the

[5] *Survey respondents were asked, "Considering the* overall hiring process, *what importance did your committee assign each of the following factors while evaluating candidates?" Five factors were listed (see Figure 2) and survey respondents were asked to identify each factor independently as extremely unimportant, unimportant, somewhat unimportant, somewhat important, important, or extremely important. These six options were assigned the numerical values 1 through 6 during the analysis of survey responses. Results of that analysis follow.*

[6] *Survey respondents were asked, "What importance did your committee assign* teaching effectiveness *in making each of the following decisions?" Three decisions were listed—deciding whom to invite for first round interviews (telephone or conference interviews), deciding whom to invite for campus interviews (final interviews), and deciding whom to offer the position—and survey respondents were asked to identify the role of teaching effectiveness in each decision as extremely unimportant, unimportant, somewhat unimportant, somewhat important, important, or extremely important.*

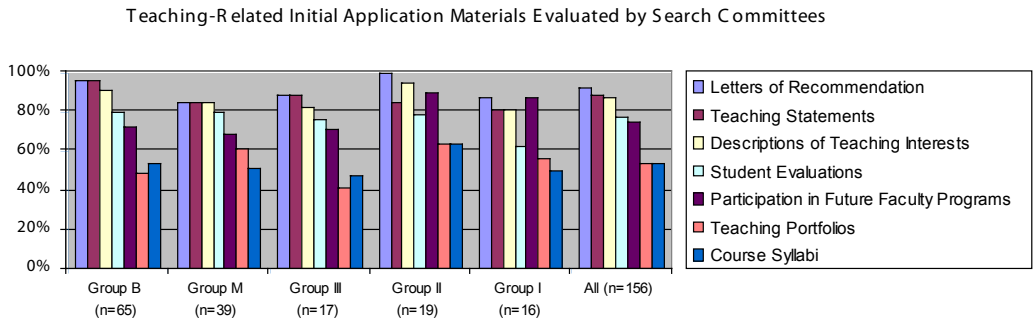

Figure 3.

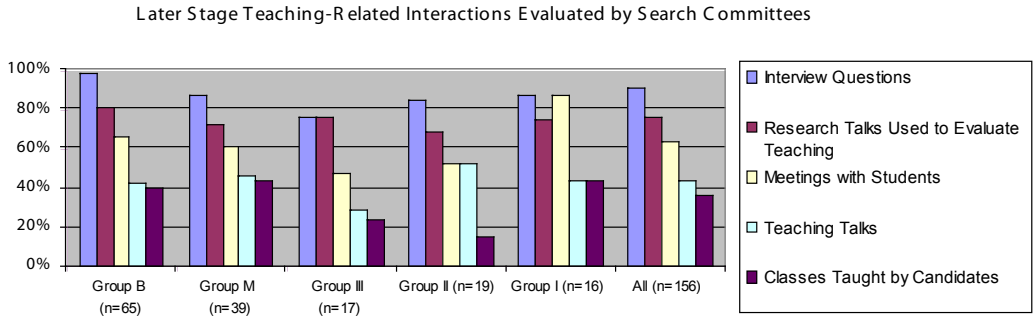

Figure 4.

trend of increasing importance applies only to the role of teaching effectiveness.

Evaluating Teaching

Survey respondents were asked several questions designed to uncover the ways in which application materials and interview interactions are used to evaluate teaching effectiveness. Figures 3 and 4 indicate the prominence of these materials and interactions in evaluating teaching effectiveness. For example, almost all survey respondents indicated using letters of recommendation, teaching statements, descriptions of teaching interests, and interview questions to evaluate candidates' teaching effectiveness. Other materials and interactions were less frequently used by search committees, including teaching portfolios, course syllabi, teaching "job talks", and classes taught by candidates.

Survey respondents were also asked to rate these application materials and interview interactions on a scale of 1 to 5 according to their usefulness in evaluating the teaching effectiveness of candidates.[7] Figures 5 and 6 indicate the relative usefulness of these materials and interactions. Letters of recommendation were the most useful application materials, whereas interview questions, teaching "job talks", and research talks were the most useful interview interactions. In contrast, course syllabi were rated as less useful in evaluating an applicant's teaching effectiveness.

Of note are the materials and interactions not commonly used but rated as highly useful by those search committees using them, including teaching portfolios, teaching "job talks", and classes taught by candidates. Also of note is the use of the research talk as a mechanism for evaluating not only a candidate's research potential, but also the candidate's teaching effectiveness. See the recommendations below for a discussion of this practice.

Successful Teaching Statements

It was expected (and, indeed, later confirmed by survey responses) that teaching statements would be frequently used to evaluate the teaching effectiveness of job applicants in mathematics, and so survey respondents who indicated they had requested teaching statements from applicants were asked three open-ended questions[8] designed to surface characteristics of successful teaching statements. An analysis of their responses to these questions revealed the following such characteristics.[9] This analysis is likely to be of particular use to those currently on the job market who are in the process of writing their teaching statements.

The most frequently cited characteristic of successful teaching statements, cited by 36% of survey respondents, was *specificity*—examples drawn from teaching experience that connected philosophy with practice. Some respondents focused on the applicant's teaching experience, such as the respondent who wanted to see a "concrete description of what the candidate has done in teaching to help students learn" and another respondent who wanted to see "specific instances of how [the

[7] *1 = Not at all useful, 2 = somewhat useful, 3 = useful, 4 = very useful, 5 = extremely useful.*

[8] *Why did your search committee request a statement of teaching philosophy? When your committee reviewed teaching philosophy statements, what factors distinguished those that were thought to be particularly successful? What factors distinguished those that were thought to be particularly unsuccessful?*

[9] *These characteristics are consistent with the results of Meizlish and Kaplan in [9], except that the importance of a match between the applicant and the hiring institution was not as evident in their findings.*

applicant] handled some difficulty in teaching." Others focused on the connection between that experience and the applicant's teaching philosophy, e.g., "Has the candidate practiced what he/she preached?" and, "General ideas not backed by classroom anecdotes are not worth much." Another respondent objected rather colorfully to statements that "sounded contrived, disingenuous, or lacked personality (i.e., generic dribble anyone could have written)."

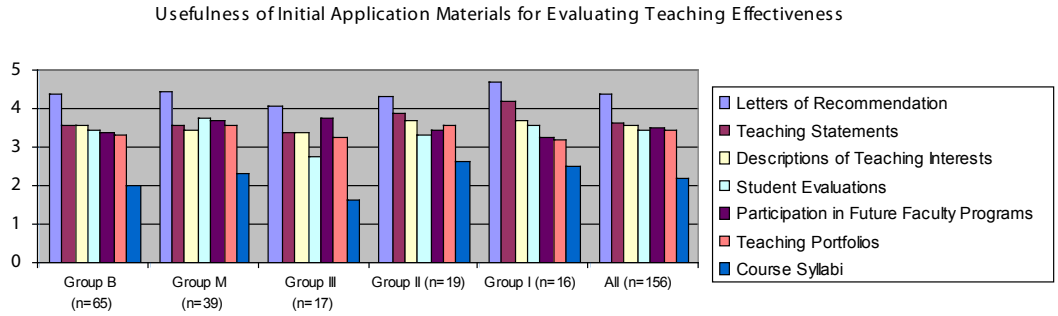

Figure 5.

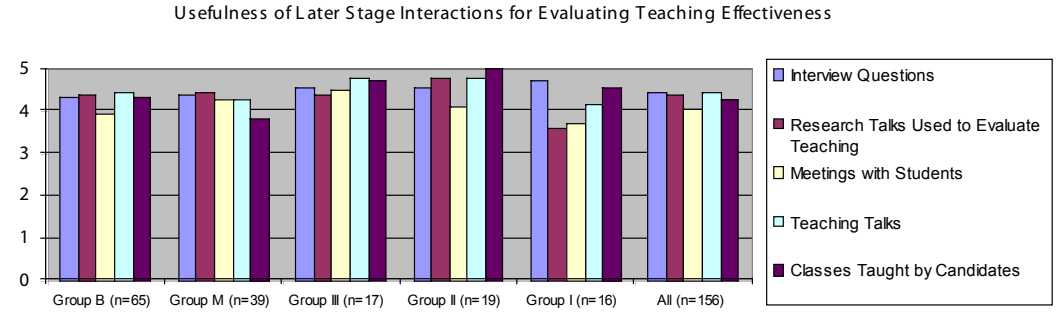

Figure 6.

Another commonly cited characteristic of successful teaching statements was evidence of *dedication to teaching*, cited by 30% of respondents. Some focused on passion or enthusiasm for teaching, including one who wanted to see "the expression (explicit or implicit) of a love of mathematics and sharing it with others" and another who said, "I think the best applicants…communicated their passion for teaching." Others made comments about commitment, including one who wanted to see "evidence of commitment to undergraduate teaching, including service courses and general education courses."

Search committees also use teaching statements to judge an applicant's *writing and communication skills*, cited by 29% of survey respondents. This was evident in responses both positive ("The best teaching statements were written in a lively, engaging style that allowed the candidate's enthusiasm to shine through") and negative ("Teaching philosophy statements poorly written with spelling errors or with no organization would generally not make a good impression").

Teaching statements were also used to look for *thoughtful reflection on one's teaching*, a characteristic cited by 28% of respondents. When asked why teaching statements were requested of applicants, one respondent said that a teaching statement "gives some idea of the candidate's maturity and depth of thinking about the thinking-learning process." Another said, "We wanted to know that the applicants had seriously reflected upon not only what they do in the classroom, but also why they do the things they do."

Another commonly-cited characteristic of a successful teaching statement was evidence of the idea of *student-centeredness*, cited by 24%, an idea that combines an interest in student success with a responsiveness to individual student learning needs. Some focused on the applicant's attitude toward students, such as the respondent who was looking for "people who convey that they are passionate, committed, and will go that extra yard in assisting students." Others emphasized the applicant's availability to students, e.g., "Candidates who were not available to students or did not spend any time with students outside of class were not successful." Other respondents made clear that being student-centered involves responding appropriately to different kinds of students. For example, one respondent said that unsuccessful teaching statements often featured a "failure to recognize that many students are not motivated by a quest for pure knowledge. An effective teacher must be able to find many different ways of motivating students in service courses and general education courses."

Successful teaching statements also conveyed a sense of *match between the applicant and the hiring institution*, a characteristic cited by 20% of survey respondents. As one respondent wrote, "We paid particular attention to those statements which tried to speak to teaching at a liberal arts school like [ours]." Another stated, "Teaching is the most important factor in both tenure and promotion decisions at our institution. It is in the candidate's

and institution's best interests to make sure we are 'on the same page' when it comes to pedagogical matters."

Of note was one response that "obviously cribbed [teaching statements] were quickly discounted." There is some disagreement over the extent to which copying another person's teaching statement is academically dishonest.[10] However, if a teaching statement must satisfy the specificity criterion mentioned above—and thus feature specific classroom anecdotes—in order to be an effective one, then copying another person's effective teaching statement would involve passing that person's classroom anecdotes off as one's own. This action would seem to ethically complicate the act of copying someone else's teaching statement without citing that original author—already an ethically questionable act.

In [3], Grundman provides advice for graduate students writing teaching statements, and this advice is largely consistent with the survey results presented here. The primary exception is the lack of any indication in the survey results that hiring committees are looking for "ways in which [one] want[s] to grow as a teacher" in teaching statements, as Grundman claims in [3]. However, given the open-ended nature of many of the survey questions, that might indeed be the case.

Recommendations

Recommendations for Future Job Seekers

• In the overall hiring process, research potential is viewed as more important than teaching ability at schools in Groups I, II, and III. However, keep in mind that 68% of fall 2005 tenure or tenure-track mathematics hires were made by schools in Groups B and M, where teaching ability is viewed as more important than research potential. Pursuing your research agenda to the exclusion of the development of your teaching skills and experience can limit your ability to find positions at these schools.

• Almost 92% of search committees indicated in their survey responses that they used letters of recommendation to evaluate an applicant's teaching effectiveness. Furthermore, such letters were rated as the most useful application material for doing so. While you are teaching, ask a mentor or supervisor to observe you teach several times so that he or she will be in a position to write a persuasive letter when you go on the job market. As one survey respondent stated, "It seems to be helpful to have…a letter from a faculty member supervising the course taught by the candidate discussing their strengths and weaknesses as an instructor and how to interpret any student evaluations that may be included in the application."

[10] *See [1] for discussion of a faculty member ostensibly fired for plagiarizing another's teaching statement.*

• While not as important in the hiring process as some might think, student evaluations were rated as almost as useful in evaluating teaching effectiveness as teaching statements and several other materials. Be sure to seek out and archive student feedback on your teaching. If your department's course evaluation forms do not elicit much of this kind of feedback from students, you may need to seek out more meaningful feedback on your own.

• Participate in a future faculty preparation program designed to improve your teaching skills. Records of participation in such programs were rated as almost as useful in evaluating applicants' teaching effectiveness as teaching statements. If your department does not provide such a program, your institution may have a Preparing Future Faculty program or a teaching center that provides this kind of development opportunity.[11]

Recommendations for Current Job Applicants

• Take the list of application materials in job ads with a grain of salt. Of the survey respondents whose job advertisements did not request teaching statements, 88% indicated that they had, in fact, evaluated teaching statements submitted by candidates and found them useful for evaluating an applicant's teaching effectiveness. Similarly, student evaluations and teaching portfolios were requested in about 2% of job ads, yet a majority of survey respondents indicated that they did, in fact, evaluate these application materials and found them useful. Some search committees may be assuming that you are going to submit these materials, even if they do not request them. Indeed, a number of survey responses were made to that effect. If you are not sure about the application materials you should submit to a particular institution, then ask the hiring institution.

• When writing your teaching statement, consider the characteristics of successful teaching statements identified by survey respondents that are listed above. The Center for Research on Learning and Teaching at the University of Michigan has developed a rubric, [5], for assessing teaching statements that is based on the research by Meizlish and Kaplan in [9]. This rubric can be used to determine the extent to which your teaching statement exhibits these characteristics.

• Prepare for teaching "job talks" and teaching demonstrations, used by 44% and 37% of search committees, respectively, during campus interviews. Both types of interactions were rated as highly useful in evaluating applicants' teaching effectiveness by survey respondents. One respondent wrote, "[Candidates] need to spend as much

[11] *For readers not familiar with these kinds of initiatives, see* `http://www.preparing-faculty.org` *for more information on the national Preparing Future Faculty program and [7] for an introduction to teaching centers.*

time preparing their teaching presentation as their research presentation. Practicing in front of a seasoned teacher or class who could give feedback would be useful." Another wrote, "Be sure the candidate is ready to teach a 'demonstration class' to real live students as part of the interview process. This is a critical indicator to hiring committees—a good job here can clinch an offer; a bad one (mumbling, getting lost, running beyond the time limit) can be the kiss of death for a liberal arts job."

• Bear in mind that when you give a research talk as part of a campus interview, the hiring committee may be using this talk as a way to evaluate your teaching ability, not just your research potential. As noted above, 76% of survey respondents indicated doing so. If you are asked to give a research talk, clarify with the search committee who the audience will be and what kind of a talk will be expected of you. Is the purpose of the talk to inform the faculty of the nature and scope of your research? Or is it to communicate your research in such a way that undergraduates can make some sense of it? Or is it to gauge your ability to actively engage undergraduates in a classroom? See also [8] for further advice.

Recommendation for Doctoral Programs

• Teaching is playing an increasingly important role in your graduates' ability to obtain faculty positions. Although research potential is more important than teaching effectiveness at Group I, II, and III schools, 68% of fall 2005 tenure or tenure-track mathematics hires were made by Group B and M schools where teaching is rated as more important than research. Furthermore, when asked if there has been a change in their departments in the last five years in the emphasis placed on teaching in the evaluation of job candidates, 19% of Group I, II, and III schools indicated an increased emphasis on teaching. Only 6% indicated a decreased emphasis, with the remaining respondents indicating they did not know or had observed no change. Reasons cited for an increased emphasis on teaching included increased demands for accountability in higher education as well as better candidates and tighter job markets. Preparing your graduates to teach effectively and communicate that ability during the hiring process is increasingly likely to improve their chances of landing faculty positions at the fullest range of institutions.

• Provide meaningful letters of recommendation addressing teaching. As noted above, almost 92% of survey respondents indicated using letters of recommendation to evaluate applicants' teaching effectiveness, and such letters were the most useful application material for doing so. As one survey respondent wrote, "It is extremely helpful to have several letters of recommendation from faculty members who have observed the candidate teach, preferably several times."

• Give graduate students opportunities to teach, especially opportunities to teach their own courses. As mentioned above, when hiring committees read an applicant's teaching statement, they often look for examples drawn from the applicant's teaching experience that connect philosophy with practice. Applicants without significant teaching experiences will not be able to provide such examples. Furthermore, when asked to give advice to doctoral programs, the most frequent piece of advice, cited by 16% of survey respondents to this open-ended question, was to provide graduate students more teaching opportunities. The following response from a Group I department is a typical response: "Provide teaching assignments where the candidate has full charge of all aspects of the course, not just a grader or lab assistant."

• Provide training programs designed to improve graduate students' teaching skills. This is important not only because of the role teaching plays in the hiring process in general, but also because records of participation in future faculty preparation programs were rated as about as useful in evaluating applicants' teaching effectiveness as teaching statements and student evaluations. One survey respondent wrote, "Stronger preparation in areas of curriculum, pedagogy, learning assessment, and student interaction would be very much appreciated by those departments who place a high priority on teaching effectiveness." Another wrote, "Recommend books for students to read about teaching. Some formal discussion of teaching and curriculum issues could be helpful. Encourage graduate students to watch effective teaching in the classroom." Furthermore, helping graduate students develop effective and efficient approaches to their teaching can help them become "quick starters" as junior faculty, [2]. See the recommendations for future job seekers above for resources useful for developing these kinds of training programs.

Recommendations for Hiring Institutions

• Consider a variety of initial application materials. Although letters of recommendation addressing teaching were rated as most useful in evaluating an applicant's teaching effectiveness, a number of other materials were essentially tied for second place in terms of utility. Consider requesting teaching statements, descriptions of teaching interests, student evaluations, and teaching portfolios, all rated as highly useful.

• Be intentional about requesting application materials in your job advertisements that you expect to evaluate. As noted above, 88% of the survey respondents who did not request teaching statements reported evaluating them anyway, and they found them as useful as many other application materials in evaluating applicants' teaching effectiveness. Of the survey respondents who indicated they had not requested teaching statements, 21%

said they had not done so because they assumed applicants would submit them whether or not they were requested. As Meizlish and Kaplan note in [9], such mixed messages "can be problematic, especially for students who are not familiar with academic cultures (first-generation college or graduate school attendees) or those who receive less mentoring (oftentimes underrepresented minority students and women in the sciences)."

• Consider a variety of campus interview interactions. Although only 37% of search committees asked an applicant to teach a class during a campus interview, those that did rated it as almost as useful in evaluating teaching effectiveness as interview questions about teaching. Similarly, only 44% of search committees asked candidates to give teaching "job talks", but those that did found them equally as useful as interview questions. The format and audience for these kinds of talks likely varies from campus to campus, but one useful model for such talks is the "pedagogical colloquium" described in [10].

• Reconsider using candidates' research talks to evaluate their teaching effectiveness, if that has been your practice. As noted above, 76% of survey respondents indicated that they do so and find the research talk a useful mechanism for evaluating teaching. Although a research talk can provide a sense of a candidate's public speaking ability, there is a significant difference between talking about one's research to a group of experts and teaching first-year college students calculus. The research talk does not typically allow a candidate to demonstrate many of the teaching skills that are needed to effectively teach undergraduates. Furthermore, it does a disservice to candidates if they are not aware that their research talk, ostensibly part of the interview process to evaluate their research potential, is also being used to evaluate their teaching effectiveness. See Meizlish and Kaplan, [9], for more on this problematic practice.

• Discuss among your hiring committee the characteristics of successful and unsuccessful teaching statements, perhaps by starting with a discussion of the characteristics listed above. Being more specific about these characteristics can assist in the evaluation of teaching statements (perhaps by using some kind of shared rubric similar to the one developed at the University of Michigan, [5]), and communicating your expectations about teaching statements to applicants might result in the submission of teaching statements that are more useful to you.

Conclusions and Next Steps

The survey results presented here indicated that mathematics faculty search committees value teaching effectiveness in job applicants and that they use a variety of mechanisms for judging an applicant's teaching effectiveness. These findings have implications for job seekers, who should work towards developing their teaching skills and communicating about those skills on the job market. Doctoral programs have a role to play in directing their graduate students' attention to matters of teaching and providing professional development opportunities for their students around teaching skills. Search committees are encouraged to reflectively consider the ways in which they assess the teaching skills of their job applicants and to be mindful about how they communicate their expectations with applicants.

Although this survey included a set of questions on understanding what search committees look for in one particular application document, the teaching statement, future surveys could focus on other application materials and interview interactions. What are useful components of a teaching portfolio? How do search committees make sense of student evaluations? What formats and functions are associated with teaching "job talks" on different campuses and how are they evaluated?

Other questions for future research include the following. Are there particular approaches to teaching, such as the use of in-class group work or technology, that are valued by certain types of departments? Or are they more interested in seeing evidence of alignment among an applicant's teaching goals, methods, and assessments? What role does the prestige or reputation of an applicant's current institution play in the hiring process? What recommendations would search committees make to doctoral programs developing "teaching certificate" programs for developing their graduate students' teaching skills? Finally, and perhaps most importantly, how is teaching effectiveness evaluated after a candidate obtains a job during the tenure and promotion process, and how do those methods of evaluation compare to those used at the hiring stage?

In spite of the importance teaching plays in the careers of many mathematicians, often mathematicians do not receive training in teaching to the extent that they receive training in mathematics research. By clarifying the role that teaching plays in the graduate student and faculty careers of mathematicians, the results of this study can help them to prepare for that role in more meaningful and effective ways.

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Flatland: The Movie

Reviewed by Ian Stewart

Flatland: The Movie—A Journey of Many Dimensions
Flat World Productions
Directed by Jeffrey Travis

"It must be that a square… moving *somehow parallel to itself…can make something else—like a…* supersquare *that represents three to the third power, or 27 units…That's so hard to imagine, but—wouldn't that be amazing? A supersquare in the third dimension! I wonder what's so special about Area 33H? I bet it has a clue to explain all this!"*

And so the intrepid little Hex, a small orange hexagon living in a Euclidean plane, defies her well-meaning grandfather, Arthur Square, and comes into conflict with the arrogant priesthood by dabbling in heresy. And her world is changed, forever.

It's *Flatland*—I don't think I'm giving much away here—updated for a modern audience, animated using modern techniques, and packaged into a 45-minute movie. The DVD includes an interview with Tom Banchoff, geometer and *Flatland* authority *par excellence*, but I'll confine this review to the main story.

Flatland, first published in 1884, was written by the clergyman, schoolmaster, and Shakespearean scholar Edwin Abbott Abbott—*two* Abbotts, to distinguish him from his father, Edwin Abbott, and to commemorate his mother, Jane Abbott, who was his father's cousin. *Flatland* is a much-loved classic, the founding member of a tiny but select sub-genre of "Math Fiction", most of whose other members are sequels by modern writers or short science fiction stories with an overtly mathematical flavour. Its main competitors are Charles Howard Hinton's 1907 *An Episode of Flatland* and Kee Dewdney's 1984 *The Planiverse*. Both of these writers pay close attention to the physics and engineering of two-dimensional structures, whereas Abbott is more interested in telling the story of "A. Square" and his revelation of the Third Dimension.

Anyone who tries to reinterpret or extend *Flatland* faces a number of obstacles. The original was written in an elegant but old-fashioned style. It managed to combine a masterly exposition of the "dimensional analogy" between the Flatland view of 2-space and the human view of 3-space with some biting social criticism of the Victorian treatment of two disadvantaged groups: women and the poor. It relied for its effect on a default view of society that mercifully has largely vanished. And it started from a level of scientific and mathematical understanding that is now 120 years out of date. So the choice facing any would-be writer or animator is simple but stark. They can pander to the *Flatland* fans' prejudices, and follow the original faithfully for both content and style…but then they will without doubt offend a number of pressure groups, because satire and political correctness are uneasy bedfellows. Alternatively, they can bring both style and content up to date, and risk the wrath of those who dislike anyone tampering with holy writ.

Abbott lived and worked in Victorian England, which we tend to think of as an inhibited, hypocritical, and exceedingly snobbish society in which everyone knew their place, and everyone except criminals and other low-life conformed

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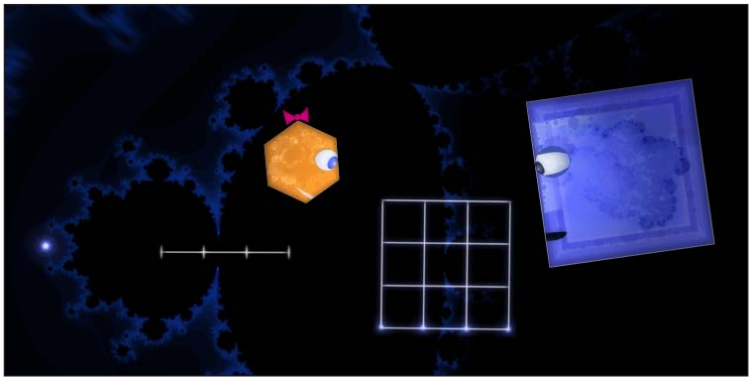
Distribution of *Flatland: The Movie*

The "Special Educator Edition" of *Flatland: The Movie* (US$120.00) is ready for purchase on the website `http://store.flatlandthemovie.com`. This edition is primarily intended for educators, teachers, schools, and institutions that will use the movie as part of classes, lectures, and courses. The purchase of the DVD includes a school site license, a bonus featurette discussing the 4th dimension, behind-the-scenes footage, and math worksheets for use in the classroom.

At the time of this writing, Flat World Productions was also taking pre-orders for a private home-use DVD (US$29.95), to be shipped starting in fall 2007.



Arthur Square and his granddaughter Hex imagine the geometric progression of dimensions.

to the prevailing social norms. The Church (of England, thanks to the marital problems of Henry VIII) was the guardian of the nation's morals, the Law regulated behaviour, and the Monarchy set policy—ordinary people did not have the vote and Parliament mainly expressed the views and wishes of the wealthy. The Queen supposedly had to be protected from such erotic sights as the legs of a piano, which were covered up to avoid exciting wild passions.

Well, yes, maybe...but it wasn't quite that simple. Victoria collected paintings of male nudes, one being presented to her by her husband Albert, and had a healthy enjoyment of sex. More significantly, despite its apparent social conformity, Victorian England also gave the world some of its greatest innovations. Darwin's *Origin of Species*, first published in 1859, made a persuasive case against supernatural creation by pointing out the mechanism of natural selection. Charles Lyell's 1830 *Principles of Geology*, following pioneering work of James Hutton, made it clear that our planet is far older than had previously been assumed. Advances began to be made in the humane treatment of prisoners and the poor. Women began to free themselves from centuries of subservience. In fact, many basic rights and ideas that intelligent, informed people now take for granted emerged from the Victorians' struggle to reconcile their rigid social structure with a changing understanding of the natural world.

Mathematics, too, changed. When Victoria came to the throne in 1837, mathematics was almost entirely concrete, its concepts mostly modelled on the natural world. Analysis had embraced complex numbers and progressed as far as elliptic functions, but its logical foundations remained obscure, and it was really just calculus. Geometry remained rooted in human perceptions of physical space, although it was now projective as well as Euclidean. Algebra was largely about the solution of polynomial equations with numerical coefficients. There were revolutions waiting in the wings—Bernhard Bolzano was pioneering logical rigour in calculus; Janós Bolyai and Nicolai Ivanovich Lobachevsky had invented non-Euclidean geometries, though these were still neither welcomed nor understood; Evariste Galois had begun to free algebra from the shackles of numerical interpretation. But these revolutions were at best incipient.

By 1901, when Victoria died, mathematics had become almost unrecognisable. Abstractions were replacing the concrete. Non-Euclidean geometry was part of the mainstream, joined by differential geometry and even the beginnings of topology. Karl Weierstrass and his successors had reformulated analysis, and infinite processes were no longer a puzzle. Georg Cantor had dazzled the world, and baffled it, with set theory and transfinite numbers. Algebra now included finite fields, rings of algebraic integers, and groups. William Rowan Hamilton had struggled his way to the invention of quaternions, Sophus Lie had invented his eponymous groups, Henri Poincaré had encountered the obstacle that we now call his conjecture, and David Hilbert had produced his hit-list of twenty-three unsolved problems. Almost everything that was taken for granted at the start of Victoria's reign was up for grabs when it ended. Allegedly "self-evident" propositions proved to be false, allegedly universal imperatives were revealed as parochial conventions, and alleged impossibilities were not only possible, but unavoidable.

The late Victorian era, in short, was a period of remarkable progress and free thinking. Science and the Church came to a gentleman's agreement not to tread on each others' toes, and many a country clergyman became the world expert on six types of beetle or the reproductive habits of slugs. Scientific advances were discussed along with the price of sugar and the increasingly parlous state of the British Empire at garden parties and polite social gatherings.

Victorians, in particular, were fascinated by "the" fourth dimension. Mathematicians had come to recognise that the dimensionality of our own familiar space did not necessarily impose constraints on the dimensionality of any other structure. Mathematics was littered with "spaces"

of dimension four, or ten, or a hundred. Many of these spaces accurately represented aspects of the physical world—for instance, as "degrees of freedom" of a mechanical system. Spiritualism, another flourishing Victorian interest, latched on to the fourth dimension as a convenient location for the spirit world. Ghosts could enter our world "sideways" along a dimension that mere humans could not observe or experience. Hyperspace theologians seized on the fourth dimension as an excellent place in which to put God and His angels, though they quickly realised that the fifth, sixth, and seventh dimensions were even better, and the infinitieth dimension added a satisfactory element of closure.

While well-meaning people and charlatans of every kind were appealing to the fourth dimension to justify their beliefs and scams, the mathematics of four or more dimensions was changing from an obscure and esoteric collection of ideas into something straightforward and ubiquitous. And it was at this juncture that Abbott produced his curious and highly original book. *Flatland* has a timeless appeal, and it remains in print to this day; as I write it is the bestselling mathematics book on Amazon. It has spawned several sequels and two animations, the most recent being the subject of this review, to which I now return.

To appreciate the problems faced by the animators, and how they handle them, let me briefly recall the plot. Flatland is a Euclidean plane, inhabited by polygonal beings whose lives resemble our own closely enough for social satire. The main character, A. Square, lives in a pentagonal house together with his wife and children. His wife, like all Flatland women, is a mere line segment. His four sons are pentagons, his two grandsons are hexagons. Flatland heredity produces an extra side in each generation, except in the isosceles triangles of the lower classes, where each generation approaches more closely the equilateral ideal that admits the family into the middle classes. Irregular offspring are destroyed. Intelligence (allegedly) and social standing (indubitably) increase with the number of sides, and the pinnacle of society comprises the priests, which are circles—or, more accurately, polygons with several hundred sides.

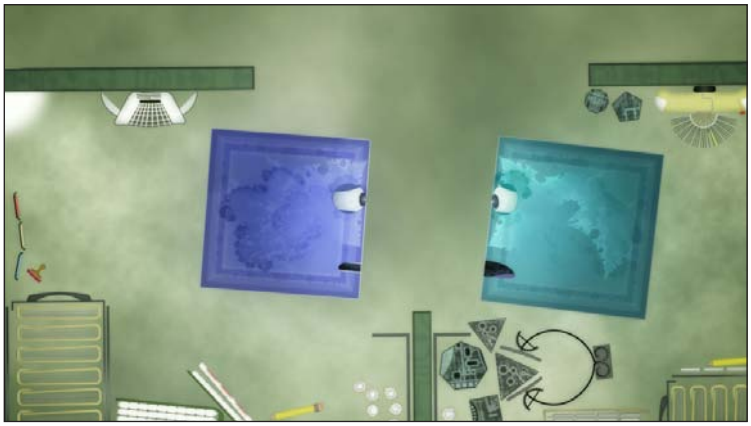
The most serious heresy in Flatland's totalitarian theocracy is belief in the Third Dimension. Every new millennium a Sphere from this nonexistent realm visits Flatland and causes trouble, and the priests suppress public knowledge of such incidents to preserve their own power. Poor Mr. Square (Abbott never tells us what "A" stands for, because his protagonist is merely *a* square) gets caught up in these events and is set up for the book's main mathematical theme, a dimensional analogy. Our own difficulties in contemplating the fourth dimension are analogous to those of A. Square contemplating the third.

Arthur and Arlene Square in their Flatland Home.

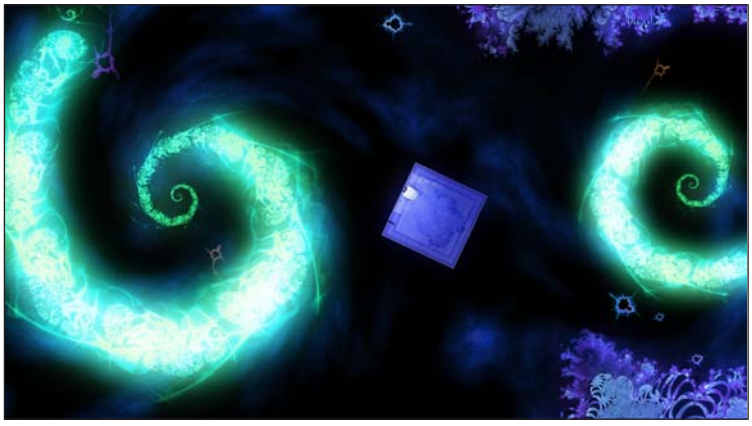
Hex is comforted by her grandmother, Arlene Square.

Abbott uses this analogy to explain four-dimensional space to his readers, while appearing to be explaining three-dimensional space to A. Square. It seems likely that he got the basic ideas from Charles Howard Hinton, an incorrigible rogue and accomplished geometer who wrote widely about four dimensions. In 1880 Hinton published an article "What is the Fourth Dimension" in the *Dublin University Magazine*, and it was reprinted in the *Cheltenham Ladies College Gazette* a year later. In 1884 it was reprinted yet again as a pamphlet, with the subtitle "Ghosts explained". While there is no documentary evidence that the two men ever met, the similarities between Hinton's article and plot elements of *Flatland* are extensive.

It also seems inconceivable that they did not meet. Abbott's interest in advancing the education of women brought him into contact with Dorothea Buss, headmistress of Cheltenham Ladies College, and Hinton was appointed to teach at the college in 1875. In 1884 Hinton moved to Uppingham School as science master, where Abbott's lifelong friend Howard Candler was mathematics master. Abbott and his wife were regular visitors to the Candlers. *Flatland* is dedicated to "The Inhabitants of SPACE IN GENERAL and H. C. IN PARTICULAR", and H. C.



Arthur Square shocks his brother and officemate Abbott Square.



Arthur awakens in a mysterious part of Flatland.

is Candler. Finally, Abbott's theological book *The Kernel and the Husk* of 1887 refers to "a very able and original work by C. H. Hinton" about "a being of Four Dimensions".

In 1907 Hinton produced his own book, the aforementioned *An Episode of Flatland*, subtitled *How a Plane Folk Discovered the Third Dimension*. The geometry of Hinton's world "Astria" is closer to our own: not an infinite Euclidean plane, but the surface of a circular planet in a planar (actually, slightly curved) universe. Hinton was probably influenced by Herbert George Wells, who used four dimensions to justify time travel in his 1895 novel *The Time Machine*, and Wells picked up his ideas from the wider scientific community.

At any rate, the Sphere convinces A. Square that the third dimension exists, but he succeeds only when he takes the drastic step of pushing A. Square out of his plane into the wider realm of Space. Even the most ardent disbeliever in the fourth dimension might well change their minds in similar circumstances. But the ending is dark and tragic. A. Square, on his return to Flatland, proclaims the Truth of the Third Dimension and ends up in jail, having failed to convince anybody else, and at times doubts his own sanity: "It is part of the martyrdom which I endure for the cause of the Truth that there are seasons of mental weakness, when Cubes and spheres flit away into the background of scarce-possible existences; when the Land of Three dimensions seems almost as visionary as the Land of One or none; nay, when even this hard wall that bars me from my freedom, these very tablets on which I am writing, and all the substantial realities of Flatland itself, appear no better than the offspring of a diseased imagination, or the baseless fabric of a dream."

Fans of the original will wonder how much of this survives in the animation. (The dangers are evident: my friend Terry Pratchett once sold an option for the movie rights to his book *Mort*, which is all about Death's apprentice. Death, in the Discworld series of which this one is a part, is a skeletal figure with a scythe. The gentlemen from Hollywood contemplated their purchase and approached Terry, saying "Is it okay if we leave this Death guy out? He's a bit depressing.") The good news is: more than you might expect. The price to be paid (I don't think it's bad news but some of you will) is that the story has been modernised.

Arthur Square (so much for my theory that his name had to be Albert, for reasons you will find in the preface to my sequel *Flatterland*) and his wife are living in a house much the shape of any normal three-floor building, with their granddaughter Hex, who is a hexagon. Equal opportunities have clearly arrived in Flatland, and the women are no longer one-dimensional and mindless. Little Hex is bright as a button, and has a deep desire to find out what happened to her parents. Arthur knows, but insists that she waits until she is old enough to understand.

Social standing still depends upon how many sides you have, as we are reminded when Hex is going over her homework with Grandpa, but she is sceptical, pointing out that she doesn't feel any more intelligent than her four-sided progenitor. The top dogs are still the priests, which are circular. So are the senior civil servants, notably Miss Helios, who is some sort of Big Cheese in the Ministry of Regularity where Arthur works. The circles are portrayed as arrogant and strident. Their attitude seems to be more a parody of Soviet-era communism than anything else, except for the Circle of Circles, Pantocyclus, who runs the whole country and makes a credibly nasty high priest.

The Ministry employees assemble, and Pantocyclus addresses them on the subject of the New Millennium, warning them not to talk about the Third Dimension. This topic always surfaces at such times, mainly because that is when a visitor from the Third Dimension has a habit of appearing and proclaiming that he and his world do, in fact, exist. But this cannot be so, because "such a notion is of course absurd, and furthermore illegal." In particular, the law-abiding citizens of

Flatland are forbidden to approach Area 33H, where foolish conspiracy theorists have long claimed some artifact from the Third Dimension is being kept.

This proclamation leads Hex to ask "what is a dimension?", and the dimensional analogy can then be wheeled out. A point, a line three units long, and a square with sides three units long, serve to illustrate the progression 3^0, 3^1, 3^2. This reminds Hex of some pictures she once saw, supposedly from Area 33H, and prompts her to wonder about the next term in the series, and conjecture the existence of a supersquare. Grandpa tells her off and justifies his harshness to his wife: "Hex is going down a dangerous path. The circles don't tolerate curiosity." To which his wife responds "Apparently neither do you," and goes off to comfort Hex, giving her a box of documents that once belonged to her (mysteriously vanished) mother.

Arthur now has a dream in which he visits Pointland and Lineland, sequences that are fairly faithful to the original. The solipsistic King of Pointland acknowledges no other thing than himself in the entire zero-dimensional universe. The King of Lineland has a Queen on either side and is shocked when Arthur intersects his linear world, so that a new line segment suddenly appears from nowhere. Arthur's explanation that he comes from *above* the line is met with incredulity: "Above…uh? What do you mean by this? You jest, Arthur of the above. The youngest child knows that space consists of the two directions—left and right." In vain does Arthur tell him that real space also has *width*—the vast two-dimensional plane of Flatland.

At the dawn of the New Millennium, Arthur receives a visit from Spherius the sphere, an extradimensional being from the mysterious world of Space. But this is no dream. A quick run through the dimensional analogy fails to convince Arthur that Space can possibly exist, so Spherius bumps him out of Flatland. Now he sees the entire plane spread out before him. "I can see *inside* everything…I can see inside everyone's bodies and I'm going to be sick." He even sees the artifact in Area 33H, which is a slowly spinning cube. Now Arthur realises that Hex was right—a supersquare does exist. And back to Flatland he goes, to spread the gospel of the Third Dimension.

No sooner has he returned than Hex goes off on some unspecified errand, and the isosceles security staff detect an intruder in Area 33H, a discovery that is announced to all the civil servants in the Ministry of Regularity. Putting two and two together, Arthur and his colleague Abbott Square head off to rescue Hex…Well, that's about as much of the plot as I can give away without spoiling the story, but you get the idea.

I think it works. The graphics, with their Mandelbrot-ish decorations, are wonderful, and so is the soundtrack music. The characters work pretty well, for polygons, and the dialogue stays on the right side of sentimentality, though occasionally it gets too close for comfort. And Hex's voice reminds me of Babe, the pig that became a sheepdog. But then, Dorothy Parker said much the same about Winnie-the-Pooh ("Tonstant weader fwowed up"), and all that did was prove she didn't have a clue what was going on. Pooh Bear (the one portrayed by A. A. Milne, not the Disneyfied one in the movies) is a blunt, matter-of-fact type. Anyway, *Babe* was a brilliant movie. The portrayal of a two-dimensional world is played for amusement rather than physical realism, which is a sensible choice; otherwise the story would get hung up trying to explain a realistic design for an internal combustion engine in 2D or how a hexagon eats peas when it has to hold the fork in its mouth. The technology is visibly more modern than anything in Abbott's version.

The ending (which I mustn't divulge, but we do find out about Hex's mother's suppressed work on cubic equations) is a bit abrupt, but we're not talking social realism here. There is a marvellously subtle hint about—no, I can't even reveal *that*. Damn. The animation of *Flatland* stays close to the original in spirit, reinterpreting the tale for today's audiences. You won't learn a lot about either geometry or the fourth dimension just by watching the movie, but I can imagine young people being intrigued by the ideas. And a teacher or parent with moderate skills can draw a lot of useful lessons from this animation, as Banchoff's interview makes clear. The main objective is to have fun playing around with the dimensional analogy, and I'd say the animation does that very well indeed. I only wish it had been a bit longer, but I imagine the budget didn't stretch that far, and it's always better to leave your audience wanting more.

Maybe we'll get the Director's cut next year.

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The "What Is…?" Column Turns 50

Allyn Jackson

With this issue of the *Notices*, the "What Is…?" column reaches a landmark, its 50th installment. The column was born in 2001, when for some reason I was wondering what a *brane* is. What a strange name, I thought. What could a brane be?

Mathematics is replete with bland terms like *normal space, regular map, simple group, complex number.* But there are also plenty of names just as intriguing as brane—terms like *amoeba, gerbe, shtuka,* and *grope*. As I accumulated a list of such terms, a concept emerged for the "What Is…?" column: Each installment would focus on a single mathematical object, preferably one with a whimsical name that was being bandied about, making people wonder what the thing could be. I imagined people hanging around in math department common rooms asking each other, "Just what *is* a gerbe anyway?" Then someone who had been leafing through a copy of the *Notices* would burst out, "Hey! It's right here! In the *Notices*! There's an article called 'What is a gerbe?'" (This column, written by Nigel Hitchin, appeared in the February 2003 issue.)

Requiring that every "What Is…?" topic have a wonder-inducing name like "gerbe" seemed to narrow the field too much. By relaxing that rule a bit the list of possible topics grew to about fifty terms, some of which (*dunce hat, crumpled cube, Lego, nurb,…*) never went anywhere. Once about twenty topics were paired with potential authors, the column looked viable.

The "What Is…?" column harks back to the classic *What Is Mathematics?* by Richard Courant and Herbert Robbins. Another precursor is the distinguished series of articles with "what is" format titles that appeared in the *American Mathematical Monthly*, such as "What Is Geometry?" by Shiing-Shen Chern [**97** (1990), no. 8, 679–686]. But the *Notices* column would be different from these venerable progenitors. Rather than tackle a wide swath of the field, the "What Is…?" column would zero in on one particular object. By describing the role the object played, the column would ideally provide a window on the branch of mathematics in which the object arose.

From the outset, we wanted the "What Is…?" column to be conceptual and nontechnical. We imposed a strict limit of just two pages partly to discourage authors from larding their columns with technical detail. A list of "Further Reading" would contain no more than three items—usually expository works that develop the topic further rather than research papers that support the assertions made in the column.

Early on, before the column established an identity, it was often difficult to get people to write. Nowadays it's a bit easier, for people seem to understand what the column is about and agree more readily to write. And we have gotten some high-quality unsolicited contributions. But the challenge of identifying good topics and good authors still remains. The *Notices* Editorial Board has been an important source of ideas and advice for the "What Is…?" column, particularly Susanne Brenner (Louisiana State University), the board member designated to help with the column. From the column's inception, D. Kotschick (Ludwig-Maximilians-Universität München) has generously provided much guidance and help.

The "What Is…?" column was in part inspired by the phenomenon of math department seminars like the "Basic Notions" seminar at Harvard, whose goal is to present informal, nontechnical expositions about fundamental ideas in mathematics. This inspiration has now come full circle with the establishment of "What Is…?" seminars in mathematics departments at, for example, the University of Michigan, Cornell University, and the ETH (Eidgenössisches Technische Hochscule) in Zurich. The University of Massachusetts at Amherst took the spirit of the column very much to heart by giving its seminar the whimsical name TWIGS (The "What Is…?" Graduate Seminar). TWIGS also recently celebrated its own milestone, the 100th installment of the seminar.

The target audience for the "What Is…?" column is first-year graduate students in mathematics. If the columns really are written at that level, many seasoned mathematicians enjoy them as well. We have had mixed success in making the columns really accessible. Some were way too difficult; others were just right. I don't think any have been too easy. Some of the topics have been too recondite, while others have hit the mark in zeroing in on a concept that plays a key role in current research. Among those in this second category, my favorites include "What is a pseudoholomorphic

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curve?" by Simon Donaldson (October 2005) and "What is an expander?" by Peter Sarnak (August 2004).

The inaugural column, "What is an amoeba?" by Oleg Viro, remains one of my favorites. It demonstrates the quintessentially mathematical act of taking a very complicated object and constructing a second, simpler object that amplifies some salient features of the original object so that those features can be visualized and studied.

Publishing columns by such masters of exposition as David Ruelle ("What is a strange attractor?", August 2006), Harry Kesten ("What is percolation?", May 2006), and Martin Davis ("What is Turing reducibility?", November 2006) was a real privilege. The wisdom and experience shared in their writings are priceless. Other favorites of mine include "What is a free lunch?" by Fredy Delbaen and Walter Schachermayer (May 2004), which explains with verve and style just why the Black-Scholes theory is so powerful in finance, and "What is a minimal model?" by János Kóllar (March 2007), which manages to be both concrete and elegant. Valentin Poénaru's recent "What is an infinite swindle?" (May 2007)—with evocative illustrations created by *Notices* Graphics Editor Bill Casselman and David Austin of Grand Valley State University—is written in a rapturous style that for me captures a sense of the magic and fascination that drives the best mathematics.

All the "What is...?" authors have worked hard to meet the column's goal of offering brief gems of exposition that can be understood and appreciated by a wide mathematical audience. As we look to the next fifty columns, the *Notices* welcomes comments and suggestions from readers, which may be sent to `notices-whatis.org`.

The First 50 "What Is..." Columns

1. What is…an **amoeba**?
Oleg Viro
September 2002

2. What is…the **monster**?
Richard Borcherds
October 2002

3. What is…a **building**?
Kenneth S. Brown
November 2002

4. What is…an **alteration**?
Frans Oort
December 2002

5. What is…a **shtuka**?
David Goss
January 2003

6. What is…a **gerbe**?
Nigel Hitchin
February 2003

7. What is…a **train track**?
Lee Mosher
March 2003

8. What is…a **stack**?
Dan Edidin
April 2003

9. What is…a **worm**?
Harold Boas
May 2003

10. What is…a **bubble tree**?
Thomas Parker
June/July 2003

11. What is…a dessin d'enfant?
Leonardo Zapponi
August 2003

12. What is…a **curvelet**?
Emmanuel Candès
December 2003

13. What is…a **quasi-morphism**?
D. Kotschick
February 2004

14. What is…a **billiard**?
Yakov Sinai
April 2004

15. What is…a **free lunch**?
Fredy Delbaen and Walter Schachermayer
May 2004

16. What is…an **operad**?
James Stasheff
June/July 2004

17. What is…an **expander**?
Peter Sarnak
August 2004

18. What is…a **grope**?
Peter Teichner
September 2004

19. What is…a **topos**?
Luc Illusie
October 2004

20. What is…a **motive**?
Barry Mazur
November 2004

21. What is…a **flip**?
Alessio Corti
December 2004

22. What is…an **open book**?
Emmanuel Giroux
January 2005

23. What is…a **brane**?
Gregory Moore
February 2005

24. What is…a **dimer**?
Richard Kenyon and Andrei Okounkov
March 2005

25. What is…a **horseshoe**?
Mike Shub
May 2005

26. What is…**property tau**?
Alex Lubotzky
June/July 2005

27. What is…a **compacton**?
Philip Rosenau
August 2005

28. What is…a **Lefschetz pencil**?
Robert Gompf
September 2005

29. What is…a **pseudoholomorphic curve**?
Simon Donaldson
October 2005

30. What is…a **Gröbner basis**?
Bernd Sturmfels
November 2005

31. What is…a **random matrix**?
Persi Diaconis
December 2005

32. What is…a **quantum group**?
Shahn Majid
January 2006

33. What is…a **graph minor**?
Bojan Mohar
March 2006

34. What is…a **syzygy**?
Roger Wiegand
April 2006

35. What is…**percolation**?
Harry Kesten
May 2006

36. What is…a **coarse structure**?
John Roe
June/July 2006

37. What is…a **strange attractor**?
David Ruelle
August 2006

38. What is…a **quasicrystal**?
Marjorie Senechal
September 2006

39. What is…a **bad end**?
Charles Epstein
October 2006

40. What is…**Turing reducibility**?
Martin Davis
November 2006

41. What is…a **quasiconformal mapping**?
Juha Heinonen
December 2006

42. What is…a **projective structure**?
William Goldman
January 2007

43. What is…a **Young tableau**?
Alexander Yong
February 2007

44. What is…a **minimal model**?
János Kollár
March 2007

45. What is…a **tropical curve**?
Grigory Mikhalkin
April 2007

46. What is…an **infinite swindle**?
Valentin Poénaru
May 2007

47. What is…a **Galois representation**?
Mark Kisin
June/July 2007

48. What is…a **Higgs bundle**?
Steve Bradlow, Oscar García-Prada, and Peter Gothen
September 2007

49. What is…a **Woodin cardinal**?
John Steel
October 2007

50. What is…**Boy's surface**?
Robion Kirby
November 2007

Bella Abramovna Subbotovskaya and the "Jewish People's University"

George G. Szpiro

Exactly 25 years ago, on September 23, 1982, at about 11 o'clock at night, an accident occurred in a dark street in Moscow. A woman walked along the sidewalk. She had just visited her mother and was on her way home. It was a quiet street, hardly a vehicle passed by at this hour. Suddenly a truck appeared at high speed, hit the woman, and drove off. Moments later another car drove up, stopped for a moment next to the victim, and also drove off. An ambulance came—who had called it?—and took the victim straight to the morgue. The funeral took place the next day. It was a very low key affair, nobody talked, no eulogy was held. Mourners only whispered among themselves, all the while observed by a few official-looking men. Eventually everybody quietly dispersed. The hit-and-run driver was never found, and the case was closed. The accident had all the trappings of a KGB hit. The victim was the 44-year old mathematician Bella Abramovna Subbotovskaya. In the days preceding her death she had been summoned several times for interrogations to KGB offices. The "crime" about which she was questioned was the organization of a "Jewish People's University".

It is almost forgotten today, but not so long ago Jews were routinely denied entry to reputable institutes of higher education in the Soviet Union. Although the discriminatory practice was not limited to mathematics, it was especially glaring in this field to which Jews had been traditionally drawn. Twenty-five to thirty percent of the graduates of the high schools that were geared towards physics and mathematics were Jewish; only a handful were admitted to the top institutes. The most prestigious among them was MekhMat, the Department of Mechanics and Mathematics at Moscow State University. The driving forces behind MekhMat's adherence to the anti-Semitic admissions policy decreed from above were V. A. Sadovnichii, currently rector of Moscow University; O. B. Lupanov, MekhMat's dean from 1980 until his death in 2006; and A. S. Mishchenko, professor and senior examiner at MekhMat. But anti-Semitism in Soviet mathematics was not restricted to insignificant, small-minded people. Distinguished Soviet mathematicians were known to be pathological anti-Semites, for example L. S. Pontryagin and I. M. Vinogradov, who wielded enormous power over the lives and careers of Soviet mathematicians, but also, surprisingly, the human rights activist I. R. Shafarevich. The absurd justifications some of them gave for their virulent feelings against Jews—which were buttressed by the administrative authority some of them held—was that Jews are genetically programmed to develop mathematical abilities at an early age. By the time ethnic Russians fully develop their mathematical powers, so the reasoning went, all opportunities to study and all faculty positions are already taken by Jews. Such a situation was to be prevented by barring the latter from access to higher mathematics education right after high school. A more prosaic reason for the rabid anti-Semitism exhibited by the Soviet authorities was their cowardly desire to blame others for their economic and other failures.

During the 1970s and the 1980s, up until Perestroika, such a policy was strictly enforced. One institute to which entrance was all but barred to Jews was MekhMat. It was—and is—considered the premiere mathematical center in the then-Soviet Union and today's Russia. Jews—or applicants

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I would like to thank Dmitry Fuchs, Boris Kanevsky, Arkadi Livshits, Leonid Polterovich, Andrei Reznikov, Mark Saul, Boris Shapiro, Mikhail Shifman, Alexander Soifer, Sergei Tabachnikov, Anatoly Vershik, Andrei Zelevinsky for comments, and Allyn Jackson for making me aware of the memorial conference at the Technion in Haifa.

with Jewish-sounding names—were singled out at the entrance exams for special treatment. Written tests, identical for all applicants, were usually no problem for gifted and well-prepared students.[1] The hurdles were raised in the oral exam. Unwanted candidates were given "killer questions" that required difficult reasoning and long computations. Some questions were impossible to solve, were stated in an ambiguous way, or had no correct answer. They were not designed to test a candidate's skill but meant to weed out "undesirables". The grueling, blatantly unfair interrogations often lasted five or six hours, even though by decree they should have been limited to three and a half. Even if a candidate's answers were correct, reasons could always be found to fail him. On one occasion a candidate was failed for answering the question "what is the definition of a circle?" with "the set of points equidistant to a given point." The correct answer, the examiner said, was "the set of *all* points equidistant to a given point." On another occasion an answer to the same question was deemed incorrect because the candidate had failed to stipulate that the distance had to be nonzero. When asked about the solutions to an equation, the answer "1 and 2" was declared wrong, the correct answer being, according to an examiner, "1 *or* 2".[2] One candidate received a failing grade for making use of the "unsubstantiated inequality" $\sqrt{6}/2 > 1$. And if an applicant, against all odds, managed to pass both the written and the oral test, he or she could always be failed on the required essay on Russian literature with the set phrase "the theme has not been sufficiently elaborated."[3] With very rare exceptions, appeals against negative decisions had no chance of success. At best they were ignored, at worst the applicant was chastised for showing "contempt for the examiners".

Such was the setting when, unbeknownst to each other, two courageous individuals, Valery Senderov and Bella Subbotovskaya, decided to do something about the sorry situation. Senderov, who had done work in functional analysis, was a mathematics teacher at Moscow's famed "School Number 2", and Bella, who had already published important papers on mathematical logic, held positions at various technical research institutes performing programming tasks and numerical computations. The two met by coincidence in July 1978 on the steps of the main building of Moscow State University, where the entrance exams to MekhMat were taking place. Their aim was to assist students who had just failed the oral exams with the formulation of letters to the Appeal Committee. Senderov had a further aim in mind: together with his colleague Boris Kanevsky, he was going to document the racially motivated bias and unfairness in the MekhMat entrance exams. Senderov was just talking to one of the flunked students when the examiner rushed out and challenged him. An altercation ensued that soon degenerated into a scuffle; security was called, and Senderov was forcefully removed from the premises. This event marked—as Kanevsky recounted at a recent memorial session at the Technion in Haifa in tribute to Bella[4]—the beginning of an ambitious and dangerous undertaking, the creation of a "Jewish People's University".

Photo courtesy of Ilya Muchnik. Picture quality improved by Poline Tylevich.

Bella Abramovna Subbotovskaya, 1961.

Bella Abramovna is described by her friends and admirers variously as loud, energetic, and demanding, but also as warm, kind-hearted, optimistic, with great courage and resolve. She had fallen in love with mathematics beginning in first grade and that love never abated, even though she also informally prepared for a career in music and played

[1] *Even this is not quite correct. According to one source, MekhMat officials opened the written exams—which had been handed in carrying only ID-numbers and no names—identified the Jews, and drastically reduced their grades.*

[2] *On a diffferent occasion, the same examiner told another student the exact opposite: "1* or *2" was considered wrong.*

[3] *In truly Kafkaesque manner, even a perfect score did not guarantee admittance to a Jewish student. "Grades received at entrance examinations do not play a decisive role for admission to our Institute," the prospectus of the Moscow Institute for Physics and Technology read.*

[4] *I will refer to B. A. Subbotovskaya simply as Bella, as everybody did and does. The conference in her honor took place March 12–19, 2007.*

several instruments. As an educator "she had the ability to convey her perception to the most varied types of people," her husband Ilya Muchnik would later write.[5] She could evoke appreciation for her subject in almost all persons with whom she dealt, be they grade-school children for whom she designed mathematical games; adults attending evening school, weary from a full day's work; or gifted high-school graduates who were denied entry to Moscow State University.

Bella and Ilya met at a seminar on cybernetics where a paper on how to compose music on a computer was discussed. Bella, who had studied violin for ten years at the music school, and Ilya, who had the idea of studying the statistics of musical fragments in Jewish folk songs by computer, immediately took a liking to each other. After about a year, in the summer of 1961, they decided to get married and moved into a six square meter room with a stove-heater and an outhouse in the yard. They lived in poor surroundings in a beehive of buildings, each of which was occupied by three or four Jewish families, complete with numerous children and grandparents. The common language among the neighbors was Yiddish. The wedding was a very authentic affair held in the yard, with everybody singing Jewish folk songs, accompanied by Bella on the violin.

After their marriage, Bella made a meager living performing engineering tasks for various technical research institutes. She did not like her routine work but did it diligently nevertheless. A change was brought about when the couple's daughter began studying at high school.[6] Bella started wondering where children of her daughter's school, many of whom were Jewish, would pursue their studies after graduating. This is when she became painfully aware of the dead-end that awaited Jewish children. Even the most gifted among them had practically no hope of studying at first-rate institutes. Bella herself had been lucky enough to attend MekhMat in the mid-1950s, a period after Stalin's death and at the beginning of the Khrushchev era, when Jews were not yet discriminated against. But by now, in the late 1970s, the situation had vastly deteriorated. Bella decided to devote herself to furthering the ambition of dedicated and mathematically gifted high-school graduates. She helped prepare them for the entrance exam to the faculty of mathematics and assisted those denied entry in writing the necessary letters to the appeals committees.

Meanwhile Senderov and Kanevsky wrote the underground classic "Intellectual Genocide" in which they documented the results of their investigations of failed Jewish MekhMat candidates. The mathematical economist Victor Polterovich had collected statistics on the admission of students from Moscow's leading mathematics and physics high schools to MekhMat. In 1979, of the 47 non-Jewish students who applied, 40 were admitted, but only six of the 40 students with Jewish names. This was after a kind of self-selection had already taken place, with many Jewish students not even applying. The questions given to candidates with Jewish names were distressingly difficult, and the reasons for failing the students or denying their appeals were equally hair-raising. Polterovich also wrote a "Memo for students applying to MekhMat who are thought of as being Jewish", which was distributed by Senderov and Kanevsky. But then Bella did much more. She decided to partially restore hope and fairness by giving the rebuffed students an opportunity to obtain a fundamental mathematical education at her home.

Since appeals to the appropriate committee were of no avail, the failed students were left with no option but to study at institutions that prepared them for professional careers, like the Institute of Metallurgy, the Pedagogical Institute, the Institute of Railway Engineers, or the Institute for the Petrochemical and Natural Gas Industry. They would get a solid grounding in applied mathematics but would have no hope of ever glimpsing beyond the immediate areas of the professions for which they were trained. Pure mathematics would remain out of reach.

But Bella would have none of that. In the fall of 1978 she started an ambitious and unprecedented undertaking in her own home: the "Jewish People's University". Bella's former classmate Alexandre Vinogradov, who had received his doctorate from MekhMat fifteen years earlier and was now a professor at that institute, devised a nonstandard advanced study program for the initial course. Together with former and current Ph.D. students, he taught the initial course.[7] The university began as a study group with a dozen or so students, but news about the undertaking quickly spread by word of mouth. No equipment was available except for a children's chalkboard standing on an unstable tripod. Later, a more suitable blackboard was obtained. Since it could not fit through the narrow staircase of the tenement where Bella (now divorced) lived, it had to be hoisted through the fifth-floor window. Bella was the guiding spirit behind every aspect of the unique undertaking. She herself did not teach, but solicited the help of former classmates, now established mathematicians, to lecture at her university. The informal institution was open to everyone, but most

[5] *Muchnik is now Research Professor at the Department of Computer Science, Rutgers University, New Jersey.*

[6] *Bella's daughter today lives in the USA and works for a furniture company.*

[7] *Because of ideological differences with other faculty members, Vinogradov left the project after a few months. The point of contention was whether Bella's university should limit itself to teaching mathematics or be part of the broader struggle against the Soviet regime.*

students and many teachers, though by no means all, were Jewish.

And there was no lack of gifted teachers; the recruited faculty was of the highest caliber. The courses taught in Bella's apartment, and later at other venues, corresponded to the first two years of the MekhMat undergraduate curriculum. Vinogradov, Senderov, Alexander Shen, and Andrei Zelevinsky taught calculus; Dmitry Fuchs differential geometry and linear algebra; Alexey Sossinski, a Russian born in Paris and brought up in America, lectured on modern algebra; Boris Feigin gave courses on topology and commutative algebra; Victor A. Ginzburg taught linear algebra; Mikhail Marinov—who, after having applied for an exit visa to Israel, labored as a construction worker—lectured on quantum mechanics and field theory; seminars were run by Boris Kanevsky.[9] Universities all over the world would have been proud to have a faculty of the quality found at Bella's Jewish People's University. Nobody received any money. The teachers took on the selfless and risky task motivated solely by human decency, to right a wrong, and out of love for mathematics. There was even a "visiting" professor: once, during a trip to Moscow, John Milnor came to lecture.

Word of the underground university got around, and the student body grew. Soon, the auditors no longer fit into Bella's minuscule apartment. Other venues were sought and used—with and without permission: classrooms in elementary schools, empty study halls in the university's law department, the chemistry building, the humanities building, the Institute for the Petrochemical and Natural Gas Industry. In 1979, the second year of the Jewish People's University's operation, about 90 students attended its classes. Bella did everything, organizing the meetings, calling the students to inform them of the schedule and venue, even distributing tea and homemade sandwiches during the breaks between the lectures. One important and risky undertaking that she organized was the samizdat preparation and distribution of lecture notes. At first they were typed and re-typed using carbon copies, equations being inserted by hand. Eventually they were photocopied. Nobody dared ask how and where, since unauthorized duplication was considered a serious crime in the Soviet Union. In 1980, study sessions were increased to twice a week. Saturdays were reserved for three lectures and a seminar.

Even though some of the faculty members and students, especially Senderov, were known dissenters of the Soviet system, any mention of politics was carefully avoided by the teachers at Bella's university. But the enterprise was becoming too successful for the authorities to ignore. Even though it had no political intent whatsoever, it defied the Soviet system on a grand scale. The authorities could not allow an unofficial and independent institution to flourish, thereby challenging its sole claim to authority. The mere existence of the Jewish People's University was considered a political act of resistance by the authorities. The end loomed near.

At the beginning of the university's fifth year of operation, Bella was summoned to KGB offices and interrogated. It had been known all along that KGB agents had attended lectures in order to observe the goings-on. They must have known that no subversive activities were carried out at the Jewish People's University. But they never comprehended what kind of institution Bella's university was. The agents just could not grasp that people were willing to teach mathematics without being paid. One day in the summer of 1982, news came that Senderov, Kanevsky, and a student, Ilya Geltzer, had been arrested.[10] They had distributed leaflets protesting unpaid "volunteer" work that the Communist Party demanded of loyal citizens on the Saturday commemorating Lenin's birthday. Senderov and Kanevsky were known dissenters of the Soviet regime but had always kept mathematics and politics strictly separate. Nevertheless their and the student's affiliation with Bella's enterprise gave the authorities the excuse they sought.

Bella was summoned again and asked to serve as a witness against Senderov. Of course, she refused. Her independent spirit would not allow anything but defiance of authority. The tragic consequences occurred a few days later. The bus of Moscow State University's chamber orchestra, where she had played first viola since her student days, took her body to the cemetery. Her ashes were later buried at the Jewish cemetery Vostryakovo.

Bella's death spelled the end of the Jewish People's University. Senderov was sentenced on charges of anti-Soviet agitation and propaganda to seven years in prison—where he would spend long stretches in punishment cells sustained by a meager diet that left him too weak to even rise from his bunk.[11] Kanevsky was sentenced to one year and two months in prison. Seminars continued for a few more months due to the valiant efforts of some remaining faculty members, but without Bella's support and guiding hand the spirit was missing. In the spring of 1983 the institution finally closed its non-existent doors. During the four years of its operation, the "Jewish People's University" had instructed about 350 alumni in higher mathematics and brought forth about 100 "graduates", some of whom would become professional mathematicians and faculty members at

[9] *There were more. Altogether 21 people taught at the university.*

[10] *Another young man, Vladimir Gershuni, was arrested together with them and later forcibly confined to a mental institution.*

[11] *He was released by Gorbachev after Perestroika, having spent five years in prison.*

prestigious institutions, mostly in the United States and in Israel. But Bella had given her alumni more than just a math education: in the face of injustice, discrimination, and seemingly insurmountable difficulties, she had offered them hope and taught them to fight back.

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A. Everett Pitcher (1912–2006)

Steven H. Weintraub

Arthur Everett Pitcher was born in Hanover, New Hampshire, on July 18, 1912, and died on December 4, 2006, at the age of 94.

Everett (as he was always known) grew up in Cleveland, where his father was head of the mathematics department at Adelbert College of Western Reserve University until his premature death when Everett was eleven. Everett received his A.B. from Western Reserve University in 1932, which later awarded him an honorary D. Sc. in 1957. He remembered with great fondness throughout his life how the mathematics department at Western Reserve University took him under its wing. He received the degrees of M.A. (1933) and Ph.D. (1935) from Harvard University, where he was a student of Marston Morse. After two years as a Benjamin Peirce Instructor at Harvard, Everett came to Lehigh University in 1938. During World War II he served in the U. S. Army at the Ballistics Research Laboratory at Aberdeen Proving Ground and later in scientific intelligence in the European Theatre. Everett served on the Lehigh faculty for forty years, retiring in 1978 as University Distinguished Professor of Mathematics. Even after his retirement, he continued his close connection with the Lehigh math department. Until shortly before his ninetieth birthday he came into Lehigh every day (driving himself), and even afterwards he was a regular attendee at the weekly departmental colloquia and colloquium dinners. Those of us who attended these dinners will remember what a great raconteur he was.

Everett married Sarah Mathiott Hindman in 1936. They had two children, Susan Pitcher and Joan Pitcher Morrison. Sarah passed away in 1972. Everett married Theresa Sell in 1973. Terry died in 2001.

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Photograph courtesy Math Dept., Lehigh University.

Everett Pitcher

Everett's scientific work was mostly in topology, and especially in applications and extensions of Morse theory. *Mathematical Reviews* lists 16 publications by him, but this listing is incomplete, as Everett's earliest works predate the founding of MR in 1939. Everett gave an Invited Address to the AMS in 1955, published as "Inequalities of critical point theory", *Bull. Amer. Math. Soc.* **64** (1958), 1–30. Also particularly notable is his paper with John L. Kelly "Exact homomorphism sequences in homology theory", *Ann. Math.* (2) **28** (1947), 682–709, which marks the first appearance in print of the term "exact sequence", now ubiquitous in algebraic topology. (This term had been invented by Eilenberg and Steenrod and was to appear in their book *Foundations of Algebraic Topology*, which was first published in 1952.)

Everett chose to devote his energies principally to service, rather than research. This service was in two forms, local and global.

Locally, Everett assumed the position of head of the Lehigh Department of Mathematics and Astronomy in 1960, and held this position until retiring as chair of the Lehigh Department of Mathematics in 1978. In addition to direct leadership as department chair, he served on countless committees and acted as mathematical advisor to several Lehigh presidents. While Lehigh awarded its first Ph.D. in mathematics in 1939, before Everett's tenure as chair the Lehigh mathematics department was primarily a service department. He deserves the

Tree dedication ceremony at Lehigh, spring 2007. Left to right: Pitcher's daughters Susan Pitcher and Joan Pitcher Morrison, and Steven H. Weintraub, Lorraine Wiedorn, Bruce A. Dodson, and Donald M. Davis of Lehigh.

bulk of the credit for transforming it into one that is heavily involved in mathematical research.

Everett and his second wife Terry made a great financial contribution to the Lehigh math department as well, and as a result of their generosity we have the A. Everett Pitcher Professorship of Mathematics (a chaired senior position), the A. Everett Pitcher Mathematical Research Scholar Position (a rotating postdoc), and the annual Pitcher Lectures, our distinguished lecture series. This year's Pitcher Lectures were given by George Andrews, and before the second of the three lectures a tree dedication ceremony was held in Everett's memory. (This tree, bare at the time of planting, is now in full bloom and visible from the window of my office as I write this.)

It is Everett's global service that made him one of the most well-known figures in the American mathematical community. Everett served the AMS as an associate secretary for seven years, from 1959 to 1966, and then as secretary for a further twenty-two years, from 1966 to 1988. He was one of the founders of the Society for Industrial and Applied Mathematics (SIAM) and served on its board of trustees from 1961 to 1963. In 1985 he received the Award for Distinguished Service from the Mathematical Association of America (MAA). Everett's work for the AMS is described in his reminiscences (both personal and about the AMS) "Off the Record", in *A Century of Mathematics in America, Part III*, Peter Duren, ed., Amer. Math. Soc. 1989, which make for interesting reading.

2006 Annual Survey of the Mathematical Sciences in the United States

(Third Report)

Faculty Profile
Enrollment and Degrees Awarded Profile
Graduate Student Profile

Polly Phipps, James W. Maxwell, and Colleen A. Rose

This Third Report of the 2006 Annual Survey gives information about faculty size, departmental enrollments, majors, and graduate students for departments of mathematical sciences in four-year colleges and universities in the United States. Prior to 2000, these data were included as part of the Second Report.

The 2006 Annual Survey represents the fiftieth in an annual series begun in 1957 by the American Mathematical Society. The 2006 Survey is under the direction of the Data Committee, a joint committee of the American Mathematical Society, the American Statistical Association, the Institute of Mathematical Statistics, the Society of Industrial and Applied Mathematics, and the Mathematical Association of America. The current members of this committee are Richard Cleary, Amy Cohen-Corwin, Richard M. Dudley, John W. Hagood, Abbe H. Herzig, Donald R. King, David J. Lutzer, James W. Maxwell (ex officio), Bart Ng, Polly Phipps (chair), David E. Rohrlich, and Henry Schenck. The committee is assisted by AMS survey analyst Colleen A. Rose. Comments or suggestions regarding this Survey Report may be directed to the 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. The information presented in this report was gathered on a questionnaire called the Departmental Profile which was mailed to all mathematical sciences departments in Groups I, II, III, IV, Va, and M and to a stratified random sample drawn from Group B. The questionnaire gathered information about the number of faculty in various categories, the recruitment of new faculty, undergraduate and graduate course enrollments, bachelors and masters degrees awarded during the preceding year, and the number of graduate students, all as of fall 2006. The 2006 First Report presented data collected earlier about faculty salaries (pages 252–67 of the February 2007 issue of *Notices of the AMS*). Definitions of the various departmental groupings used in the Annual Survey reports can be found on page 1344 of this report.

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). Further details on the statistical procedures used with the survey are described on page 1344.

Faculty Size

Table 1A gives the number of faculty for different categories of faculty broken down by survey group, Table 1B gives the same information for females only, and 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 22,086, up just 183 from last

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Highlights

The changes in the numbers of faculty in various categories from 2005 to 2006 were modest. The estimated number of full-time faculty in all mathematics groups combined is 22,086 (with a standard error of 399), up slightly from 21,903 last year. The number of nondoctoral full-time faculty is 4,107, up moderately from 3,804 last year. The number of part-time faculty is 6,543, almost unchanged from 6,526 last year.

Women comprise 27% of the full-time faculty in mathematics in fall 2006 compared with 26% in fall 2005. The size of the standard errors make it possible that some of the changes observed are due solely to sampling error.

The number of doctoral full-time non-tenure-track faculty continued its slow but steady climb for 2006. For the doctoral mathematics departments this number reached 1,461, up 44% over its 1999 figure of 1,014. For Group M the 2006 figure reached 283, only slightly higher than in recent years. For Group B the 2006 figure of 545 was the highest reported since 1998 but only 6% above the 1999 figure of 514.

Among the doctoral full-time math faculty in fall 2006, women comprised 12% of the tenured and tenure-track faculty and 25% of the non-tenure-track faculty. For Group M faculty these same percentages are 25 and 28 respectively, and for Group B faculty they are 27 and 25 respectively. Among the nondoctoral full-time faculty in all math departments combined, women comprise 53%.

The number of tenured and tenure-track positions under recruitment during 2005-2006 was the highest reported over the past five years. Furthermore, the number of new doctoral hires is up 28% over last year, to 701 for positions beginning in fall 2006. The number of new doctoral hires into tenure-track positions is up 38% to 406 for fall 2006, with all the increase coming in Group M and Group B departments where the total was 362, up 84% from fall 2005's figure of 230.

Among the 230 individuals hired into tenure-track positions in the doctoral mathematics departments, two out of three (152) held a non-tenure-track position when hired and 80% of these were postdoctoral positions. For the 613 individuals hired into tenure-track positions in Groups M and B combined, just under half (292) held a non-tenure-track position when hired and just under half of these were postdoctoral positions.

The number of full-time graduate students at doctoral mathematics departments continued its steady climb over the past ten years reaching a new high of 11,686 for fall 2006. The number of women among these graduate students also reached a new high of 3,478, maintaining its percentage at 30%, a figure typical over this ten-year period. The percent of U.S. citizens among the total full-time graduate students remains steady at 56%.

year, with a standard error of 399. The doctoral mathematics departments (Groups I, II, III, and Va) are up 13 full-time faculty members, Group M is up 173 faculty members, and Group B is down 3. Given the size of the standard errors, these changes are clearly not significant. The total faculty size in the statistics and biostatistics group (Group IV) is up to 1,702 this year from 1,626 last year, a 5% increase.

This year the estimated number of part-time faculty in Groups I, II, III, Va, B, and M combined is up to 6,543, essentially unchanged from last year's estimate of 6,526. The number of non-tenure-track doctoral faculty (including postdoctoral positions) is estimated at 2,289 this year, up 5% from 2,180 last year. Another category that has been increasing the past few years is the nondoctoral full-time faculty; this year this group is estimated at 4,107 in Groups I, II, III, Va, M, and B combined, up from 3,804 last year, an 8% increase. In Group IV the number of part-time faculty decreased from 254 last year to 201 this year, and the number of non-tenure-track doctoral faculty increased from 376 last year to 402 this year due to the increased number of postdoctoral appointments.

Table 1D gives an eight-year history of tenured/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 2006 values to the 1999 values, we see that for Groups I, II, III, and Va combined the number of tenured/tenure-track faculty is down 2%, the number of non-tenure-track doctoral faculty is up 44%, and the number of part-time faculty is down 7%. Likewise for Group M, the number of tenured/tenure-track faculty is down 6%, the number of non-tenure-track doctoral faculty is up 94%, and the number of part-time faculty is down 16%. Finally in Group B, the number of tenured/tenure-track faculty is up 45%, the number of non-tenure-track doctoral faculty is up 6%, and the number of part-time faculty is up 19%.

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 4,107 full-time faculty who do not have doctoral degrees. The majority of these faculty, 3,436 (84%), are found in Groups M and B departments. Table 1G shows the part-

Table 1A: Total Faculty, Fall 2006

	GROUP									
	I Public	I Private	II	III	Va	I, II, III, & Va	M	B	I, II, III, Va, M, & B	IV
Total full-time faculty *(Standard error)*	**1763**	**997**	**2553**	**2211**	**276**	**7800**	**4695** *(108)*	**9591** *(384)*	**22086** *(399)*	**1702**
Doctoral full-time faculty	1707	989	2289	1882	262	**7129**	3683	7167	**17979**	1639
Tenured	1109	551	1574	1275	172	**4681**	2479	4614	**11774**	851
Untenured, tenure-track	179	95	311	367	35	**986**	921	2009	**3916**	386
Postdoctoral appointments	269	218	238	52	32	**809**	30	24	**863**	150
Other non-tenure-track *(Standard error)*	150	125	166	189	23	**652**	252 *(24)*	521 *(68)*	**1426** *(72)*	252
Nondoctoral full-time faculty	56	8	264	329	14	**671**	1012	2424	**4107**	63
Total part-time faculty *(Standard error)*	**132**	**48**	**399**	**522**	**27**	**1128**	**1493** *(112)*	**3922** *(366)*	**6543** *(383)*	**201**

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 doctoral part-time faculty (down 19% from 1,633 last year to 1,326 this year).

Female Faculty

Table 1B gives a complete breakdown of all categories of female faculty by group and shows small increases in the (estimated) number of female faculty in all categories, except Group I Public. For 2006–2007 the estimated total number of full-time faculty in Groups I, II, III, Va, M, and B combined is 22,086, of which 6,063 (27%) are females, up from 5,638 (26%) last year. In Group B the estimated number of doctoral female faculty increased from 1,859 last year to 1,903 this year, tenured female faculty increased from 1,080 to 1,158, untenured but tenure-track female faculty decreased from 614 to 610, and non-tenure-track doctoral female faculty (including postdoctoral appointments) decreased from 166 to 135. In Group M the doctoral full-time female faculty increased from 883 last year to 916 this year.

Table 1C compares the number of full-time and female full-time faculty that fall into each reporting group for fall 2006. The percentage who are female in each group is given in the bottom row of Table 1C. These percentages vary considerably among the groups, from a low of 13% for Group I Private to a high of 33% for Group B.

Table 1D contains information about the percentage of female faculty among the tenured/tenure-track and non-tenure-track doctoral full-time faculty and among the part-time faculty for the years 1999 to 2006.

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 4,107 nondoctoral full-time faculty in Groups I, II, III, Va, M, and B combined, 2,194 (53%) are females. From Table 1G we see that in these same groups there are 6,543 part-time faculty, of which 2,642 (40%) are females.

Faculty Recruitment

Table 2A contains detailed information on the number of full-time doctoral faculty positions in mathematical sciences departments under recruitment during 2005–2006 for employment beginning in the academic year 2006–2007. Among mathematics departments (Groups I, II, III, Va, M, and B), 1,798 positions were under recruitment, up 6% compared to those under recruitment during 2004-2005. Of those 1,798 positions, 1,595 (89%) were available to new doctoral recipients, and of those 1,595 positions, 1,073 (67%) were tenured/tenure-track positions. The 1,073 tenured/tenure-track positions open to new doctoral recipients is up 11% from the 969 such positions under recruitment in 2004–2005. The total number of tenured/tenure-track full-time doctoral positions under recruitment in Groups I, II, III, Va, M, and B combined is 1,231, up from last year's 1,176 (an increase of 5%). In Groups I, II, III, and Va combined, the total number of posted doctoral positions open at the associate/full level decreased from 100 last year to 93 this year.

Table 1B: Female Faculty, Fall 2006

	GROUP									
	I Public	I Private	II	III	Va	I, II, III, & Va	M	B	I, II, III, Va, M, & B	IV
Female full-time faculty *(Standard error)*	**244**	**128**	**505**	**525**	**47**	**1449**	**1470** *(47)*	**3144** *(464)*	**6063** *(466)*	**469**
Doctoral full-time faculty	211	125	333	344	38	**1051**	916	1903	**3869**	437
Tenured	79	34	143	175	18	**449**	527	1158	**2133**	156
Untenured, tenure-track	38	18	80	98	5	**240**	309	610	**1159**	136
Postdoctoral appointments	55	37	42	13	8	**155**	10	18	**183**	47
Other non-tenure-track	39	36	68	57	7	**207**	70	117	**394**	98
Nondoctoral full-time faculty	33	3	172	181	9	**398**	554	1241	**2194**	32
Female part-time faculty	54	4	181	211	5	**455**	615	1572	**2642**	85

Table 1C: Full-Time Faculty, Fall 2006

	GROUP								
	I Public	I Private	II	III	Va	M	B	IV	TOTAL
Full-time faculty									
Number	1763	997	2553	2211	276	4695	9591	1702	**23789**
Percentage of total full-time faculty	7%	4%	11%	9%	1%	19%	40%	7%	**100%**
Female full-time faculty									
Number	244	128	505	525	47	1470	3144	469	**6532**
Percentage of total female full-time faculty	4%	2%	8%	8%	1%	22%	48%	7%	**100%**
Percentage female full-time faculty within group	14%	13%	20%	24%	17%	31%	33%	28%	**27%**

Table 1D: Faculty Counts and Percentage Female, Fall 1999-2006

	1999	2000	2001	2002	2003	2004	2005	2006
Groups I, II, III, & Va								
Doctoral full-time faculty								
Tenured/tenure-track	5765	5568	5598	5616	5559	5604	5686	5668
Percentage female	9%	9%	10%	10%	10%	11%	11%	12%
Non-tenure-track	1014	993	1233	1274	1343	1314	1401	1461
Percentage female	22%	21%	21%	23%	25%	25%	24%	25%
Part-time faculty	1217	1399	1467	1504	1389	1355	1054	1128
Percentage female	38%	37%	38%	35%	35%	37%	37%	40%
Group M								
Doctoral full-time faculty								
Tenured/tenure-track	3599	3670	3191	3188	3005	3113	3351	3400
Percentage female	20%	21%	23%	22%	22%	23%	24%	25%
Non-tenure-track	146	262	183	276	230	277	263	283
Percentage female	56%	29%	24%	39%	33%	48%	36%	28%
Part-time faculty	1768	1906	2323	2393	1952	1888	1842	1493
Percentage female	43%	35%	36%	37%	37%	37%	37%	41%
Group B								
Doctoral full-time faculty								
Tenured/tenure-track	4580	5486	5665	5569	6172	5770	6875	6623
Percentage female	25%	22%	24%	23%	26%	25%	25%	27%
Non-tenure-track	514	407	504	507	460	472	516	545
Percentage female	24%	30%	29%	36%	20%	29%	32%	25%
Part-time faculty	3298	3580	4197	4117	3997	4846	3630	3922
Percentage female	41%	40%	43%	45%	42%	44%	41%	40%

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.

This year the estimated total number of new doctoral hires in mathematics departments is up 28% (to 701 from 547) from last year; it is up 12% (to 271 from 241) in Groups I, II, III, and Va combined, and up 40% (to 430 from 306) in Groups M and B combined. The number of new doctoral tenure-track hires in the math groups combined is up 38% as a result of a small decrease in Groups I, II, III, and Va combined (down to 44 from 65) and a very large increase in Groups M & B combined (up to 362 from 230). Among the new doctoral hires in Groups I, II, III, and Va combined, 15% of all males and 20% of all females took tenure-track positions. In contrast, for new doctoral hires in Groups M and B combined, 79% of all males and 91% of all females took tenure-track positions. From Table 2C we see that in Groups I, II, III, and Va 16% of the hires of new doctoral recipients are in tenured/tenure-track positions (last year it was 27%), while in Groups M and B 84% of the new doctoral hires are in tenured/tenure-track positions (last year it was 75%).

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 1,435 from 1,385 last year (an increase of 4%); it is up 1% in Groups I, II, III, and Va combined and 5% in Groups M and B combined. This year Groups I, II, III, and Va combined filled 581 doctoral positions, of which 230 (40%) were tenured/tenure-track positions. Last year these same groups filled 574 doctoral positions, of which 266 (46%) were tenured/tenure-track. Groups M and B combined filled 854 doctoral positions this year, and 613 (72%) of these were tenured/tenure-track positions. Last year these two groups filled 811 doctoral positions, of which 562 (69%) were tenured/tenure-track.

Beginning with the 2004 Annual Survey, departments were asked to report the number of doctoral hires into tenured/tenure-track positions

Table 1E: Summary of Full-Time and Part-Time Faculty, Fall 2006

	GROUP					
	I, II, III, & Va		M & B		IV	
	Male	Female	Male	Female	Male	Female
Full-time faculty	**6351**	**1449**	**9672**	**4614**	**1233**	**469**
Percentage	81%	19%	68%	32%	72%	28%
Doctoral full-time faculty	6076	1051	8032	2819	1202	437
Percentage	85%	15%	74%	26%	73%	27%
Tenured	4232	449	5409	1684	695	156
Percentage	90%	10%	76%	24%	82%	18%
Untenured, tenure-track	747	240	2011	919	249	136
Percentage	76%	24%	69%	31%	65%	35%
Postdoctoral appointments	652	155	26	28	103	47
Percentage	81%	19%	48%	52%	69%	31%
Other non-tenure-track	446	207	586	187	155	98
Percentage	68%	32%	76%	24%	61%	39%
Nondoctoral full-time faculty	273	398	1641	1795	31	32
Percentage	41%	59%	48%	52%	49%	51%
Part-time faculty	**673**	**455**	**3229**	**2187**	**116**	**85**
Percentage	60%	40%	60%	40%	58%	42%

Table 1F: Doctoral and Nondoctoral Full-Time Faculty, Fall 2006

	GROUP					
	I, II, III, & Va		M & B		TOTAL	
	Male	Female	Male	Female	Male	Female
Doctoral full-time faculty	**6076**	**1051**	**8032**	**2819**	**14108**	**3869**
Tenured	4232	449	5409	1684	9641	2133
Untenured, tenure-track	747	240	2011	919	2757	1159
Postdoctoral appointments	652	155	26	28	678	183
Other non-tenure-track	446	207	586	187	1032	394
Nondoctoral full-time faculty	**273**	**398**	**1641**	**1795**	**1913**	**2194**
Tenured	14	8	503	237	517	245
Untenured, tenure-track	3	1	195	209	198	210
Postdoctoral appointments	2	0	0	0	2	0
Other non-tenure-track	255	389	942	1349	1198	1738

Table 1G: Part-Time Faculty, Fall 2006

	GROUP				
	I, II, III, & Va		M & B		
	Male	Female	Male	Female	TOTAL
Doctoral part-time faculty	308	93	737	187	**1326**
Nondoctoral part-time faculty	365	362	2492	1999	**5218**
TOTAL	**673**	**455**	**3229**	**2187**	**6543**

Table 2A: Recruitment of Doctoral Faculty, Fall 2006

	GROUP									
	I Public	I Private	II	III	Va	I, II, III, & Va	M	B	I, II, III, Va, M, & B	IV
Posted Doctoral Positions										
Total number[1]	**176**	**137**	**201**	**157**	**27**	**699**	**351**	**748**	**1798**	**180**
(Standard error)							*(47)*	*(77)*	*(90)*	
Tenured/tenure-track	64	47	100	124	21	**535**	305	570	**1231**	140
Open to new doctoral recipients	123	98	168	125	23	**536**	321	738	**1595**	131
Tenured/tenure-track	22	17	71	103	16	**229**	281	563	**1073**	104
Open at assoc/full level	22	18	15	32	7	**93**	39	56	**189**	56
Reported Hires for Above										
Total number	**159**	**122**	**176**	**121**	**21**	**599**	**282**	**651**	**1531**	**122**
Male doctoral hires	123	97	129	89	15	**453**	184	348	**985**	75
Tenured/tenure-track	30	22	53	60	11	**176**	140	244	**560**	51
Female doctoral hires	36	21	41	24	6	**128**	81	241	**450**	44
Tenured/tenure-track	9	6	17	19	2	**54**	70	159	**283**	32
Male temporary hires	0	3	4	6	0	**14**	16	33	**62**	3
Female temporary hires	0	1	1	1	0	**4**	2	28	**34**	0
Total new doctoral hires	92	67	67	36	10	**271**	140	290	**701**	**71**
Male new doctoral hires	70	55	49	31	6	**211**	74	169	**454**	41
Tenured/tenure-track	1	5	7	15	5	**32**	57	135	**225**	27
Female new doctoral hires	22	12	17	5	5	**60**	66	121	**247**	30
Tenured/tenure-track	3	1	4	1	2	**12**	60	110	**182**	20
Unfilled positions	**17**	**15**	**25**	**36**	**7**	**100**	**69**	**93**	**262**	**59**

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

Table 2B: A Summary of Recruitment of Doctoral Faculty, Fall 2006

	GROUP		
	I, II, III, & Va	M & B	IV
Posted Doctoral Positions			
Total number	**699**	**1099**	**180**
Tenured/tenure-track	355	876	140
Open to new doctoral recipients	536	1059	131
Tenured/tenure-track	229	844	104
Reported Hires for Above			
Total doctoral hires	**581**	**854**	**119**
Tenured/tenure-track	230	613	83
Previously in non-tenure-track	152	292	21
Previously in postdoc	121	137	18
Total new doctoral hires[1]	**271**	**430**	**71**
Tenured/tenure-track	44	362	47
Male	211	243	41
Tenured/tenure-track	32	192	27
Female	60	187	30
Tenured/tenure-track	12	170	20
Total not-new doctoral hires	**310**	**424**	**48**
Tenured/tenure-track	185	251	36
Male	242	290	35
Tenured/tenure-track	144	191	24
Female	68	134	14

[1] New doctoral hires are individuals who have held a doctorate for less than one year at the time of hiring.

filled by individuals who held a non-tenure-track position the previous year and of those, how many were in postdoctoral appointments. For Groups I, II, III, and Va combined, 152 individuals reported having held a non-tenure-track position the previous year (66% of the 230 tenure-track hires), with 121 (53%) having held a postdoctoral appointment the previous year. This compares with last year's figure of 161 (61%) positions filled by individuals who held a postdoctoral appointment the previous year. For Groups M and B combined, 292 individuals (48% of the 613 tenure-track hires) reported having held a non-tenure-track position the previous year, with 137 (22%) having held a postdoctoral appointment the previous year. This compares with last year's figure of 83 (15%) positions filled by individuals who held a postdoctoral appointment the previous year.

The estimated number of not-new doctoral hires in mathematics departments is 734, down from 838 last year. The total of not-new doctoral hires into tenured/tenure-track positions in all the mathematics groups combined is 436, down 18% from last year. It is down 8% in Groups I, II, III, and Va combined (to 185 from 201 last year), and down 24% in Groups M and B combined (251 from 332).

Figure 1 shows the number of full-time doctoral positions posted for all groups combined except Group IV, as well as the number of those that were tenured/tenure-track and the number unfilled for the years 1994 to 2006. The number of positions posted and the number of available tenured/tenure-track positions steadily increased, reaching a maximum in 2001. These numbers declined for the next two years. This year both the number of positions posted and the number of tenured/

Table 2C: Positions Posted and Filled, Fall 2006

Positions	GROUP		
	I, II, III, & Va	M & B	IV
Posted positions opened to new doctoral recipients	536	1059	131
% tenured/tenure-track	43%	80%	79%
Positions filled by new doctoral recipients	271	430	71
% tenured/tenure-track	16%	84%	66%
Positions filled by not-new doctoral recipients[1]	310	424	48
% tenured/tenure-track	60%	59%	75%

[1] Not-new doctoral recipients are individuals who have held their doctorate for more than one year.

tenure-track positions posted increased over the previous two years.

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 2006 faculty attrition rate for Groups I, II, III, Va, M, and B combined is 2.3%, and it is 1.6% for Group IV. For fall 2006, Group Va had the lowest attrition rate at 1.2%, while Group II had the highest at 2.9%.

Figure 2 shows the trends in these attrition rates between 1993 and 2006. While the rates vary from group to group and from year to year within each group, for most of the 1990s the dominant tend was one of increasing attrition for all groups combined. In the late 1990s attrition leveled off then began dropping in 2003, reaching a new low for 2006.

Enrollment Profile and Degrees Awarded Profile

The Departmental Profile Survey obtained information about course 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 2006 for each group. The estimated total undergraduate enrollment in fall 2006 for all groups combined is 2,170,000. Table 4A gives these totals for fall 2001 to fall 2006. Total undergraduate enrollments for all groups combined is down 2% from last year; the total is up 29% in Group Va.

Table 4B gives total graduate enrollments for fall 2001 to fall 2006. Total graduate course enrollments for all groups combined is down 2% from last year; the total is up 11% for Group III,

Figure 1: Number of Full-Time Doctoral Positions under Recruitment
Groups I, II, III, Va, M, & B Combined, Fall 1994 to Fall 2006

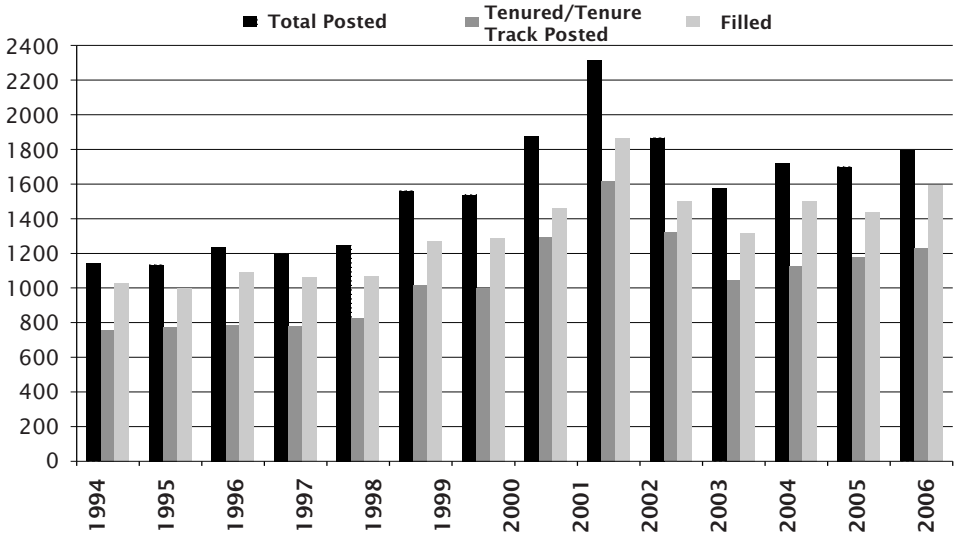
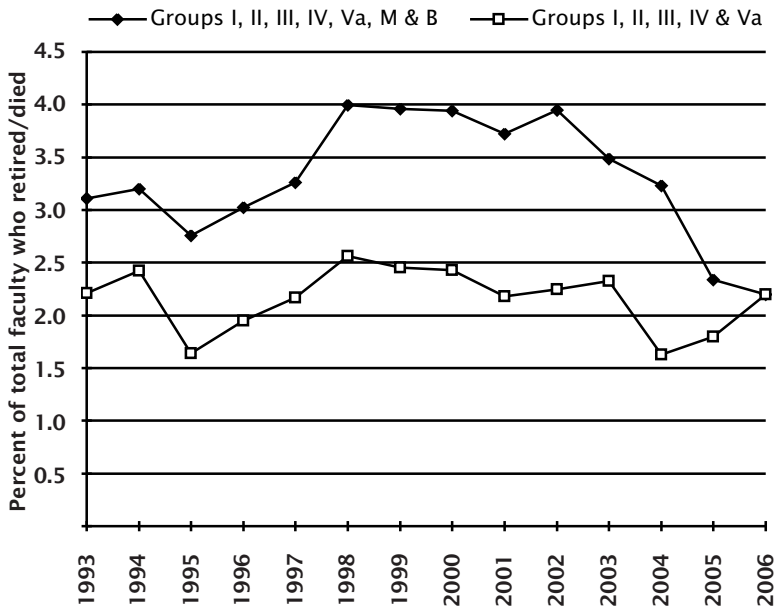


Table 3: Faculty Attrition,[1] Fall 2006

	GROUP									
	I Public	I Private	II	III	Va	I, II, III, & Va	M	B	I, II, III, Va, M, & B	IV
Full-time faculty who retired or died										
Total number	38	15	73	61	3	**190**	103	221	**514**	27
(Standard error)							*(19)*	*(36)*	*(41)*	
Percentage	2.1%	1.5%	2.9%	2.8%	1.2%	**2.4**%	2.2%	2.2%	**2.3**%	1.6%

[1] Number and percentage of full-time faculty who were in the department in fall 2005 but were reported to have retired or died by fall 2006.

Figure 2: Faculty Attrition



down 11% in Group I Pu, and down 6% in Group M.

The historical data on enrollment numbers presented in Tables 4A and 4B for fall 2001 to fall 2006 suggest a trend of gradually increasing undergraduate and graduate enrollments.

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 2001 to fall 2006 and shows a slightly downward trend over the period shown.

For a comprehensive survey of undergraduate courses, please refer to the report of the 2005 CBMS survey. This publication is available from the AMS website at www.ams.org/cbms/.

Undergraduate and Masters Degrees

Tables 5A and 5C display the number of undergraduate and masters degrees reported for 2005–2006 for each departmental group. Table 5B shows the total undergraduate degrees awarded for the period 2001-2002 through 2005-2006. (These data were not collected prior to 2002.) After the drop reported last year, the number of undergraduate degrees awarded has rebounded somewhat this year. The number of masters degrees awarded in mathematics decreased from 4,300 reported in 2005 to 4,000 reported in 2006.

The reader should be aware that at least 44 of the 189 departments in the 2006 Group M population and at least 274 of the 1,041 departments in the 2006 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 23,800 undergraduate degrees awarded includes 500 in statistics and 2,400 in computer science. (The report of the 2005 CBMS survey provides a more comprehensive study of departmental bachelors degrees.) Of the 4,000 masters degrees awarded, 500 were in statistics, and 500 were in computer science.

Graduate Student Profile

Table 6A summarizes information gathered by the 2006 Departmental Profile survey about graduate students enrolled in fall 2006. 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.

The estimated total number of graduate students in all mathematics groups combined increased from 13,068 in 2005 to 14,496 in 2006, and the total number of full-time graduate students in Groups I, II, III, and Va combined increased from 10,565 in 2005 to 11,686 in 2006. The number of U.S. citizen full-time graduate students in Groups I, II, III, and Va combined increased by 10% to 6,501. The number of first-year full-time students in Groups I, II, III, and Va combined increased by 12%, from 2,832 last year to 3,161 this year (both the number of first-year U.S. citizens and the number of first-year non-U.S. citizens were up). The

Table 4A: Total Undergraduate Course Enrollments (thousands)

Fall	GROUP								
	I Public	I Private	II	III	Va	M	B	IV	Total
2001	176	42	279	246	12	513	743	81	**2092**
2002	187	41	275	250	16	507	774	76	**2125**
2003	185	41	283	255	17	498	774	72	**2125**
2004	159	42	277	261	16	492	782	72	**2101**
2005	177	43	273	249	12	509	872	70	**2205**
2006	172	43	290	251	15	496	826	77	**2170**
(Standard error)						*(8)*	*(26)*		*(27)*

Table 4B: Total Graduate Course Enrollments (thousands)

Fall	GROUP							
	I Public	I Private	II	III	Va	M	IV	Total
2001	7	5	9	9	2	14	26	72
2002	10	4	11	10	3	12	29	79
2003	10	5	11	11	2	16	31	87
2004	9	4	12	10	2	12	31	81
2005	10	4	13	9	2	16	29	84
2006	9	4	13	10	2	15	29	82
(Standard error)						*(1)*		*(1)*

Table 4C: Undergraduate and Graduate Enrollments per Full-Time Faculty Member, Fall 2006

	GROUP							
	I Public	I Private	II	III	Va	M	B	IV
Undergraduate Course Enrollments Number per full-time faculty member	98	43	105	113	56	106	82	45
Graduate Course Enrollments Number per full-time faculty member	5	4	5	5	8	3	—	17

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

Fall	GROUP							
	I Public	I Private	II	III	Va	M	B	IV
2001	101	47	114	120	41	118	94	57
2002	107	43	114	121	50	117	95	55
2003	104	42	113	121	46	121	89	46
2004	90	44	113	126	49	120	89	49
2005	96	44	108	116	43	113	91	43
2006	98	43	105	113	56	106	82	45

Table 5A: Undergraduate Degrees Awarded (hundreds), Fall 2006

	GROUP								
	I Public	I Private	II	III	Va	M	B	I, II, III, Va, M, & B	IV
Total Undergraduate Degrees Awarded	**23**	**8**	**19**	**16**	**3**	**45**	**123**	**238**	**5**
(Standard error)						*(2)*	*(11)*	*(12)*	
Statistics only	1	0	0	1	0	1	2	**5**	3
Computer science only	1	0	1	1	0	3	18	**24**	0
Female Undergraduate Degrees Awarded	**8**	**2**	**7**	**7**	**1**	**20**	**51**	**97**	**2**
Statistics only	0	0	0	0	0	1	1	**3**	1
Computer science only	0	0	0	0	0	1	2	**3**	0

Table 5B: Undergraduate Degrees Awarded (hundreds)

Fall	2002	2003	2004	2005	2006
Total Undergraduate Degrees Awarded	217	220	244	234	238
Female Undergraduate Degrees Awarded	91	90	102	93	97
Percentage female	42%	41%	42%	40%	41%

number of female full-time graduate students in Groups I, II, III, and Va combined increased from 3,111 to 3,478.

In Group IV the number of full-time graduate students increased by 11% to 4,787 and the number of U.S. citizen full-time graduate students increased by 16% to 1,831. The first-year full-time graduate students in Group IV increased by 179 to 1,524 and the number of first-year full-time U.S. citizens was up from 550 to 664. The number of female full-time graduate students in Group IV increased from 2,076 to 2,249, an 8% increase.

The percentage of full-time graduate students who are U.S. citizens in the mathematics groups combined is 60% while the percentage of full-time graduate students who are U.S. citizens in Group IV is 38%; the percentage of women is 32% in mathematics groups combined and 47% in Group IV. The number of full-time graduate students in Group M increased from 2,503 to 2,810.

The number of part-time graduate students in Groups I, II, III, and Va increased 15% to 2,027 this year, and in Group IV increased 10% to 823. Group III has 985 (49%) 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 75% are U.S. citizens, and in Group IV 54% of the part-time graduate students are females and 62% are U.S. citizens. The number of Group M part-time graduate students decreased from 3,181 to 2,412, with a standard error of 168 this year and 341 last year. For Group M, 46% 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 1997 through fall 2006. From these data we can see that total number of full-time graduate students in the doctoral mathematics groups has been generally increasing since 1999, with this years enrollment the largest reported. Similarly, the number of full-time graduate students who

Table 5C: Masters Degrees Awarded (hundreds), Fall 2006

	GROUP							
	I Public	I Private	II	III	Va	M	I, II, III, Va & M	IV
Total Masters Degrees Awarded	**5**	**2**	**6**	**7**	**1**	**18**	**40**	**12**
(Standard error)						*(1)*	*(1)*	
Statistics only	0	0	0	1	0	2	5	8
Computer science only	0	0	0	1	0	4	5	0
Female Masters Degrees Awarded	**2**	**0**	**3**	**3**	**0**	**9**	**17**	**6**
Statistics only	0	0	0	1	0	1	2	4
Computer science only	0	0	0	0	0	2	2	0

are U.S. citizens has been increasing since 2002 and remains stable this year at 56%. The number of first-year full-time graduate students who are U.S. citizens had been increasing until 2004 when it reached 60%, dropping slightly last year and then again this year to 55%. 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 2006 Annual Survey First and Second Reports were published in the *Notices of the AMS* in the February and August 2007 issues respectively. The previous version of this report, the 2005 Annual Survey Third Report was published in the *Notices of the AMS* in the December 2006 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/employment/surveyreports.html.

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.

Table 6A: Graduate Students, Fall 2006

	GROUP								
	I Public	I Private	II	III	Va	I, II, III, & Va	M	I, II, III, Va, & M	IV
Total Graduate Students									
Full-time	3219	1709	3402	2596	760	11686	2810	14496	4787
(Standard error)							*(148)*	*(148)*	
First-year full-time	651	560	911	851	188	3161	1078	4240	1524
Part-time	166	271	486	985	118	2027	2412	4439	823
(Standard error)							*(168)*	*(168)*	
Female Graduate Students									
Full-time	797	401	1094	957	230	3478	1132	4611	2249
First-year full-time	184	150	298	320	71	1024	438	1462	749
Part-time	73	50	219	397	23	763	1102	1865	448
U.S. Citizen Graduate Students									
Full-time	1875	771	2045	1425	384	6501	2237	8738	1831
(Standard error)							*(136)*	*(136)*	
First-year full-time	378	210	562	499	93	1742	838	2581	664
Part-time	129	147	385	754	104	1519	2129	3648	509
(Standard error)							*(153)*	*(153)*	

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

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total full-time graduate students	9003	8791	8838	9637	9361	9972	10444	10707	10565	11686
Female	2691	2770	2766	3016	2899	3136	3215	3245	3111	3478
% Female	29%	32%	31%	31%	31%	31%	31%	30%	29%	30%
% U.S. citizen	57%	55%	53%	53%	49%	51%	54%	55%	56%	56%
Total first-year graduate students	2386	2458	2664	2839	2875	2996	2711	3004	2832	3161
Female	836	859	866	879	1014	1038	902	983	851	1024
% Female	35%	35%	33%	31%	35%	35%	33%	33%	30%	32%
% U.S. citizen	55%	55%	53%	54%	53%	55%	56%	60%	59%	55%

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.*[1] These rankings update those reported in a previous study published in 1982.[2] 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.

[1]Research-Doctorate Programs in the United States: Continuity and Change, *edited by Marvin L. Goldberger, Brendan A. Maher, and Pamela Ebert Flattau, National Academy Press, Washington, DC, 1995.*

[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.*

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 this page. Groups for doctoral-granting departments are I (Public), I (Private), II, III, IV, and Va. Groups M and B consist of those departments offering masters and bachelors degrees respectively.

The questionnaire on which this report is based is sent to every doctoral department and starting with this year's survey to every masters department. It is sent to a stratified random sample of Group B departments, the stratifying variable being the undergraduate enrollment at the institution.

The response rates vary substantially across the different department groups. For the doctoral departments it ranges between 75 and 90 percent. For Group M it ranges between 50 and 60 percent. For Group B, the response from the approximately 350 sampled departments drawn from the 1,040 total bachelors departments typically ranges between 40 and 45 percent. For most of the data collected on the Departmental Profile form, the year-to-year changes in a given department's data are very small when compared to the variations among the departments within a given group. As a result of this, the most recent prior year's response is used for a nonresponding department, provided the response is within three years of the current survey. After the inclusion of prior responses, standard adjustments for the remaining nonresponse are then made to arrive at the estimates reported for the entire groups.

Beginning with the 2001 Annual Survey, standard errors were calculated for some of the key estimates for Groups M and B. Standard errors are calculated using the variability in the data and can be used to 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 4,695, with a standard error of 108. This means the actual number of full-time faculty in Group M is most likely between 4,695 plus or minus two standard errors, or between 4,479 and 4,911. This is much more informative than simply giving the estimate of 4,695.

Estimates are also given for parameters that are totals from all groups, such as the total number of full-time faculty. Standard errors are ignored for the doctoral groups since the number of missing responses for each group is so small that the standard errors that could be computed are insignificant compared to those for Groups M & 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 22,086, with a standard error of 399.

Standard errors, when calculated for an estimate, appear in the tables in parentheses underneath the estimate.

Mathematics People

Kenyon Awarded 2007 Loève Prize

The 2007 Line and Michel Loève International Prize in Probability is awarded to RICHARD KENYON of the University of British Columbia. The prize, which carries a monetary award of US$30,000, will be presented at a ceremony in Berkeley in October 2007.

Richard Kenyon received his Ph.D. in 1990, advised by Bill Thurston at Princeton. His research has dealt with the interface between statistical mechanics, probability, and discrete conformal geometry. His 1997 paper "Local statistics of lattice dimers" studies uniform random dimer configurations (domino tilings) on a graph and shows how to perform many interesting calculations. This has come to be regarded as the seminal work in the subsequent emergence of a large field studying Gibbs distributions of combinatorial configurations, which has developed in unexpected directions. For instance: (i) His 2000 paper "Conformal invariance of domino tiling" proves that the height function of a random domino tiling of the two-dimensional lattice has a distribution which, in the scaling limit, is conformally invariant. (ii) His 2006 paper "Dimers and amoebae" (with Andrei Okounkov and Scott Sheffield) associates to any periodic bipartite planar graph a curve that can be used to describe the phase space of Gibbs distributions on dimer configurations and categorize them as gaseous, liquid, or frozen. Other aspects of this field involve spanning trees, matchings, the Gaussian free field, Harnack curves, and various models for random surfaces.

The Loève Prize commemorates Michel Loève, professor at the University of California, Berkeley, from 1948 until his untimely death in 1979. The prize was established by his widow, Line, shortly before her death in 1992. Awarded every two years, it is intended to recognize outstanding contributions by researchers in probability who are under forty-five years old.

—David Aldous, University of California Berkeley

Iliopoulos and Maiani Awarded 2007 Dirac Medal

JEAN ILIOPOULOS of the Laboratoire de Physique Théorique, École Normale Supérieure, and LUCIANO MAIANI of the Università degli Studi di Roma "La Sapienza" have been jointly awarded the 2007 Dirac Medal by the Abdus Salam International Centre for Theoretical Physics (ICTP). They were honored "for their work on the physics of the charm quark, a major contribution to the birth of the Standard Model, the modern theory of elementary particles."

The ICTP awarded its first Dirac Medal in 1985. Given in honor of P. A. M. Dirac, the medal is awarded annually on Dirac's birthday, August 8, to an individual or individuals who have made significant contributions to theoretical physics and mathematics. The medalists also receive a prize of US$5,000. An international committee of distinguished scientists selects the winners from a list of nominated candidates. The Dirac Medal is not awarded to Nobel laureates, Fields Medalists, or Wolf Foundation Prize winners.

—From an ICTP announcement

MAA Awards Presented

The Mathematical Association of America (MAA) presented several awards for excellence in expository writing and teaching at its Summer Mathfest, August 3–5, 2007, in San Jose, California.

The Trevor Evans Award is given to authors of expository articles that are accessible to undergraduates and that were published in *Math Horizons.* The prize carries a cash award of US$250. The prizes for 2007 were awarded to ADRIAN RICE and EVE TORRENCE, both of Randolph-Macon College, for their joint article "Lewis Carroll's condensation method for evaluating determinants", *Math Horizons*, November 2006; and to ROBERT BOSCH of Oberlin College for his article "Opt art", *Math Horizons*, February 2006.

The George Pólya Award is given for articles published in the *College Mathematics Journal* and has a cash prize of US$500. RICHARD JERRARD, emeritus professor at the University of Illinois; the late JOEL SCHNEIDER, formerly of Sesame Workshop; RALPH SMALLBERG, an independent developer of curricular software and educational television for children in New York City; and JOHN WETZEL, retired professor at the University of Illinois at Urbana-Champaign, were honored for their joint article, "Straw in a box", *College Mathematics Journal*, March 2006. ALLEN SCHWENK of Western Michigan University was recognized for his article "Distortion of average class size: The Lake Wobegon effect", *College Mathematics Journal*, September 2006.

The Carl B. Allendoerfer Award is given for articles published in *Mathematics Magazine* and has a cash prize of US$500. The 2007 awardees are CARL V. LUTZER of the Rochester Institute of Technology for his article "Hammer juggling, rotational instability, and eigenvalues", *Mathematics Magazine*, October 2006; and SAUL STAHL of the University of Kansas for his article "The evolution of the normal distribution", *Mathematics Magazine*, April 2006.

The Lester R. Ford Award is given for articles published in the *American Mathematical Monthly* and carries a cash prize of US$500. The following authors were honored for 2007: ANDREW GRANVILLE, University of Montreal, and GREG MARTIN, University of British Columbia, for their joint article "Prime number races", *American Mathematical Monthly*, January 2006; JEFFREY C. LAGARIAS, University of Michigan, for "Wild and Wooley numbers", *Monthly*, February 2006; LLUÍS BIBILONI, Universitat Autònoma de Barcelona, JAUME PARADÍS, Universitat Pompeu Fabra, Barcelona, and PELEGRÍ VIADER, Universitat Pompeu Fabra, Barcelona, for their joint article "On a series of Goldbach and Euler", *Monthly*, March 2006; HAROLD P. BOAS, Texas A&M University, for "Reflections on the Arbelos", *Monthly*, March 2006; and MICHAEL J. MOSSINGHOFF, Davidson College, for "A $1 problem", *Monthly*, May 2006.

The Merten M. Hasse Prize recognizes a noteworthy expository paper appearing in an MAA publication, at least one of whose authors is a younger mathematician. The 2007 prize was awarded to FRANKLIN MENDIVIL of Acadia University, Nova Scotia, Canada, for "Fractals, graphs, and fields", published in the *American Mathematical Monthly*, June–July 2003.

The Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member honors a beginning college or university teacher whose teaching has been extraordinarily successful and whose effectiveness in teaching undergraduate mathematics is shown to have influence beyond his or her own classroom. The 2007 awardees are TIMOTHY CHARTIER of Davidson College, SATYAN DEVADOSS of Williams College, and DARREN NARAYAN of the Rochester Institute of Technology.

—From an MAA announcement

Prizes of the Canadian Mathematical Society

The Canadian Mathematical Society (CMS) has announced the awarding of several major prizes.

RICHARD NOWAKOWSKI of Dalhousie University has been awarded the Adrien Pouliot Award for 2007. The award recognizes individuals or teams of individuals who have made significant and sustained contributions to mathematics education in Canada. According to the prize citation, Nowakowski was honored for "his long-term involvement with and leadership of the Canadian Mathematical Olympiad (CMO) and the International Mathematical Olympiad (IMO)." He has been "instrumental in establishing the Nova Scotia Math League (a set of mathematics problem-solving competitions) and the Math Circles (a series of activities to foster interest in mathematics among talented high-school students)," programs that have greatly increased schoolchildren's interest in mathematics.

LAP CHI LAU of the Chinese University of Hong Kong has been honored with the 2007 CMS Doctoral Prize. According to the prize citation, as a graduate student at the University of Toronto, he "wrote a groundbreaking dissertation which attacks fundamental and difficult problems concerning connectivity in graphs." The Doctoral Prize recognizes outstanding performance by a doctoral student who graduated from a Canadian university in the preceding year (January 1st to December 31st). The prize carries a cash award of C$500.

BRIAN FORREST of the University of Waterloo was chosen to receive the Excellence in Teaching Prize. The prize citation recognizes his "contagious excitement and enthusiasm for teaching mathematics" and refers to him as "someone who stands out both as a lucid expositor and as a caring mentor." The award recognizes sustained and distinguished contributions in teaching at the postsecondary undergraduate level at a Canadian institution.

GRAHAM P. WRIGHT of the University of Ottawa has been honored with the 2007 Distinguished Service Award. This award is given annually in recognition of sustained and significant service to the CMS or the Canadian mathematical community. He has served as executive director of the CMS since 1979 and, according to the citation, "has profoundly influenced and shaped the Society. His skillful and dedicated service to the CMS has been a major factor in the dramatic growth and transformation of the Society."

—From a CMS announcement

Rosenthal Receives COPSS Award

JEFFREY S. ROSENTHAL of the University of Toronto has been chosen to receive the 2007 Presidents' Award of the Committee of Presidents of Statistical Societies (COPSS). The award is given annually to a statistician under the

age of forty in recognition of outstanding contributions to the profession.

According to the prize citation, Rosenthal was selected "for his fundamental contributions to probability theory, stochastic processes and MCMC algorithms with applications to statistics; for seminal contributions to the theoretical underpinnings of the convergence rates of MCMC algorithms; for his prolific record of collaboration, resulting in significant publications in economics, mathematical finance, artificial intelligence and survival analysis; and for outstanding mentoring and extraordinary skill at communicating some of the deeper ideas of our discipline through the media (print, radio, and TV) and through the publication of a general audience book on probability in real life which, less than two years after publication, is in its 6th printing."

—From a COPSS announcement

ONR Young Investigator Award

Three researchers whose work involves the mathematical sciences have been selected to receive Young Investigator Awards from the Office of Naval Research (ONR) in the 2007 ONR Young Investigators Program competition. Their names, affiliations, and the titles of their proposals follow.

RAVI RAMAMOORTHI, Columbia University, "Mathematical Models of Illumination and Reflectance for Image Understanding and Machine Vision"; TIM ROUGHGARDEN, Stanford University, "Design and Analysis of Resource Allocation Protocols for Large Communication Networks"; MASSIMO FRANCESCHETTI, University of California, San Diego, "From Physics to Information, a Unified Approach to Diversity in Wireless Communication".

The Young Investigator Program supports basic research by exceptional faculty at U.S. universities who have received Ph.D.'s or equivalent degrees within the preceding five years. Grants to their institutions provide up to US$100,000 per year for three years. The funds may be applied to a variety of research costs, including salary, graduate student support, laboratory supplies, and operating costs. Young Investigators are selected on the basis of prior professional achievement, the submission of a meritorious research proposal, and evidence of strong support by their respective universities. The program supports outstanding research in a wide range of science and engineering fields that are critical to the evolution of a first-rate navy and Marine Corps.

—From an ONR announcement

2007 International Mathematical Olympiad

The 48th International Mathematical Olympiad (IMO) was held in Hanoi, Vietnam, July 19–31, 2007. The IMO is the preeminent mathematical competition for high-school-age students from around the world. This year 536 young mathematicians from 94 countries competed. The IMO consists of solving six extremely challenging mathematical problems in a nine-hour competition administered over two days.

The team from Russia finished first, with a total of 184 points and five gold medals; followed by China (181 points, four golds); Vietnam (168 points, three golds); and South Korea (168 points, two golds). The United States team finished fifth, with 155 points and two gold medals.

The U.S. team consisted of SHERRY GONG (Phillips Exeter Academy, Exeter, New Hampshire), ERIC LARSON (South Eugene High School, Eugene, Oregon), BRIAN LAWRENCE (Montgomery Blair High School, Silver Spring, Maryland), TEDRICK LEUNG (North Hollywood High School, North Hollywood, California), ARNAV TRIPATHY (East Chapel Hill High School, Chapel Hill, North Carolina), and ALEX ZHAI (University Laboratory High School, Urbana, Illinois). Gong and Zhai won gold medals; Larson, Lawrence, and Tripathy received silver medals; and Leung received a bronze medal.

The Mathematical Association of America sponsors the U.S. team through its American Mathematics Competitions program, with travel support provided by a grant from the Army Research Office. Training for the team at the University of Nebraska-Lincoln is aided by a grant from the Akamai Foundation. Additional support for the team is provided by the National Council of Teachers of Mathematics.

More information about the 48th International Mathematical Olympiad is available at `http://www.imo2007.edu.vn/`.

—Elaine Kehoe

U.S. High School Girls Compete at China Girls' Math Olympiad

The Mathematical Sciences Research Institute (MSRI) sent two teams of high school girls, one each from the eastern and western United States, to participate in the 2007 China Girls' Mathematical Olympiad, an international competition held in central China August 11–16, 2007. This is the first year in which teams from the United States have competed in the China Girls' Mathematical Olympiad.

Representing the United States were MARIANNA MAO of Fremont, California; WENDY MU of Saratoga, California; COLLEEN LEE of Palo Alto, California; PATRICIA LI of San Jose, California; SWAY CHEN of Lexington, Massachusetts; JENNIFER IGLESIAS of Aurora, Illinois; WENDY HOU of Tampa, Florida; and SHERRY GONG of Exeter, New Hampshire. The eight students were chosen from the ranks of

CMS Winter 2007 Meeting

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Local Arrangements: Dr. David Riley (Western)

PRIZES

Coxeter-James Prize
Vinayak Vatsal University of British Columbia)
Doctoral Prize
Lap Chi Lau (Chinese University of Hong Kong)
Adrien Pouliot Prize
Richard Nowakowski (Dalhousie University)
G. de B. Robinson Award
to be announced

PLENARY LECTURERS

Erich Kaltofen (North Carolina State)
Mikhail Kapranov (Yale)
Giovanni Landi (Trieste)
Blaine Lawson (SUNY/Stony Brook)
Seth Lloyd (MIT)
Otmar Venjakob (Heidelberg)
Marcelo C. Borba (UNESP-São Paulo State University)

SESSIONS

Algebraic Combinatorics, Representations and Geometry
Algebraic Stacks
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Combinatorics & its Applications to Mathematical Physics
Complex Analytic Geometry
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Mathematical Imagination
Mathematics of Finance
Non-Commutative Geometry
Nonlinear Wave Equations and Applications
Quantum Information Theory in Quantum Gravity
Contributed Papers

www.cms.math.ca/Events/

the top female finalists in the 2006 USA Mathematical Olympiad. Coaches for the team were Melanie Matchett Wood, a graduate student at Princeton University and the first female to make the U.S. International Math Olympiad team; Zuming Feng of Phillips Exeter Academy, director of the Mathematical Olympiad Summer Program; and Alison Miller, a member of the USA International Math Olympiad team in 2004. Gong won a gold medal and tied for first place, with 114 points out of 120. Hou received a silver medal, and Mu, Li, and Mao received bronze medals.

The China Girls' Mathematical Olympiad was founded in 2002 as a regional competition for teams of female students from China and other eastern Asian countries, including Russia. This year China expanded the competition to countries from around the world, with the United States, Canada, South Africa, and Australia among the invitees.

—From an MSRI announcement

Monroe H. Martin, 1907–2007

Monroe H. Martin, professor emeritus at the University of Maryland, passed away on March 11, 2007, about a month after reaching the age of 100. When he turned 100 years old, the governor of Maryland signed a proclamation paying tribute to Martin. The text of the proclamation reads as follows:

"Whereas, Maryland recognizes Monroe H. Martin for his extraordinary contributions as an assistant professor of mathematics commencing in 1936, tenured full professor commencing in 1942, Chair of the Mathematics Department commencing in 1943, member of the University Senate where he was the chief architect of the University's first statement on procedures for appointments and promotions; and

"Whereas, in acknowledgement of his serving as chair of the 1969–70 study on integration, which is widely acknowledged as opening greater educational opportunities for minorities at the University of Maryland; and

"Whereas, in tribute to his role as founding director of the Institute for Fluid Dynamics and Applied Mathematics in 1949, now known as the Institute for Physical Science and Technology which, by virtue of his energy, wisdom and insight brought together many of the University's—indeed the world's—most innovative thinkers in mathematics, physics, and other related disciplines; and

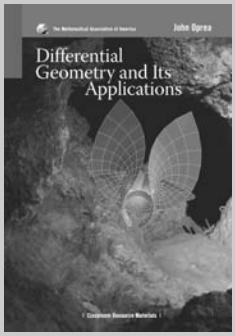
"Whereas, in gratitude for his endowing the Monroe H. Martin Professorship which will forever remind the University of a proud part of its history and will help the Institute for Physical Science and Technology thrive in the future as it has in its first 56 years.

"Now, therefore, I, Martin O'Malley, Governor of the State of Maryland, do join with all Marylanders in congratulating Professor Monroe H. Martin on the occasion of his 100th birthday."

—James Yorke, University of Maryland

New

From the Mathematical Association of America



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John Oprea

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This book studies the differential geometry of surfaces with the goal of helping students make the transition from the compartmentalized courses in a standard university curriculum to a type of mathematics that is a unified whole. It mixes together geometry, calculus, linear algebra, differential equations, complex variables, the calculus of variations, and notions from the sciences.

That mix of ideas offers students the opportunity to visualize concepts through the use of computer algebra systems such as *Maple*. **Differential Geometry and Its Applications** emphasizes that this visualization goes hand-in-hand with understanding the mathematics behind the computer construction. The book is rich in results and exercises that form a continuous spectrum, from those that depend on calculation to proofs that are quite abstract.

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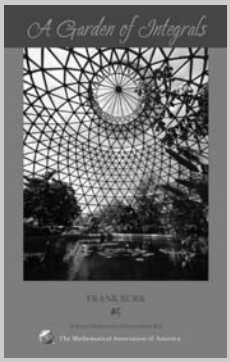

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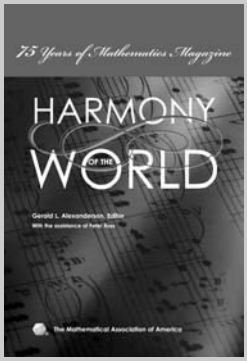

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The Harmony of the World: 75 Years of Mathematics Magazine

Gerald Alexanderson | *With the assistance of Peter Ross*

The **Harmony of the World** is a sampling of some of the best articles appearing in *Mathematics Magazine*. This collection offers articles on the history of mathematics (algebraic numbers, inequalities, probability and the Lebesgue integral, quaternions, Pólya's enumeration theorem, and group theory) and stories of mathematicians (Hypatia, Gauss, E. T. Bell, Hamilton, and Euler). The list of authors is star-studded: E. T. Bell, Otto Neugebauer, D. H. Lehmer, Morris Kline, Einar Hille, Richard Bellman, Judith Grabiner, Paul Erdős, B. L. van der Waerden, Paul R. Halmos, Doris Schattschneider, J. J. Burckhardt, Branko Grünbaum, and many more. Eight of the articles included have received the Carl B. Allendoerfer or Lester R. Ford awards.

To order **call 1-800-331-1633 or visit us online at www.maa.org**

Mathematics Opportunities

American Mathematical Society Centennial Fellowships

Invitation for Applications for Awards for 2008–2009
Deadline December 1, 2007

Description: The AMS Centennial Research Fellowship Program makes awards annually to outstanding mathematicians to help further their careers in research. The number of fellowships to be awarded is small and depends on the amount of money contributed to the program. The Society supplements contributions as needed. One Fellowship will be awarded for the 2008–2009 academic year. A list of previous fellowship winners can be found at: `http://www.ams.org/prizes-awards`.

Eligibility: The eligibility rules are as follows. The primary selection criterion for the Centennial Fellowship is the excellence of the candidate's research. Preference will be given to candidates who have not had extensive fellowship support in the past. Recipients may not hold the Centennial Fellowship concurrently with another research fellowship, such as a Sloan or National Science Foundation Postdoctoral Fellowship. Under normal circumstances, the fellowship cannot be deferred. A recipient of the fellowship shall have held his or her doctoral degree for at least three years and not more than twelve years at the inception of the award (that is, received between September 1, 1996, and September 1, 2005). Applications will be accepted from those currently holding a tenured, tenure-track, postdoctoral, or comparable (at the discretion of the selection committee) position at an institution in North America. Applications should include a cogent plan indicating how the fellowship will be used. The plan should include travel to at least one other institution and should demonstrate that the fellowship will be used for more than reductions of teaching at the candidate's home institution. The selection committee will consider the plan in addition to the quality of the candidate's research and will try to award the fellowship to those for whom the award would make a real difference in the development of their research careers. Work in all areas of mathematics, including interdisciplinary work, is eligible.

Grant amount: The stipend for fellowships awarded for 2008–2009 is expected to be US$70,000, with an additional expense allowance of about US$7,000. Acceptance of the fellowship cannot be postponed.

Deadline: The deadline for receipt of applications is **December 1, 2007**. Awards will be announced in February 2008 or earlier, if possible.

Application information: Application forms are available via the Internet at `http://www.ams.org/employment/centflyer.html`. For paper copies of the form, write to the Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294; or send email to `prof-serv@ams.org`; or call 401-455-4107.

—AMS announcement

NSF Graduate Research Fellowships

The National Science Foundation (NSF) awards Graduate Research Fellowships to graduating seniors and first-year graduate students. These are three-year fellowships awarded to U.S. students for full-time graduate study at the institutions of their choice. The fellowships include a stipend, tuition coverage, and possible international travel allowances. Awards are made based on the candidates' intellectual merit and potential for research achievement. The deadline for full proposals in mathematical sciences is **November 2, 2007**. For more information see `http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf07576`.

—From an NSF announcement

Research Opportunities for U.S. Graduate Students in Asia and Australia

The National Science Foundation (NSF) and the National Institutes of Health (NIH) are cosponsoring a summer research program in Australia, China, Japan, Korea, Taiwan, New Zealand, and Singapore for U.S. graduate students during the summer of 2008. The East Asia and Pacific Summer Institutes (EAPSI) provide U.S. graduate students in science and engineering with firsthand research experience in Australia, China, Japan, Korea, Taiwan, New Zealand, or Singapore; an introduction to the science and science policy infrastructure of the respective location; and orientation to the culture and language. The primary goals of EAPSI are to introduce students to East Asian and Pacific science and engineering in the context of a research laboratory and to initiate personal relationships that will better enable them to collaborate with foreign counterparts in the future. The institutes last approximately eight weeks, from June to August, and are administered in the United States by the NSF. The National Institutes of Health (NIH) cosponsor the summer institute in Japan.

Applicants must be U.S. citizens or permanent residents. They must be enrolled at U.S. institutions in science or engineering Ph.D. programs, in M.D. programs with an interest in biomedical research, or in master's degree programs with at least one full academic year completed by the end of the calendar year of application. They must be pursuing studies in fields of science or engineering that are supported by the NSF or the NIH (for Japan) and that also are represented among the potential host institutions. International travel will be provided, and each awardee will receive an allowance of US$4,000.

The deadline for application materials to be postmarked is **December 11, 2007**. Proposers are required to prepare and submit all proposals for this announcement/solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: `http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5284`.

—From an NSF announcement

AMS Congressional Fellowship

The AMS, in conjunction with the American Association for the Advancement of Science (AAAS), will sponsor a Congressional Fellow from September 2008 through August 2009. The fellow will spend the year working on the staff of a member of Congress or a congressional committee as a special legislative assistant in legislative and policy areas requiring scientific and technical input. The fellowship is designed to provide a unique public policy learning experience, to demonstrate the value of science-government interaction, and to bring a technical background and external perspective to the decision-making process in Congress. The deadline for applications is **January 31, 2008**. Applicants should have a Ph.D. or an equivalent doctoral-level degree in the mathematical sciences by the application deadline. For further information, please consult the webpage `http://www.ams.org/government/congressfellowann.html` or contact the AMS Washington office at 202-588-1100, email: `amsdc@ams.org`.

—AMS Washington office

Jefferson Science Fellows Program

The Jefferson Science Fellows (JSF) program at the U.S. Department of State is intended to involve the American academic science, technology, and engineering communities in the formulation and implementation of U.S. foreign policy.

Each fellow will spend one year at the U.S. Department of State for an on-site assignment in Washington, DC, that may also involve extended stays at U.S. foreign embassies and/or missions. Each fellow will receive a stipend of US$50,000. Following the fellowship year, the Jefferson Science Fellow will return to his or her academic career but will remain available to the U.S. Department of State for short-term projects over the following five years.

The JSF program is administered by the National Academies and is supported through a partnership among the MacArthur Foundation; the Carnegie Corporation; the U.S. science, technology, and academic communities; professional scientific societies; and the U.S. Department of State. The deadline for applications is **January 15, 2008**. For further information, email: `jsf@nas.edu`, telephone 202-334-2643, or see the website `http://www7.nationalacademies.org/jefferson/`.

—From a National Academies announcement

NSF Program ADVANCE

The National Science Foundation (NSF) has instituted the ADVANCE Program in an effort to increase the representation and advancement of women in academic science and engineering careers.

In 2008 this program will support three types of projects. Partnerships for Adaptation, Implementation, and Dissemination (PAID) awards support analysis, adaptation, dissemination, and use of existing innovative materials and practices that have been demonstrated to be effective in increasing representation and participation of women in academic science and engineering careers. This category of award also supports proposals for developing national and/or discipline-specific leadership enabling the full participation and advancement of women in academic science and engineering careers. The deadline for proposals for these awards is **January 17, 2008**.

Institutional Transformation (IT) awards support academic institutional transformation to promote the

increased participation and advancement of women scientists and engineers in academe. These awards support innovative and comprehensive programs for institution-wide change. The proposal deadline for these awards is **December 6, 2007**.

Institutional Transformation Planning Grants (IT-Start) support basic data collection and analysis functions necessary to understand the status of women faculty in academic science and engineering at institutions seeking institutional transformation. This category of award is intended to broaden the spectrum of institutions participating in ADVANCE activities. IT-Start awards seek to include institutions with varying institutional scope, sizes, experiences, and perspectives such as (but not limited to) primarily undergraduate institutions, teaching-intensive colleges, community colleges, minority-serving institutions (e.g., tribal colleges, historically black colleges and universities, and Hispanic-serving institutions), as well as women's colleges. The proposal deadline for these awards is **December 6, 2007**.

Proposals are sought from both men and women for creative strategies to realize the goals of the ADVANCE Program. Members of underrepresented minority groups and individuals with disabilities are especially encouraged to apply. Proposals that address the participation and advancement of women from underrepresented minority groups are encouraged. For more information see `http://www.nsf.gov/pubs/2007/nsf07582/nsf07582.txt`.

—From an NSF announcement

AAUW Educational Foundation Fellowships and Grants

The American Association of University Women (AAUW) awards Selected Professions Fellowships to women who intend to pursue a full-time course of study at accredited institutions during the fellowship year in a designated degree program in which women's participation has traditionally been low. All women who are candidates for the master of science (M.S.) degree in mathematics or statistics are eligible to apply. Candidates are eligible to apply for support for the final year of study only and are expected to receive their degrees at the end of the fellowship year. Special consideration is given to applicants who show professional promise in innovative or neglected areas of research or practice in areas of public interest.

Applications are now available for Master's and First Professional Awards, which carry cash awards of between US$5,000 and US$12,000. The deadline for applications to be postmarked is **January 10, 2008.** The fellowship year runs from July 1, 2008, to June 30, 2009. For more information, see the AAUW's website at `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.

—From an AAUW announcement

EDGE Summer Program

The Enhancing Diversity in Graduate Education (EDGE) Program is a postbaccalaureate summer enrichment program designed to strengthen the ability of women and minority students to successfully complete graduate programs in the mathematical sciences.

The summer program consists of two core courses in analysis and algebra/linear algebra. There will also be minicourses in vital areas of mathematical research in pure and applied mathematics, short-term visitors from academia and industry, guest lectures, graduate student mentors, and problem sessions. In addition, a follow-up mentoring program and support network will be established with the participants' respective graduate programs.

Applicants to the program should be women who are (1) graduating seniors who have applied to graduate programs in the mathematical sciences, (2) recent recipients of undergraduate degrees who are now entering graduate programs, or (3) first-year graduate students. All applicants should have completed standard junior- or senior-level undergraduate courses in analysis and abstract algebra and have a desire to earn the doctorate degree. Women from minority groups who fit one of the above three categories are especially encouraged to apply. Final acceptance to the program is contingent on acceptance to a graduate program in the mathematical sciences.

The 2008 EDGE Summer Program will be held June 5–July 2, 2008, at Pomona College in Claremont, CA, with local coordinator Dr. Ami Radunskaya. The deadline for applications is **March 3, 2008**. See the website `http://www.edgeforwomen.org/enextyear.html` for further information as it becomes available.

—From an EDGE Program announcement

News from the Fields Institute

Applications are invited for postdoctoral fellowship positions at the Fields Institute in Toronto, Ontario, Canada, for the 2008–2009 academic year. The Thematic Program on Arithmetic Geometry, Hyperbolic Geometry, and Related Topics will take place from July through December 2008, and the Thematic Program on O-Minimal Structures and Real Analytic Geometry will take place from January through June 2009. The fellowships provide for a period of engagement in research and participation in the activities of the Institute. They may be offered in conjunction with partner universities, through which a further period of support may be possible.

Qualified candidates who will have recently completed their Ph.D. degrees in a related area of the mathematical sciences are encouraged to apply. The deadline is **December 7, 2007**. For more information see `http://www.fields.utoronto.ca/proposals/postdoc.html`.

—From a Fields Institute announcement

News from IPAM

The Institute for Pure and Applied Mathematics (IPAM), located at the University of California, Los Angeles, holds long- and short-term research programs and workshops throughout the academic year for junior and senior mathematicians and scientists who work in academia, the national laboratories, and industry. In the summer IPAM sponsors a program for undergraduate students (RIPS) and graduate students/postdocs (Summer School). IPAM's upcoming programs are listed below. Please go to `http://www.ipam.ucla.edu` for detailed information and online application and registration forms.

IPAM's Science Advisory Board meets in November, when it considers program proposals. Program proposals from the community are encouraged; instructions are available at our website.

IPAM is seeking its next director, to begin July 2008. Information about the position and how to apply is available on our website.

Mathematics of Knowledge and Search Engines, September 10–December 14, 2007. The application for the long program is closed, but you may still register for the two remaining Search Engines workshops:

- Workshop III: Social Data Mining and Knowledge Building. November 5–9, 2007.
- Workshop IV: Search and Knowledge Building for Biological Datasets. November 26–30, 2007.

Winter 2008 Short Programs. You may apply online for support to attend each workshop.

- Scientific Computing Applications in Surgical Simulation of Soft Tissues. January 7–11, 2008.
- Image Analysis Challenges in Molecular Microscopy. January 28–February 1, 2008.
- Expanders in Pure and Applied Math. February 11–15, 2008.
- Graph Cuts and Related Discrete or Continuous Optimization Problems. February 25–29, 2008.

Optimal Transport, March 10–June 13, 2008. Please apply by February 1, 2008. This long program includes the following workshops that are also open for participation. You may apply online for support to be core participants for the entire program or to attend individual workshops.

- Optimal Transport Tutorials. March 11–14, 2008.
- Workshop I: Aspects of Optimal Transport in Geometry and Calculus of Variations. March 31–April 4, 2008.
- Workshop II: Numerics and Dynamics for Optimal Transport. April 14–18, 2008.
- Workshop III: Transport Systems in Geography, Geosciences, and Networks. May 5–9, 2008.
- Workshop IV: Optimal Transport in the Human Body: Lungs and Blood. May 19–23, 2008.

Summer School: Mathematics in Brain Imaging, July 14–25, 2008. Please see the webpage for more information and an online application.

Research in Industrial Projects for Students (RIPS) 2008, June 22–August 22, 2008. Teams of undergraduate students from around the world solve industrial problems involving mathematics. Each project is sponsored by industry. Applications are due February 15.

Internet Multi-Resolution Analysis, September 8–December 12, 2008. The schedule of workshops will be available online soon.

Quantum and Kinetic Transport Equations: Analysis, Computations, and New Applications, March 9–June 12, 2009. The schedule of workshops will be available online soon.

—From an IPAM announcement

News from the Institut Mittag-Leffler

The Institut Mittag-Leffler, Djursholm, Sweden, announces its programs for the academic year 2008–2009.

The fall term 2008 will be devoted to *Geometry, Analysis and General Relativity*. The organizing committee consists of Hans Ringström (chair), KTH, Stockholm; Lars Andersson, Albert-Einstein-Institut, Golm; Piotr Chruściel, Oxford University; and Richard Schoen, Stanford University.

The spring term 2009 will be devoted to *Discrete Probability*. The organizing committee consists of Sven Erick Alm (chair), University of Uppsala; Olle Häggström, CTH, Gothenburg; Svante Janson, University of Uppsala; Kurt Johansson, KTH, Stockholm; and Jeff Steif, CTH, Gothenburg.

The application deadline for postdoctoral fellowships is **January 31, 2008**. Applications should be sent to Marie-Louise Koskull, email: `koskull@mittag-leffler.se`. The postal address is: Institut Mittag-Leffler, Auravägen 17, SE-182 60 Djursholm, Sweden.

For further information and application forms, see our homepage, `http://www.mittag-leffler.se/programs/0809/grants.php`.

—Institut Mittag-Leffler announcement

Inside the AMS

Bulletin Digitization, 1891–1991

Readers may now view online the first century of the *Bulletin of the AMS*, from 1891 to 1991, searchable and fully integrated with the modern *Bulletin*. The digitization was carried out through the Digital Mathematics Library Project of the Mathematical Sciences Research Institute and was funded by a grant from the Gordon and Betty Moore Foundation.

The approximately 84,000 pages of the *Bulletin* are freely accessible to all. The final phase of the project under way now is work on the references—to verify and add links to MathSciNet where possible—completing the digitization of this important collection of mathematical literature. The archive is also online at Project Euclid.

To access this material, visit the *Bulletin* website, `http://www.ams.org/journals/bull`, and click on "All Issues: 1891–Present".

—AMS announcement

AMS Sponsors NExT Fellows

Each year the AMS sponsors six Project NExT (New Experiences in Teaching) Fellows who are affiliated with Ph.D.-granting institutions and who show promise in mathematics research.

The names, affiliations, and areas of research of the 2007–2008 NExT Fellows are: EMILY GAMBER BURKHEAD, Meredith College, topological and symbolic dynamics; TODD FISHER, Brigham Young University, dynamical systems; HEMANSHU KAUL, Illinois Institute of Technology, discrete math and operations research; JOAN LIND, Belmont University, complex analysis and stochastic analysis; CARL TOEWS, Duquesne University, operator theory/applied mathematics; and DEBBIE YUSTER, Rutgers University, combinatorics (appointed through DIMACS).

Project NExT is a professional development program for new or recent Ph.D.'s in the mathematical sciences (including pure and applied mathematics, statistics, operations research, and mathematics education). It addresses all aspects of an academic career: improving the teaching and learning of mathematics, engaging in research and scholarship, and participating in professional activities. It also provides the participants with a network of peers and mentors as they assume these responsibilities. Each year sixty to seventy new Ph.D.'s receive Project NExT Fellowships, which allow them to attend special events at the summer MathFest of the Mathematical Association of America and at the Joint Mathematics Meetings. The AMS also holds activities for the AMS NExT Fellows at the Joint Mathematics Meetings.

For further information about Project NExT, visit the website `http://archives.math.utk.edu/projnext/`.

—Elaine Kehoe

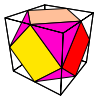
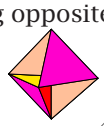
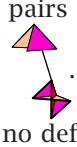
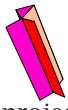
AMS Sponsors Capitol Hill Exhibit

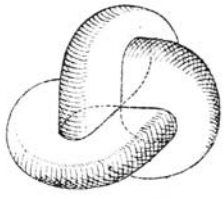
DALIN TANG, professor of mathematical sciences and biomedical engineering at Worcester Polytechnic Institute (WPI), represented the AMS at the 13th annual Exhibition of the Coalition for National Science Funding (CNSF) held June 26, 2007, on Capitol Hill in Washington, DC. Tang highlighted his work on "Computational Models for Cardiovascular Disease Assessment and Surgery Design" by showing how integrating computational modeling, magnetic resonance imaging (MRI), mechanical testing, and pathological analysis can be used to assess the state of cardiovascular disease and the potential that quantitative computational modeling and assessment can be integrated into imaging technologies for better patient screening, early diagnosis, and surgery design.

Tang's presentation at the exhibition was received by members of Congress, congressional staff, administration

About the Cover

Collapsing Boy's Umbrellas

This month's cover accompanies Rob Kirby's *What is Boy's Surface?* A polyhedral model of the real projective plane is obtained by identifying opposite points on a truncated cube  to obtain a  heptahedron whose 1-skeleton is a well known figure  . It possesses at each vertex a copy of a singularity known as *Whitney's umbrella*. One can connect these in pairs along three transverse edges of the heptahedron  . As is often pointed out in the literature, there is no deformation of Whitney's umbrella into an immersion, since the boundary of a small neighborhood disk is a figure eight. But the neighborhood of an edge with two such singularities at opposite ends  may be deformed into an immersion  to obtain Boy's surface, an immersed copy of the real projective plane in three dimensions. The resulting tubes may be seen in the usual pictures of Boy's surface, for example this one taken from Boy's original paper:



A nice image of a smooth version of Whitney's umbrella can be found at `http://www.geom.uiuc.edu/zoo/features/whitney/`.

The smooth version of the heptahedron is called Roman's surace. It can be seen at `http://mathworld.wolfram.com/RomanSurface.html`.

—Bill Casselman, Graphics Editor

(`notices-covers@ams.org`)

representatives, and members of the scientific community. The 2007 exhibition included 34 exhibit booths and drew over 400 attendees.

CNSF is an alliance of over one hundred scientific and professional societies and universities that are united by a concern for the future vitality of the national science, mathematics, and engineering enterprise. This coalition, chaired by Samuel M. Rankin III, associate executive director of the AMS and the director of its Washington office, works to increase the federal investment in the National Science Foundation (NSF).

The annual CNSF exhibition showcases the crucial role the NSF plays in meeting the nation's research and education needs. It highlights research made possible by the NSF through exhibits displaying a wide range of scientific research and education projects. The exhibition provides an opportunity for university researchers and educators to describe their work to leaders on Capitol Hill. For more information, see `http://www.ams.org/government/cnsfex07.html`.

—AMS Washington office

Deaths of AMS Members

WALTER F. BRADY, associate professor, Connecticut College, died on January 23, 2007. Born on October 16, 1933, he was a member of the Society for 39 years.

JOHN A. EWELL, professor emeritus, Northern Illinois University, died on July 21, 2007. Born on February 28, 1928, he was a member of the Society for 34 years.

A. W. GOODMAN, retired, from Clearwater, FL, died on July 30, 2004. Born on July 20, 1915, he was a member of the Society for 60 years.

WILLIAM D. HAHN, from Etnus, Inc., Framingham, MA, died on June 19, 2007. Born on July 25, 1949, he was a member of the Society for 9 years.

WILLIAM H. MILLS, from Newtown, PA, died on March 7, 2007. Born on November 9, 1921, he was a member of the Society for 63 years.

OMAR K. MOORE, from Pittsburgh, PA, died on April 1, 2006. Born on February 11, 1920, he was a member of the Society for 47years.

FRANCIS D. PARKER, professor emeritus, St. Lawrence University, died on July 29, 2006. Born on July 27, 1918, he was a member of the Society for 58 years.

WILLIAM L. ROOT, professor emeritus, University of Michigan, Ann Arbor, died on April 22, 2007. Born on October 6, 1919, he was a member of the Society for 57 years.

DOV TAMARI, professor emeritus, from New York, NY, died on August 11, 2006. Born on April 29, 1911, he was a member of the Society for 56 years.

RADU THEODORESCU, from Quebec, Canada, died on August 14, 2007. Born on April 12, 1933, he was a member of the Society for 37 years.

D. RANSOM WHITNEY, professor emeritus, Ohio State University, Columbus, died on August 16, 2007. Born on November 27, 1915, he was a member of the Society for 65 years.

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

October 10, 2007: Proposals for NSF Distinguished International Postdoctoral Research Fellowships. See http://www.nsf.gov/pubs/2001/nsf01154/nsf01154.txt.

October 15, 2007: Proposals for NSA Mathematical Sciences Program grants. See http://www.nsa.gov/msp/index.cfm or contact the program staff: MSP Director Michelle D. Wagner (mdwagn4@nsa.gov) or MSP Program Administrator Rosalie (Jackie) Smith (rjsmit2@nsa.gov). To obtain brochures or for questions, please call 301-688-0400 or write to: Mathematical Sciences Program, National Security Agency, Suite 6557, Fort Meade, MD 20755-6557.

October 15, 2007: Preferred deadline for January entrance in junior-year program at the Smith College

Where to Find It

A brief index to information that appears in this and previous issues of the *Notices*.

Center for Women in Mathematics. See http://www.math.smith.edu/center.

October 17, 2007: Proposals for NSF Mathematical Sciences Postdoctoral Research Fellowships. See http://www.nsf.gov/pubs/2007/nsf07573/nsf07573.htm.

October 17, 2007: Full proposals for NSF Computational Science Training for Undergraduates in the Mathematical Sciences (CSUMS). See http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf06559.

October 30, 2007: Nominations for Clay Research Fellowships. See http://www.claymath.org/fas/research_fellows/; telephone: 617-995-2600; or email: nominations@claymath.org.

November 2, 2007: Full proposals for NSF Graduate Research Fellowships. See "Mathematics Opportunities" in this issue.

November 2, 2007: Entries for AWM Essay Contest. See http://www.awm-math.org/biographies/contest.html.

November 15, 2007: Applications for NSA Mathematics Sabbatical program. See http://www.nsa.gov/msp/index.cfm or contact the program staff: MSP Director Michelle D. Wagner (mdwagn4@nsa.gov) or MSP Program Administrator Rosalie (Jackie) Smith (rjsmit2@nsa.gov). To obtain brochures or for questions, please call 301-688-0400 or write to: Mathematical Sciences Program, National Security Agency, Suite 6557, Fort Meade, MD 20755-6557.

December 1, 2007: Applications for AMS Centennial Fellowships. See http://www.ams.org/employment/centflyer.html or write to the Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294; email: prof-serv@ams.org; telephone 401-455-4107. See "Mathematics Opportunities" in this issue.

December 6, 2007: Proposals for NSF ADVANCE Program Institutional Transformation (IT) awards and Institutional Transformation Planning Grants (IT-Start). See "Mathematics Opportunities" in this issue.

December 7, 2007: Applications for Fields Institute Postdoctoral Fellowships. See "Mathematics Opportunities" in this issue.

December 11, 2007: Applications for NSF East Asia and Pacific Summer Institutes (EAPSI). See "Mathematics Opportunities" in this issue.

December 15, 2007: Applications for AMS Epsilon Fund grants. See 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.

January 5, 2008: Applications for IMA postdoctoral and New Directions program. See http://www/ima.umn.edu.

January 10, 2008: Applications for AAUW Educational Foundation Fellowships and Grants. See "Mathematics Opportunities" in this issue.

January 15, 2008: Applications for AMS-AAAS Mass Media Summer Fellowships. See http://www.aaas.org/programs/education/MassMedia/ or contact Stacey Pasco, Director, Mass Media Program, AAAS Mass Media Science and Engineering Fellows Program, 1200 New York Avenue, NW, Washington, DC 20005; telephone 202-326-6645; fax 202-371-9849; email: spasco@aaas.org. Further information is also available at http://www.ams.org/government/massmediaann.html and through the AMS Washington Office, 1527 Eighteenth Street, NW, Washington, DC 20036; telephone 202-588-1100; fax 202-588-1853; email: amsdc@ams.org.

January 15, 2008: Applications for Jefferson Science Fellows Program. See "Mathematics Opportunities" in this issue.

January 17, 2008: Proposals for NSF ADVANCE Program Partnerships for Adaptation, Implementation, and Dissemination (PAID) awards. See "Mathematics Opportunities" in this issue.

February 1, 2008: Applications for AWM Travel Grants and AWM Mentoring Grants. See http://www.awm-math.org/travelgrants.html; telephone: 703-934-0163; email: awm@awm-math.edu; or contact Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.

February 1, 2008: Applications for 2008 IPAM workshops and programs. See "Mathematics Opportunities" in this issue.

February 15, 2008: Applications for IPAM Research in Industrial Projects for Students (RIPS). See "Mathematics Opportunities" in this issue.

March 3, 2008: Applications for Enhancing Diversity in Graduate Education (EDGE) Program. See "Mathematics Opportunities" in this issue.

April 15, 2008: Applications for Math in Moscow for fall 2008. See http://www.mccme.ru/mathinmoscow or write to: Math in Moscow, P.O. Box 524, Wynnewood, PA 19096; fax: +7095-291-65-01; email: mim@mccme.ru; 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, 2008: Applications for AWM Travel Grants. See http://www.awm-math.org/travelgrants.html; telephone: 703-934-0163; email: awm@awm-math.edu; or contact Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.

June 10, 2008: Proposals for Enhancing the Mathematical Sciences Workforce in the Twenty-First Century. See http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf05595.

August 18, 2008: Applications for NSF Research Experiences for Undergraduates (REU) program sites. See http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf07569.

October 1, 2008: Applications for AWM Travel Grants. See http://www.awm-math.org/travelgrants.html; telephone: 703-934-0163; email: awm@awm-math.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 wewbpage is http://www.nsf.gov/div/index.jsp?div=DMS.

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Christopher W. Stark
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Administrative Officer
Maria Sutton
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msutton@nsf.gov

Division Secretary
Jennifer A. Connell
703-292-5301
jconnell@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.

An Abundance of Katherines, by John Green. Dutton Juvenile Books, September 2006. ISBN 0-525-47688-1.

Alfred Tarski: Life and Logic, by Anita Burdman Feferman and Solomon Feferman. Cambridge University Press, October 2004. ISBN 0-

521-80240-7. (Reviewed September 2007.)

Analysis and Probability: Wavelets, Signals, Fractals, by Palle E. T. Jorgensen. Springer, September 2006. ISBN 0-387-29519-4.

Ants, Bikes, and Clocks: Problem Solving for Undergraduates, by William Briggs. Society for Industrial and Applied Mathematics, 2005. ISBN 0-89871-574-1.

The Archimedes Codex, by Reviel Netz and William Noel. Weidenfeld and Nicolson, May 2007. ISBN-13: 978-0-29764-547-4.

The Art of Mathematics: Coffee Time in Memphis, by Béla Bollobás. Cambridge University Press, September 2006. ISBN-13: 978-0-52169-395-0.

The Artist and the Mathematician: The Story of Nicolas Bourbaki, the Genius Mathematician Who Never Existed, by Amir D. Aczel. Thunder's Mouth Press, August 2006. ISBN 1-560-25931-0. (Reviewed October 2007.)

A Beautiful Math: John Nash, Game Theory, and the Modern Quest for a Code of Nature, by Tom Siegfried. Joseph Henry Press, October 2006. ISBN 0-309-10192-1.

The Best of All Possible Worlds: Mathematics and Destiny, by Ivar Ekeland. University of Chicago Press, October 2006. ISBN-13: 978-0-226-19994-8.

Bourbaki, a Secret Society of Mathematicians, by Maurice Mashaal. AMS, June 2006. ISBN 0-8218-3967-5. (Reviewed October 2007.)

The Cat in Numberland, by Ivar Ekeland. Cricket Books, April 2006. ISBN-13: 978-0-8126-2744-2.

A Certain Ambiguity: A Mathematical Novel, by Gaurav Suri and Hartosh Singh Bal. Princeton University Press, June 2007. ISBN-13: 978-0-691-12709-5.

Chases and Escapes: The Mathematics of Pursuit and Evasion, by Paul J. Nahin. Princeton University Press, May 2007. ISBN-13: 978-0-69112-514-5.

Descartes: A Biography, by Desmond Clarke. Cambridge University Press, March 2006. ISBN 0-521-82301-3.

Einstein's Heroes: Imagining the World through the Language of Mathematics, by Robyn Arianrhod. Oxford University Press, July 2006. ISBN-13: 978-0-195-30890-7.

Ernst Zermelo: An Approach to His Life and Work, by Heinz-Dieter Ebbinghaus. Springer, April 2007. ISBN-13: 978-3-540-49551-2.

Evolutionary Dynamics: Exploring the Equations of Life, by Martin Nowak. Belknap Press, September 2006. ISBN 0-674-02338-2.

The Fabulous Fibonacci Numbers, by Alfred S. Posamentier and Ingmar Lehmann. Prometheus Books, February 2007. ISBN 1-591-02475-7.

Fearless Symmetry: Exposing the Hidden Patterns of Numbers, by Avner Ash and Robert Gross. Princeton University Press, May 2006. ISBN 0-691-12492-2. (Reviewed January 2007.)

Fly Me to the Moon: An Insider's Guide to the New Science of Space Travel, by Edward Belbruno. Princeton University Press, January 2007. ISBN-13: 978-0-691-12822-1.

From Cosmos to Chaos: The Science of Unpredictability, by Peter Coles. Oxford University Press, August 2006. ISBN 0-198-56762-6.

From Zero to Infinity: What Makes Numbers Interesting, by Constance Reid. Fiftieth anniversary edition, A K Peters, February 2006. ISBN 1-568-81273-6. (Reviewed February 2007.)

Gödel's Theorem: An Incomplete Guide to Its Use and Abuse, by Torkel Franzen. A K Peters, May 2005. ISBN 1-568-81238-8. (Reviewed March 2007.)

Great Feuds in Mathematics: Ten of the Liveliest Disputes Ever, by Hal Hellman. Wiley, September 2006. ISBN 0-471-64877-9.

The Great π/e Debate: Which Is the Better Number?, DVD by Colin Adams and Thomas Garrity. Mathematical Association of America, 2007. ISBN 0-88385-900-9.

How Mathematicians Think: Using Ambiguity, Contradiction, and Paradox to Create Mathematics, by William Byers. Princeton University Press, May 2007. ISBN-13: 978-0-6911-2738-5.

How Mathematics Happened, by Peter S. Rudman. Prometheus Books, October 2006. ISBN 1-591-02477-3.

How to Cut a Cake: And Other Mathematical Conundrums, by Ian Stewart. Oxford University Press, November 2006. ISBN 0-199-20590-6.

I Am a Strange Loop, by Douglas R. Hofstadter. Basic Books, March 2007. ISBN-13: 978-0-46503-078-1. (Reviewed August 2007.)

John von Neumann: Selected Letters, edited by Miklós Rédei. AMS, November 2005. ISBN 0-8218-3776-1. (Reviewed June/July 2007.)

Karl Pearson: The Scientific Life in a Statistical Age, by Theodore M. Porter. Princeton University Press, new edition, December 2005. ISBN-13: 978-0-69112-635-7.

Leonhard Euler, by Emil A. Fellmann. Birkhäuser, 2007. ISBN-13: 978-3-7643-7538-6.

Leonhard Euler, a Man to Be Reckoned With, by Andreas K. Heyne and Alice K. Heyne. Birkhäuser, 2007. ISBN-13: 978-3-7643-8332-9.

Letters to a Young Mathematician, by Ian Stewart. Perseus Books, April 2006. ISBN-13: 978-0-465-08231-5. (Reviewed May 2007.)

A Madman Dreams of Turing Machines, by Janna Levin. Knopf, August 2006. ISBN 1-400-04030-2.

The Math behind the Music, by Leon Harkleroad. Cambridge University Press, August 2006. ISBN-13: 978-0-521-00935-5.

**Math Doesn't Suck: How to Survive Middle-School Math Without Losing Your Mind or Breaking a Nail*, by Danica McKellar. Hudson Street Press, August 2007. ISBN-13: 978-1-5946-3039-2.

Mathematical Illustrations: A Manual of Geometry and PostScript, by Bill Casselman. Cambridge University Press, December 2004. ISBN 0-521-54788-1. (Reviewed January 2007.)

The Mathematician's Brain, by David Ruelle. Princeton University Press, July 2007. ISBN-13: 978-0-691-12982-2.

Mathematics and Common Sense: A Case of Creative Tension, by Philip J. Davis. A K Peters, October 2006. ISBN 1-568-81270-1.

Measuring the World, by Daniel Kehlmann. Pantheon, November 2006. ISBN 0-375-42446-6.

**The Millennium Prize Problems*, edited by James Carlson, Arthur Jaffe, and Andrew Wiles. AMS, June 2006. ISBN-13: 978-0-8218-3679-8.

The Mind of the Mathematician, by Michael Fitzgerald and Ioan James.

Johns Hopkins University Press, May 2007. ISBN-13: 978-0-8018-8587-7.

More Mathematical Astronomy Morsels, by Jean Meeus. Willmann-Bell, 2002. ISBN 0-943396-743.

More Sex Is Safer Sex: The Unconventional Wisdom of Economics, by Steven E. Landsburg. Free Press, April 2007. ISBN-13: 978-1-416-53221-7.

The Motion Paradox: The 2,500-Year Old Puzzle behind All the Mysteries of Time and Space, by Joseph Mazur. Dutton Adult, April 2007. ISBN-13: 978-0-52594-992-3.

**Mr. Hopkins' Men: Cambridge Reform and British Mathematics in the 19th Century*, by A. D. D. Craki. Springer, July 2007. ISBN-13: 978-1-8462-8790-9.

Music: A Mathematical Offering, by David J. Benson. Cambridge University Press, December 2006. ISBN-13: 978-0-521-61999-8.

Music and Probability, by David Temperley. MIT Press, January 2007. ISBN-13: 978-0-262-20166-7.

Musimathics: The Mathematical Foundations of Music, by Gareth Loy. MIT Press, June 2006 and June 2007. Volume 1: ISBN-13: 978-0-262-12282-5. Volume 2: ISBN-13: 978-0-262-12285-6.

Negative Math: How Mathematics Rules Can Be Positively Bent, by Alberto A. Martinez. Princeton University Press, November 2005. ISBN-13: 978-0-691-12309-7.

New Theories of Everything, by John D. Barrow. Oxford University Press, July 2007. ISBN-13: 978-0-192-80721-2.

Nonplussed! Mathematical Proof of Implausible Ideas, by Julian Havil. Princeton University Press, May 2007. ISBN-13: 978-0-691-12056-0.

**The Numbers Behind NUMB3RS: Solving Crime with Mathematics*, by Keith Devlin and Gary Lorden. Plume, August 2007. ISBN-13: 978-0-4522-8857-7.

Once upon Einstein, by Thibault D'Amour. A K Peters, March 2006. ISBN 1-568-81289-2.

Out of the Labyrinth: Setting Mathematics Free, by Robert Kaplan and Ellen Kaplan. Oxford University Press, January 2007. ISBN-13: 978-0-19514-744-5.

Piero della Francesca: A Mathematician's Art, by J. V. Field. Yale University Press, August 2005. ISBN 0-300-10342-5. (Reviewed March 2007.)

The Poincaré Conjecture: In Search of the Shape of the Universe, by Donal O'Shea. Walker, March 2007. ISBN-13: 978-0-8027-1532-6.

Poincaré's Prize: The Hundred-Year Quest to Solve One of Math's Greatest Puzzles, by George Szpiro. Dutton Adult, June 2007. ISBN-13: 978-0-525-95024-0.

Prince of Mathematics: Carl Friedrich Gauss, by M. B. W. Tent. A K Peters, January 2006. ISBN 1-568-81261-2.

Project Origami: Activities for Exploring Mathematics, by Thomas Hull. A K Peters, March 2006. ISBN 1-568-81258-2. (Reviewed May 2007.)

Pursuit of Genius: Flexner, Einstein, and the Early Faculty at the Institute for Advanced Study, by Steve Batterson. A K Peters, June 2006. ISBN 1-568-81259-0.

Pythagoras: His Life, Teaching and Influence, by Christoph Riedweg. Translated by Steven Rendall. Cornell University Press, March 2005. ISBN-13: 978-0-80144-240-7.

Pythagoras: The Mathemagician, by Karim El-koussa. Cloonfad Press, September 2005. ISBN-13: 978-0-97694-042-5.

Shadows of Reality: The Fourth Dimension in Relativity, Cubism, and Modern Thought, by Tony Robbin. Yale University Press, March 2006. ISBN 0-300-11039-1. (Reviewed April 2007.)

The Shoelace Book: A Mathematical Guide to the Best (and Worst) Ways to Lace Your Shoes, by Burkard Polster. AMS, June 2006. ISBN 0-8218-3933-0. (Reviewed December 2006.)

Solving Mathematical Problems: A Personal Perspective, by Terence Tao. Oxford University Press, September 2006. ISBN-13: 978-0-199-20560-8.

The Square Root of 2: A Dialogue Concerning a Number and a Sequence, by David Flannery. Springer, December 2005. ISBN-13: 978-0-38720-220-4.

Superior Beings: If They Exist, How Would We Know? Game-Theoretic Implications of Omnipotence, Omniscience, Immortality, and Incomprehensibility, by Steven Brams. Springer, second edition, November 2007. ISBN-13: 978-0-387-48065-7.

Symmetry and the Monster: The Story of One of the Greatest Quests of Mathematics, by Mark Ronan. Oxford University Press, May 2006. ISBN 0-192-80722-6. (Reviewed February 2007.)

**Thinking about Gödel and Turing: Essays on Complexity, 1970–2007*, by Gregory J. Chaitin. World Scientific, August 2007. ISBN-13: 978-9-8127-0895-3.

The Triumph of Numbers: How Counting Shaped Modern Life, by I. B. Cohen. W. W. Norton, July 2006. ISBN-13: 978-0-393-32870-7.

The Trouble with Physics: The Rise of String Theory, the Fall of a Science, and What Comes Next, by Lee Smolin. Joseph Henry Press, October 2006. ISBN 0-309-10192-1. (Reviewed September 2007.)

Useless Arithmetic: Why Environmental Scientists Can't Predict the Future, by Orrin Pilkey and Linda Pilkey-Jarvis. Columbia University Press, February 2007. ISBN 0-231-13212-3.

The Volterra Chronicles: The Life and Times of an Extraordinary Mathematician, by Judith R. Goodstein. AMS, February 2007. ISBN-13: 978-0-8218-3969-0.

Why Beauty Is Truth: The Story of Symmetry, by Ian Stewart. Perseus Books Group, April 2007. ISBN-13: 978-0-46508-236-0.

Yearning for the Impossible: The Surprising Truths of Mathematics, by John Stillwell. A K Peters, May 2006. ISBN 1-568-81254-X. (Reviewed June/July 2007.)

You Failed Your Math Test, Comrade Einstein: Adventures and Misadventures of Young Mathematicians, or Test Your Skills in Almost Recreational Mathematics, edited by M. Shifman. World Scientific, June 2005. ISBN-13: 978-9-8125-6279-1.

Backlog of Mathematics Research Journals

Journal (Print and Electronic)	Number issues per Year	Approximate Number Pages per Year	2006 Median Time (in Months) from: Submission to Final Acceptance	Acceptance to Print	Acceptance to Electronic Posting	Editor's Current Estimate of Waiting Time between Submission and Publication (in Months) Print	Electronic
Abstr. Appl. Anal.	1*	1000	3	3	1	5	4
Acta Inform.	8	640	11	4	2	12	10
Acta Math.	4	600	8	11	11	23	23
Adv. Difference Equ.	1*	400	3	3	1	5	4
Aequationes Math.	6	640	13	10	10	18	18
Algebr. Geom. Topol.	1**	2500	5	14	2	9	7
Algebra Number Theory	***	1000	NA	NA	NA	6	4
Algorithmica	12	1200	15	15	8	18	12
Amer. J. Math.	6	1728	NA	13.16	12.16	16–18	15–17
Ann. Appl. Probab.	6	2400	5	6	6	11	11
Ann. Mat. Pura Appl. (4)	4	640	8.1	7.9	3.2	12	9
Ann. of Math. (2)	6	2000	13	19	19	18	18
Ann. Probab.	6	2400	NA	10	NA	18	NA
Arch. Hist. Exact. Sci.	6	696	3	6	3	5	2
Arch. Math. Logic	8	1040	16.3	10.6	5.7	25.2	20.3
Arch. Ration. Mech. Anal.	12	2208	3.5	4.8	2.6	6	2
Balkan J. Geom. Appl.	2	240	3	5	3	8	6
Bound. Value Probl.	1*	400	3	3	1	5	4
Bull. Austral. Math. Soc.	6	960	8	3	NR	9	NR
Bull. London Math. Soc.	6	1056	5.5	12	11.5	10.5	7.5
Bull. Soc. Math. France	4	600	5.5	12	10	9	6
Calc. Var. Partial Diff. Equations	12	1632	6.8	3.7	1.8	9.8	6.7
Combinatorica	6	750	18	12	6	12	6
Comm. Algebra	12	4800	6	9	9	23	23
Comm. Math. Phys.	24	6840	6	4	2	4	2
Comm. Partial Diff. Equations	12	1920	5	12	12	20	20
Commun. Appl. Math. Comput. Sci.	1	228	NA	NA	NA	NA	NA
Commun. Pure Appl. Anal.	4	1200	5	6	3	11	9
Compos. Math.	6	1632	7.5	8.5	8	15	11
Comput. Math. Appl.	24	1600	6	5	3	7	5
Computing	12	1052	9	5.5	1	12	6
Constr. Approx.	6	720	10	9	5	14	11
Des. Codes Cryptogr.	12	527	8	7	2	8	2
Discrete Comput. Geom.	8	1440	8	11	9	16	14
Discrete Contin. Dyn. Syst.	12	2800	6	7	4	13	10
Discrete Contin. Dyn. Syst. Ser. B	8	2000	5	5	2	10	7
Duke Math. J.	15	3000	10	9	9	18	18
Fixed Point Theory Appl.	1*	400	3	3	1	5	4
Found. Comput. Math.	4	539	9.5	10.5	4.5	15	12
Geom. Dedicata	7	1700	6	3	1	9	9
Geom. Topol.	1**	2500	10	14	12	12	11
Georgian Math. J.	4	800	6	4	3	11	10
Graphs Combin.	4	570	15	6	6	12	12
Houston J. Math.	4	1250	5	15	13	18	16
Illinois J. Math.	4	1350	7	9	8	15	14
Indag. Math. (N.S.)	4	640	5.5	11.5	12	12	12
Indiana Univ. Math. J.	6	3000	19.5	11.5	NA	18.5	†
Int. J. Math. Math. Sci.	1*	4000	3	3	1	5	4
Invent. Math.	12	2730	11	7.7	3	18	15
Israel J. Math.	6	2400	7	13	NA	22	10
J. Algebraic Geometry	4	800	8	9	3	14	12

Journal (Print and Electronic)	Number issues per Year	Approximate Number Pages per Year	2006 Median Time (in Months) from: Submission to Final Acceptance	Acceptance to Print	Acceptance to Electronic Posting	Editor's Current Estimate of Waiting Time between Submission and Publication (in Months) Print	Electronic
J. Amer. Math. Soc.	4	1200	15.1	6	1.2	21.6	14.2
J. Anal. Math.	3	1188	5	8	NR	13	13
J. Appl. Math.	1*	600	3	3	1	5	4
J. Appl. Math. Stochastic Anal.	1*	400	3	3	1	6	4
J. Aust. Math. Soc.	6	850	25	17	16	23	16
J. Complexity	6	1000	8	6	1	14	9
J. Comput. System Sci.	6	1400	12	18	14	18	14
J. Convex Anal.	4	900	10	8	1	12	10
J. Differential Geom.	9	3000	6	8	2	3	3
J. Eur. Math. Soc. (JEMS)	4	800	4	9	8	12	11
J. Geom. Anal.	4	740	7	7	7	6	6
J. Inequal. Appl.	1*	700	3	3	1	6	4
J. Integral Equations Appl.	4	500	5	7	5	9	7
J. Lie Theory	4	900	6	4	2	7	5
J. London Math. Soc. (2)	6	1632	6.5	9.5	9	14	8.5
J. Math. Biol.	12	1776	10.7	7.9	3.2	18.6	13.9
J. Math. Phys.	12	7000	2.5	2	1	4.5	3.5
J. Operator Theory	4	1000	8.6	9.8	8	24.6	23
J. Symbolic Logic	4	1400	15	3	3	15	15
J. Theoret. Probab.	4	1000	9	19	15	††	††
Linear Algebra Appl.	24	5400	6	6	0.75	12	7
Manuscripta Math.	12	1632	8	3.9	2.2	11.9	10.2
Math. Ann.	12	3000	11.5	6.2	4.5	16	14
Math. Comp.	4	2200	9.8	12.3	8.7	21.4	16.9
Math. Control Signals Systems	4	394	15	24†††	16	18	15
Math. Oper. Res.	4	906	20.9	5.3	5.3	26.2	26.2
Math. Program.	9	1782	15.2	11.8	7.4	23.7	18.6
Math. Res. Let.	6	1015	5	2	1	9	6
Math. Social Sci.	6	660	9	5	3	8	5
Math. Z.	12	2900	10.5	6.8	3.1	17.2	14.1
Methods Appl. Anal.	4	600–800	3–6	3–6	3–6	7–8	7–8
Michigan Math. J.	3	720	5	11	10	10	9
Monatsh. Math.	12	1056	5	12	8	18	12
Multiscale Model. Simul.	4	1380	4.8	14.9	4.4	21	9.9
Numer. Math.	12	2400	13.7	6	4.4	16.3	14
Pacific J. Math.	12	3072	3	20	18	10	9
Probab. Theory Related Fields	12	1920	11	14.9	3.9	22.1	14.9
Proc. Amer. Math. Soc.	12	3850	5.8	14.3	9.3	19.1	15.3
Proc. London Math. Soc. (3)	6	1632	7.5	8.5	8	16	10
Publ. Math. Inst. Hautes Etudes Sci.	2	500	15	3.4	3.1	16	15.5
Q. J. Math.	4	512	8	10	1.5	14	9
Quart. Appl. Math.	4	800	3.5	8.1	4.9	10.7	8.3
Results Math.	8	800	2.6	3	1	7	5
Rocky Mountain J. Math.	6	2100	10	23	21	24–27	22–25
Semigroup Forum	6	970	7	7	7	16	11
SIAM J. Appl. Math.	6	1800	8.5	8.3	3.9	18.2	13.9
SIAM. J. Comput.	6	1950	15.4	11.3	5.5	31.2	20.8
SIAM J. Control Optim.	6	2300	12.6	15.4	5.5	32.4	21.2
SIAM J. Discrete Math.	4	1080	12.4	15.9	5.8	33	21.3
SIAM J. Math. Anal.	6	2050	8.7	13.6	5.9	21.5	13.8
SIAM J. Matrix Anal. Appl.	4	1400	10.8	13	5.3	31.9	18.9
SIAM J. Numer. Anal.	6	2700	10.8	17	5.8	31.2	16.7
SIAM J. Optim.	4	1500	12.6	13.5	5.5	27.3	15.8
SIAM J. Sci. Comput.	6	2700	11.5	15.1	6	29.9	16.7
SIAM Rev.	4	800	9.2	12.6	12.6	23.4	23.4
Theory Comput. Syst.	8	1200	9	25	9	20	10
Trans. Amer. Math. Soc.	12	6050	9.9	20	12.7	30	26.5

Journal (Print)	Number issues per Year	Approximate Number Pages per Year	2006 Median Time (in Months) from: Submission to Final Acceptance	2006 Median Time (in Months) from: Acceptance to Final Publication	Editor's Current Estimate of Waiting Time between Submission and Publication (in Months)
Algebras Groups Geom.	4	550	1	3	1
Mem. Amer. Math. Soc.	4	3200	11.3	13.7	37.5

Journal (Electronic)	Number of Articles Posted in 2006	2006 Median Time (in days) from: Submission to Final Acceptance	2006 Median Time (in days) from: Acceptance to Posting	Format(s)
Acta Math. Acad. Paedagog. Nyházi. (N.S.) (www.emis.de/journals/AMAPN)	27	271	89	pdf, ps
AMA Algebra Montp. Announc. (www.emis.ams.org/journals/AMA/index.html)	0	NR	NR	pdf, ps, dvi
Appl. Math. E-Notes (www.math.nthu.edu.tw/~amen/)	36	180	180	pdf
Cent. Eur. J. Math. (www.versita.com/science/mathematics/cejm/)	42	168	75	pdf, ps, dvi, tex
Chic. J. Theoret. Comput. Sci. (cjtcs.cs.uchicago.edu/)	2	237	3	pdf, ps, dvi, tex
Conform. Geom. Dyn. (www.ams.org/journals/ecgd)	18	333	57	pdf, ps, dvi
Differ. Geom. Dyn. Syst. (www.mathem.pub.ro/dgds)	33	90	90	pdf, ps
Differ. Uravn. Protsessy Upr. (www.neva.ru/journal) (www.math.spbu.ru/user/diffjournal)	16	45	5	html, pdf, tex
Discrete Math. Theor. Comput. Science (www.dmtcs.org/)	19	390	30	pdf, ps
Doc. Math. (www.math.uni-bielefeld.de/documenta/)	18	208	16	pdf, ps, dvi
Electron. J. Combin. (www.combinatorics.org/)	143	183	10	pdf, ps
Electron. J. Differential Equations (ejde.math.txstate.edu)	156	126	8	html, pdf, ps, dvi, tex
Electron. J. Linear Algebra (www.math.technion.ac.il/iic/ela)	28	130	8	pdf, ps, dvi, tex
Electron. J. Qual. Theory Differ. Equ. (www.math.u-szeged.hu/ejqtde/)	20	150	10	pdf, ps, dvi
Electron. Res. Announc. Amer. Math. Soc (www.ams.org/journals/era)	15	153	15	pdf, ps, dvi
Electron. Trans. Numer. Anal. (etna.mcs.kent.edu/)	54/20‡	180/150‡‡	330/180‡‡	html, pdf, ps, tex
ESAIM Control Optim. Calc. Var. (www.esaim-cocv.org/)	34	178	360	pdf
ESAIM Probab. Stat. (www.esaim-ps.org/)	18	240	90	pdf
Homology, Homotopy Appl. (www.intlpress.com/hha)	14	210	33	pdf, ps, dvi
Integers (www.integers-ejcnt.org)	44	197.5	16	pdf, dvi, tex
J. Integer Seq. (www.cs.uwaterloo.ca/journals/JIS/index.html)	32	187	1	html, pdf, ps, dvi, tex
JIPAM. J. Inequal. Pure Appl. Math (jipam.vu.edu.au)	195	100	60	pdf
LMS J. Comput. Math. (www.lms.ac.uk/jcm/)	13	189	55	html, pdf
Lobachevskii J. Math. (ljm.ksu.ru)	26	60	40	pdf, ps, dvi, MathML
Numer. Funct. Anal. Optim. (www.informaworld.com/0163-0563)	43	210	150	tex, latex, MS Word, Word Perfect.

Journal (Electronic)	Number of Articles Posted in 2006	2006 Median Time (in days) from: Submission to Final Acceptance	Acceptance to Posting	Format(s)
Represent. Theory (www.ams.org/journals/ert)	18	312	42	pdf, ps, dvi
Sém. Lothar. Combin. (www.mat.univie.ac.at/~slc/)	36	188	7	pdf, ps, dvi, tex
SIAM J. Appl. Dyn. Syst. epubs.siam.org/SIADS/siads_toc.html) (epubs.siam.org/)	31	247	118	pdf, bibtex
Theory Appl. Categ. (www.tac.mta.ca/tac/)	39	286	11	html, pdf, ps, dvi

NR means no response received. NA means not available or not applicable. *Starting in 2006, articles published on an article-by-article basis, Open Access Journal. **Not broken down into issues, published electronically as soon as an article is written; when 500–600 papers have been published, it is printed and mailed. ***One volume, variable number of issues. This journal started in January 2007. †Accepted papers are posted as preprints when the final version is received and do not carry the legend "Article electronically published" since the peprints have not been reformatted to conform to the print format. †† The electronic version is the main version. Authors cite papers using the DOI before they are put into an issue. Once an editor submits a paper, it takes 3–4 months to publish the online version. For the print version, times vary for each paper since it waits for the next issue. †††The long time between acceptance and publication for papers published in 2006 is due to special factors. The delay is currently much less. ‡The first number is special volumes, the second number is regular volumes. ‡‡ The first number is for all articles; the second number is for regular articles.

From the AMS Secretary

Bylaws of the American Mathematical Society

Article I

Officers

Section 1. There shall be a president, a president elect (during the even-numbered years only), an immediate past president (during the odd-numbered years only), three vice presidents, a secretary, four associate secretaries, a treasurer, and an associate treasurer.

Section 2. It shall be a duty of the president to deliver an address before the Society at the close of the term of office or within one year thereafter.

Article II

Board of Trustees

Section 1. There shall be a Board of Trustees consisting of eight trustees, five trustees elected by the Society in accordance with Article VII, together with the president, the treasurer, and the associate treasurer of the Society *ex officio*. The Board of Trustees shall designate its own presiding officer and secretary.

Section 2. The function of the Board of Trustees shall be to receive and administer the funds of the Society, to have full legal control of its investments and properties, to make contracts, and, in general, to conduct all business affairs of the Society.

Section 3. The Board of Trustees shall have the power to appoint such assistants and agents as may be necessary or convenient to facilitate the conduct of the affairs of the Society and to fix the terms and conditions of their employment. The Board may delegate to the officers of the Society duties and powers normally inhering in their respective corporative offices, subject to supervision by the Board. The Board of Trustees may appoint committees to facilitate the conduct of the financial business of the Society and delegate to such committees such powers as may be necessary or convenient for the proper exercise of those powers. Agents appointed, or members of committees designated, by the Board of Trustees need not be members of the Board.

Nothing herein contained shall be construed to empower the Board of Trustees to divest itself of responsibility for, or legal control of, the investments, properties, and contracts of the Society.

Article III

Committees

Section 1. There shall be eight editorial committees as follows: committees for the *Bulletin*, for the *Proceedings*, for the *Colloquium Publications*, for the *Journal*, for *Mathematical Surveys and Monographs*, for *Mathematical Reviews*; a joint committee for the *Transactions* and the *Memoirs*; and a committee for *Mathematics of Computation*.

Section 2. The size of each committee shall be determined by the Council.

Article IV

Council

Section 1. The Council shall consist of fifteen members at large and the following *ex officio* members: the officers of the Society specified in Article I, except that it shall include only one associate secretary, the chairman of each of the editorial committees specified in Article III, any former secretary for a period of two years following the terms of office, and members of the Executive Committee (Article V) who remain on the Council by the operation of Article VII, Section 4.

The chairman of any committee designated as a Council member may name a deputy from the committee as substitute. The associate secretary shall be the one charged with the scientific program of the meeting at which the Council meets except that at a meeting associated with no scientific meeting of the Society the secretary may designate the associate secretary.

Section 2. The Council shall formulate and administer the scientific policies of the Society and shall act in an advisory capacity to the Board of Trustees.

Section 3. In the absence of the secretary from any meeting of the Council, a member may be designated as acting secretary for the meeting, either by written authorization of the secretary, or, failing that, by the presiding officer.

Section 4. All members of the Council shall be voting members. Each member, including deputies and the designated associate secretary, shall have one vote. The method for settling matters before the Council at any meeting shall be by majority vote of the members present. If the result of a vote is challenged, it shall be the duty of the presiding officer to determine the true vote by a roll call. In a roll call vote, each Council member shall vote only once (although possibly a member of the Council in several capacities).

Section 5. Any five members of the Council shall constitute a quorum for the transaction of business at any meeting of the Council.

Section 6. Between meetings of the Council, business may be transacted. Votes shall be counted as specified in Section 4 of this Article, "members present" being replaced by "members voting". An affirmative vote on any proposal shall be declared if, and only if, (a) more than half of the total number of possible votes is received by the time announced for the closing of the polls, and (b) at least three-quarters of the votes received by then are affirmative. If five or more members request postponement at the time of voting, action on the matter at issue shall be postponed until the next meeting of the Council, unless either (1) at the discretion of the secretary, the question is made the subject of a second vote, in connection with which brief statements of reason, for and against, are circulated; or (2) the Council places the matter at issue before the Executive Committee for action.

Section 7. The Council may delegate to the Executive Committee certain of its duties and powers. Between meetings of the Council, the Executive Committee shall act for the Council on such matters and in such ways as the Council may specify. Nothing herein contained shall be construed as empowering the Council to divest itself of responsibility for formulating and administering the scientific policies of the Society.

Section 8. The Council shall also have power to speak in the name of the Society with respect to matters affecting the status of mathematics or mathematicians, such as proposed or enacted federal or state legislation; conditions of employment in universities, colleges, or business, research or industrial organizations; regulations, policies, or acts of governmental agencies or instrumentalities; and other items which tend to affect the dignity and effective position of mathematics.

With the exception noted in the next paragraph, a favorable vote of two-thirds of the entire membership of the Council shall be necessary to authorize any statement in the name of the Society with respect to such matters. With the exception noted in the next paragraph, such a vote may be taken only if written notice shall have been given to the secretary by the proposer of any such resolution not later than one month prior to the Council meeting at which the matter is to be presented, and the vote shall be taken not earlier than one month after the resolution has been discussed by the Council.

If, at a meeting of the Council, there are present twelve members, then the prior notification to the secretary may be waived by unanimous consent. In such a case, a unanimous favorable vote by those present shall empower the Council to speak in the name of the Society.

The Council may also refer the matter to a referendum of the entire membership of the Society and shall make such reference if a referendum is requested, prior to final action by the Council, by two hundred or more members. The taking of a referendum shall act as a stay upon Council action until the votes have been canvassed, and thereafter no action may be taken by the Council except in accordance with a plurality of the votes cast in the referendum.

Article V

Executive Committee

Section 1. There shall be an Executive Committee of the Council, consisting of four elected members and the following *ex officio* members: the president, the secretary, the president elect (during even-numbered years), and the immediate past president (during odd-numbered years).

Section 2. The Executive Committee of the Council shall be empowered to act for the Council on matters which have been delegated to the Executive Committee by the Council. If three members of the Executive Committee request that any matter be referred to the Council, the matter shall be so referred. The Executive Committee shall be responsible to the Council and shall report its actions to the Council. It may consider the agenda for meetings of the Council and may make recommendations to the Council.

Section 3. Each member of the Executive Committee shall have one vote. An affirmative vote on any proposal before the Executive Committee shall be declared if, and only if, at least four affirmative votes are cast for the proposal. A vote on any proposal may be determined at a meeting of the Executive Committee, but it shall not be necessary to hold a meeting to determine a vote.

Article VI

Executive Director

Section 1. There shall be an Executive Director who shall be a paid employee of the Society. The Executive Director shall have charge of the offices of the Society, except for the office of the secretary, and shall be responsible for the general administration of the affairs of the Society in accordance with the policies that are set by the Board of Trustees and by the Council.

Section 2. The Executive Director shall be appointed by the Board of Trustees with the consent of the Council. The terms and conditions of employment shall be fixed by the Board of Trustees, and the performance of the Executive Director will be reviewed regularly by the Board of Trustees.

Section 3. The Executive Director shall be responsible to and shall consult regularly with a liaison committee consisting of the president as chair, the secretary, the treasurer, and the chair of the Board of Trustees.

Section 4. The Executive Director shall attend meetings of the Board of Trustees, the Council, and the Executive Committee, but shall not be a member of any of these bodies.

Article VII

Election of Officers and Terms of Office

Section 1. The term of office shall be one year in the case of the president elect and the immediate past president; two years in the case of the president, the secretary, the associate secretaries, the treasurer, and the associate treasurer; three years in the case of vice presidents and members at large of the Council, one vice president and five members at large retiring annually; and five years in the case of the trustees. In the case of members of the editorial committees and appointed members of the communications committees, the term of office shall be determined by the Council. The term of office for elected members of the Executive Committee shall be four years, one of the elected members retiring annually. All terms of office shall begin on February 1 and terminate on January 31, with the exception that the officials specified in Articles I, II, III, IV, and V (excepting the president elect and immediate past president) shall continue to serve until their successors have been duly elected or appointed and qualified.

Section 2. The president elect, the vice presidents, the trustees, and the members at large of the Council shall be elected by ballot. The secretary shall send notification to each member of the Society about the slate of candidates and the voting procedure on or before October 10, and legitimate ballots received by an established deadline at least 30 days later will be counted. Each ballot shall contain one or more names proposed by the Council for each office to be filled, with blank spaces in which the voter may substitute other names. A plurality of all votes cast shall be necessary for election. In case of failure to secure a plurality for any office, the Council shall choose by ballot among the members having the highest number of votes. The secretary, the associate secretaries, the treasurer, and the associate treasurer shall be appointed by the Council in a manner designated by the Council. Each committee named in Article III shall be appointed by the Council in a manner designated by the Council. Each such committee shall elect one of its members as chairman in a manner designated by the Council.

Section 3. The president becomes immediate past president at the end of the term of office and the president elect becomes president.

Section 4. On or before February 15, the secretary shall send to all members of the Council a ballot containing two names for each place to be filled on the Executive Committee. The nominees shall be chosen by a committee appointed by the president. Members of the Council may vote for persons not nominated. Any member of the Council who is not an *ex officio* member of the Executive Committee (see Article V, Section 1) shall be eligible for election to the Executive Committee. In case a member is elected to the Executive Committee for a term extending beyond the regular term on the Council, that person shall automatically continue as a member of the Council during the remainder of that term on the Executive Committee.

Section 5. The president and vice presidents shall not be eligible for immediate re-election to their respective offices. A member at large or an *ex officio* member of the Council shall not be eligible for immediate election (or re-election) as a member at large of the Council.

Section 6. If the president of the Society should die or resign while a president elect is in office, the president elect shall serve as president for the remainder of the year and thereafter shall serve the regular two-year term. If the president of the Society should die or resign when no president elect is in office, the Council, with the approval of the Board of Trustees, shall designate one of the vice presidents to serve as president for the balance of the regular presidential term. If the president elect of the Society should die or resign before becoming president, the office shall remain vacant until the next regular election of a president elect, and the Society shall, at the next annual meeting, elect a president for a two-year term. If the immediate past president should die or resign before expiration of the term of office, the Council, with the approval of the Board of Trustees, shall designate a former president of the Society to serve as immediate past president during the remainder of the regular term of the immediate past president. Such vacancies as may occur at any time in the group consisting of the vice presidents, the secretary, the associate secretaries, the treasurer, and the associate treasurer shall be filled by the Council with the approval of the Board of Trustees. If a member of an editorial or communications committee should take temporary leave from duties, the Council shall then appoint a substitute. The Council shall fill from its own membership any vacancy in the elected membership of the Executive Committee.

Section 7. If any elected trustee should die while in office or resign, the vacancy thus created shall be filled for the unexpired term by the Board of Trustees.

Section 8. If any member at large of the Council should die or resign more than one year before the expiration of the term, the vacancy for the unexpired term shall be filled by the Society at the next annual meeting.

Section 9. In case any officer should die or decline to serve between the time of election and the time to assume office, the vacancy shall be filled in the same manner as if that officer had served one day of the term.

Article VIII

Members and Their Election

Section 1. Election of members shall be by vote of the Council or of its Executive Committee.

Section 2. There shall be four classes of members, namely, ordinary, contributing, corporate, and institutional.

Section 3. Application for admission to ordinary membership shall be made by the applicant on a blank provided

by the secretary. Such applications shall not be acted upon until at least thirty days after their presentation to the Council (at a meeting or by mail), except in the case of members of other societies entering under special action of the Council approved by the Board of Trustees.

Section 4. An ordinary member may become a contributing member by paying the dues for such membership. (See Article IX, Section 3.)

Section 5. A university or college, or a firm, corporation, or association interested in the support of mathematics may be elected a corporate or an institutional member.

Article IX

Dues and Privileges of Members

Section 1. Any applicant shall be admitted to ordinary membership immediately upon election by the Council (Article VIII) and the discharge within sixty days of election of the first annual dues. Dues may be discharged by payment or by remission when the provision of Section 7 of this Article is applicable. The first annual dues shall apply to the year of election, except that any applicant elected after August 15 of any year may elect to have the first annual dues apply to the following year.

Section 2. The annual dues of an ordinary member of the Society shall be established by the Council with the approval of the Trustees. The Council, with the approval of the Trustees, may establish special rates in exceptional cases and for members of an organization with which the Society has a reciprocity agreement.

Section 3. The minimum dues for a contributing member shall be three-halves of the dues of an ordinary member per year. Members may, upon their own initiative, pay larger dues.

Section 4. The minimum dues of an institutional member shall depend on the scholarly activity of that member. The formula for computing these dues shall be established from time to time by the Council, subject to approval by the Board of Trustees. Institutions may pay larger dues than the computed minimum.

Section 5. The privileges of an institutional member shall depend on its dues in a manner to be determined by the Council, subject to approval by the Board of Trustees. These privileges shall be in terms of Society publications to be received by the institution and of the number of persons it may nominate for ordinary membership in the Society.

Section 6. Dues and privileges of corporate members of the Society shall be established by the Council subject to approval by the Board of Trustees.

Section 7. The dues of an ordinary member of the Society shall be remitted for any years during which that member is the nominee of an institutional member.

Section 8. After retirement from active service on account of age or on account of long-term disability, any ordinary or contributing member who is not in arrears of dues and with membership extending over at least twenty years may, by giving proper notification to the secretary, have dues remitted. Such a member shall receive the *Notices* and may request to receive *Bulletin* as privileges of membership during each year until membership ends.

Section 9. An ordinary or contributing member shall receive the *Notices* and *Bulletin* as privileges of membership during each year for which dues have been discharged.

Section 10. The annual dues of ordinary, contributing, and corporate members shall be due by January 1 of the year to which they apply. The Society shall submit bills for dues. If the annual dues of any member remain undischarged beyond what the Board of Trustees deems to be a reasonable time, the name of that member shall be removed from the list of members after due notice. A member wishing to discontinue membership at any time shall submit a resignation in writing to the Society.

Section 11. An eligible member may become a life member by making a one-time payment of dues. The criteria for eligibility and the amount of dues shall be established by the Council, subject to approval by the Board of Trustees. A life member is subsequently relieved of the obligation of paying dues. The status and privileges are those of ordinary members.

An eligible member of the Society by reciprocity who asserts the intention of continuing to be a member by reciprocity may purchase a life membership by a one-time payment of dues. The criteria for eligibility and the amount of dues shall be established by the Council, subject to approval by the Board of Trustees.

Article X

Meetings

Section 1. The annual meeting of the Society shall be held between the fifteenth of December and the tenth of February next following. Notice of the time and place of this meeting shall be sent by the secretary or an associate secretary to each member of the Society. The times and places of the annual and other meetings of the Society shall be designated by the Council.

Section 2. There shall be a business meeting of the Society only at the annual meeting. The agenda for the business meeting shall be determined by the Council. A business meeting of the Society can take action only on items notified to the full membership of the Society in the call for the meeting. A business meeting can act on items recommended to it jointly by the Council and the Board of Trustees; a majority of members present and voting is required for passage of such an item. A business meeting of the Society can place action items on the agenda for a future business meeting. Final action on an item proposed by a previous business meeting can be taken only provided there is a quorum of 400 members, a majority of members at a business meeting with a quorum being required for passage of such an item.

Section 3. Meetings of the Executive Committee may be called by the president. The president shall call a meeting at any time upon the written request of two of its members.

Section 4. The Council shall meet at the annual meeting of the Society. Special meetings of the Council may be called by the president. The president shall call a special meeting at any time upon the written request of five of its members. No special meeting of the Council shall be held unless written notice of it shall have been sent to all

members of the Council at least ten days before the day set for the meeting.

Section 5. The Board of Trustees shall hold at least one meeting in each calendar year. Meetings of the Board of Trustees may be called by the president, the treasurer, or the secretary of the Society upon three days' notice of such meetings sent to each trustee. The secretary of the Society shall call a meeting upon the receipt of a written request of two of the trustees. Meetings may also be held by common consent of all the trustees.

Section 6. Papers intended for presentation at any meeting of the Society shall be passed upon in advance by a program committee appointed by or under the authority of the Council, and only such papers shall be presented as shall have been approved by such committee. Papers in form unsuitable for publication, if accepted for presentation, shall be referred to on the program as preliminary communications or reports.

Article XI

Publications

Section 1. The Society shall publish an official organ called the *Bulletin of the American Mathematical Society*. It shall publish four journals, known as the *Journal of the American Mathematical Society*, the *Transactions of the American Mathematical Society*, the *Proceedings of the American Mathematical Society*, and *Mathematics of Computation*. It shall publish a series of mathematical papers known as the *Memoirs of the American Mathematical Society*. The object of the *Journal*, *Transactions*, *Proceedings*, *Memoirs*, and *Mathematics of Computation* is to make known important mathematical researches. It shall publish a periodical called *Mathematical Reviews*, containing abstracts or reviews of current mathematical literature. It shall publish a series of volumes called *Colloquium Publications* which shall embody in book form new mathematical developments. It shall publish a series of monographs called *Mathematical Surveys and Monographs* which shall furnish expositions of the principal methods and results of particular fields of mathematical research. It shall publish a news periodical known as the *Notices of the American Mathematical Society*, containing programs of meetings, items of news of particular interest to mathematicians, and such other materials as the Council may direct.

Section 2. The editorial management of the publications of the Society listed in Section 1 of this article, with the exception of the *Notices*, shall be in the charge of the respective editorial committees as provided in Article III, Section 1. The editorial management of the *Notices* shall be in the hands of a committee chosen in a manner established by the Council.

Article XII

Indemnification

Any person who at any time serves or has served as a trustee or officer of the Society, or as a member of the Council, or, at the request of the Society, as a director or officer of another corporation, whether for profit or not for profit, shall be indemnified by the Society and be reimbursed against and for expenses actually and necessarily incurred in connection with the defense or reasonable settlement of any action, suit, legal or administrative proceeding, whether civil, criminal, administrative or investigative, threatened, pending or completed, to which that person is made a party by reason of being or having been such trustee, officer or director or Council member, except in relation to matters as to which the person shall be adjudged in such action, suit, or proceeding to be liable for negligence or misconduct in the performance of official duties. Such right of indemnification and reimbursement shall also extend to the personal representatives of any such person and shall be in addition to and not in substitution for any other rights to which such person or personal representatives may now or hereafter be entitled by virtue of the provisions of applicable law or of any other agreement or vote of the Board of Trustees, or otherwise.

Article XIII

Amendments

These bylaws may be amended or suspended on recommendation of the Council and with the approval of the membership of the Society, the approval consisting of an affirmative vote by two-thirds of the members present at a business meeting or of two-thirds of the members voting in a mail ballot in which at least ten percent of the members vote, whichever alternative shall have been designated by the Council, and provided notice of the proposed action and of its general nature shall have been given in the call for the meeting or accompanies the ballot in full.

As amended December 2003

AMS Lecturers, Officers, Prizes, and Funds

Colloquium Lecturers
James Pierpont, 1896
Maxime Bôcher, 1896
W. F. Osgood, 1898
A. G. Webster, 1898
Oskar Bolza, 1901
E. W. Brown, 1901
H. S. White, 1903
F. S. Woods, 1903
E. B. Van Vleck, 1903
E. H. Moore, 1906
E. J. Wilczynski, 1906
Max Mason, 1906
G. A. Bliss, 1909
Edward Kasner, 1909
L. E. Dickson, 1913
W. F. Osgood, 1913
G. C. Evans, 1916
Oswald Veblen, 1916
G. D. Birkhoff, 1920
F. R. Moulton, 1920
L. P. Eisenhart, 1925
Dunham Jackson, 1925
E. T. Bell, 1927
Anna Pell-Wheeler, 1927
A. B. Coble, 1928
R. L. Moore, 1929
Solomon Lefschetz, 1930
Marston Morse, 1931
J. F. Ritt, 1932
R. E. A. C. Paley, 1934
Norbert Wiener, 1934
H. S. Vandiver, 1935
E. W. Chittenden, 1936
John von Neumann, 1937
A. A. Albert, 1939
M. H. Stone, 1939
G. T. Whyburn, 1940
Oystein Ore, 1941
R. L. Wilder, 1942
E. J. McShane, 1943
Einar Hille, 1944
Tibor Radó, 1945
Hassler Whitney, 1946
Oscar Zariski, 1947
Richard Brauer, 1948
G. A. Hedlund, 1949
Deane Montgomery, 1951
Alfred Tarski, 1952
Antoni Zygmund, 1953
Nathan Jacobson, 1955
Salomon Bochner, 1956
N. E. Steenrod, 1957
J. L. Doob, 1959
S. S. Chern, 1960
G. W. Mackey, 1961
Saunders Mac Lane, 1963
C. B. Morrey, Jr., 1964
A. P. Calderón, 1965
Samuel Eilenberg, 1967
D. C. Spencer, 1968
J. W. Milnor, 1968
Raoul H. Bott, 1969
Harish-Chandra, 1969
R. H. Bing, 1970
Lipman Bers, 1971
Armand Borel, 1971
Stephen Smale, 1972
John T. Tate, 1972
M. F. Atiyah, 1973
E. A. Bishop, 1973
F. E. Browder, 1973
Louis Nirenberg, 1974
John G. Thompson, 1974
H. Jerome Keisler, 1975
Ellis R. Kolchin, 1975
Elias M. Stein, 1975
I. M. Singer, 1976
Jürgen K. Moser, 1976
William Browder, 1977
Herbert Federer, 1977
Hyman Bass, 1978
Philip A. Griffiths, 1979
George D. Mostow, 1979
Julia B. Robinson, 1980
Wolfgang M. Schmidt, 1980
Mark Kac, 1981
Serge Lang, 1981
Dennis Sullivan, 1982
Morris W. Hirsch, 1982
Charles L. Fefferman, 1983
Bertram Kostant, 1983
Barry Mazur, 1984
Paul H. Rabinowitz, 1984
Daniel Gorenstein, 1985
Karen K. Uhlenbeck, 1985
Shing-Tung Yau, 1986
Peter D. Lax, 1987
Edward Witten, 1987
Victor W. Guillemin, 1988
Nicholas Katz, 1989
William P. Thurston, 1989
Shlomo Sternberg, 1990
Robert D. MacPherson, 1991
Robert P. Langlands, 1992
Luis A. Caffarelli, 1993
Sergiu Klainerman, 1993
Jean Bourgain, 1994
Clifford H. Taubes, 1995
Andrew W. Wiles, 1996
Daniel W. Stroock, 1997
Gian-Carlo Rota, 1998
Helmut H. Hofer, 1999
Curtis T. McMullen, 2000
János Kollár, 2001
L. Craig Evans, 2002
Peter Sarnak, 2003
Sun-Yung Alice Chang, 2004
Robert K. Lazarsfeld, 2005
Hendrik W. Lenstra Jr., 2006
Andrei Okounkov, 2007

Gibbs Lecturers
M. I. Pupin, 1923
Robert Henderson, 1924
James Pierpont, 1925
H. B. Williams, 1926
E. W. Brown, 1927
G. H. Hardy, 1928
Irving Fisher, 1929
E. B. Wilson, 1930
P. W. Bridgman, 1931
R. C. Tolman, 1932
Albert Einstein, 1934
Vannevar Bush, 1935
H. N. Russell, 1936
C. A. Kraus, 1937
Theodore von Kármán, 1939
Sewall Wright, 1941
Harry Bateman, 1943
John von Neumann, 1944
J. C. Slater, 1945
S. Chandrasekhar, 1946
P. M. Morse, 1947
Hermann Weyl, 1948
Norbert Wiener, 1949
G. E. Uhlenbeck, 1950
Kurt Gödel, 1951
Marston Morse, 1952
Wassily Leontief, 1953
K. O. Friedrichs, 1954
J. E. Mayer, 1955
M. H. Stone, 1956
H. J. Muller, 1958
J. M. Burgers, 1959
Julian Schwinger, 1960
J. J. Stoker, 1961
C. N. Yang, 1962
C. E. Shannon, 1963
Lars Onsager, 1964
D. H. Lehmer, 1965
Martin Schwarzschild, 1966
Mark Kac, 1967
E. P. Wigner, 1968
R. L. Wilder, 1969
W. H. Munk, 1970
E. F. F. Hopf, 1971
F. J. Dyson, 1972
J. K. Moser, 1973
Paul A. Samuelson, 1974
Fritz John, 1975

T. S. Fiske, 1903, 1904
W. F. Osgood, 1905, 1906
H. S. White, 1907, 1908
Maxime Bôcher, 1909, 1910
H. B. Fine, 1911, 1912
E. B. Van Vleck, 1913, 1914
E. W. Brown, 1915, 1916
L. E. Dickson, 1917, 1918
Frank Morley, 1919, 1920
G. A. Bliss, 1921, 1922
Oswald Veblen, 1923, 1924
G. D. Birkhoff, 1925, 1926
Virgil Snyder, 1927, 1928
E. R. Hedrick, 1929, 1930
L. P. Eisenhart, 1931, 1932
A. B. Coble, 1933, 1934
Solomon Lefschetz, 1935, 1936
R. L. Moore, 1937, 1938
G. C. Evans, 1939, 1940
Marston Morse, 1941, 1942
M. H. Stone, 1943, 1944
T. H. Hildebrandt, 1945, 1946
Einar Hille, 1947, 1948
J. L. Walsh, 1949, 1950
John von Neumann, 1951, 1952
G. T. Whyburn, 1953, 1954
R. L. Wilder, 1955, 1956
Richard Brauer, 1957, 1958
E. J. McShane, 1959, 1960
Deane Montgomery, 1961, 1962
J. L. Doob, 1963, 1964
A. A. Albert, 1965, 1966
C. B. Morrey, Jr., 1967, 1968
Oscar Zariski, 1969, 1970
Nathan Jacobson, 1971, 1972
Saunders Mac Lane, 1973, 1974
Lipman Bers, 1975, 1976
R. H. Bing, 1977, 1978
Peter D. Lax, 1979, 1980
Andrew M. Gleason, 1981, 1982
Arthur S. Wightman, 1976
Joseph B. Keller, 1977
Donald E. Knuth, 1978
Martin D. Kruskal, 1979
Kenneth G. Wilson, 1980
Cathleen Synge Morawetz, 1981
Elliott W. Montroll, 1982
Samuel Karlin, 1983
Herbert A. Simon, 1984
Michael O. Rabin, 1985
L. E. Scriven, 1986
Thomas C. Spencer, 1987
David P. Ruelle, 1988
Elliott H. Lieb, 1989
George B. Dantzig, 1990
Michael F. Atiyah, 1991
Michael E. Fisher, 1992
Charles S. Peskin, 1993
Robert M. May, 1994
Andrew J. Majda, 1995
Steven Weinberg, 1996
Persi Diaconis, 1997
Edward Witten, 1998
Nancy Kopell, 1999
Roger Penrose, 2000
Ronald L. Graham, 2001
Michael V. Berry, 2002
David B. Mumford, 2003
Eric Lander, 2004
Ingrid Daubechies, 2005
Michael Savageau, 2006
Peter D. Lax, 2007

Presidents
J. H. Van Amringe, 1889, 1890
J. E. McClintock, 1891-1894
G. W. Hill, 1895, 1896
Simon Newcomb, 1897, 1898
R. S. Woodward, 1899, 1900
E. H. Moore, 1901, 1902
Julia B. Robinson, 1983, 1984
Irving Kaplansky, 1985, 1986
George Daniel Mostow, 1987, 1988
William Browder, 1989, 1990
Michael Artin, 1991, 1992
Ronald L. Graham, 1993, 1994
Cathleen Synge Morawetz, 1995, 1996
Arthur M. Jaffe, 1997, 1998
Felix E. Browder, 1999, 2000
Hyman Bass, 2001, 2002
David Eisenbud, 2003, 2004
James G. Arthur, 2005, 2006
James G. Glimm, 2007, 2008

Secretaries
T. S. Fiske, 1888-1895
F. N. Cole, 1896-1920
R. G. D. Richardson, 1921-1940
J. R. Kline, 1941-1950
E. G. Begle, 1951-1956
J. W. Green, 1957-1966
Everett Pitcher, 1967-1988
Robert M. Fossum, 1989-1998
Robert J. Daverman, 1999-

Treasurers
T. S. Fiske, 1890, 1891
Harold Jacoby, 1892-1894
R. S. Woodward, 1895, 1896
Harold Jacoby, 1897-1899
W. S. Dennett, 1900-1907
J. H. Tanner, 1908-1920
W. B. Fite, 1921-1929
G. W. Mullins, 1930-1936
P. A. Smith, 1937
B. P. Gill, 1938-1948
A. E. Meder, Jr., 1949-1964
W. T. Martin, 1965-1973
Franklin P. Peterson, 1974-1998
John M. Franks, 1999-

Prizes

The George David Birkhoff Prize in Applied Mathematics

This prize was established in 1967 in honor of Professor George David Birkhoff. The initial endowment was contributed by the Birkhoff family and there have been subsequent additions by others. It is awarded for an outstanding contribution to "applied mathematics in the highest and broadest sense." Currently, the prize amount is US$5,000, and it is awarded every three years. The award is made jointly by the American Mathematical Society and the Society for Industrial and Applied Mathematics. The recipient must be a member of one of these societies and a resident of the United States, Canada, or Mexico.

First award, 1968: To Jürgen K. Moser for his contributions to the theory of Hamiltonian dynamical systems, especially his proof of the stability of periodic solutions of Hamiltonian systems having two degrees of freedom and his specific applications of the ideas in connection with this work.

Second award, 1973: To Fritz John for his outstanding work in partial differential equations, in numerical analysis, and, particularly, in nonlinear elasticity theory; the latter work has led to his study of quasi–isometric mappings as well as functions of bounded mean oscillation, which have had impact in other areas of analysis.

Third award, 1973: To James B. Serrin for his fundamental contributions to the theory of nonlinear partial differential equations, especially his work on existence and regularity theory for nonlinear elliptic equations, and applications of his work to the theory of minimal surfaces in higher dimensions.

Fourth award, 1978: To Garrett Birkhoff for bringing the methods of algebra and the highest standards of mathematics to scientific applications.

Fifth award, 1978: To Mark Kac for his important contributions to statistical mechanics and to probability theory and its applications.

Sixth award, 1978: To Clifford A. Truesdell for his outstanding contributions to our understanding of the subjects of rational mechanics and nonlinear materials, for his efforts to give precise mathematical formulation to these classical subjects, for his many contributions to applied mathematics in the fields of acoustic theory, kinetic theory, and nonlinear elastic theory, and the thermodynamics of mixtures, and for his major work in the history of mechanics.

Seventh award, 1983: To Paul R. Garabedian for his important contributions to partial differential equations, to the mathematical analysis of problems of transonic flow and airfoil design by the method of complexification, and to the development and application of scientific computing to problems of fluid dynamics and plasma physics.

Eighth award, 1988: To Elliott H. Lieb for his profound analysis of problems arising in mathematical physics.

Ninth award, 1994: To Ivo Babuška for important contributions to the reliability of finite element methods, the development of a general framework for finite element error estimation, and the development of p and h-p finite element methods; and to S. R. S. Varadhan for important contributions to the martingale characterization of diffusion processes, to the theory of large deviations for functionals of occupation times of Markov processes, and to the study of random media.

Tenth award, 1998: To Paul H. Rabinowitz for his deep influence on the field of nonlinear analysis.

Eleventh award, 2003: To John Mather for being a mathematician of exceptional depth, power, and originality; and to Charles S. Peskin for devoting much of his career to understanding the dynamics of the human heart and bringing an extraordinarily broad range of expertise to bear on this problem.

Twelfth award, 2006: To Cathleen Synge Morawetz for her deep and influential work in partial differential equations, most notably in the study of shock waves, transonic flow, scattering theory, and conformally invariant estimates for the wave equation.

Next award: January 2009.

The Bôcher Memorial Prize

This prize, the first to be offered by the AMS, was founded in memory of Professor Maxime Bôcher, who served as president of the AMS 1909–1910. The original endowment was contributed by members of the Society. It is awarded for a notable paper in analysis published during the preceding six years. To be eligible, the author should be a member of the American Mathematical Society or the paper should have been published in a recognized North American journal. Currently, the US$5,000 prize is awarded every three years.

First (preliminary) award, 1923: To G. D. Birkhoff for his memoir *Dynamical systems with two degrees of freedom*. Transactions of the American Mathematical Society **18** (1917), pp. 199–300.

Second award, 1924: To E. T. Bell for his memoir *Arithmetical paraphrases. I, II*, Transactions of the American Mathematical Society **22** (1921), pp. 1–30, 198–219; and to Solomon Lefschetz for his memoir *On certain numerical invariants with applications to Abelian varieties*, Transactions of the American Mathematical Society **22** (1921), pp. 407–482.

Third award, 1928: To J. W. Alexander for his memoir *Combinatorial analysis situs*, Transactions of the American Mathematical Society **28** (1926), pp. 301–329.

Fourth award, 1933: To Marston Morse for his memoir *The foundations of a theory of the calculus of variations in the large in m-space*, Transactions of the American Mathematical Society **31** (1929), pp. 379–404; and to Norbert Wiener for his memoir, *Tauberian theorems*, Annals of Mathematics, Series 2, **33** (1932), pp. 1–100.

Fifth award, 1938: To John von Neumann for his memoir *Almost periodic functions and groups. I, II*, Transactions of the American Mathematical Society **36** (1934), pp. 445–492; and **37** (1935), pp. 21–50.

Sixth award, 1943: To Jesse Douglas for his memoirs *Green's function and the problem of Plateau*, American Journal of Mathematics **61** (1939), pp. 545–589; *The most general form of the problem of Plateau*, American Journal of Mathematics **61** (1939), pp. 590–608; and *Solution of the inverse problem of the calculus of variations*, Proceedings of the National Academy of Sciences **25** (1939), pp. 631–637.

Seventh award, 1948: To A. C. Schaeffer and D. C. Spencer for their memoir *Coefficients of schlicht functions. I, II, III, IV*, Duke Mathematical Journal **10** (1943), pp. 611–635; **12** (1945), pp. 107–125; and the Proceedings of the National Academy of Sciences **32** (1946), pp. 111–116; **35** (1949), pp. 143–150.

Eighth award, 1953: To Norman Levinson for his contributions to the theory of linear, nonlinear, ordinary, and partial differential equations contained in his papers of recent years.

Ninth award, 1959: To Louis Nirenberg for his work in partial differential equations.

Tenth award, 1964: To Paul J. Cohen for his paper *On a conjecture of Littlewood and idempotent measures*, American Journal of Mathematics **82** (1960), pp. 191–212.

Eleventh award, 1969: To I. M. Singer in recognition of his work on the index problem, especially his share in two joint papers with Michael F. Atiyah, *The index of elliptic operators. I, III*, Annals of Mathematics, Series 2, **87** (1968), pp. 484–530, 546–604.

Twelfth award, 1974: To Donald S. Ornstein in recognition of his paper *Bernoulli shifts with the same entropy are isomorphic*, Advances in Mathematics **4** (1970), pp. 337–352.

Thirteenth award, 1979: To Alberto P. Calderón in recognition of his fundamental work on the theory of singular integrals and partial differential equations, and in particular for his paper *Cauchy integrals on Lipschitz curves and related operators*, Proceedings of the National Academy of Sciences, USA, **74** (1977), pp. 1324–1327.

Fourteenth award, 1984: To Luis A. Caffarelli for his deep and fundamental work in nonlinear partial differential

equations, in particular his work on free boundary problems, vortex theory, and regularity theory.

Fifteenth award, 1984: To Richard B. Melrose for his solution of several outstanding problems in diffraction theory and scattering theory and for developing the analytical tools needed for their resolution.

Sixteenth award, 1989: To Richard M. Schoen for his work on the application of partial differential equations to differential geometry, in particular his completion of the solution to the Yamabe Problem in *Conformal deformation of a Riemannian metric to constant scalar curvature*, Journal of Differential Geometry **20** (1984), pp. 479–495.

Seventeenth award, 1994: To Leon Simon for his profound contributions toward understanding the structure of singular sets for solutions of variational problems.

Eighteenth award, 1999: To Demetrios Christodoulou for his contributions to the mathematical theory of general relativity, to Sergiu Klainerman for his contributions to nonlinear hyperbolic equations, and to Thomas Wolff for his work in harmonic analysis.

Nineteenth award, 2002: To Daniel Tataru for his fundamental paper *On global existence and scattering for the wave maps equations*, Amer. Jour. Math. **123** (2001), no. 1, pp. 37–77; and to Terence Tao for his recent fundamental breakthrough on the problem of critical regularity in Sobolev spaces of the wave maps equations, *Global regularity of wave maps I. Small critical Sobolev norm in high dimensions*, Int. Math. Res. Notices (2001), no. 6, pp. 299–328, and *Global regularity of wave maps II. Small energy in two dimensions*, to appear in Comm. Math. Phys. (2001 or early 2002); and to Fanghua Lin for his fundamental contributions to our understanding of the Ginzburg-Landau (GL) equations with a small parameter.

Twentieth award, 2005: To Frank Merle for his fundamental work in the analysis of nonlinear dispersive equations.

Next award: January 2008.

The Frank Nelson Cole Prize in Algebra

This prize (and the Frank Nelson Cole Prize in Number Theory) was founded in honor of Professor Frank Nelson Cole on the occasion of his retirement as secretary of the American Mathematical Society after twenty-five years of service and as editor-in-chief of the *Bulletin* for twenty-one years. The original fund was donated by Professor Cole from moneys presented to him on his retirement and was augmented by contributions from members of the Society. The fund was later doubled by his son, Charles A. Cole. The prize is for a notable paper in algebra published during the preceding six years. To be eligible, the author should be a member of the American Mathematical Society or the paper should have been published in a recognized North American journal. Currently, the US$5,000 prize is awarded every three years.

First award, 1928: To L. E. Dickson for his book *Algebren und ihre Zahlentheorie*, Orell Füssli, Zürich and Leipzig, 1927.

Second award, 1939: To A. Adrian Albert for his papers on the construction of Riemann matrices published in the Annals of Mathematics, Series 2, **35** (1934) and **36** (1935).

Third award, 1944: To Oscar Zariski for four papers on algebraic varieties published in the American Journal of Mathematics **61** (1939) and **62** (1940), and in the Annals of Mathematics, Series 2, **40** (1939) and **41** (1940).

Fourth award, 1949: To Richard Brauer for his paper *On Artin's L-series with general group characters*, Annals of Mathematics, Series 2, **48** (1947), pp. 502–514.

Fifth award, 1954: To Harish–Chandra for his papers on representations of semisimple Lie algebras and groups, and particularly for his paper *On some applications of the universal enveloping algebra of a semisimple Lie algebra*, Transactions of the American Mathematical Society **70** (1951), pp. 28–96.

Sixth award, 1960: To Serge Lang for his paper *Unramified class field theory over function fields in several variables*, Annals of Mathematics, Series 2, **64** (1956), pp. 285–325; and to Maxwell A. Rosenlicht for his papers *Generalized Jacobian varieties*, Annals of Mathematics, Series 2, **59** (1954), pp. 505–530, and *A universal mapping property of generalized Jacobians*, Annals of Mathematics, Series 2, **66** (1957), pp. 80–88.

Seventh award, 1965: To Walter Feit and John G. Thompson for their joint paper *Solvability of groups of odd order*, Pacific Journal of Mathematics **13** (1963), pp. 775–1029.

Eighth award, 1970: To John R. Stallings for his paper *On torsion-free groups with infinitely many ends*, Annals of Mathematics, Series 2, **88** (1968), pp. 312–334; and to Richard G. Swan for his paper *Groups of cohomological dimension one*, Journal of Algebra **12** (1969), pp. 585–610.

Ninth award, 1975: To Hyman Bass for his paper *Unitary algebraic K-theory*, Springer Lecture Notes in Mathematics 343, 1973; and to Daniel G. Quillen for his paper *Higher algebraic K-theories*, Springer Lecture Notes in Mathematics 341, 1973.

Tenth award, 1980: To Michael Aschbacher for his paper *A characterization of Chevalley groups over fields of odd order*, Annals of Mathematics, Series 2, **106** (1977), pp. 353–398; and to Melvin Hochster for his paper *Topics in the homological theory of commutative rings*, CBMS Regional Conference Series in Mathematics, Number 24, American Mathematical Society, 1975.

Eleventh award, 1985: To George Lusztig for his fundamental work on the representation theory of finite groups of Lie type. In particular for his contributions to the classification of the irreducible representations in characteristic zero of the groups of rational points of reductive groups over finite fields, appearing in *Characters of Reductive Groups over Finite Fields*, Annals of Mathematics Studies 107, Princeton University Press, 1984.

Twelfth award, 1990: To Shigefumi Mori for his outstanding work on the classification of algebraic varieties and, in particular, for his paper *Flip theorem and the existence of minimal models for 3-folds*, Journal of the American Mathematical Society **1** (1988), pp. 117–253.

Thirteenth award, 1995: To Michel Raynaud and David Harbater for their solution of Abhyankar's conjecture. This work appeared in the papers *Revêtements de la*

droite affine en caractéristique $p > 0$, Invent. Math. **116** (1994), pp. 425–462 (Raynaud); and *Abhyankar's conjecture on Galois groups over curves*, Invent. Math. **117** (1994), pp. 1–25 (Harbater).

Fourteenth award, 2000: To Andrei Suslin for his work on motivic cohomology, and to Aise Johan de Jong for his important work on the resolution of singularities by generically finite maps.

Fifteenth award, 2003: To Hiraku Nakajima for his work in representation theory and geometry.

Sixteenth award, 2006: To János Kollár for his outstanding achievements in the theory of rationally connected varieties and for his illuminating work on a conjecture of Nash.

Next award: January 2009.

The Frank Nelson Cole Prize in Number Theory

This prize (and the Frank Nelson Cole Prize in Algebra) was founded in honor of Professor Frank Nelson Cole on the occasion of his retirement as secretary of the American Mathematical Society after twenty-five years of service and as editor-in-chief of the *Bulletin* for twenty-one years. The original fund was donated by Professor Cole from moneys presented to him on his retirement and was augmented by contributions from members of the Society. The fund was later doubled by his son, Charles A. Cole. The prize is for a notable paper in number theory published during the preceding six years. To be eligible, the author should be a member of the American Mathematical Society or the paper should have been published in a recognized North American journal. Currently, the US$5,000 prize is awarded every three years.

First award, 1931: To H. S. Vandiver for his several papers on Fermat's last theorem published in the *Transactions of the American Mathematical Society* and in the *Annals of Mathematics* during the preceding five years, with special reference to a paper entitled *On Fermat's last theorem*, Transactions of the American Mathematical Society 31 (1929), pp.-613–642.

Second award, 1941: To Claude Chevalley for his paper *La théorie du corps de classes*, Annals of Mathematics, Series 2, 41 (1940), pp.-394–418.

Third award, 1946: To H. B. Mann for his paper *A proof of the fundamental theorem on the density of sums of sets of positive integers*, Annals of Mathematics, Series 2, 43 (1942), pp.-523–527.

Fourth award, 1951: To Paul Erdős for his many papers in the theory of numbers, and in particular for his paper *On a new method in elementary number theory which leads to an elementary proof of the prime number theorem*, Proceedings of the National Academy of Sciences 35 (1949), pp.-374–385.

Fifth award, 1956: To John T. Tate for his paper *The higher dimensional cohomology groups of class field theory*, Annals of Mathematics, Series 2, **56** (1952), pp. 294–297.

Sixth award, 1962: To Kenkichi Iwasawa for his paper *Gamma extensions of number fields*, Bulletin of the American Mathematical Society **65** (1959), pp. 183–226; and to Bernard M. Dwork for his paper *On the rationality of the zeta function of an algebraic variety*, American Journal of Mathematics **82** (1960), pp. 631–648.

Seventh award, 1967: To James B. Ax and Simon B. Kochen for a series of three joint papers: *Diophantine problems over local fields. I, II, III*, American Journal of Mathematics **87** (1965), pp. 605–630, 631–648; and Annals of Mathematics, Series 2, **83** (1966), pp. 437–456.

Eighth award, 1972: To Wolfgang M. Schmidt for the following papers: *On simultaneous approximation of two algebraic numbers by rationals*, Acta Mathematica (Uppsala) **119** (1967), pp. 27–50; *T-numbers do exist*, Symposia Mathematica, IV, Academic Press, 1970, pp. 1–26; *Simultaneous approximation to algebraic numbers by rationals*, Acta Mathematica (Uppsala) **125** (1970), pp. 189–201; *On Mahler's T-numbers*, Proceedings of Symposia in Pure Mathematics 20, American Mathematical Society, 1971, pp. 275–286.

Ninth award, 1977: To Goro Shimura for his two papers *Class fields over real quadratic fields and Heche operators*, Annals of Mathematics, Series 2, **95** (1972), pp. 130–190; and *On modular forms of half integral weight*, Annals of Mathematics, Series 2, **97** (1973), pp. 440–481.

Tenth award, 1982: To Robert P. Langlands for pioneering work on automorphic forms, Eisenstein series and product formulas, particularly for his paper *Base change for GL(2)*, Annals of Mathematics Studies 96, Princeton University Press, 1980; and to Barry Mazur for outstanding work on elliptic curves and Abelian varieties, especially on rational points of finite order, and his paper *Modular curves and the Eisenstein ideal*, Publications Mathematiques de l'Institut des Hautes Études Scientifiques **47** (1977), pp. 33–186.

Eleventh award, 1987: To Dorian M. Goldfeld for his paper *Gauss's class number problem for imaginary quadratic fields*, Bulletin of the American Mathematical Society **13** (1985), pp. 23–37; and to Benedict H. Gross and Don B. Zagier for their paper *Heegner points and derivatives of L-series*, Inventiones Mathematicae **84** (1986), pp. 225–320.

Twelfth award, 1992: To Karl Rubin for his work in the area of elliptic curves and Iwasawa theory, with particular reference to his papers *Tate-Shafarevich groups and L-functions of elliptic curves with complex multiplication* and *The "main conjectures" of Iwasawa theory for imaginary quadratic fields;* and to Paul Vojta for his work on Diophantine problems, with particular reference to his paper *Siegel's theorem in the compact case*.

Thirteenth award, 1997: To Andrew J. Wiles for his work on the Shimura-Taniyama conjecture and Fermat's Last Theorem, published in *Modular elliptic curves and Fermat's Last Theorem*, Ann. of Math. 141 (1995), pp. 443–551.

Fourteenth award, 2002: To Henryk Iwaniec for his fundamental contributions to analytic number theory, and to Richard Taylor for several outstanding advances in algebraic number theory.

Fifteenth award, 2005: To Peter Sarnak for his fundamental contributions to number theory and in particular his book *Random Matrices, Frobenius Eigenvalues and*

Monodromy, written jointly with his Princeton colleague Nicholas Katz.

Next award: January 2008.

The Levi L. Conant Prize

This prize was established in 2000 in honor of Levi L. Conant to recognize the best expository paper published in either the *Notices of the AMS* or the *Bulletin of the AMS* in the preceding five years. Levi L. Conant was a mathematician at Worcester Polytechnic Institute. His will provided for funds to be donated to the AMS upon his wife's death. The US$1,000 prize is awarded annually.

First award, 2001: To Carl Pomerance for his paper "A tale of two sieves", *Notices of the AMS* **43**, no. 12 (1996), pp. 1473–1485.

Second award, 2002: To Elliott H. Lieb and Jakob Yngvason for their article "A guide to entropy and the Second Law of Thermodynamics", *Notices of the AMS* **45**, no. 5 (1998), pp. 571–581.

Third award, 2003: To Nicholas Katz and Peter Sarnak for their expository paper "Zeroes of zeta functions and symmetry", *Bulletin of the AMS* **36** (1999), pp. 1–26.

Fourth award, 2004: To Noam D. Elkies for his enlightening two-part article "Lattices, linear codes, and invariants", *Notices of the AMS* **47**, no. 10 (2000), Part I, pp. 1238–1245; no. 11, Part II, pp. 1382–1391.

Fifth award, 2005: To Allen Knutson and Terence Tao for their stimulating article "Honeycombs and sums of Hermitian matrices", *Notices of the AMS* **48**, no. 2 (2001), pp. 175–186.

Sixth award, 2006: To Ronald Solomon for his article "A Brief History of the Classification of the Finite Simple Groups", *Bulletin of the AMS* **38** (2001), no. 3, 315–352.

Seventh award, 2007: To Jeffrey Weeks for his article "The Poincare dodecahedral space and the mystery of the missing fluctuations," *Notices of the AMS* **51** (2004) no. 6, 610–619.

Next award: January 2008.

Joseph L. Doob Prize

This prize was established by the AMS in 2003 to recognize a single, relatively recent, outstanding research book that makes a seminal contribution to the research literature, reflects the highest standards of research exposition, and promises to have a deep and long-term impact in its area. The book must have been published within the six calendar years preceding the year in which it is nominated. Books may be nominated by members of the Society, by members of the selection committee, by members of AMS editorial committees, or by publishers. The US$5,000 prize is awarded every three years.

The prize (originally called the Book Prize) was endowed in 2005 by Paul and Virginia Halmos and renamed in honor of Joseph L. Doob. Paul Halmos (Professor Emeritus at Santa Clara University) was Doob's first Ph.D. student. Doob received his Ph.D. from Harvard in 1932 and three years later joined the faculty at the University of Illinois, where he remained until his retirement in 1978. He worked in probability theory and measure theory, served as AMS president in 1963–1964, and received the AMS Steele Prize in 1984 "for his fundamental work in establishing probability as a branch of mathematics." Doob passed away on June 7, 2004, at the age of ninety-four.

First award, 2005: To William P. Thurston for his book *Three-Dimensional Geometry and Topology*, edited by Silvio Levy.

Next award: January 2008.

Leonard Eisenbud Prize for Mathematics and Physics

This prize was established in 2006 in memory of the mathematical physicist, Leonard Eisenbud (1913–2004), by his son and daughter-in-law, David and Monika Eisenbud. Leonard Eisenbud was a student of Eugene Wigner. He was particularly known for the book, *Nuclear Structure* (1958), which he co-authored with Wigner. A friend of Paul Erdős, he once threatened to write a dictionary of "English to Erdős and Erdős to English." He was one of the founders of the Physics Department at SUNY Stony Brook, where he taught from 1957 until his retirement in 1983. In later years he became interested in the foundations of quantum mechanics and in the interaction of physics with culture and politics, teaching courses on the anti-science movement. His son, David, was President of the American Mathematical Society 2003–2004.

The prize will honor a work or group of works that brings the two fields closer together. Thus, for example, the prize might be given for a contribution to mathematics inspired by modern developments in physics or for the development of a physical theory exploiting modern mathematics in a novel way.

The US$5,000 prize will be awarded every three years for a work published in the preceding six years.

It is expected that the first award will be made in January 2008.

The Delbert Ray Fulkerson Prize

The Fulkerson Prize for outstanding papers in the area of discrete mathematics is sponsored jointly by the Mathematical Programming Society (MPS) and the American Mathematical Society (AMS). Up to three awards of US$1,500 each are presented at each (triennial) International Symposium of the MPS. Originally, the prizes were paid out of a memorial fund administered by the AMS that was established by friends of the late Delbert Ray Fulkerson to encourage mathematical excellence in the fields of research exemplified by his work. The prizes are now funded by an endowment administered by the MPS.

First award, 1979: To Richard M. Karp for *On the computational complexity of combinatorial problems*, Networks, **5** (1975), pp. 45–68; to Kenneth Appel and Wolfgang Haken for *Every planar map is four colorable*, Part I: *Discharging*, Illinois Journal of Mathematics **21** (1977), pp. 429–490; and to Paul D. Seymour for *The matroids with the max-flow min-cut property*, Journal of Combinatorial Theory, Series B, **23** (1977), pp. 189–222.

Second award, 1982: To D. B. Judin and A. S. Nemirovskii for *Informational complexity and effective methods of solution for convex extremal problems*, Ekonomika i Matematicheskie Metody **12** (1976), pp. 357–369; to L. G. Khachiyan for *A polynomial algorithm in linear*

programming, Akademiia Nauk SSSR. Doklady **244** (1979), pp. 1093–1096; to G. P. Egorychev for *The solution of van der Waerden's problem for permanents*, Akademiia Nauk SSSR. Doklady **258** (1981), pp. 1041–1044; D. I. Falikman for *A proof of the van der Waerden conjecture on the permanent of a doubly stochastic matrix*, Matematicheskie Zametki **29** (1981), pp. 931–938; and to M. Grötschel, L. Lovasz, and A. Schrijver for *The ellipsoid method and its consequences in combinatorial optimization*, Combinatorica **1** (1981), pp. 169–197.

Third award, 1985: To Jozsef Beck, for *Roth's estimate of the discrepancy of integer sequences is nearly sharp*, Combinatorica **1** (4) (1981), pp. 319–325; to H. W. Lenstra Jr. for *Integer programming with a fixed number of variables*, Mathematics of Operations Research **8** (4) (1983), pp. 538–548; and to Eugene M. Luks for *Isomorphism of graphs of bounded valence can be tested in polynomial time*, Journal of Computer and System Sciences **25** (1) (1982), pp. 42–65.

Fourth award, 1988: To Éva Tardos for *A strongly polynomial minimum cost circulation algorithm*, Combinatorica **5** (1985), pp. 247–256; and to Narendra Karmarkar for *A new polynomial-time algorithm for linear programming*, Combinatorica **4** (1984), pp. 373–395.

Fifth award, 1991: To Martin Dyer, Alan Frieze, and Ravi Kannan for *A random polynomial time algorithm for approximating the volume of convex bodies*, Journal of the Association for Computing Machinery **38**/1 (1991), pp. 1–17; to Alfred Lehman for *The width-length inequality and degenerate projective planes*, W. Cook and P. D. Seymour (eds.), *Polyhedral Combinatorics*, DIMACS Series in Discrete Mathematics and Theoretical Computer Science 1, American Mathematical Society, 1990, pp. 101–105; and to Nikolai E. Mnev for *The universality theorems on the classification problem of configuration varieties and convex polytope varieties*, O. Ya. Viro (ed.), *Topology and Geometry–Rohlin Seminar*, Lecture Notes in Mathematics 1346, Springer–Verlag, Berlin, 1988, pp. 527–544.

Sixth Award, 1994: To Lou Billera for *Homology of smooth splines: Generic triangulations and a conjecture of Strang*, Transactions of the AMS **310** (1988), pp. 325–340; to Gil Kalai for *Upper bounds for the diameter and height of graphs of the convex polyhedra*, Discrete and Computational Geometry **8** (1992), pp. 363–372; and to Neil Robertson, Paul D. Seymour, and Robin Thomas for *Hadwiger's conjecture for K6; free graphs*, Combinatorica **13** (1993), pp. 279–361.

Seventh award, 1997: To Jeong Han Kim for *The Ramsey number R*(3,*t*) *has order of magnitude*, which appeared in Random Structures and Algorithms **7** (1995) no. 3, pp. 173–207.

Eighth award, 2000: To Michel X. Goemans and David P. Williamson for *Improved approximation algorithms for the maximum cut and satisfiability problems using semi-definite programming*, Journal of the Association for Computing Machinery **42** (1995), no. 6, pp. 1115–1145; and to Michele Conforti, Gerard Cornuejols, and M. R. Rao for *Decomposition of balanced matrices*, Journal of Combinatorial Theory, Series B **77** (1999), no. 2, pp. 292–406.

Ninth award, 2003: To J. F. Geelen, A. M. H. Gerards, and A. Kapoor for *The excluded minors for GF(4)-representable matroids*, Journal of Combinatorial Theory Series B, **79** (2000), no. 2, pp. 247–299; to Bertrand Guenin for *A characterization of weakly bipartite graphs*, Journal of Combinatorial Theory Series B, **83** (2001), no. 1, pp. 112–168; to Satoru Iwata, Lisa Fleischer, and Satoru Fujishige for *A combinatorial strongly polynomial algorithm for minimizing submodular functions*, Journal of the ACM, **48** (July 2001), no. 4, pp. 761–777; and to Alexander Schrijver for *A combinatorial algorithm minimizing submodular functions in strongly polynomial time,* Journal of Combinatorial Theory, Series B, **80** (2000), no. 2, pp. 346–355.

Tenth award, 2006: To Manindra Agrawal, Neeraj Kayal and Nitin Saxena, *PRIMES is in P*, Annals of Mathematics, Volume 160, issue 2, 2004, Pp. 781–793; and to Mark Jerrum, Alistair Sinclair and Eric Vigoda, *A polynomial-time approximation algorithm for the permanent of a matrix with nonnegative entries*, J. ACM, Volume 51, Issue 4, 2004, pp. 671–697; and to Neil Robertson and Paul D. Seymour, *Graph Minors. XX. Wagner's conjecture*, Journal of Combinatorial Theory, Series B, **92** (2004), no. 2, pp. 325–357.

Next award: August 2009.

E. H. Moore Research Article Prize

This prize was established in 2002 in honor of E. H. Moore. Among other activities, Moore founded the Chicago branch of the American Mathematical Society, served as the Society's sixth president (1901–1902), delivered the Colloquium Lectures in 1906, and founded and nurtured the *Transactions of the AMS*. The US$5,000 prize will be awarded every three years for an outstanding research article to have appeared in one of the AMS primary research journals (namely, the *Journal of the AMS*, *Proceedings of the AMS*, *Transactions of the AMS*, *Memoirs of the AMS*, *Mathematics of Computation*, *Electronic Journal of Conformal Geometry and Dynamics*, and *Electronic Journal of Representation Theory*) during the six calendar years ending a full year before the meeting at which the prize is awarded.

First award, 2004: To Mark Haiman for *Hilbert schemes, polygraphs, and the Macdonald positivity conjecture*, Journal of the AMS **14** (2001), pp. 941–1006.

Second award, 2007: To Ivan Shestakov and Ualbai Umirbaev for their two ground-breaking papers, both published in the Journal of the American Mathematical Society: *The tame and the wild automorphisms of polynomial rings in three variables*, **17** (2004), no. 1, 197–227; and *Poisson brackets and two-generated subalgebras of rings of polynomials*, **17** (2004), no. 1, 181–196.

Next award: January 2010.

The Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student

This prize, which was established in 1995, is to be awarded to an undergraduate student (or students having submitted joint work) for outstanding research in mathematics. It is entirely endowed by a gift from Mrs. Frank (Brennie) Morgan. Any student who is an undergraduate in a

college or university in Canada, Mexico, or the United States or its possessions is eligible to be considered for this US$1,000 prize, which is to be awarded annually. The award is made jointly by the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics.

First award, 1995: To Kannan Soundararajan for truly exceptional research in analytic number theory. Honorable mention: Kiran Kedlaya.

Second award, 1996: To Manjul Bhargava for truly outstanding mathematical research in algebra. Honorable mention: Lenhard L. Ng.

Third award, 1997: To Jade Vinson for wide-ranging research in analysis and geometry. Honorable mention: Vikaas Sohal.

Fourth award, 1998: To Daniel Biss for his remarkable breadth, as well as depth. The most exciting aspect of his submission was his extension of a category which more closely binds the associations between combinatorial group theory and combinatorial topology. Honorable mention: Aaron E. Archer.

Fifth award, 1999: To Sean McLaughlin for his proof of the Dodecahedral Conjecture, a major problem in discrete geometry related to, but distinct from, Kepler's sphere-packing problem and a conjecture that has resisted the efforts of the strongest workers in this area for nearly sixty years. Honorable mention: Samit Dasgupta.

Sixth award, 2000: To Jacob Lurie for his paper "On simply laced Lie algebras and their miniscule representations". Honorable mention: Wai Ling Yee.

Seventh award, 2001: To Ciprian Manolescu for making a fundamental advance in the field by giving an elegant construction of Floer homology. Honorable mention: Michael A. Levin.

Eighth award, 2002: To Joshua Greene for his work in combinatorics.

Ninth award, 2003: To Melanie Wood for research on Belyi-extending maps and *P*-orderings. Honorable mention: Karen Yeats.

Tenth award, 2004: To Reid W. Barton for his paper "Packing densities of patterns". Honorable mention: Po-Shen Loh.

Eleventh award, 2006: To Jacob Fox for a most astounding collection of research papers by any undergraduate mathematician.

Twelfth award, 2007: To Daniel Kane for establishing a research record that would be the envy of many professional mathematicians.

Next award: January 2008.

David P. Robbins Prize

This prize was established in 2005 in memory of David P. Robbins by members of his family. Robbins, who died in 2003, received his Ph.D. in 1970 from MIT. He was a long-time member of the Institute for Defense Analysis Center for Communications Research and a prolific mathematician whose work (much of it classified) was in discrete mathematics. The prize is for a paper with the following characteristics: it shall report on novel research in algebra, combinatorics, or discrete mathematics and shall have a significant experimental component; and it shall be on a topic which is broadly accessible and shall provide a simple statement of the problem and clear exposition of the work. The US$5,000 prize will be awarded every three years.

First award, 2007: To Samuel P. Ferguson and Thomas C. Hales, for the paper *A proof of the Kepler conjecture*, by Thomas C. Hales, Annals of Mathematics, **162** (2005), 1065–1185 (Section 5 of this paper is jointly authored with Ferguson).

Next award: January 2010.

The Ruth Lyttle Satter Prize in Mathematics

The prize was established in 1990 using funds donated by Joan S. Birman in memory of her sister, Ruth Lyttle Satter. Professor Birman requested that the prize be established to honor her sister's commitment to research and to encouraging women in science. The US$5,000 prize is awarded every two years to recognize an outstanding contribution to mathematics research by a woman in the previous six years.

First award, 1991: To Dusa McDuff for her outstanding work during the past five years on symplectic geometry.

Second award, 1993: To Lai-Sang Young for her leading role in the investigation of the statistical (or ergodic) properties of dynamical systems.

Third award, 1995: To Sun-Yung Alice Chang for her deep contributions to the study of partial differential equations on Riemannian manifolds and in particular for her work on extremal problems in spectral geometry and the compactness of isospectral metrics within a fixed conformal class on a compact 3-manifold.

Fourth award, 1997: To Ingrid Daubechies for her deep and beautiful analysis of wavelets and their applications.

Fifth award, 1999: To Bernadette Perrin-Riou for her number theoretical research on *p*-adic *L*-functions and Iwasawa Theory.

Sixth award, 2001: To Karen E. Smith for her outstanding work in commutative algebra, and to Sijue Wu for her work on a long-standing problem in the water wave equation.

Seventh award, 2003: To Abigail Thompson for her outstanding work in 3-dimensional topology.

Eighth award, 2005: To Svetlana Jitomirskaya for her pioneering work on nonpertubative quasiperiodic localization, in particular for results in her papers (1) *Metal-insulator transition for the almost Mathieu operator*, Ann. of Math. (2) **150** (1999), no. 3, pp. 1159–1175; and (2) with J. Bourgain, *Absolutely continuous spectrum for 1D quasiperiodic operators*, Invent. Math. **148** (2002), no. 3, pp. 453–463.

Ninth award, 2007: To Claire Voisin for her deep contributions to algebraic geometry, and in particular for her recent solutions to two long-standing open problems: the Kodaira problem (*On the homotopy types of compact Kähler and complex projective manifolds*, Inventiones Mathematicae, **157** (2004), no. 2, 329–343) and Green's Conjecture (*Green's canonical syzygy conjecture for generic curves of odd genus*, Compositio Mathematica, **141** (2005), no. 5, 1163–1190; and *Green's generic syzygy*

conjecture for curves of even genus lying on a K3 surface, Journal of the European Mathematical Society, **4** (2002), no. 4, 363–404).

Next award: January 2009.

The Leroy P. Steele Prize for Lifetime Achievement
The Leroy P. Steele Prize for Mathematical Exposition
The Leroy P. Steele Prize for Seminal Contribution to Research

These prizes were established in 1970 in honor of George David Birkhoff, William Fogg Osgood, and William Caspar Graustein and are endowed under the terms of a bequest from Leroy P. Steele. From 1970 to 1976 one or more prizes were awarded each year for outstanding published mathematical research; most favorable consideration was given to papers distinguished for their exposition and covering broad areas of mathematics. In 1977 the Council of the AMS modified the terms under which the prizes are awarded. Since then, up to three prizes have been awarded each year in the following categories: (1) for the cumulative influence of the total mathematical work of the recipient, high level of research over a period of time, particular influence on the development of a field, and influence on mathematics through Ph.D. students; (2) for a book or substantial survey or expository research paper; (3) for a paper, whether recent or not, that has proved to be of fundamental or lasting importance in its field, or a model of important research. In 1993 the Council formalized the three categories of the prize by naming each of them: (1) The Leroy P. Steele Prize for Lifetime Achievement, (2) The Leroy P. Steele Prize for Mathematical Exposition, and (3) The Leroy P. Steele Prize for Seminal Contribution to Research. Each of these three US$5,000 prizes is awarded annually.

Special Note: Beginning with the 1994 prize, there has been a five-year cycle of fields for the Seminal Contribution to Research Award. That cycle would have the 2008 prize awarded in discrete mathematics (discrete mathematics alternates with logic every five years), then analysis in 2009, algebra in 2010, applied mathematics in 2011, geometry/topology in 2012, and then logic in 2013, renewing the cycle.

August 1970: To Solomon Lefschetz for his paper *A page of mathematical autobiography*, Bulletin of the American Mathematical Society **74** (1968), pp. 854–879.

August 1971: To James B. Carrell for his paper, written jointly with Jean A. Dieudonne, *Invariant theory, old and new*, Advances in Mathematics **4** (1970), pp. 1–80.

August 1971: To Jean A. Dieudonné for his paper *Algebraic geometry*, Advances in Mathematics **3** (1969), pp. 223–321; and for his paper, written jointly with James B. Carrell, *Invariant theory, old and new*, Advances in Mathematics **4** (1970), pp. 1–80.

August 1971: To Phillip A. Griffiths for his paper *Periods of integrals on algebraic manifolds*, Bulletin of the American Mathematical Society **76** (1970), pp. 228–296.

August 1972: To Edward B. Curtis for his paper *Simplicial homotopy theory*, Advances in Mathematics **6** (1971), pp. 107–209.

August 1972: To William J. Ellison for his paper *Waring's problem*, American Mathematical Monthly **78** (1971), pp. 10–36.

August 1972: To Lawrence F. Payne for his paper *Isoperimetric inequalities and their applications*, SIAM Review **9** (1967), pp. 453–488.

August 1972: To Dana S. Scott for his paper *A proof of the independence of the continuum hypothesis*, Mathematical Systems Theory **1** (1967), pp. 89–111.

January 1975: To Lipman Bers for his paper *Uniformization, moduli, and Kleinian groups*, Bulletin of the London Mathematical Society **4** (1972), pp. 257–300.

January 1975: To Martin D. Davis for his paper *Hilbert's tenth problem is unsolvable*, American Mathematical Monthly **80** (1973), pp. 233–269.

January 1975: To Joseph L. Taylor for his paper *Measure algebras*, CBMS Regional Conference Series in Mathematics, Number 16, American Mathematical Society, 1972.

August 1975: To George W. Mackey for his paper *Ergodic theory and its significance for statistical mechanics and probability theory*, Advances in Mathematics **12** (1974), pp. 178–286.

August 1975: To H. Blaine Lawson for his paper *Foliations*, Bulletin of the American Mathematical Society **80** (1974), pp. 369–418.

1976, 1977, 1978: No awards were made.

January 1979: To Salomon Bochner for his cumulative influence on the fields of probability theory, Fourier analysis, several complex variables, and differential geometry.

January 1979: To Hans Lewy for three fundamental papers: *On the local character of the solutions of an atypical linear differential equation in three variables and a related theorem for regular functions of two complex variables*, Annals of Mathematics, Series 2, **64** (1956), pp. 514–522; *An example of a smooth linear partial differential equation without solution*, Annals of Mathematics, Series 2, **66** (1957), pp. 155–158; and *On hulls of holomorphy*, Communications in Pure and Applied Mathematics **13** (1960), pp. 587–591.

August 1979: To Antoni Zygmund for his cumulative influence on the theory of Fourier series, real variables, and related areas of analysis.

August 1979: To Robin Hartshorne for his expository research article *Equivalence relations on algebraic cycles and subvarieties of small codimension*, Proceedings of Symposia in Pure Mathematics, volume 29, American Mathematical Society, 1975, pp. 129–164; and his book *Algebraic Geometry*, Springer–Verlag, Berlin and New York, 1977.

August 1979: To Joseph J. Kohn for his fundamental paper *Harmonic integrals on strongly convex domains. I, II*, Annals of Mathematics, Series 2, **78** (1963), pp. 112–248; and 79 (1964), pp.-450–472.

August 1980: To André Weil for the total effect of his work on the general course of twentieth-century mathematics, especially in the many areas in which he has made fundamental contributions.

August 1980: To Harold M. Edwards for mathematical exposition in his books *Riemann's Zeta Function*, Pure and

Applied Mathematics, number 58, Academic Press, New York and London, 1974; and *Fermat's Last Theorem*, Graduate Texts in Mathematics, number 50, Springer-Verlag, New York and Berlin, 1977.

August 1980: To Gerhard P. Hochschild for his significant work in homological algebra and its applications.

August 1981: To Oscar Zariski for his work in algebraic geometry, especially his fundamental contributions to the algebraic foundations of this subject.

August 1981: To Eberhard Hopf for three papers of fundamental and lasting importance: *Abzweigung einer periodischen Lösung von einer stationären Lösung eines Differential systems*, Berichte über die Verhandlungen der Sächsischen Akademie der Wissenschaften zu Leipzig. Mathematisch–Naturwissenschaftliche Klasse **95** (1943), pp. 3–22; *A mathematical example displaying features of turbulence*, Communications on Applied Mathematics **1** (1948), pp. 303–322; and *The partial differential equation* $u_t+uu_x=u_{xx}$, Communications on Pure and Applied Mathematics **3** (1950), pp. 201–230.

August 1981: To Nelson Dunford and Jacob T. Schwartz for their expository book *Linear Operators*, Part I, *General Theory*, 1958; Part II, *Spectral Theory*, 1963; Part III, *Spectral Operators*, 1971, Interscience Publishers, New York.

August 1982: To Lars V. Ahlfors for his expository work in *Complex Analysis,* McGraw-Hill Book Company, New York, 1953; and in *Lectures on Quasiconformal Mappings,* D. Van Nostrand Co., Inc., New York, 1966; and *Conformal Invariants,* McGraw-Hill Book Company, New York, 1973.

August 1982: To Tsit-Yuen Lam for his expository work in his book *Algebraic Theory of Quadratic Forms* (1973), and four of his papers: K_0 *and* K_1*—an introduction to algebraic K-theory* (1975), *Ten lectures on quadratic forms over fields* (1977), *Serre's conjecture* (1978), and *The theory of ordered fields* (1980).

August 1982: To John W. Milnor for a paper of fundamental and lasting importance, *On manifolds homeomorphic to the -sphere*, Annals of Mathematics (2) **64** (1956), pp. 399–405.

August 1982: To Fritz John for the cumulative influence of his total mathematical work, high level of research over a period of time, particular influence on the development of a field, and influence on mathematics through Ph.D. students.

August 1983: To Paul R. Halmos for his many graduate texts in mathematics and for his articles on how to write, talk, and publish mathematics.

August 1983: To Steven C. Kleene for three important papers which formed the basis for later developments in generalized recursion theory and descriptive set theory: *Arithmetical predicates and function quantifiers*, Transactions of the American Mathematical Society **79** (1955), pp. 312–340; *On the forms of the predicates in the theory of constructive ordinals (second paper)*, American Journal of Mathematics **77** (1955), pp. 405–428; and *Hierarchies of number-theoretic predicates*, Bulletin of the American Mathematical Society **61** (1955), pp. 193–213.

August 1983: To Shiing-Shen Chern for the cumulative influence of his total mathematical work, high level of research over a period of time, particular influence on the development of the field of differential geometry, and influence on mathematics through Ph.D. students.

August 1984: To Elias M. Stein for his book *Singular Integrals and the Differentiability Properties of Functions*, Princeton University Press, 1970.

August 1984: To Lennart Carleson for his papers *An interpolation problem for bounded analytic functions*, American Journal of Mathematics **80** (1958), pp. 921– 930; *Interpolation by bounded analytic functions and the Corona problem*, Annals of Mathematics (2) **76** (1962), pp. 547–559; and *On convergence and growth of partial sums of Fourier series*, Acta Mathematica **116** (1966), pp. 135–157.

August 1984: To Joseph L. Doob for his fundamental work in establishing probability as a branch of mathematics and for his continuing profound influence on its development.

August 1985: To Michael Spivak for his five-volume set *A Comprehensive Introduction to Differential Geometry* (second edition), Publish or Perish, 1979.

August 1985: To Robert Steinberg for three papers on various aspects of the theory of algebraic groups: *Representations of algebraic groups*, Nagoya Mathematical Journal **22** (1963), pp. 33–56; *Regular elements of semisimple algebraic groups*, Institut des Hautes Études Scientifiques Publications Mathématiques **25** (1965), pp. 49–80; and *Endomorphisms of linear algebraic groups*, Memoirs of the American Mathematical Society **80** (1968).

August 1985: To Hassler Whitney for his fundamental work on geometric problems, particularly in the general theory of manifolds, in the study of differentiable functions on closed sets, in geometric integration theory, and in the geometry of the tangents to a singular analytic space.

January 1986: To Donald E. Knuth for his expository work *The Art of Computer Programming*, 3 volumes (first edition, 1968; second edition, 1973).

January 1986: To Rudolf E. Kalman for his two fundamental papers: *A new approach to linear filtering and prediction problems*, Journal of Basic Engineering **82** (1960), pp. 35–45; and *Mathematical description of linear dynamical systems,* SIAM Journal on Control and Optimization **1** (1963), pp. 152–192; and for his contribution to a third paper (with R. S. Bucy), *New results in linear filtering and prediction theory*, Journal of Basic Engineering **83D** (1961), pp. 95–108.

January 1986: To Saunders Mac Lane for his many contributions to algebra and algebraic topology, and in particular for his pioneering work in homological and categorical algebra.

August 1987: To Martin Gardner for his many books and articles on mathematics and particularly for his column "Mathematical Games" in *Scientific American*.

August 1987: To Herbert Federer and Wendell Fleming for their pioneering paper *Normal and integral currents*, Annals of Mathematics **72** (1960), pp. 458–520.

August 1987: To Samuel Eilenberg for his fundamental contributions to topology and algebra, in particular for his classic papers on singular homology and his work on axiomatic homology theory, which had a profound influence on the development of algebraic topology.

August 1988: To Sigurdur Helgason for his books *Differential Geometry and Symmetric Spaces*, Academic Press, 1962; *Differential Geometry, Lie Groups, and Symmetric Spaces,* Academic Press, 1978; and *Groups and Geometric Analysis,* Academic Press, 1984.

August 1988: To Gian-Carlo Rota for his paper *On the foundations of combinatorial theory, I. Theory of Möbius functions*, Zeitschrift für Wahrscheinlichkeitstheorie und Verwandte Gebiete, volume 2 (1964), pp. 340–368.

August 1988: To Deane Montgomery for his lasting impact on mathematics, particularly mathematics in America. He is one of the founders of the modern theory of transformation groups and is particularly known for his contributions to the solution of Hilbert's fifth problem.

August 1989: To Daniel Gorenstein for his book *Finite Simple Groups, An Introduction to Their Classification,* Plenum Press, 1982; and his two survey articles, *The classification of finite simple groups* and *Classifying the finite simple groups*, Bulletin of the American Mathematical Society **1** (1979), pp. 43–199; and **14** (1986), pp. 1–98, respectively.

August 1989: To Alberto P. Calderón for his paper *Uniqueness in the Cauchy problem for partial differential equations*, American Journal of Mathematics **80** (1958), pp. 16–36.

August 1989: To Irving Kaplansky for his lasting impact on mathematics, particularly mathematics in America. By his energetic example, his enthusiastic exposition, and his overall generosity, he has made striking changes in mathematics and has inspired generations of younger mathematicians.

August 1990: To R. D. Richtmyer for his book *Difference Methods for Initial-Value Problems*, Interscience, first edition, 1957; and second edition, with K. Morton, 1967.

August 1990: To Bertram Kostant for his paper *On the existence and irreducibility of certain series of representations*, Lie Groups and Their Representations (1975), pp. 231–329.

August 1990: To Raoul Bott for having been instrumental in changing the face of geometry and topology with his incisive contributions to characteristic classes, *K*-theory, index theory, and many other tools of modern mathematics.

August 1991: To Jean-François Trèves for *Pseudodifferential and Fourier Integral Operators*, Volumes 1 and 2, Plenum Press, 1980.

August 1991: To Eugenio Calabi for his fundamental work on global differential geometry, especially complex differential geometry.

August 1991: To Armand Borel for his extensive contributions in geometry and topology, the theory of Lie groups, their lattices and representations and the theory of automorphic forms, the theory of algebraic groups and their representations, and extensive organizational and educational efforts to develop and disseminate modern mathematics.

January 1993: To Jacques Dixmier for his books *von Neumann Algebras* (*Algèbres de von Neumann*), Gauthier-Villars, Paris, 1957; *C*-Algebras* (*Les C*-Algèbres et leurs Representations*), Gauthier-Villars, Paris, 1964; and *Enveloping Algebras* (*Algèbres Enveloppantes*), Gauthier-Villars, Paris, 1974.

January 1993: To James Glimm for his paper *Solution in the large for nonlinear hyperbolic systems of conservation laws*, Communications on Pure and Applied Mathematics, **XVIII** (1965), pp. 697–715.

January 1993: To Peter D. Lax for his numerous and fundamental contributions to the theory and applications of linear and nonlinear partial differential equations and functional analysis, for his leadership in the development of computational and applied mathematics, and for his extraordinary impact as a teacher.

August 1993 – Mathematical Exposition: To Walter Rudin for his books *Principles of Mathematical Analysis*, McGraw-Hill, 1953, 1964, and 1976; and *Real and Complex Analysis*, McGraw-Hill, 1966, 1974, and 1976.

August 1993 – Seminal Contribution to Research: To George Daniel Mostow for his paper *Strong rigidity of locally symmetric spaces*, Annals of Mathematics Studies, number **78**, Princeton University Press, 1973.

August 1993 – Lifetime Achievement: To Eugene B. Dynkin for his foundational contributions to Lie algebras and probability theory over a long period and his production of outstanding research students in both Russia and the United States, countries to whose mathematical life he has contributed so richly.

August 1994 – Mathematical Exposition: To Ingrid Daubechies for her book *Ten Lectures on Wavelets*, CBMS, volume 61, SIAM, 1992.

August 1994 – Seminal Contribution to Research: To Louis de Branges for his proof of the Bieberbach Conjecture.

August 1994 – Lifetime Achievement: To Louis Nirenberg for his numerous basic contributions to linear and nonlinear partial differential equations and their application to complex analysis and differential geometry.

August 1995 – Mathematical Exposition: To Jean-Pierre Serre for his 1970 book *Cours d'Arithmétique*, with its English translation, published in 1973 by Springer Verlag, *A Course in Arithmetic*.

August 1995 – Seminal Contribution to Research: To Edward Nelson for the following two papers in mathematical physics, characterized by leaders of the field as extremely innovative: *A quartic interaction in two dimensions* in *Mathematical Theory of Elementary Particles*, MIT Press, 1966, pp. 69–73; and *Construction of quantum fields from Markoff fields* in Journal of Functional Analysis **12** (1973), pp. 97–112. In these papers he showed for the first time how to use the powerful tools of probability theory to attack the hard analytic questions of constructive quantum field theory, controlling renormalizations with estimates in the first paper, and in the second turning Euclidean quantum field theory into a subset of the theory of stochastic processes.

August 1995 – Lifetime Achievement: To John T. Tate for scientific accomplishments spanning four and a half decades. He has been deeply influential in many of the important developments in algebra, algebraic geometry, and number theory during this time.

August 1996 – Mathematical Exposition: To Bruce C. Berndt for the four volumes, *Ramanujan's Notebooks*, Parts I, II, III, and IV (Springer, 1985, 1989, 1991, and 1994).

August 1996 – Mathematical Exposition: To William Fulton for his book *Intersection Theory*, Springer-Verlag, Ergebnisse series, 1984.

August 1996 – Seminal Contribution to Research: To Daniel Stroock and S. R. S. Varadhan for their four papers: *Diffusion processes with continuous coefficients I and II*, Comm. Pure Appl. Math. **22** (1969), pp. 345–400, pp. 479– 530; *On the support of diffusion processes with applications to the strong maximum principle*, Sixth Berkeley Sympos. Math. Statist. Probab., vol. III, 1970, pp. 333–360; *Diffusion processes with boundary conditions*, Comm. Pure Appl. Math. **34** (1971), pp. 147–225; *Multidimensional diffusion processes*, Springer-Verlag, 1979.

August 1996 – Lifetime Achievement: To Goro Shimura for his important and extensive work on arithmetical geometry and automorphic forms; concepts introduced by him were often seminal and fertile ground for new developments, as witnessed by the many notations in number theory that carry his name and that have long been familiar to workers in the field.

January 1997 – Mathematical Exposition: To Anthony W. Knapp for his book *Representation Theory of Semisimple Groups (An overview based on examples)*, Princeton University Press, 1986, a beautifully written book which starts from scratch but takes the reader far into a highly developed subject.

January 1997 – Seminal Contribution to Research: To Mikhael Gromov for his paper *Pseudo-holomorphic curves in symplectic manifolds*, Inventiones Math. **82** (1985), pp. 307–347, which revolutionized the subject of symplectic geometry and topology and is central to much current research activity, including quantum cohomology and mirror symmetry.

January 1997 – Lifetime Achievement: To Ralph S. Phillips for being one of the outstanding analysts of our time. His early work was in functional analysis: his beautiful theorem on the relation between the spectrum of a semigroup and its infinitesimal generator is striking as well as very useful in the study of PDEs. His extension theory for dissipative linear operators predated the interpolation approach to operator theory and robust control. He made major contributions to acoustical scattering theory in his joint work with Peter Lax, proving remarkable results on local energy decay and the connections between poles of the scattering matrix and the analytic properties of the resolvent. He later extended this work to a spectral theory for the automorphic Laplace operator, relying on the Radon transform on horospheres to avoid Eisenstein series. In the last fifteen years, Ralph Phillips has done brilliant work, in collaboration with others, on spectral theory for the Laplacian on symmetric spaces, on the existence and stability of cusp forms for general noncompact quotients of the hyperbolic plane, on the explicit construction of sparse optimal expander graphs, and on the structure of families of isospectral sets in two dimensions (the collection of drums that sound the same).

January 1998 – Lifetime Achievement: To Nathan Jacobson for his many contributions to research, teaching, exposition, and the mathematical profession. Few mathematicians have been as productive over such a long career or have had as much influence on the profession as has Professor Jacobson.

January 1998 – Seminal Contribution to Research: To Herbert Wilf and Doron Zeilberger for their joint paper *Rational functions certify combinatorial identities*, Journal of the American Mathematical Society **3** (1990), pp. 147–158.

January 1998 – Mathematical Exposition: To Joseph Silverman for his books *The Arithmetic of Elliptic Curves*, Graduate Texts in Mathematics, volume 106, Springer-Verlag, New York and Berlin, 1986; and *Advanced Topics in the Arithmetic of Elliptic Curves*, Graduate Texts in Mathematics, volume 151, Springer-Verlag, New York, 1994.

January 1999 – Lifetime Achievement: To Richard V. Kadison. For almost half a century, Professor Kadison has been one of the world leaders in the subject of operator algebras, and the tremendous flourishing of this subject in the last thirty years is largely due to his efforts.

January 1999 – Seminal Contribution to Research: To Michael G. Crandall for two seminal papers: *Viscosity solutions of Hamilton-Jacobi equations* (joint with P.-L. Lions), Trans. Amer. Math. Soc. **277** (1983), pp. 1–42; and *Generation of semi-groups of nonlinear transformations on general Banach spaces* (joint with T. M. Liggett), Amer. J. Math. **93** (1971), pp. 265–298.

January 1999 – Seminal Contribution to Research: To John F. Nash for his remarkable paper *The embedding problem for Riemannian manifolds*, Ann. of Math. (2) **63** (1956), pp. 20–63.

January 1999 – Mathematical Exposition: To Serge Lang for his many books. Among Lang's most famous texts are *Algebra*, Addison-Wesley, Reading, MA, 1965; second edition, 1984; third edition, 1993; and *Algebraic Number Theory,* Addison-Wesley, Reading, MA, 1970; second edition, Graduate Texts in Mathematics, volume 110, Springer-Verlag, New York, 1994.

January 2000 – Lifetime Achievement: To Isadore M. Singer. Singer's series of five papers with Michael F. Atiyah on the Index Theorem for elliptic operators (which appeared in 1968–71) and his three papers with Atiyah and V. K. Patodi on the Index Theorem for manifolds with boundary (which appeared in 1975–76) are among the great classics of global analysis.

January 2000 – Seminal Contribution to Research: To Barry Mazur for his paper *Modular curves and the Eisenstein ideal* in Publications Mathematiques de l'Institut des Hautes Études Scientifiques, **47** (1978), pp. 33–186.

January 2000 – Mathematical Exposition: To John H. Conway in recognition of his many expository contributions in automata, the theory of games, lattices, coding theory, group theory, and quadratic forms.

January 2001 – Lifetime Achievement: To Harry Kesten for his many and deep contributions to probability theory and its applications.

January 2001 – Seminal Contribution to Research: To Leslie F. Greengard and Vladimir Rokhlin for the paper *A fast algorithm for particle simulations*, J. Comput. Phys. **73**, no. 2 (1987), pp. 325–348.

January 2001 – Mathematical Exposition: To Richard P. Stanley in recognition of the completion of his two-volume work *Enumerative Combinatorics*.

January 2002 – Lifetime Achievement: To Michael Artin for helping to weave the fabric of modern algebraic geometry and to Elias Stein for making fundamental contributions to different branches of analysis.

January 2002 – Seminal Contribution to Research: To Mark Goresky and Robert MacPherson for the papers *Intersection homology theory*, Topology **19** (1980), no. 2, pp. 135–162 (IH1); and *Intersection homology. II*, Invent. Math. **72** (1983), no. 1, pp. 77–129 (IH2).

January 2002 – Mathematical Exposition: To Yitzhak Katznelson for his book on harmonic analysis.

January 2003 – Lifetime Achievement: To Ron Graham for being one of the principal architects of the rapid development worldwide of discrete mathematics in recent years and to Victor Guillemin for playing a critical role in the development of a number of important areas in analysis and geometry.

January 2003 – Seminal Contribution to Research: To Ronald Jensen for his paper *The fine structure of the constructible hierarchy*, Annals of Mathematical Logic **4** (1972), 229–308 pp.; and to Michael Morley for his paper *Categoricity in power*, Transactions of the AMS **114** (1965), pp. 514–538.

January 2003 – Mathematical Exposition: To John B. Garnett for his book *Bounded Analytic Functions*, Pure and Applied Mathematics, volume 96, Academic Press, Inc. [Harcourt Brace Jovanovich, Publishers], New York and London, 1981.

January 2004 – Lifetime Achievement: To Cathleen Synge Morawetz for greatly influencing mathematics in the broad sense throughout her long and distinguished career.

January 2004 – Seminal Contribution to Research: To Lawrence C. Evans and Nicolai V. Krylov for the "Evans-Krylov theorem", as first established in the papers: Lawrence C. Evans, *Classical solutions of fully nonlinear convex, second order elliptic equations*, Communications in Pure and Applied Mathematics **35** (1982), no. 3, pp. 333–363; and N. V. Krylov, *Boundedly inhomogeneous elliptic and parabolic equations*, Izvestiya Akad. Nauk SSSR, Ser. Mat. **46** (1982), no. 3, pp. 487–523; translated in Mathematics of the USSR, Izvestiya **20** (1983), no. 3, pp. 459–492.

January 2004 – Mathematical Exposition: To John W. Milnor in recognition of a lifetime of expository contributions ranging across a wide spectrum of disciplines, including topology, symmetric bilinear forms, characteristic classes, Morse theory, game theory, algebraic K-theory, iterated rational maps,…and the list goes on.

January 2005 – Lifetime Achievement: To Israel M. Gelfand for profoundly influencing many fields of research through his own work and through his interactions with other mathematicians and students.

January 2005 – Seminal Contribution to Research: To Robert P. Langlands for his paper *Problems in the theory of automorphic forms*, Springer Lecture Notes in Math., volume 170, 1970, pp. 18–86. This is the paper that introduced what are now known as the Langlands conjectures.

January 2005 – Mathematical Exposition: To Branko Grünbaum for his book *Convex Polytopes*.

January 2006 – Lifetime Achievement: To Frederick W. Gehring for being a leading figure in the theory of quasiconformal mappings for over fifty years; and to Dennis P. Sullivan for his fundamental contributions to many branches of mathematics.

January 2006 – Seminal Contribution to Research: To Clifford S. Gardner, John M. Greene, Martin D. Kruskal, and Robert M. Miura for their paper *KortewegdeVries equation and generalizations. VI. Methods for exact solution*, Comm. Pure Appl. Math. **27** (1974), 97–133.

January 2006 – Mathematical Exposition: To Lars V. Hörmander for his book, *The Analysis of Linear Partial Differential Operators*.

January 2007 – Lifetime Achievement: To Henry P. McKean for his rich and magnificent mathematical career and for his work in analysis, which has a strong orientation towards probability theory.

January 2007 – Seminal Contribution to Research: To Karen Uhlenbeck for her foundational contributions in analytic aspects of mathematical gauge theory. These results appeared in the two papers: *Removable singularities in Yang-Mills fields*, Communications in Mathematical Physics, **83** (1982), 11–29 and *Connections with L:P bounds on curvature*, Communications in Mathematical Physics, **83** (1982), 31–42.

January 2007 – Mathematical Exposition: To David Mumford for his beautiful expository accounts of a host of aspects of algebraic geometry, including *The Red Book of Varieties and Schemes* (Springer, 1988).

Next awards: January 2008.

The Oswald Veblen Prize in Geometry

This prize was established in 1961 in memory of Professor Oswald Veblen through a fund contributed by former students and colleagues. The fund was later doubled by the widow of Professor Veblen. The prize is awarded for research in geometry or topology that has appeared during the past six years in a recognized North American journal. Currently, the US$5,000 prize is awarded every three years.

First award, 1964: To C. D. Papakyriakopoulos for his papers *On solid tori*, Annals of Mathematics, Series 2, **66** (1957), pp. 1–26; and *On Dehn's lemma and the asphericity of knots*, Proceedings of the National Academy of Sciences **43** (1957), pp. 169–172.

Second award, 1964: To Raoul Bott for his papers *The space of loops on a Lie group*, Michigan Mathematical Journal **5** (1958), pp. 35–61; and *The stable homotopy of the classical groups*, Annals of Mathematics, Series 2, **70** (1959), pp. 313–337.

Third award, 1966: To Steven Smale for his contributions to various aspects of differential topology.

Fourth award, 1966: To Morton Brown and Barry Mazur for their work on the generalized Schoenflies theorem.

Fifth award, 1971: To Robion C. Kirby for his paper *Stable homeomorphisms and the annulus conjecture*, Annals of Mathematics, Series 2, **89** (1969), pp. 575–582.

Sixth award, 1971: To Dennis P. Sullivan for his work on the Hauptvermutung summarized in the paper *On the Hauptvermutung for manifolds*, Bulletin of the American Mathematical Society **73** (1967), pp. 598–600.

Seventh award, 1976: To William P. Thurston for his work on foliations.

Eighth award, 1976: To James Simons for his work on minimal varieties and characteristic forms.

Ninth award, 1981: To Mikhael Gromov for his work relating topological and geometric properties of Riemannian manifolds.

Tenth award, 1981: To Shing-Tung Yau for his work in nonlinear partial differential equations, his contributions to the topology of differentiable manifolds, and for his work on the complex Monge-Ampère equation on compact complex manifolds.

Eleventh award, 1986: To Michael H. Freedman for his work in differential geometry and, in particular, the solution of the four-dimensional Poincaré conjecture.

Twelfth award, 1991: To Andrew J. Casson for his work on the topology of low-dimensional manifolds and to Clifford H. Taubes for his foundational work in Yang-Mills theory.

Thirteenth award, 1996: To Richard Hamilton for his continuing study of the Ricci flow and related parabolic equations for a Riemannian metric, and to Gang Tian for his contributions to geometric analysis.

Fourteenth award, 2001: To Jeff Cheeger for his work in differential geometry, to Yakov Eliashberg for his work in symplectic and contact topology, and to Michael J. Hopkins for his work in homotopy theory.

Fifteenth award, 2004: To David Gabai in recognition of his work in geometric topology, in particular, the topology of 3-dimensional manifolds.

Sixteenth award, 2007: To Peter Kronheimer and Tomasz Mrowka for their joint contributions to both three- and four-dimensional topology through the development of deep analytical techniques and applications; and to Peter Ozsváth and Zoltán Szabó for their contributions to 3- and 4-dimensional topology through their Heegaard Floer homology theory.

Next award: January 2010.

The Albert Leon Whiteman Memorial Prize

This prize was established in 1998 using funds donated by Mrs. Sally Whiteman in memory of her husband, Albert Leon Whiteman, to recognize notable exposition and exceptional scholarship in the history of mathematics. Starting in 2009, the US$5,000 prize will be awarded every three years.

First award, 2001: To Thomas Hawkins to recognize an outstanding historian of mathematics whose current research and numerous publications display the highest standards of mathematical and historical sophistication.

Second award, 2005: To Harold M. Edwards to pay tribute to his many publications over several decades that have fostered a greater understanding and appreciation of the history of mathematics, expecially the theory of algebraic numbers.

Next award: January 2009.

The Norbert Wiener Prize in Applied Mathematics

This prize was established in 1967 in honor of Professor Norbert Wiener and was endowed by a fund from the Department of Mathematics of the Massachusetts Institute of Technology. The prize is awarded for an outstanding contribution to "applied mathematics in the highest and broadest sense". The award is made jointly by the American Mathematical Society and the Society for Industrial and Applied Mathematics. The recipient must be a member of one of these societies and a resident of the United States, Canada, or Mexico. Beginning in 2004, the US$5,000 prize will be awarded every three years.

First award, 1970: To Richard E. Bellman for his pioneering work in the area of dynamic programming and for his related work on control, stability, and differential-delay equations.

Second award, 1975: To Peter D. Lax for his broad contributions to applied mathematics, in particular, for his work on numerical and theoretical aspects of partial differential equations and on scattering theory.

Third award, 1980: To Tosio Kato for his distinguished work in the perturbation theory of quantum mechanics.

Fourth award, 1980: To Gerald B. Whitham for his broad contributions to the understanding of fluid dynamical phenomena and his innovative contributions to the methodology through which that understanding can be constructed.

Fifth award, 1985: To Clifford S. Gardner for his contributions to applied mathematics in the areas of supersonic aerodynamics, plasma physics and hydromagnetics, and especially for his contributions to the truly remarkable development of inverse scattering theory for the solution of nonlinear partial differential equations.

Sixth award, 1990: To Michael Aizenman for his outstanding contribution of original and nonperturbative mathematical methods in statistical mechanics, by means of which he was able to solve several long open important problems concerning critical phenomena, phase transitions, and quantum field theory; and to Jerrold E. Marsden for his outstanding contributions to the study of differential equations in mechanics: he proved the existence of chaos in specific classical differential equations; his work on the momentum map, from abstract foundations to detailed applications, has had great impact.

Seventh award, 1995: To Hermann Flaschka for deep and original contributions to our understanding of completely integrable systems, and to Ciprian Foias for basic contributions to operator theory, analysis, and dynamics and their applications.

Eighth award, 2000: To Alexandre J. Chorin in recognition of his seminal work in computational fluid dynamics, statistical mechanics, and turbulence; and to Arthur T. Winfree in recognition of his profound impact on the field of biological rhythms, otherwise known as coupled nonlinear oscillators.

Ninth award, 2004: To James A. Sethian for his seminal work on the computer representation of the motion of curves, surfaces, interfaces, and wave fronts, and for his brilliant applications of mathematical and computational ideas to problems in science and engineering.

Tenth award, 2007: To Craig Tracy and Harold Widom for their deep and original work on Random Matrix Theory, a subject which has remarkable applications across the scientific spectrum, from the scattering of neutrons off large nuclei to the behavior of the zeros of the Riemann zeta-function.

Next award: January 2010.

Awards

AMS Centennial Fellowships

A Research Fellowship Fund was established by the AMS in 1973 to provide one-year fellowships for research in mathematics. In 1988 the Fellowship was renamed to honor the AMS Centennial. The number of fellowships granted each year depends on the contributions received; the Society supplements contributions as needed. The primary selection criterion for the Centennial Fellowship is the excellence of the candidate's research. A recipient of the fellowship shall have held his or her doctoral degree for at least three years and not more than twelve years at the inception of the award. Applications will be accepted from those currently holding a tenured, tenure-track, postdoctoral, or comparable (at the discretion of the selection committee) position at an institution in North America. The amount of the fellowship varies each year. See the last entry on the list below to find the amount and number of fellowships awarded most recently. To make a contribution to the Centennial Fellowship Fund, see `http://www.ams.org/development/centennialfund.html`. To apply for a Centennial Fellowship, see `http://www.ams.org/employment/centflyer.html`.

First award, 1974–1975: Fred G. Abramson, James Li-Ming Wang.

Second award, 1975–1976: Terence J. Gaffney, Paul Nèvai, George M. Reed.

Third award, 1976–1977: Fredric D. Ancel, Joseph A. Sgro.

Fourth award, 1977–1978: Steven Kalikow, Charles Patton, Duong-Hong Phong, David Vogan.

Fifth award, 1978–1979: Alan Dankner, David Harbater, Howard Hiller, Steven P. Kerckhoff, Robert C. McOwen.

Sixth award, 1979–1980: Scott W. Brown, Jeffrey E. Hoffstein, Jeffry N. Kahn, James E. McClure, Rick L. Smith, Mark Steinberger.

Seventh award, 1980–1981: Robert K. Lazarsfeld, Thomas H. Parker, Robert Sachs.

Eighth award, 1981–1982: Lawrence Man-Hou Ein, Mark Williams.

Ninth award, 1982–1983: Nicholas J. Kuhn.

Tenth award, 1983–1984: Russell David Lyons.

Eleventh award, 1984–1985: Richard Timothy Durrett.

Twelfth award, 1985–1986: R. Michael Beals.

Thirteenth award, 1986–1987: Dinakar Ramakrishnan.

Fourteenth award, 1987–1988: Richard Hain, Bill Jacob.

Fifteenth award, 1988–1989: Steven R. Bell, Don M. Blasius, David Gabai.

Sixteenth award, 1989–1990: Isaac Y. Efrat, John M. Lee, Ralf J. Spatzier.

Seventeenth award, 1990–1991: Michael Anderson, Carolyn Gordon, Steven Mitchell.

Eighteenth award, 1991–1992: Daniel Bump, Kari Vilonen.

Nineteenth award, 1992–1993: Krzysztof Burdzy, William Menasco, David Morrison.

Twentieth award, 1993–1994: Jacques Hurtubise, Andre Scedrov, David Webb.

Twenty-first award, 1994–1995: Patricia E. Bauman, David E. Marker.

Twenty-second award, 1995–1996: Rafael de la Llave, William Gordon McCallum, Kent Edward Orr.

Twenty-third award, 1996–1997: Yi Hu, Robert McCann, Alexander Voronov, Jiaping Wang.

Twenty-fourth award, 1997–1998: Ovidiu Costin, Fred Diamond, Gang Liu, Zhongwei Shen, Stephanie Frank Singer.

Twenty-fifth award, 1998–1999: Mark Andrea A. de Cataldo, Stavros Garoufalidis, Sándor Kovács, Yanguang Li.

Twenty-sixth award, 1999–2000: Charles W. Rezk, Bin Wang, Changyou Wang, Tonghai Yang.

Twenty-seventh award, 2000–2001: Siqi Fu, Christopher Herald, Wei-Dong Ruan, Vasily Strela.

Twenty-eighth award, 2001–2002: Ivan Dimitrov, Ravi Vakil, Jiahong Wu, Meijun Zhu.

Twenty-ninth award, 2002–2003: Albert C. Fannjiang, Wee Teck Gan, Ravi Kumar Ramakrishna.

Thirtieth award, 2003–2004: Henry H. Kim, John E. Meier.

Thirty-first award, 2004–2005: Jinho Baik, Nitu Kitchloo.

Thirty-second award, 2005–2006: Yuan-Pin Lee, Mihnea Popa.

Thirty-third award, 2006–2007: Christopher Hacon, Bryna Kra.

Thirty-fourth award, 2007–2008: Martin Kassabov.

Next award (for 2008–2009 academic year): March 2008.

JPBM Communications Award

This award was established by the Joint Policy Board for Mathematics (JPBM) in 1988 to reward and encourage communicators who, on a sustained basis, bring mathematical ideas and information to nonmathematical audiences. Both mathematicians and nonmathematicians are eligible. Currently, the US$1,000 award is made annually. JPBM is a collaborative effort of the American Mathematical Society, the Mathematical Association of America, the Society for Industrial and Applied Mathematics, and the American Statistical Association.

First award, 1988: To James Gleick for sustained and outstanding contributions in communicating mathematics to the general public.

Second award, 1990: To Hugh Whitemore for contributions to communicating mathematics to the public in his play *Breaking the Code*, which chronicles the brilliant but troubled life of British mathematician Alan Turing.

Third award, 1991: To Ivars Peterson for exceptional skill in communicating mathematics to the general public over the last decade.

Fourth award, 1993: To Joel Schneider for *Square One TV*.

Fifth award, 1994: To Martin Gardner, for authoring numerous books and articles about mathematics, including his long-running *Scientific American* column "Mathematical Games", and his books *Fads and Fallacies in the Name of Science* and *Mathematical Carnival*.

Sixth award, 1996: To Gina Kolata for consistently giving outstanding coverage to many of the most exciting breakthroughs in mathematics and computer science over the past twenty years.

Seventh award, 1997: To Philip J. Davis for being a prolific communicator of mathematics to the general public.

Eighth award, 1998: To Constance Reid for writing about mathematics with grace, knowledge, skill, and clarity.

Ninth award, 1999: To Ian Stewart for communicating the excitement of science and mathematics to millions of people around the world for more than twenty years. Also a "Special Communications Award" to John Lynch and Simon Singh for their exceptional contributions to public understanding of mathematics through their documentary on Andrew Wiles and the Fermat Conjecture, entitled *Fermat's Last Theorem* (shown on *NOVA* as "The Proof").

Tenth award, 2000: To Sylvia Nasar for *A Beautiful Mind*, her biography of John Forbes Nash Jr.

Eleventh award, 2001: To Keith J. Devlin for his many contributions to public understanding of mathematics through great numbers of radio and television appearances; public talks; books; and articles in magazines, newsletters, newspapers, journals, and online.

Twelfth award, 2002: To Helaman and Claire Ferguson for dazzling the mathematical community and a far wider public with exquisite sculptures embodying mathematical ideas, along with artful and accessible essays and lectures elucidating the mathematical concepts.

Thirteenth award, 2003: To Robert Osserman for being an erudite spokesman for mathematics, communicating its charm and excitement to thousands of people from all walks of life.

2004: No award given.

Fourteenth award, 2005: To Barry Cipra for writing about mathematics of every kind—from the most abstract to the most applied—for nearly twenty years. His lucid explanations of complicated ideas at the frontiers of research have appeared in dozens of articles in newspapers, magazines, and books.

Fifteenth award, 2006: To Roger Penrose for the discovery of Penrose tilings, which have captured the public's imagination, and for an extraordinary series of books that brought the subject of consciousness to the public in mathematical terms.

Sixteenth award, 2007: To Steven H. Strogatz for making a consistent effort to reach out to a wider audience. He has made significant contact with the wider scientific community. The style of his book, *Sync: The Emerging Science of Spontaneous Order* (2003), and its sales indicate that it is intended for and has reached an even wider audience. The volume of this work is impressive, but the quality and breadth are spectacular as well.

Next award: January 2008.

AMS Epsilon Awards for Young Scholars Programs

In 1999 the American Mathematical Society started the Epsilon Fund to help support existing summer programs for mathematically talented high school students. The name for the fund was chosen in remembrance of the late Paul Erdős, who was fond of calling children "epsilons". At its meeting in November 2000, the AMS Board of Trustees approved the Society's engagement in a sustained effort to raise an endowment for the Epsilon Fund. In addition, a Board-designated fund of US$500,000 was created as a start for the endowment. As a start for the program, the AMS used money from its Program Development Fund to award Epsilon grants for activities during summers 2000, 2001, 2002, and 2003. Once the Epsilon Fund endowment has reached the targeted amount of US$2,000,000, the AMS intends to award a total of US$100,000 in Epsilon grants each year. To make a contribution to the Epsilon Fund, see `http://www.ams.org/development/epsilon.html`. To apply for an Epsilon grant, see `http://www.ams.org/employment/epsilon.html`.

First awards, 2000: To All Girls/All Math (University of Nebraska, Lincoln), Hampshire College Summer Studies in Mathematics, Mathcamp, PROMYS (Boston University), Ross Young Scholars Program (Ohio State University), SWT Honors Summer Math Camp (Southwest Texas State University), and the University of Michigan Math Scholars.

Second awards, 2001: To All Girls/All Math (University of Nebraska), Mathcamp (Port Huron, Michigan), Michigan Math & Science Scholars (University of Michigan, Ann Arbor), Mathematics Scholars Academy (Oklahoma State University), Hampshire College Summer Studies in Mathematics (Hampshire College), PROMYS (Boston University), Young Scholars Program (University of Chicago), and Ross Mathematics Program (The Ohio State University).

Third awards, 2002: To All Girls/All Math (University of Nebraska), Hampshire College Summer Studies in Mathematics (Amherst, Massachusetts), Mathcamp (Mathematics Foundation of America), Michigan Math and Science Scholars (University of Michigan, Ann Arbor), PROMYS (Boston University), Ross Mathematics Program (The Ohio State University), SWT Honors Summer Math Camp (Southwest Texas State University), and University of Chicago Young Scholars Program.

Fourth awards, 2003: To All Girls/All Math (University of Nebraska), Canada/USA Mathcamp (Mathematics Foundation of America), Hampshire College Summer Studies in Mathematics (Amherst, Massachusetts), PROMYS (Boston University), Ross Mathematics Program (The Ohio State University), Stanford University Mathematics Camp (Stanford University), SWT Honors Summer Math Camp (Southwest Texas State University), and University of Chicago Young Scholars Program.

Fifth awards, 2004: To Ross Mathematics Program (The Ohio State University), Texas State University Honors Summer Math Camp, PROMYS (Boston University), Canada/USA Mathcamp (Mathematics Foundation of America), Hamp-

shire College Summer Studies in Mathematics (Amherst, Massachusetts), All Girls/All Math (University of Nebraska), University of Chicago Young Scholars Program, and MathPath (MathPath Foundation).

Sixth awards, 2005: To All Girls/All Math Summer Camp for High School Girls (University of Nebraska, Lincoln), Canada/USA Mathcamp (Reed College, Portland, Oregon), Hampshire College Summer Studies in Mathematics (Hampshire College, Amherst, Massachusetts), MathPath, (Colorado College, Colorado Springs), Michigan Math and Science Scholars Program (University of Michigan, Ann Arbor), PROMYS (Boston University), Ross Mathematics Program (The Ohio State University), Texas State Honors Summer Math Camp (Texas State University, San Marcos), and University of Chicago Young Scholars Program.

Seventh awards, 2006: To All Girls/All Math Summer Camp for High School Girls (University of Nebraska, Lincoln), Canada/USA Mathcamp (University of Puget Sound, Tacoma, Washington), Hampshire College Summer Studies in Mathematics (Hampshire College, Amherst, Massachusetts), MathPath, (University of California, Santa Cruz), Michigan Math and Science Scholars Program (University of Michigan, Ann Arbor), PROMYS (Boston University), Puerto Rico Opportunities for Talented Students in Mathematics (PROTaSM) (University of Puerto Rico, Mayaguez), Ross Mathematics Program (Ohio State University, Columbus), Summer Explorations and Research Collaborations for High School Girls (SEARCH) (Mount Holyoke College, South Hadley, Massachusetts), Texas State Honors Summer Math Camp (Texas State University, San Marcos), Texas Tech University Summer Mathematics Academy (Texas Tech University, Lubbock), and University of Chicago Young Scholars Program (University of Chicago).

Eighth awards, 2007: Hampshire College Summer Studies in Mathematics, Amherst, Massachusetts; Michigan Math and Science Scholars Summer Program, University of Michigan, Ann Arbor; PROMYS, Boston University; Ross Mathematics Program, Ohio State University, Columbus; Summer Explorations and Research Collaborations for High School Girls (SEARCH), Mount Holyoke College, South Hadley, Massachusetts; and Texas State University Honors Summer Math Camp, Texas State University, San Marcos.

Next awards (for summer 2008): March 2008.

Award for an Exemplary Program or Achievement in a Mathematics Department

This award was established in 2004 to recognize a department which has distinguished itself by undertaking an unusual or particularly effective program of value to the mathematics community, internally or in relation to the rest of society. Examples might include a department that runs a notable minority outreach program, a department that has instituted an unusually effective industrial mathematics internship program, a department that has promoted mathematics so successfully that a large fraction of its university's undergraduate population majors in mathematics, or a department that has made some form of innovation in its research support to faculty and/or graduate students or which has created a special and innovative environment for some aspect of mathematics research. Departments of mathematical sciences in North America that offer at least a bachelor's degree in mathematical sciences are eligible. The US$1,200 prize will be awarded annually. The initial award was presented at the January 2006 Joint Mathematics Meetings.

Nomination process: A letter of nomination may be submitted by one or more individuals. Nomination of the writer's own institution is permitted. The letter should describe the specific program(s) for which the department in being nominated as well as the achievements which make the program(s) an outstanding success and may include any ancillary documents which support the success of the program(s). The letter should not exceed two pages, with supporting documentation not to exceed an additional three pages. Nominations should be submitted to the Office of the Secretary. Nominations received by September 15 will be considered for the award presented the following January.

First award, 2006: Harvey Mudd College.

Second award, 2007: University of California, Los Angeles (UCLA).

Next award: Spring 2008.

The Award for Mathematics Programs that Make a Difference

This award was established in 2005 in response to a recommendation from the AMS's Committee on the Profession that the AMS compile and publish a series of profiles of programs that:

1) aim to bring more persons from underrepresented minority backgrounds into some portion of the pipeline beginning at the undergraduate level and leading to advanced degrees in mathematics and professional success, or retain them once in the pipeline;

2) have achieved documentable success in doing so; and are replicable models.

Two programs are highlighted annually.

First award, 2006: Summer Institute in Mathematics for Undergraduates (SIMU), Universidad de Puerto Rico, Humacao; and Graduate Program, Department of Mathematics, University of Iowa.

Second award, 2007: Enhancing Diversity in Graduate Education (EDGE), Bryn Mawr College and Spelman College; and Mathematical Theoretical Biology Institute (MTBI), Arizona State University.

Next award: January 2008.

The Karl Menger Memorial Awards

Family members of the late Karl Menger were the major contributors to a fund established at Duke University. The majority of the income from this fund is to be used by the Society for annual awards at the International Science and Engineering Fair.

First award, 1990: Daniel K. Dugger, Joshua Erlich, Joshua B. Fischman, Min-Horng Chen, Matthew Baker, Michael L. Harrison, Virginia A. DiDomizio.

Second award, 1991: Monwhea Jeng, Hans Christian Gromoll, Jesse L. Tseng, Andrew Olstrom Dittmer, Matthew A. Neimark, Rageshree Ramachandran, Jeb E. Willenbring.

Third award, 1992: Mahesh Kalyana Mahanthappa, Harrison Kwei Tsai, Andrew Olstrom Dittmer, Jonobie Dale Baker, Joshua Brody, Yen-Hsiang Li, Robert Jordon Pollack.

Fourth award, 1993: Mahesh Kalyana Mahanthappa, Steve Shaw-Tang Chien, Andrew Olstrom Dittmer, Moon Duchin, Robert Michael Kirby II, Sarah Ann Lord, Anna Ruth Terry.

Fifth award, 1994: Davesh Maulik, Eric Matthew Dennis, Sarah Ann Lord, Timothy Stephen Eller, Rahul Manu Kohli, Fam-ye Lin, Benedek Valko, Mary Kathleen Clavenna, Vinay Kumak Goyal-Singhal, Jan Kristian Haugland, Wes Andres Watters, Ian George Zacharia.

Sixth award, 1995: Davesh Maulik, Benjamin Michael Goetz, Jacob Lurie, Daniel Kalman Biss, Samit Dasgupta, Yueh-Hsing Lin, Claus Mazanti Sorensen, Theodore Haw-Yun Hwa, Samuel Jacob Klein Jr., Katherine Anne Paur, Bridget Helen Penny, Scott Nicholas Sanders.

Seventh award, 1996: Davesh Maulik, Nicholas Karl Eriksson, Logan Joseph Kleinwaks, Eric Jon Landquist, Vanesa Miranda-Diaz, Jason Charles Stone, Lauren Kiyomi Williams, Ryan Thomas Hebert, Kendrick Norris Kay, Scott Nicholas Sanders, Claus Mazanti Sorensen, Yvette Karen Wood.

Eighth award, 1997: Davesh Maulik, Nicholas Eriksson, Jeremy Rahe, Jennifer Pelka, Yen-Jen Chen, Sylvain Halle, Melanie Schechter, Matthew Seligman, Thomas Mack, Susannah Rutherglen, Jy-Ying Janet Chen, Chun-Hsiang Fu, Daniel Ying-Jeh Little.

Ninth award, 1998: Jonathan Adam Kelner, Michael Yanchee Lee, Daniel Yamins, Alexey Evgenjevitch Eroshin, Sarah Flannery, Jeremy Ryan Rahe, Jennifer Rose Walk, Richard Lee Barnes, Matthew Christopher Ong, David Carl Rennard, Anna Welling Salamon, Hui Yu.

Tenth award, 1999: Amit Kumar Sabharwal, Andrew Chi, Jennifer Lynn Pelka, Ching-Tang Chen, C. Andrew McManus, Jennifer Rose Walk, Heidi Lee Williams, Jack Nelson Bewley, Adam Douglas Bryant, Jason A. Loy, John William Pope, Bryce Leitner Roberts.

Eleventh award, 2000: Jayce R. Getz, Aadel Ahmed Chaudhuri, Zachary Howard Cohn, Ching Tang Chen, Elaine Pei-San Gee, Siarhei Markouski, Ilya Malakhovsky, Vassily Vladimirovich Starodubtsev, Daniel Richard Green, Daniyar Z. Kamenov, Craig Allan Schroeder.

Twelfth award, 2001: Abdur Rasheed Sabar, Yuri Georgievich Kudryashov, Serge A. Tishchenko, Jason Wah Lone Chiu, Craig Allen Schroeder, Hasuk Francis Song, Daniel Wichs, Jennifer Shyamala Sayaka Balakrishnan, Christopher Ryan Bruner, Lindsey Jo Cable, Michael Harry Kaleta, Matthew Howard Stemm, Heon Joon Choe, Jesse Scott Trana.

Thirteenth awards, 2002: Jacob Licht, Matthew Aaron Tesch, Andrew Michael Korth, Chun-Chen Yeh, Liang Chen, Ashum Karahanovich Kaibhanov, Amanda Bryce Shaw, Mary Augusta Brazelton, Nikita Rozenblyum, Jonathan Charles Zweig, Boris O. Figovsky, Ronli Phyllis Diakow.

Fourteenth awards, 2003: Andrew Michael Leifer, Raymund Chun-Hung To, David Guillaume Pothier, Alexandr V. Medvedev, Ethan James Street, Hyeyoun Chung, Anatoly Preygel, Lester Wayne Mackey, Evgeniy E. Loharu, Sergey O. Ivanov, Robert Shea Bracco, Brian Todd Rice, Alexey V. Baran, Evgeny A. Amosov, Artem G. Viktorov, Jeremy Takashi Warshauer, Alan Craig Taylor, Hannah Chung.

Fifteenth awards, 2004: Brett Alexander Harrison, Ilya Gurwich, Brian Todd Rice, Sam Jay Lewallen, Brianna Rachel Satinoff, Huan-Chun Yeh, Ning Zhang, Carolos Eduardo Arreche-Aguayo, Tair Assangali, Nurlan Bakitzhanov, Allison Paige Berke, Ginger Beardslee Howell, Nimish P. Ramanlal.

Sixteenth awards, 2005: Scott Duke Kominers, Samuel Mohun Bhagwat, Matthew Ryan Tierney, Elad Oster, John Michael Sillcox, Carlos Manuel Fonseca, Manuel Luis Rivera, Niket Ranjan Pandey, Robert Thomas Cordwell, Paul Francis Jacobs, Valentina N. Dobrovolskaya, Vladimir N. Trubnikov, Oleg V. Mikhaylovsky, Mikhail A. Ptichkin.

Seventeenth awards, 2006: Michael Anthony Viscardi, Daniel Abraham Litt, Brett Alexander Harrison, Anarghya A. Vardhana, Gleb A. Pogudin, Nicholas Michael Wage, Sohan Venkat, Meelap Vijay Shah, Manuel Luis Rivera-Morales, Bakhytzhan Baizhanov.

Eighteenth awards, 2007: Dmitry Vaintrob, Cheng-Tao Chung, Daniel K. Bezdek, Christopher Lopez, Hagai Helman, Albert C. Liu, Nikita M. Savushkin, Lado Meskhishvili, Almas U. Abdulla, Avi W. Levy, Ardit Kroni, Alexey S. Telishev.

Next awards: May 2008.

Public Policy Award

This award was established in 2007 by the American Mathematical Society (AMS) to recognize a public figure for sustained and exceptional contributions to public policies that foster support for research, education, and innovation. The award will be given annually, starting in 2008.

The Award for Distinguished Public Service

This award was established by the AMS Council in response to a recommendation from their Committee on Science Policy. The award is presented every two years to a research mathematician who has made a distinguished contribution to the mathematics profession during the preceding five years.

First award, 1990: To Kenneth M. Hoffman for his outstanding leadership in establishing channels of communication between the mathematical community and makers of public policy as well as the general public.

Second award, 1992: To Harvey B. Keynes for his multifaceted efforts to revitalize mathematics education, especially for young people.

Third award, 1993: To Isadore M. Singer in recognition of his outstanding contributions to his profession, to science more broadly, and to the public good by bringing the best of mathematics and his own insights to bear on the activities of the National Academy of Sciences; on committees of the National Research Council, including the two so-called David Committees on the health of the mathematical sciences, and the Committee on Science, Engineering, and Public Policy; on the President's Science Advisory Council; on decisions of Congress, through testimony concerning the support of mathematics and mathematical research; and on a host of critical situations over many years in which his wisdom and intervention helped gain a hearing for the problems of his community and the contributions it makes to the nation.

Fourth award, 1995: To Donald J. Lewis for his many contributions to mathematical education, mathematics policy, and mathematical research and administration during a career that has spanned several decades.

Fifth award, 1997: No award made.

Sixth award, 1998: To Kenneth C. Millett for his work devoted to underrepresented minority students in the mathematical sciences. Professor Millett founded the University of California, Santa Barbara, Achievement Program and directed the mathematics component of the Summer Academic Research Internship and the Summer Institute in Mathematics and Science at UCSB.

Seventh award, 2000: To Paul J. Sally Jr. for the quality of his research, for his service to the [American Mathematical] Society as trustee, but more importantly for his many efforts in improvement of mathematics education for the nation's youth and especially for members of minority and underrepresented groups and for his longitudinal mentoring of students, in particular the mathematics majors at Chicago.

Eighth award, 2002: To Margaret H. Wright for notable contributions to the federal government and the scientific community and for encouraging women and minority students.

Ninth award, 2004: To Richard A. Tapia for inspiring and teaching thousands of people (from elementary school students to senior citizens) to study and appreciate the mathematical sciences.

Tenth award, 2006: To Roger Howe for his multifaceted contributions to mathematics and to mathematics education.

Next award: January 2008.

Citation for Public Service

To provide encouragement and recognition for contributions to public service activities in support of mathematics, the Council of the Society established the Citation for Public Service. The award is no longer being made.

First award, 1991: Andre Z. Manitius for the contributions he made to the mathematical community while employed in the Division of Mathematical Sciences at the National Science Foundation.

Second award, 1992: Marcia P. Sward for her contributions toward establishing and directing the Mathematical Sciences Education Board from its inception in the fall of 1985 until August 1989.

Third award, 1998: Liang-Shin Hahn and Arnold E. Ross. Liang-Shin Hahn for carrying forward and developing the New Mexico High School Mathematics Contest and for exposition and popularization of mathematics attractive to and suitable for potential candidates for the contest and others with similar intellectual interests. Arnold E. Ross for inspiring generations of young people through the summer mathematics programs he created and has continued to run for nearly 40 years.

AAS-AMS-APS Public Service Award

This award was established in 1999 by the American Mathematical Society (AMS), the American Astronomical Society (AAS), and the American Physical Society (APS) to recognize a public figure for his or her sustained and exceptional contributions to public policies that foster support for research, education, and industrial innovation in the physical sciences and mathematics. As of January 2007, the AMS no longer participates in this award, but instead offers the AMS Public Policy Award.

First award, 2000: To William Frist, Joseph L. Lieberman, and Harold Varmus.

Second award, 2001: To Vernon Ehlers and Neal Lane.

Third award, 2002: To James T. Walsh and Barbara Mikulski.

Fourth award, 2003: To Sherwood L. Boehlert, Alan B. Mollohan, and Pete V. Domenici.

2004: No award made.

2005: No award made.

2006: No award made.

Waldemar J. Trjitzinsky Memorial Awards

The Society received a bequest from the estate of Waldemar J., Barbara G., and Juliet Trjitzinsky, the income from which is used to assist students who have declared a major in mathematics at a college or university that is an institutional member of the AMS. These funds help support students who lack adequate financial resources and who may be in danger of not completing the degree program in mathematics for financial reasons. Each year the Society selects a number of geographically distributed schools who in turn make one-time awards to beginning mathematical students to assist them in pursuit of careers in mathematics. The amount of each scholarship is currently US$3,000, and the number of scholarships awarded each year varies.

First award, 1991: Duke University (Robert Lane Bassett, Linie Yunwen Chang, Kara Lee Lavender), University of Scranton (Thomas A. Shimkus), Montana State University (Melissa Cockerill, Deborah Fagan, Sherry Heis), Howard Payne University (Pamela Jo Chaney).

Second award, 1992: Allegheny College (Julianne Stile), Memphis State University (Cassandra Burns), University of California at Irvine (James Anthony Nunez), University of Puerto Rico (Juan Ramon Romero-Oliveras).

Third award, 1993: University of California at Los Angeles (Michelle L. Lanir), State University of New York at Geneseo (Jodi C. Wright), Eastern New Mexico University (Rebecca K. Moore), University of Virginia (Mikhail Krichman).

Fourth award, 1994: Boise State University (William Hudson and Margaret Norris), Illinois Institute of Technology (Guanghong Xu), Temple University (Coleen Clemetson), University of Maryland at College Park (Mikhail G. Konikov).

Fifth award, 1995: University of Arizona (Mark Robert Moseley), Arkansas State University (Donna J. Shepherd), Mississippi State University (Clayton T. Hester), Montclair State College (James R. Jarrell III).

Sixth award, 1996: Murray State University (Christie M. Safin), Stanford University (Andreea Nicoara), Union College (Allison Pacelli), Western Illinois University (Lorna Renee Sanders).

Seventh award, 1997: Georgetown University (Martin Akguc), Loyola Marymount University (Laura Steiner, Claudia Catalan, Elizabeth Madrigal), New York University (Emily Press), Southern Illinois University at Carbondale (Laura Wasser).

Eighth award, 1998: Stevens Institute of Technology (Kelly Cornish), Georgia State University (Kevin A. Wilson), Iowa State University (Matthew A. Halverson), University of Nevada at Las Vegas (Dumitru C. Tutuianu).

Ninth award, 1999: City University of New York (Hulya Cebeciouglu), Reed College (Jeremy Copeland), University of Texas at San Antonio (Danielle Lyles), Western Kentucky University (Marcia Jean Mercer).

Tenth award, 2000: California State University at Long Beach (Yen Hai Le), Case Western Reserve University (Alexander Statnikov), Clarkson University (Matthew Bartholomew), University of Houston (Alyssa Burns).

Eleventh award, 2001: Columbia University (Alexander Ivanov Sotirov), Florida Atlantic University (Gregory Nevil Leuchiali Maxwell), Henderson State University (Ann Smith), John Carroll University (Andrea C. Forney), Seattle University (Sinead Pollom), University of Texas at Austin (Virginia Roberts), University of Utah (Paul T. Watkins), Worcester Polytechnic Institute (Yakov Kronrod and Megan Lally).

Twelfth award, 2002: Stephen F. Austin State University (Marcus A. Arreguin), Bates College (Challis Kinnucan), Brigham Young University (Julie Brinton), The College of William and Mary (Suzanne L. Robertson), Furman University (Kevin L. Smith), University of Hartford (Aimee J. Groudas), University of Southern California (Peter Kirkpatrick), University of Texas at Dallas (Kevin R. Pond).

Thirteenth award, 2003: Bryn Mawr College (Thida S. Aye), Minnesota State University at Mankato (Andrew Richard Tackmann), University of Maryland at Baltimore County (Maria Christin Llewellyn), Colorado College (Rahbar Virk), California State University, Hayward (Sarah Deiwert and Angela Martinho), Lehigh University (Timothy P. Lewis), State University of New York at Potsdam (Bishal Thapa).

Fourteenth award, 2004: Beloit College (Laura Wolfram), Lafayette College (Prince Chidyagwai, Ekaterina Jager, Blerta Shtylla), Michigan State University (Antonio Veloz), University of Pennsylvania (Daniel Pomerleano), Portland State University (Kathryn Carr and Cass Bath), Santa Clara University (Olivia Gistand).

Fifteenth award, 2005: Abilene Christian University (Carissa Joy Strawn), Amherst College (Jennifer A. Roberge), Arizona State University (Yukiko Kozakai), University of Missouri, Kansas City (Melanie Marie Meyer), University of North Carolina at Greensboro (Christian Sykes), University of Rhode Island (Christopher Piecuch), Ohio State University (Sophia Leibman and Gabor Revesz).

Sixteenth award, 2006: California State University, San Bernardino (Lorena Pulido and Jennifer Renee Winter), University of Missouri, Rolla (Sean Michael Eagan), University of Central Missouri (Khadijah Shadeed), Boston College (Elizabeth Rini), Eckerd College (Elizabeth R. Morra), University of California, San Diego (John Roosevelt Quinn), Swarthmore College (Adam Joseph Lizzi).

Next awards: Fall 2007.

Reciprocity Agreements

Africa

Egyptian Mathematical Society (ETMS)

Apply to: Prof. M. H. Fahmy, Department of Mathematics, Faculty of Science, Al-Azhar University, Nasr City 11884, Cairo, Egypt; email: Secretary_etms@yahoo.com; http://www.etms-web.org.

Dues: U.S. $15, payable to Egyptian Mathematical Society at the above address.

Privileges: Receive a 60% discount on the prices of ETMS publications, a 50% discount on the publication charge per printed page in *ETMS Journal*, and reduced charge for participating at ETMS conferences.

Officers: A.-S. F. Obada (President), E. H. Doha (Vice-President), F. F. Ghaleb (Treasurer), M. H. Fahmy (Secretary).

Nigerian Mathematical Society

Apply to: Dr. Franic I. Njoku (Secretary), Nigerian Mathematical Society, Department of Mathematics, University of Nigeria, Nsukka, Nigeria or Professor Reuben O. Ayeni, Department of Pure and Applied Mathematics, Ladoke Akintola University of Technology, Ogbomoso, Nigeria; email: ayeni_ro@yahoo.com; http://www.nigerianmathematicalsociety.com.

Dues: U.S. $60, payable to S. S. Okoya (Treasurer), Dept. of Maths., Obafemi Awolowo University, Osun State, Nigeria.

Privileges: *Journal of the Nigerian Mathematical Society* and *Notices of Nigerian Mathematical Society*.

Officers: Reuben O. Ayeni (President), M. O. Osilike (Vice-President), Samuel S. Okoya (Treasurer), Franic I. Njoku (Secretary).

South African Mathematical Society

Address for mail: School of Mathematics, Witwatersrand University, Private Bag 3, Wits 2050, South Africa; email: clint.VanAlten@wits.ac.za.

Apply to: Erwin Brüning, School of Mathematical Sciences, Kwazulu-Natal University, Private Bag X54001, Durban 4000, South Africa.

Dues: R210.00 (Two hundred ten rands), payable to the South African Mathematical Society (SAMS), c/o Prof. Erwin Brüning (Treasurer) at the above address.

Privileges: The right to receive the *Notices of the SAMS* at no additional cost; reduced fees at SAMS meetings.

Officers: Nigel Bishop (President), Themba Dube (Vice-President), Erwin Brüning (Treasurer), Clint Van Alten (Secretary).

The Americas

Canadian Mathematical Society*

Apply to: Liliane Sousa, Canadian Mathematical Society, 577 King Edward Avenue, Ottawa, Ontario, Canada K1N 6N5; email: office@cms.math.ca; http://www.cms.math.ca/.

Dues: 50% off applicable rate, payable in U.S. funds to the Canadian Mathematical Society.

Privileges: *CMS Notes*, access to members section on website; reductions on all CMS periodicals, publications, and meeting registration.

Officers: Thomas Salisbury (President); Jason Brown, M. Ram Murty, Edwin Perkins, Bruno Rémillard (Vice-Presidents); David Rodgers (Treasurer); Graham P. Wright (Executive Director/Secretary).

The American Mathematical Society has "reciprocity agreements" with a number of mathematical organizations around the world. A current list appears here.

These reciprocity agreements provide for reduced dues for members of these organizations who choose to join the AMS and who reside outside of the U.S. and Canada. Reciprocally, members of the AMS who reside in the U.S. or Canada may join these organizations at a reduced rate. Summaries of the privileges available to AMS members who join under the terms of reciprocity agreements are given on the following pages. Members of these organizations who join the AMS as reciprocity members enjoy all the privileges available to ordinary members of the Society. AMS dues for reciprocity members are $78 for 2007 and $80 for 2008. Each organization was asked to review and update its listing in the spring. An asterisk (*) after the name of an organization indicates that no response to this request had been received when the November *Notices* went to press.

Sociedad Colombiana de Matemáticas*

Address for mail: Apartado Aereo 2521, Bogotá, Colombia; email: scm@scm.org.co; http://www.scm.org.co.

Apply to: Carlos H. Montenegro E., Apartado Aereo 2521, Bogotá, Colombia.

Dues: U.S. $27, payable to Sociedad Colombiana de Matemáticas.

Privileges: Subscription to one of the publications of the Society (*Revista Colombiana de Matemáticas or Lecturas Matematicas*), discounts for participation in Society activities, and e-mail in the scm.org.co domain.

Officers: Carlos H. Montenegro E. (President), Jose Ricardo Arteaga (Vice-President).

Sociedad de Matemática de Chile*

Apply to: Sociedad de Matemática de Chile, María Luisa Santander 0363, Providencia, Santiago, Chile; email: socmat@mat.puc.cl; http://www.mat.puc.cl/socmat/.

Dues: U.S. $50, payable to Sociedad de Matemática de Chile.

Privileges: Receive *Gaceta de la Sociedad de Matemática*, *Notas de la Sociedad de Matemática de Chile*.

Officers: Rolando Rebolledo (President), Víctor Cortés (Vice-President), Hernán Burgos (Treasurer), Rodrigo Bamón and Sergio Plaza (Secretaries).

Sociedad Matemática de la República Dominicana*

Apply to: Isidro Rodríguez, Sociedad Matemática de la República Dominicana, Apartado 797-2, Santo Domingo, República Dominicana.

Dues: U.S. $10, payable to Amado Reyes at the above address.

Privileges: Right to receive *Notimat* (bimonthly newsletter) and *Revista Matemática Dominicana* (twice a year).

Officers: Isidro Rodríguez (President), Mariana Morales (Vice-President), Amado Reyes (Treasurer), Eliseo Cabrera (Secretary).

Sociedad Matemática Mexicana*

Apply to: Olivia Lazcano, Apartado Postal 70-450, México, D.F. 04510, México; email: smm@smm.org.mx/; http://www.smm.org.mx/.

Dues: U.S. $25, payable to Sociedad Matemática Mexicana.

Privileges: To be a regular member paying half of the regular fee for persons living outside of Mexico. Newsletter, *Bulletin of the Mexican Mathematical Society*, or *Miscelánea Matemática*.

Officers: Emilio Lluis-Puebla (President), Carlos Signoret (Vice-President), Eugenio Garnica (Treasurer), Pablo Padilla (General Secretary), Isidro Romero (Secretary), Lino Reséndiz and Silvia Morelos (Vocal).

Sociedad Uruguaya de Matemática y Estadística (SUME)*

Address for mail: J. Herrera y Reissig 565, CC 30, CP 11300, Fac. de Ingeniería, IMERL, Montevideo, Uruguay; email: jlvb@fing.edu.uy.

Apply to: José L. Vieitez (Presidente de SUME), at the above address.

Dues: U.S. $100, payable to Jorge Blanco at the above address.

Privileges: Receive PMU series and Predat series free.

Officers: José L. Vieitez (President), Jorge Blanco (Vice-President), Gonzalo Perera (Treasurer), F. Pelaez (Secretary).

Sociedade Brasileira de Matemática

Apply to: Orlando Lopes, Secretaria da SBM, Estrada Dona Castorina–110, Rio de Janeiro-RJ, 22460-320 Brazil; email: sbm@sbm.org.br; http://www.sbm.org.br.

Dues: U.S. $40, payable to Sociedade Brasileira de Matemática at above address.

Privileges: *Revista Matématica Universitária* (free subscription) and 25% discount on SBM books.

Officers: Joao Lucas Barbosa (President), Suely Druck (Vice-President), Joao Xavier Cruz (Treasurer), Orlando Lopes (Secretary).

Sociedade Brasileira de Matemática Aplicada e Computacional

Apply to: Andrea Alves Ribeiro, SBMAC/ICMC, Caixa Postal 668, Av. Trabalhador São Carlense, 400, 13560-970 São Carlos–SP, Brazil; email: sbmac@icmc.usp.br; http://www.sbmac.org.br.

Dues: U.S. $30, payable to Sociedade Brasileira de Matemática Aplicada e Computacional.

Privileges: *SBMAC Notices*.

Officers: Jose Alberto Cuminato (President), Geraldo Nunes da Silva (Vice-President), Edson Wendland (Treasurer), Jose Raimundo Coelho (Secretary).

Sociedade Paranaense de Matemática*

Apply to: C. Pereira da Silva, Sociedade Paranaense de Matemática, Caixa Postal 1261, 80001-970, Curitiba-PR, Brasil.

Dues: U.S. $12, payable to Sociedade Paranaense de Matemática.

Privileges: *Boletim da Sociedade Paranaense de Matemática* (two issues per year), *Monografias da Sociedade Paranaense de Matemática*.

Officers: C. Pereira da Silva (President), R. J. B. De Sampaio (Vice-President), E. Andretta (Treasurer), A. Moser (Secretary).

Unión Matemática Argentina*

Apply to: Alejandro Neme, IMASL, Ave. Ejercito de los Andes 950, 5700 San Luis, Argentina; email: uma@unsl.edu.ar; http://linux0@unsl.edu.ar/uma/.

Dues: U.S. $40, payable to Alejandro Neme.

Privileges: Free subscription to *Noticiero UMA* and one of either *Revista de la Unión Matemática Argentina* or *Revista de Educación Matemática*.

Officers: Felipe Zó (President), Jorge Solomin (Vice-President), Alejandro Neme (Treasurer), Hugo Alvarez (Secretary).

Asia

Allahabad Mathematical Society

Apply to: Dr. (Mrs.) Mona Khare, Secretary, Allahabad Mathematical Society, 10 C. S. P. Singh Marg, Allahabad-211001, U.P., India; email: ams10ald@dataone.in; email: ams10@rediffmail.com; http://www.amsallahabad.org.

Dues: U.S. $60 for annual members, payable to Allahabad Mathematical Society at the above address.

Privileges: All members receive a copy of the *Bulletin of the Allahabad Mathematical Society* (free). In addition, members can purchase other publications of the Society at a discounted price. Members of the American Mathematical Society receive a 50% discount on the annual membership fee.

Officers: Pramila Srivastava (President), S. P. Singh and S. L. Singh (Vice-Presidents), Shalini Srivastava (Treasurer), Mona Khare (Secretary).

Calcutta Mathematical Society*

Apply to: M. R. Adhikari, Secretary, Calcutta Mathematical Society, AE-374, Sector-1, Salt Lake City, Calcutta 700 064, India; telephone: 2337-8882; telex: 021-5380 BID IN; Fax: (0091) 33-23376290; email: cms@cal2.vsnl.net.in.

Dues: U.S. $40, payable to Secretary, Calcutta Mathematical Society, at the above address.

Privileges: *Bulletin of the Calcutta Mathematical Society*; *News Bulletin of the Calcutta Mathematical Society*; *Review Bulletin of the Calcutta Mathematical Society*; library, seminars/symposia, summer school, winter school, conferences, etc.

Officers: S. N. Ghosh (President), A. P. Baisnab, A. Chakrabarty, S. Kumaresan, P. Muldowney, and H. M. Srivastava (Vice-Presidents), U. C. De (Treasurer), M. R. Adhikari (Secretary), H. P. Mazumdar (Editorial Secretary).

Indian Mathematical Society

Apply to: Dr. (Miss) S. P. Arya, Treasurer, Department of Mathematics, Maitreyi College, Bapu Dham Complex, Chanakya Puri, New Delhi-110021, India; email: shsh-ry@yahoo.co.in; http://www.geocities.com/indianmathsociety/.

Dues: U.S. $50 (Annual) or $1000 (Life), payable to Indian Mathematical Society, at the above address.

Privileges: Complimentary copy of the *The Mathematics Student*.

Officers: R. B. Bapat (President), S. P. Arya (Treasurer), B. Nimse (Administrative Secretary), Satya Deo (Academic Secretary), V. M. Shah (General Secretary).

Indonesian Mathematical Society (IndoMS)

Apply to: Indonesian Mathematical Society, c/o Dr. Hilda Assiyatun, Department of Mathematics, Institut Teknologi Bandung (ITB), Jalan Ganesa 10 Bandung, Indonesia; http://www.indoms-center.org.

Dues: U.S. $15, payable to Dr. Hilda Assiyatun (Treasurer) at the above address.

Privileges: Reduced registration at conferences sponsored by The IndoMS and reduced price for any publications.

Officers: Edy Tri Baskoro (President), Widodo, Stevanus Budi Waluya, Angie Siti Anggari (Vice-Presidents), Hilda Assiyatun (Treasurer), Budi Nurani (Secretary).

Korean Mathematical Society*

Apply to: Korean Mathematical Society, Korea Science and Technology Center 202, 635-4 Yeoksam-dong, Kangnam-ku, Seoul 135-703, Korea; email: kms@kms.or.kr; http://www.kms.or.kr/.

Dues: U.S. $40, payable to Korean Mathematical Society.

Privileges: Members will receive six volumes of *Journal of the KMS* and four volumes of *Bulletin of the KMS*.

Officers: Kyung Chan Min (President), June Bok Lee (Vice-President), Soon Yeong Chung (Treasurer), Jung Suk Chung (Secretary).

Mathematical Society of Japan

Apply to: Akiko Hasegawa, Secretary, Mathematical Society of Japan, 34-8, Taito 1 chome, Taito-ku, Tokyo 110-0016, Japan; http://wwwsoc.nii.ac.jp/msj6/math.

Dues: Category I: 9,000 yen; Category II: 10,800 yen, payable to Mathematical Society of Japan at the above address.

Privileges: Category I: *Journal of the Mathematical Society of Japan*, *Sugaku-Tsusin* (2 issues); Category II: *Journal of the Mathematical Society of Japan*, *Sugaku* (in Japanese), *Sugaku-Tsushin* (4 issues).

Officers: Kenji Yajima (President), Liang Zhang (Treasurer), Akiko Hasegawa (Secretary).

Mathematical Society of the Philippines*

Address for mail: Mathematical Society of the Philippines, Department of Mathematics, University of the Philippines, Diliman, Quezon City, Philippines 1101;

email: mathsoc@mathsocietyphil.org; http://www.mathsocietyphil.org.

Apply to: Jumela Sarmiento, Mathematics Department, Ateneo de Manila University, P.O. Box 154, Manila, Philippines.

Dues: U.S. $7, payable to Mathematical Society of the Philippines.

Privileges: Publications of the Mathematical Society of the Philippines; discount on conference fees.

Officers: Fidel Nemenzo (President), Jumela Sarmiento (Vice-President), Marian Roque (Treasurer), Yvette Lim (Secretary).

Mathematical Society of the Republic of China

Address for mail: c/o Department of Mathematics, National Taiwan University 1, Roosevelt Road Section 4, Taipei 106, Taiwan; email: tms@math.ntu.edu.tw; http://tms.math.ntu.edu.tw.

Dues: U.S. $45, payable to Mathematical Society of the Republic of China at the above address.

Privileges: One-year free subscription to the *Taiwanese Journal of Mathematics*.

Officers: Fang-Bo Yeh (President), Ko-Wei Lih (Vice-President), Tai-Chia Lin (Treasurer), Jung-Kai Chen (Secretary).

Mongolian Mathematical Society*

Apply to: A. Galtbayar, Mongolian Mathematical Society, P. O. Box 187, Post Office 46A, Ulaanbaatar, Mongolia; email: galtbayar@yahoo.com.

Dues: U.S. $20, payable to A. Galtbayar at the above address.

Privileges: Right to receive the *Mongolian Mathematical Journal* for free and to publish in the *MMJ* .

Officers: A. Mekei (President), B. Battsengel (Vice-President), A. Galtbayar and D. Purevsuren (Secretaries).

Nepal Mathematical Society

Apply to: Tanka Nath Dhamala, Secretary, Nepal Mathematical Society, Central Department of Mathematics, Tribhuvan University, Kirtipur, Kathmandu, Nepal, P.O. Box 13143; email: cdmath@wlink.com.np.

Dues: U.S. $20, payable to B. L. Vaidya (Treasurer) at the above address.

Privileges: All privileges enjoyed by an ordinary member, which includes purchasing NMS publications and participation in seminars at concessional rates.

Officers: Hom Nath Bhattarai (President), Yadav Prasad Koirala (Vice-President), Shree Ram Khadka (Treasurer), Tanka Nath Dhamala (Secretary).

Persatuan Sains Matematik Malaysia*

Address for mail: Pusat Pengajian Sains Matematik, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia; email: maslina@pkrisc.cc.ukm.my; http://www.tmsk.uitm.edu.my/~persama.

Apply to: Dr. Maslina at the above address.

Dues: U.S. $7.50, payable to Bendahari, PERSAMA, at the above address.

Privileges: *Warkah Berita PERSAMA* (two issues per year), *Bulletin of the Malaysian Mathematical Society* (two issues per year), *Menemui Matematik* (two issues per year).

Officers: Mohd Salmi Md Noorani (President), Husna Hassan and Arsmah Ibrahim (Vice-Presidents), Wan Rosmanira Ismail (Treasurer), Maslina Darus (Secretary).

Punjab Mathematical Society*

Address for mail: Department of Mathematics, University of the Punjab, Quaid-i-Azam Campus, Lahore, Pakistan; email: mathdept@paknet.ptc.pk.

Apply to: Zia ul Haq, Secretary, Punjab Mathematical Society, Department of Maths., University of the Punjab, Lahore, Pakistan.

Dues: U.S. $30 for life membership, payable to Umar Farooq Qureshi, Treasurer, P.M.S.

Officers: G. Mustafa Habibullah (President), Zia Ullah Randhawa and Munir Ahmad Ch. (Vice-Presidents), Umar Farooq Qureshi (Treasurer), Nawazish Ali Shah (Secretary).

Ramanujan Mathematical Society*

Apply to: Professor V. Thangaraj, Secretary, Ramanujan Institute for Advanced Study in Mathematics, University of Madras, Chennai-600005, India; email: riasm@md3.vsnl.net.in; http://rms.enmail.com/.

Dues: U.S. $20 (annual), U.S. $200 (life), payable to Professor V. Thangaraj at the above address.

Privileges: Complimentary copy of the *Journal of the Ramanujan Mathematical Society*.

Officers: Phoolan Prasad (President), S. Sri Bala (Vice-President), P. Paulraja (Treasurer), V. Thangaraj (Secretary).

Singapore Mathematical Society

Address for mail: Secretary, Singapore Mathematical Society, c/o Department of Mathematics, National University of Singapore, 2 Science Drive 2, Singapore 117543, Singapore; email: smsuser@math.nus.edu.sg; http://sms.math.nus.edu.sg.

Apply to: Chan Lai Chee at the above address.

Dues: 10 Singapore dollars, payable to Singapore Mathematical Society at the above address.

Privileges: Complimentary copy of *Mathematical Medley*, the Society's official magazine, and discounts on the Society's publications and activities.

Officers: Peter Pang Yu Hin (President), Zhu Chengbo (Vice-President), Chua Seng Kee (Treasurer), Victor Tan (Secretary).

Southeast Asian Mathematical Society*

Address for mail: c/o Department of Mathematics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand; email: wanida.H@chula.ac.th; http://seams.math.nus.edu.sg.

Apply to: Prof. Wanida Hemakul at the above address.

Dues: U.S. $10, payable to Kritsana Neammanee at the above address.

Privileges: SEAMS newsletter.

Officers: Wanida Hemakul (President), Rosihan Ali and Sri Wahyuni (Vice-Presidents), Kritsana Neammanee (Treasurer), Imchit Termwuttipong (Secretary).

Vijnana Parishad of India*

Apply to: R. C. Singh Chandel, Secretary, Vijnana Parishad of India, D. V. Postgraduate College, Orai-285001, U.P., India; email: rc_chandel@yahoo.com.

Dues: U.S. $10, payable to Vijnana Parishad of India, D. V. Postgraduate College, Orai-285001, U.P., India.

Privileges: *Jñānābha* (an interdisciplinary mathematical journal currently published once a year); back volumes available at 25% discount.

Officers: V. P. Saxena (President), S. L. Singh, G. C. Sharma, and N. D. Samadhia (Vice-Presidents), R. C. Singh Chandel (Secretary-Treasurer), H. M. Srivastava (Foreign Secretary).

Europe

Azerbaijan Mathematical Society*

Apply to: A. Ali Novruzov, Department of Mechanics and Mathematics, Baku State University, Baku, Azerbaijan, 370145.

Dues: U.S. $10, payable to Azerbaijan Mathematical Society.

Privileges: All privileges of ordinary members plus 50% discount on all AzMS publications.

Officers: O. A. Veliev (President), F. A. Abdullaev (Treasurer), V. A. Gasimov (Secretary).

Balkan Society of Geometers

Apply to: Dr. Constantin Udriste, Treasurer, Department of Mathematics, University Politechnica of Bucharest, Splaiul Independentei 313, Bucharest 060042, Romania; email: udriste@mathem.pub.ro; http://www.mathem.pub.ro.

Dues: U.S. $30 (except persons of countries with financial difficulties, U.S. $10), payable to the Balkan Society of Geometers at the above address.

Privileges: Participation in meetings and all other privileges enjoyed by an ordinary member, discounts (at least 10%) on the prices of BSG publications.

Officers: Constantin Udriste (President), Mihai Anastasiei, Gabriel Pripoaie, Vladimir Balan (Vice-Presidents), Constantin Udriste (Treasurer), Vasile Iftode (Secretary).

Belgian Mathematical Society

Apply to: Jan van Casteren, Secretary, University of Antwerp, Department of Mathematics, Middelheimlaan 1, 2020 Antwerp, Belgium; email: bms@ulb.ac.be; email: Jan.VanCasteren@ua.ac.be; http://bms.ulb.ac.be.

Dues: 18 euros, payable to Belgian Mathematical Society, at the above address. Account number: 000-0641030-54 (IBAN : BE 42 0000 6410 3054, BIC : BPOTBEB1), Campus Plaine, CP 218/01, Bld. du Triomphe, B-1050 Brussels, Belgium.

Privileges: Membership includes a subscription to *Bulletin of the Belgian Mathematical Society—Simon Stevin*; newsletter.

Officers: Cathérine Finet (President), Stefaan Caenepeel (Vice-President), Guy Van Steen (Treasurer), Jan van Casteren (Secretary).

Berliner Mathematische Gesellschaft E. V.

Apply to: Dr. Wolfgang Volk, Berliner Mathematische Gesellschaft, Schriftführer, Freie Universität Berlin, Institut für Mathematik, Sekretariat Frau B. Vengel, Arnimallee 3, 14195 Berlin, Germany; email: wolfgang.volk@berlin.de; http://www.mathematik.de/BMG/.

Dues: 10 euros, payable to Dr. Jörg Schmid-Kikuchi at the above address. IBAN : DE80 1002 00002530 873 400, BIC : BEBEDEBBXXX.

Privileges: *Sitzungsberichte der BMG* at reduced rate.

Officers: Rudolf Baierl (President), Gerhard Preuss (Vice-President), Jörg Schmid-Kikuchi (Treasurer), Wolfgang Volk (Secretary).

Croatian Mathematical Society

Apply to: Dr. Renata Svedrec, Secretary, HMD, Department of Mathematics, Bijenička 30, 10000 Zagreb, Croatia; email: hmd@math.hr; http://www.math.hr/hmd.

Dues: U.S. $10, payable to HMD, Zagrebačka banka d.d. Zagreb, 2500-03688780–IBAN: HR442360000-1101530802.

Privileges: *Vjesnik HMD* (in Croatian) and one of five journals edited by CMS free of charge. All publications of the CMS and all fees reduced by at least 25%.

Officers: Hrvoje Krayević (President), Ivica Gusić and Petar Mladinić (Vice-Presidents), Hrvoje Šikić (Treasurer), Renata Svedrec (Secretary).

Cyprus Mathematical Society*

Apply to: Gregory Makrides, 36 Stasinou Street, Suite 102, Strovolos 2003, Nicosia, Cyprus; email: cms@cms.org.cy.

Dues: U.S. $20, payable to Cyprus Mathematical Society at the above address.

Privileges: Receive the annual periodical *Mathematiko VEMA* in Greek. Invitations to conferences organized in Cyprus and the Annual Summer Math School organized in Cyprus at the end of June.

Officers: Gregory Makrides (President), Athanasios Gagatsis (Vice-President), Antreas Philippou (Treasurer), Savvas Antoniou (Secretary).

Dansk Matematisk Forening (Danish Mathematical Society)

Address for mail: Department of Mathematical Sciences, University of Copenhagen, Universitetsparken 5, DK-2100 Copenhagen Ø, Denmark; email: dmf@mathematics.dk/; http://www.dmf.mathematics.dk/.

Apply to: Please use the electronic form on the home page at http://www.dmf.mathematics.dk/.

Dues: DKr. 155, payable to Carsten L. Petersen, Treasurer, IMFUFA, ROSUILDE Universitetscenter, Box 260, DK-4000 ROSUILDE, Denmark.

Privileges: *Mathematica Scandinavica* (750 DKr. per year), *Nord. Mat. Tidss.* (*Normat*) (320 SEK per year). (Members of the American Mathematical Society do not have to join Dansk Matematisk Forening to obtain the journals. Subscription orders should be sent directly to the journals: *Normat*, NCM Göteborgs Université, Box 160, SE-4053 Gothenburg, Sweden; *Mathematica Scandinavica*, Matematisk Institut, Aarhus Universitet, 8000 Aarhus C, Denmark.) Members of the American Mathematical Society who join the Danish Mathematical Society as reciprocity members will receive the newsletter *Matilde*.

Officers: Søren Eilers (President), Poul Hjorth (Vice-President), Carsten L. Peterson (Treasurer), Poul Hjorth (Secretary).

Deutsche Mathematiker-Vereinigung e.V. (DMV) (German Mathematical Society)

Apply to: Mrs. Roswitha Jahnke, DMV-Geschäftsstelle, c/o WIAS, Mohrenstr. 39, 10117 Berlin, Germany; email: dmv@wias-berlin.de; http://dmv.mathematik.de.

Dues: 23 euros, payable to Deutsche Mathematiker-Vereinigung e.V. Volksbank Freiburg, Konto: 6955002, BLZ: 680 900 00, IBAN: DE 66 6809 0000 0006 9550 02, BIC: GENODE61FR1.

Privileges: Free subscription to: *Mitteilungen der Deutschen Mathematiker-Vereinigung*. Discounts on one of three publications: *Jahresbericht der Deutschen Mathematiker-Vereinigung*, *Math. Semesterberichte*, *Journal für Mathematik-Didaktik*. Discounted registration rates at DMV meetings.

Officers: Günter M. Ziegler (President), Wolfgang Lück (Vice-President), Jürg Kramer (Treasurer), Günter Törner (Secretary).

Edinburgh Mathematical Society*

Apply to: Dr. A. D. Gilbert, Honorary Secretary, Edinburgh Mathematical Society, James Clerk Maxwell Building, King's Buildings, Mayfield Road, Edinburgh EH9 3JZ, Scotland; email: edmathsoc@maths.ed.ac.uk; http://www.maths.ed.ac.uk/~ems/.

Dues: U.S. $16 (£8 sterling) without Society's proceedings, U.S. $44 (£22 sterling) with Society's proceedings, payable to the Honorary Secretary, as above.

Privileges: The Society's proceedings are available at a concessionary rate; see above.

Officers: C. M. Campbell (President), R. J. Archbold (Vice-President), M. A. Youngson (Treasurer), A. D. Gilbert and T. H. Lenagan (Secretaries).

European Mathematical Society

Apply to: Riitta Ulmanen, Department of Mathematics, P.O. Box 68, University of Helsinki, F1-00014, Helsinki, Finland. email: riitta.ulmanen@helsinki.fi; http://www.emis.de.

Dues: 44 euros, payable to the European Mathematical Society at the above address.

Privileges: Newsletter of the European Mathematical Society.

Officers: Ari Laptev (President), Pavel Exner and Helge Holden (Vice-Presidents), Jouko Vaananen (Treasurer), Stephen Huggett (Secretary)

Gesellschaft für Angewandte Mathematik und Mechanik e.V. (GAMM)*

Address for mail: V. Ulbricht, Institut für Festkörpermechanik, Technische Universität Dresden, 01062 Dresden, Germany; email: Gamm@mailbox.tu-dresden.de; http://www.gamm-eV.de.

Apply to: R. Kienzler, Universität Bremen, Fachbereich Produktionstechnik, Postfach 330440, 28334 Bremen, Germany.

Dues: 51 euros, payable to A. Frommer, Bergische Universität Wuppertal, Fachbereich C–Mathematik, 42097 Wuppertal, Germany.

Privileges: Regular publications of GAMM and participation in scientific meetings at a reduced rate.

Officers: R. Jeltsch (President), F. Pfeiffer (Vice-President), A. Frommer (Treasurer), V. Ulbricht (Secretary), R. Kienzler (Vice-Secretary).

Glasgow Mathematical Association

Apply to: Frances Goldman, Treasurer, Glasgow Mathematical Association, Department of Mathematics, University of Glasgow, Glasgow G12 8QW, United Kingdom; email: fhg@maths.gla.ac.uk; http://www.maths.gla.ac.uk/.

Dues: £7, payable to Glasgow Mathematical Association, at the above address.

Privileges: *Glasgow Mathematical Journal* at reduced rate (£45).

Officers: A. Craw (President), F. Goldman (Treasurer), L. Moon (Secretary).

Hellenic (Greek) Mathematical Society*

Apply to: Hellenic Mathematical Society, 34, Panepistimiou Street, 106 79 Athens, Greece; email: info@hms.gr; http://www.hms.gr/.

Dues: U.S. $20 payable to Hellenic Mathematical Society at the above address.

Privileges: The *Bulletin of HMS*, News-Bulletin (Enimerosi), discounts that are available to all members.

Officers: Nikolaos Alexandris (President), George Dimakos and Dionysios Anapolitanos (Vice-Presidents), Evaggelos Eustathiou (Treasurer), Ioannis Tyrlis (Secretary).

Icelandic Mathematical Society*

Address for mail: Icelandic Mathematical Society, Raunvisindastofnun Haskolans, Dunhaga 3, IS-107 Reykjavik, Iceland; email: kristjanj@simnet.is; http://www.vedur.is/is/.

Apply to: Dr. Kristjän Jonasson at the above address.

Dues: U.S. $12, payable to Dr. Hersir Sigurgeirsson at the above address.

Privileges: Reduced subscription rate on *Mathematica Scandinavia* and *Nordisk matematisk Tidskrift* (*Normat*); subscription orders should be sent directly to the journals.

Officers: Kristjän Jonasson (President), Hersir Sigurgeirsson (Treasurer), Fjola Run Björnsdóttir (Secretary).

Irish Mathematical Society

Apply to: David Wraith, Treasurer, Irish Mathematical Society, National University of Ireland, Maynooth, Co. Kildare, Ireland; email: David.Wraith@nuim.ie; http://www.maths.tcd.ie/pub/ims/.

Dues: U.S. $10, payable to David Wraith at the above address.

Privileges: Free copy of the *Bulletin of the Irish Mathematical Society* (two times per year), free registration at IMS annual conference (September).

Officers: R. Higgs (President), J. Cruickshank (Vice-President), D. Wraith (Treasurer), A. O'Shea (Secretary).

János Bolyai Mathematical Society

Apply to: Cecilia Kulcsár, Executive Director, János Bolyai Mathematical Society, Fö utca 68, H-1027 Budapest, Hungary; email: bjmt@renyi.hu.

Dues: Are voluntary but should minimally cover duplication and mailing costs; for reciprocity members (residing outside Hungary) suggested fee is 1/8 of 1 percent of the member's net income, payable to Kereskedelmi ES Hitelbank P.T., Account Number 10200830-32310243. Sponsoring members pay at least U.S. $180 or equivalent per year.

Privileges: Upon request, *Matematikai Lapok* (twice a year), *Középiskolai Matematikai Lapok* (monthly). If sufficient interest is expressed, a bulletin in English will be available. In addition, the JBMS is negotiating to obtain discounts for its reciprocity and sponsoring members on several serial publications and periodicals appearing in Hungary. Contact the JBMS secretary for more information regarding this and other privileges of membership.

Officers: Gyula Katona (President), Cecilia Kulcsár (Executive Director), György Lippner (Treasurer), András Recski (Secretary General), Tibor Jordán (Vice Secretary General).

Jednota českých matematiků a fyziků (Union of Czech Mathematicians and Physicists)*

Apply to: Jan Kratochvíl, Union of Czech Mathematicians and Physicists, Žitná 25, 117 10 Praha 1, Czech Republic; email: jcmf@math.cas.cz; http://www.jcmf.cz.

Dues: U.S. $20, payable to Jan Obdržálek at the above address.

Privileges: (i) A discount of 20% in the conference fees for conferences, symposia, summer schools, and similar events organized (or coorganized) by the JČMF; (ii) newsletter.

Officers: Štefan Zajac (President), Eduard Fuchs and Oldřich Lepil (Vice-Presidents), Jan Obdržálek (Treasurer), Petr Řepa (Secretary).

Jednota slovenských matematikov a fyzikov (JSMF) (Union of Slovak Mathematicians and Physicists)*

Address for mail: Secretary of JSMF, FMFI UK Pavilon F1, Mlynská dolina, 842 48 Bratislava, Slovak Republic; email: JSMF@CENTER.FMPH.UNIBA.SK; http://www.uniba.sk/~jsmf.

Apply to: Hilda Draškovičová, FMFI UK, KATC, Mlynská dolina, 842 48 Bratislava, Slovak Republic.

Dues: U.S. $20, payable to Slovenská sporitel'ňa, Záhradnicka 93, 8000 Bratislava, Slovak Republic; č.u.: 101848-019/0900 IČO: 178705.

Privileges: A discount of 20% in conference fees for conferences, symposia, summer schools, and similar events organized by the JSMF.

Officers: Victor Bezak (President), Hilda Draškovičová (Vice-President), Edmund Dobročka (Treasurer), Imrich Morva (Secretary).

Koninklijk Wiskundig Genootschap

Apply to: Rob van der Mei, CWI, P. O. Box 94079, 1090 GB Amsterdam, The Netherlands; email: R.D.van.der.Mei@cwi.nl; http://www.wiskgenoot.nl.

Dues: 50 euros.

Privileges: Free periodical *Nieuw Archief voor Wiskunde*.

Officers: H. W. Broer (President), G. Vegter (Vice-President), S. Bhulai (Treasurer), R. van der Mei (Secretary).

London Mathematical Society

Address for mail: London Mathematical Society, De Morgan House, 57–58 Russell Square, London WC1B 4HS, United Kingdom; email: membership@lms.ac.uk; http://www.lms.ac.uk/.

Apply to: Miss Susan M. Oakes at the address above.

Dues: U.S. $43.50 payable to London Mathematical Society at the above address.

Privileges: *LMS Newsletter*; reduced rates for the *Bulletin*, *Journal*, and *Proceedings of the LMS*; *Nonlinearity*; *Journal of Applied Probability*; LMS Lecture Notes; LMS Student Texts; LMS Monographs. (Please write to the LMS for complete details.)

Officers: J. F. Toland (President), D. G. Larman and F. A. Rogers (Vice-Presidents), N. M. J. Woodhouse (Treasurer), P. R. Cooper (Executive Secretary).

Mathematical Society of Serbia

Apply to: Milica Babić, Mathematical Society of Serbia, Knez Mihailova 35/IV, p.p. 355, 11000 Belgrade, Serbia; email: info@dms.org.yu; http://www.dms.org.yu.

Dues: U.S. $12, payable to DRUŠTVO MATEMATIČARA SRBIJE Acct. No. 250-6498-06, NACIONALNA ŠTEDIONICA.

Privileges: *Matematički Vesnik*, *Teaching of Mathematics*.

Officers: Branislav Popović (President), Zoran Kadelburg (Vice-President), Milica Babić (Treasurer), Biljana Babić (Secretary).

Norsk Matematisk Forening (Norwegian Mathematical Society)

Apply to: Øyvind Solberg, Norsk Matematisk Forening, Department of Mathematical Sciences, NTNU, No-7491, Trondheim, Norway; email: nmf@math.ntnu.no; http://www.matematikkforeningen.no.

Dues: NOK 100, payable to Øyvind Solberg at the above address.

Privileges: All regular membership privileges, including the monthly newsletter *Infomat*.

Officers: Brynjulf Owren (President), Audun Holme (Vice-President), Øyvind Solberg (Treasurer and Secretary).

Österreichische Mathematische Gesellschaft (OMG)

Apply to: Robert F. Tichy, Institut für Mathematik, Technische Universität Graz, Steyrergasse 30, A-8010 Graz, Austria; email: oemg@oemg.ac.at; http://www.oemg.ac.at/.

Dues: 20 euros, payable to ÖMG, Wiedner Hauptstr. 8, A-1040 Wien, Bank Austria-Creditanstalt, IBAN: AT 83 12000229 10389200, BIC: BKAUATWW.

Privileges: *Internationale Mathematische Nachrichten* (IMN), reduction of fees at our congresses and meetings.

Officers: Robert F. Tichy (President), Walter Schachermayer (Vice-President), Helmut Pottmann (Treasurer), Michael Oberguggenberger (Secretary).

Polskie Towarzystwo Matematyczne

Apply to: Maciej Czarnecki, ZG Polish Mathematical Society, ul. Śniadeckich 8, 00-956 Warszawa, Poland; email: zgptm@ptm.org.pl; http://www.ptm.org.pl.

Dues: U.S. $20, payable to Polskie Towarzystwo Matematyczne, ul. Śniadeckich 8, 00-956 Warszawa, Poland, KREDYT BANK S.A., IBAN: PL 98 1500 1777 1217 7008 4349 0000, BIC: KRDBPL.

Privileges: Members receive one of the following four series of the publication *Annales Societatis Mathematicae Polonae*: *Commentationes Mathematicae*, *Wiadomości Matematyczne* (in Polish), *Matematyka Stosowana* (in Polish), *Dydaktyka Matematyki* (in Polish).

Officers: Stefan Jackowski (President), Bogusław Hajduk and Paweł Walczak (Vice-Presidents), Krystyna Jaworska (Treasurer), Maciej Czarnecki (Secretary).

Real Sociedad Matemática Española

Apply to: Pablo Fernández Gallardo, Secretaria de la Real Sociedad Matemática Española, Facultad de Matematicas, Despacho 525, Universidad Complutense de Madrid, 28040 Madrid, Spain; email: secretaria@rsme.es; http://www.rsme.es.

Dues: 23,50 euros, payable to Real Sociedad Matemática Española at the above address.

Privileges: *La Gaceta de la Real Sociedad Matemática Española* (paper and Web access); *Boletín de la RSME* (electronic Newsletter).

Officers: Olga Gil (President), Eduardo Godoy and Raúl Ibáñez (Vice-Presidents), Enrique Artal (Treasurer), Pablo Fernández Gallardo (Secretary).

SEMA, Sociedad Española de Matemática Aplicada*

Apply to: Carlos Castro (Secretary), Despacho 520, Facultad de Matematicas, Universidad Complutense, 28040 Madrid, Spain; email: sema@uca.es; http://www.sema.org.es .

Dues: 15 euros, payable to SEMA at the above address.

Privileges: Information concerning applied mathematics in Spain through *Boletín de la SEMA*, reduced inscription fee for activities sponsored by SEMA.

Officers: Juan Ignacio Montijano (President), Mikel Lezaun (Vice-President), Maria Pilar Laburta (Treasurer), Carlos Castro (Secretary).

Sociedade Portuguesa de Matemática*

Apply to: Diogo Gomes, Sociedade Portuguesa de Matemática, Av. da República 37/4, 1050-187 Lisboa, Portugal; email: spm@spm.pt; http://www.spm.pt.

Dues: 32 euros; reciprocity members and students 16 euros, payable to the Sociedade Portuguesa de Matemática, at the address above.

Privileges: Each member receives the following publication of our Society free of charge: *Boletim da Sociedade Portuguesa de Matemática* (2 issues per year). Additionally, members may subscribe to the following publications at reduced rates: *Portugaliae Mathematica* (4 issues, 55.50 euros) and *Gazeta de Matemática* (2 issues, 6.50 euros).

Officers: Nuno Crato (President), Diogo Gomes (Vice-President), Verónica Quitalo (Treasurer), Ana Paula Dias and Ercilia Sousa (Secretaries).

Societat Catalana de Matemàtiques

Address for mail: Carrer del Carme 47, 08001, Barcelona, Spain; email: scm@iec.cat; email: nfuster@iec.cat; http://scm.iec.cat.

Apply to: Secretary, Catalan Mathematical Society, at the address above.

Dues: 16 euros, payable to the Societat Catalana de Matemàtiques.

Privileges: *Butlletí de la Societat Catalana de Matemàtiques* (two times per year) plus *SCM/Notices* (two times per year).

Officers: Carles Perello (President), Josep Lluis Sole (Vice-President), M. Teresa Martinez-Seara (Treasurer), Marianna Bosch (Secretary).

Societatea Matematicienilor din Romania*

Apply to: Horia I. Ene, Calea Grivitei 21, P. O. Box 1-764, 70700 Bucharest, Romania.

Dues: U.S. $10, payable to Societatea Matematicienilor din Romania at the address above.

Privileges: Reduced rates for participation in scientific conferences organized by SMR, *Bulletin Mathématiques* (four times per year) free.

Officers: Horia I. Ene (President), Nicolae Popa (Vice-President), Serban Barcanescu (Treasurer), Radu Purice (Secretary).

Societatea de Ştiinţe Matematice din România

Apply to: Mircea Trifu, Secretary, Str. Academiei, NR. 14, Sector 1, 010014, Bucureşti, Rômania; email: office@rms.unibuc.ro; http://www.rms.unibuc.ro.

Dues: U.S. $15, payable to Societatea de Ştiinţe Matematice din România, Account R008 RCNCB 0076 0043 5732 0002.

Privileges: A free subscription to one of the Society's journals. Exempt from taxes for participation in the annual meetings of the Society.

Officers: Dorin Popescu (President), Mircea Becheanu (Vice-President), Cristina Luţu (Treasurer), Mircea Trifu (Secretary).

Société Mathématique de France

Apply to: Société Mathématique de France, Attn. Claire Ropartz, Institut Henri Poincaré, 11 Rue Pierre et Marie Curie, F-75231 Paris cedex 05, France; email: smf@dma.ens.fr; http://smf.emath.fr/.

Dues: U.S. $48, payable to the American Mathematical Society or SMF.

Privileges: *Bulletin*, U.S. $169; *Memoires*, U.S. $133; *Bulletin* and *Mémoires*, U.S. $303; *Bulletin* (version électronique seule), U.S. $130; *Astérisque*, U.S. $535; *Histoire des Mathématiques*, U.S. $82; *Histoire des Mathématiques* (version électronique seule), U.S. $61; *Panoramas et Synthèses*, U.S. $69; *Annales scientifiques de l'ENS*, U.S. $525.

Officers: Stéphane Jaffard (President); Jean-Marie Barbaroux, Lucia Di Vizio, François Germinet, Michel Granger (Vice-Presidents); Lionel Schwartz (Treasurer); Pierre Loidreau (Secretary).

Société Mathématique du Luxembourg

Apply to: Norbert Poncin, Société Mathématique du Luxembourg, Université du Luxembourg, Campus Limpertsberg, 162A, Avenue de la Faïencerie, L-1511 Luxembourg, Luxembourg; email: norbert.poncin@uni.lu.

Dues: 20 euros (less discount), payable to Société Mathématique du Luxembourg at the above address.

Privileges: Discount on membership dues (same percent as for AMS); information concerning activities of the SML.

Officers: Norbert Poncin (President), Guy Kass (Vice-President), Jean Schiltz (Treasurer), Martin Schlichenmaier (Secretary).

Société Mathématique Suisse*

Apply to: Swiss Mathematical Society, Department of Mathematics, University of Fribourg, 1700 Fribourg, Switzerland; email: norbert.hungerbuehler@unifr.ch; http://www.math.ch.

Dues: 50 CHF or 34 EUR if residing in Switzerland, 25 CHF or 17 EUR if residing outside Switzerland, payable by check to SMS, Louise Wolf, Department of Mathematics, University of Fribourg, Perolles, Chemin du Musee 23, CH-1700 Fribourg, Switzerland or by bank transfer to "Credit Suisse (Switzerland) SPH 30.265'892/0".

Privileges: *Commentarii Mathematici Helvetici* (reduced price), information concerning activities of SMS.

Officers: Peter Buser (President), Norbert Hungerbuehler (Vice-President), Viktor Schroeder (Secretary-Treasurer).

Société de Mathématiques Appliquées et Industrielles (SMAI)

Address for mail: Société de Mathématiques Appliquées et Industrielles (SMAI), Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France; email: smai@emath.fr; http://smai.emath.fr/.

Apply to: http://smai.emath.fr/article.php3?id_article=14.

Dues: 40 euros, payable to Société de Mathématiques Appliquées et Industrielles at the above address.

Privileges: Free subscription to the Society's bulletin, *Matapli* (magazine); lettre SMAI-INFO (regular electronic newsletter).

Officers: Denis Talay (President), Jacques Istas and Patrick Lascalux (Vice-Presidents), Colette Picard (Treasurer), Maria J. Esteban (Secretary).

Society of Associations of Mathematicians and Computer Scientists of Macedonia*

Apply to: Boro Piperevski, President SAMCSM, Pirinska B.B., 91000 Skopje, Macedonia.

Dues: $5, payable to SDMI na MAKEDONIA, acct. 40120-678-10217, Pirinska B.B., 91000 Skopje, Macedonia.

Privileges: Receiving the *Bulletin of SAMCSM* and taking part in SAMCSM activities.

Officers: Boro Piperevski (President), Borko Ilievski (Vice-President), Kosta Miševski (Treasurer), Vasile Marčevski (Secretary).

Society of Mathematicians, Physicists, and Astronomers of Slovenia*

Address for mail: DMFA, P.P. 2964, 1000 Ljubljana, Slovenia; email: tomaz.pisanski@fmf.uni-lj.si; http://www.dmfa.si/.

Apply to: Tomaž Pisanski at the above address.

Dues: SKB Banka D. D., Ajdovscina 4, SWIFT (BIC): SKBASI2X, IBAN: SI56 0310 0100 0018 78

Privileges: Subscription to *Obzornik za matematiko in fiziko* (surface mail).

Officers: Zvonko Trontelj (President), Nada Razpet (Vice-President), Andreja Jaklič (Treasurer), Janez Krušič (Secretary).

Suomen matemaattinen yhdistys (Finnish Mathematical Society)

Address for mail: Department of Mathematics and Statistics, P. O. Box 68 (Gustaf Hällströmin katu 2b), 00014 University of Helsinki, Finland; email: smy@www.math.helsinki.fi; http://www.math.helsinki.fi/~smy/english/.

Apply to: Henri Lindén, Secretary, at the above address.

Dues: 15 euros, payable to Jari Taskinen, Treasurer, at the above address.

Privileges: *Arkhimedes* (six issues per year) and *Eukleides* (newsletter), *Mathematica Scandinavica* at reduced price.

Officers: Mats Gyllenberg (President), Marjatta Näätänen (Vice-President), Jari Taskinen (Treasurer), Henri Lindén (Secretary).

Svenska Matematikersamfundet*

Address for mail: Ölle Häggström, Department of Mathematics, Chalmers University of Technology, SE-412 96 Gothenburg, Sweden; email: olleh@math.chalmers.se; http://www.matematikersamfundet.org.se.

Apply to: Milagros Izquierdo, Department of Mathematics, Linköping University, SE-581 83 Linköping, Sweden.

Dues: 100 Swedish crowns, payable to Milagros Izquierdo at above address.

Privileges: *Mathematica Scandinavia* and *Nordisk Matematisk Tidskrift* at reduced rate. Newsletter about the activities and meetings of the Society.

Officers: Ölle Häggström (President), Nils Dencker (Vice-President), Milagros Izquierdo (Treasurer), Johan Johasson (Secretary).

Ukrainian Mathematical Society*

Apply to: A. S. Serdyuk, Institute of Mathematics, National Academy of Sciences, Ukraine, Tereschenkivskaja str., 3, 01601 Kyiv-4, Ukraine; email: sam@imath.kiev.ua.

Dues: U.S. $30, payable to N. A. Nazarenko at the above address.

Privileges: All privileges of a normal individual UMS member.

Officers: A. M. Samoilenko (President), M. L. Gorbachuk (Vice-President), N. A. Nazarenko (Treasurer), A. S. Serdyuk (Secretary).

Union of Bulgarian Mathematicians*

Apply to: Sava Ivanov Grozdev, Secretary, Union of Bulgarian Mathematicians, Acad. G. Bonchev Str., Block 8, BG-1113 Sofia, Bulgaria.

Dues: 20 USD, payable to Union of Bulgarian Mathematicians, Account #1100366612, BULBANK AD Central office, code 62196214.

Privileges: The right to attend all events organized by the UBM at reduced rate and to present papers at them, the right to attend other events in Bulgaria at a reduced rate, and the right to purchase all UMB editions at a reduced rate.

Officers: St. Dodunekov (President), I. Tonov, O. Mushkarov, R. Nikolaev (Vice Presidents).

Unione Matematica Italiana

Apply to: Giuseppe Anichini, Segreteria dell'Unione Matematica Italiana, Dipartimento di Matematica, Piazza Porta S. Donato, 5, 40126 Bologna, Italy; email: umi@dm.unibo.it; http://umi.dm.unibo.it/.

Dues: 50 euros, payable to Unione Matematica Italiana.

Privileges: Free *Notiziario dell'UMI* (10 issues a year), *Bollettino dell'UMI, Ser. A*, reduced subscription for Ser. B (20 euros).

Officers: Franco Brezzi (President), Graziano Gentili (Vice-President), Barbara Lazzari (Treasurer), Giuseppe Anichini (Secretary).

Middle East

Iranian Mathematical Society

Apply to: M. Shokouhi, Iranian Mathematical Society, P.O. Box 13145-418, Tehran, Iran; email: iranmath@ims.ir; http://www.ims.ir.

Dues: U.S. $45 payable to Iranian Mathematical Society at the above address.

Privileges: *Bulletin of the Iranian Mathematical Society* (two issues per year in English), *Farhang va Andisheh Riazi* (two issues per year in Persian), *Khabarnameh* and *Gozaresh* (8 issues per year in Persian), and reduced rate for participation in the conferences and seminars organized by IMS.

Officers: A. R. Medghalchi (President), M. J. Mamayhani (Treasurer).

Israel Mathematical Union (IMU)

Address for mail: Israel Mathematical Union, Department of Mathematics, Ben Gurion University, Be'er Sheva 84105, Israel; email: imu@imu.org.il; http://www.imu.org.il

Apply to: Barak Weiss, Secretary, at the above address.

Dues: 50 Israeli shekels for two years.

Privileges: Participation in meetings and all other privileges enjoyed by an ordinary member.

Officers: Michael Lin (President), Ilan Hirshberg (Treasurer), Barak Weiss (Secretary).

Palestinian Society for Mathematical Sciences*

Address for mail: Mathematics Department, Birzeit University, P. O. Box 14, West Bank, Palestine.

Apply to: Fawzi Yagoub, Department of Mathematics and Computer Science, SUNY College at Fredonia, Fredonia, NY 14063.

Dues: U.S. $30, payable to Fawzi Yagoub; see address above.

Privileges: Free issues of the *PSMS Newsletter*, 50% reduction on all PSMS conference fees, 50% reduction on all PSMS publications.

Officers: Mohammad Al-Amleh (President); Mohammad Saleh, Tahseen Mughrabi (Vice-Presidents); Raghib Abu Saris, Nur edden Rabei, Mohammad El-Atrash, Taha Abu Kaf, Saber Elaydi (Members).

Saudi Association for Mathematical Sciences

Apply to: M. A. Alabdullatif, President, King Saud University, College of Science, P. O. Box 2455, Riyadh 11451, Saudi Arabia.

Dues: U.S. $30, payable to Saudi Association for Mathematical Sciences at the above address.

Privileges: Reduction in membership fee from U.S. $40 to U.S. $30; proceedings of conferences, symposia, and seminars arranged by the Association.

Officers: M. A. Alabdullatif (President), A. Alshihah (Vice-President), M. A. Aseerj (Treasurer), M. S. Qutaifan (Secretary).

South Pacific

Australian Mathematical Society Inc.

Address for mail: Department of Mathematics, University of Queensland, Brisbane, Queensland 4072, Australia; email: Secretary@austms.org.au; http://www.austms.org.au/.

Apply to: The Business Manager, Australian Mathematical Society, Department of Mathematics, Australian National University, Canberra ACT 0200, Australia.

Dues: $AUD 50 (in 2007), payable to the Australian Mathematical Society, c/o The Business Manager, at the above address.

Privileges: Complimentary issues of *The Gazette* (five issues in 2007), *Journal AustMS–Pure Mathematics and Statistics* ($AUD 62), *ANZIAM Journal* ($AUD 55), *Bulletin of AustMS* ($AUD 59). Reduced price for volumes in Lecture Series and reduced registration at conferences sponsored by AustMS.

Officers: P. G. Hall (President); N. Joshi and P. G. Taylor (Vice-Presidents); M. G. Cowling (Immediate Past President); A. Howe (Treasurer); E. J. Billington (Secretary).

New Zealand Mathematical Society*

Apply to: New Zealand Mathematical Society, c/o Dr. Winston Sweatman (NZMS Secretary), Institute of Information and Mathematical Sciences, Massey University at Albany, Private Bag 102 904, North Shore Mail Centre, Auckland, New Zealand; email: w.sweatman@massey.ac.nz; http://www.math.waikato.ac.nz/NZMS/NZMS.html.

Dues: $18 payable to Dr. John Shanks, Department of Mathematics and Statistics, University of Otago, P.O. Box 56, Dunedin, New Zealand.

Privileges: *Newsletter of the NZMS* (three per year).

Officers: Gaven Martin (President), Mick Roberts (Vice-President), Tammy Smith (Treasurer), Winston Sweatman (Secretary).

Mathematics Calendar

The most comprehensive and up-to-date Mathematics Calendar information is available on the AMS website at http://www.ams.org/mathcal/.

November 2007

* 5–9 **Social Data Mining and Knowledge Building**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California.

Overview: Social Data Mining is a fast-growing and exciting area of inquiry, in which connections among and interactions between individuals are analyzed to understand innovation, collective decision making, and problem solving, and how the structure of organizations and social networks impacts these processes. Analysis of such inherently relational datasets is currently being applied in e-commerce to drive recommendation systems, in bibliometrics to describe patterns of publication and determine the influence of specific individuals, in security environments to understand the structure of terrorist or gang networks, and numerous other areas. This workshop will bring together researchers in mathematics, computer science, and the social sciences to explore collective decision making, social network analysis, social mapping and bibliometrics, the role of information visualization in understanding social networks, the application of graph-theoretical analysis to social networks, and data representation strategies.

Organizing Committee: Peter Jones, Chair (Yale University, Mathematics), Johan Bollen (Los Alamos National Laboratory) Ronald Coifman (Yale University), Andrew McCallum (University of Massachusetts Amherst, Computer Science), and Karin Verspoor (Los Alamos National Laboratory, CCS-3).

Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/sews3/. The application part is for people requesting financial support to attend the workshop. If you don't intend to do this, you may simply register. Applications received by September 24, 2007, will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.

* 26–30 **Search and Knowledge Building for Biological Datasets**, Institute for Pure and Applied Mathematics, UCLA, Los Angeles, California.

Description: The development of new bio-technologies that probe previously unexplored aspects of biological systems has radically changed the world of biological research. Contributions from diverse areas such as combinatorics, graph and network theory, differential equations, machine learning, data mining, statistics and statistical physics have been used to create more powerful information search and knowledge management. This workshop is intended as a convergence of quantitatively oriented researchers addressing these issues in their quest to answer important biological questions.

Organizing Committee: Yuval Kluger, Xiaole Liu, Itsik Pe'er, Gustavo Stolovitzky, and Olga Troyanskaya.

Application/Registration: Application and registration forms are available on our website. The application part is for people requesting financial support to attend the workshop. If you don't intend to do this, you may simply register. Applications received by October 15, 2007, will receive fullest consideration. http://www.ipam.ucla.edu/programs/sews4/.

December 2007

* 19–22 **International Conference on Advances in Mathematics: Historical Developments & Engineering Applications**, Indian Society for History of Mathematics and G. B. Pant University at Pant Nagar, India.

This section contains announcements of meetings and conferences of interest to some segment of the mathematical public, including ad hoc, local, or regional meetings, and meetings and symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. A complete list of meetings of the Society can be found on the last page of each issue.

An announcement will be published in the *Notices* if it contains a call for papers and specifies the place, date, subject (when applicable), and the speakers; a second announcement will be published only if there are changes or necessary additional information. Once an announcement has appeared, the event will be briefly noted in every third issue until it has been held and a reference will be given in parentheses to the month, year, and page of the issue in which the complete information appeared. Asterisks (*) mark those announcements containing new or revised information.

In general, announcements of meetings and conferences held in North America carry only the date, title of meeting, place of meeting, names of speakers (or sometimes a general statement on the program), deadlines for abstracts or contributed papers, and source of further information. Meetings held outside the North American area may carry more detailed information. In any case, if there is any application deadline with respect to participation in the meeting, this fact should be noted. All communications on meetings and conferences in the mathematical sciences should be sent to the Editor of the *Notices* in care of the American Mathematical Society in Providence or electronically to notices@ams.org or mathcal@ams.org.

In order to allow participants to arrange their travel plans, organizers of meetings are urged to submit information for these listings early enough to allow them to appear in more than one issue of the *Notices* prior to the meeting in question. To achieve this, listings should be received in Providence **eight months** prior to the scheduled date of the meeting.

The complete listing of the Mathematics Calendar will be published only in the September issue of the *Notices*. The March, June/July, and December issues will include, along with new announcements, references to any previously announced meetings and conferences occurring within the twelve-month period following the month of those issues. New information about meetings and conferences that will occur later than the twelve-month period will be announced once in full and will not be repeated until the date of the conference or meeting falls within the twelve-month period.

The Mathematics Calendar, as well as Meetings and Conferences of the AMS, is now available electronically through the AMS website on the World Wide Web. To access the AMS website, use the URL: http://www.ams.org/.

Aims and Scope: The conference will cover all aspects of history of the Mathematical Sciences and recent developments including Mathematics, Statistics, Operation Research, Computer Science and Engineering applications.
Local Hospitality: Free local transport and local hospitality including boarding and lodging will be provided to all the registered participants.
Scientific Advisory Committee: Mohammad Bagheri (Iran), S. G. Dani (India), S.D.Sharma (India), Karine Chemla (France), N. K. Dadhich (India), Ivor Grattan-Guinnees (UK), Takao Hayashi (Japan), Subhash Kak (USA), Wenlin Li (China), Jean-Claude Mrtzloff (France), Jean-Paul Pier (Luxemburg), Jamil Ragep (Canada), Chikara Sasaki (Japan), Norbert Schlomiuk (Canada), Dinesh Singh (India), B. G. Sidharth (India), B. S. Yadav (India).
Invited Speakers: Invited speakers from about twenty countries abroad including eminent mathematicians from India are expected to take part in the conference.
Information: http://www.indianshm.com for information or contact bsyadav@indianshm.com, vedicmri@gmail.com, mcjoshi69@gmail.com.

January 2008

*6–13 **1st Odense Winter School on Geometry and Theoretical Physics**, University of Southern Denmark, Campusvej 55, DK-5230, Odense M, Denmark.
Description: The purpose of the school is to endow the new generation of mathematicians and physicists with a common language. We wish to bring together scientists working at the frontier between mathematics and theoretical physics while stimulating further progress.
Main Speakers: Paolo di Vecchia (Copenhagen), A basic introduction to string theory and its application to particle phenomenology; Roger Bielawski (Leeds), Magnetic monopoles, L2-metrics and L2-cohomology; Vicente Cortés (Hamburg), To be announced; Eugene Ferapontov (Loughborough), Geometry and integrability of multi-dimensional dispersionless systems; Ulf Lindström (Uppsala), To be announced; Roman Zwicky (Durham), Unparticles. Organized by: Francesco Sannino (SDU), Martin Svensson (SDU), Andrew Swann (SDU). Programme Committee: Arne Lykke Larsen (SDU), Henrik Pedersen (SDU), John C. Wood (Leeds).
Information: http://www.imada.sdu.dk/~swann/Winter-2008/.

*7–27 **Data-driven and Physically-based Models for Characterization of Processes in Hydrology, Hydraulics, Oceanography and Climate Change**, Institute for Mathematical Sciences, National University of Singapore, Singapore.
Description: This program is jointly organized with Pacific Institute for Mathematical Sciences, UBC. The 3-week program will consist of a full week of seminars/lectures, and two weeks of workshops and research discussions aimed at developing research collaboration.
Topics: Three main topics are covered in the program: Development of fully integrated data driven and physical-based models for water resources management, Dynamic and Statistical Downscaling on Climate Change Study, Nonlinear Wave Dynamics and Tsunami Modeling.
Organizing Committee: Co-chairs: Sylvia Esterby (University of British Columbia); Hans-Rudolf Künsch (ETH Zurich); Shie-Yui Liong (National University of Singapore); Members: Vladan Babovic (National University of Singapore); Wolfgang Kinzelbach (ETH Zurich); Pavel Tkalich (National University of Singapore); Jim Zidek (University of British Columbia).
Information: For more information write to: email: imssec@nus.edu.sg. For enquiries on scientific aspects of the program, please email Yui Liong at: tmslsy@nus.edu.sg. email: imscec@nus.edu.sg; http://www.ims.nus.edu.sg/Programs/ocean07/index.htm.

February 2008

*11–15 **Expanders in Pure and Applied Mathematics**, Institute for Pure and Applied Math (IPAM), UCLA, Los Angeles, California.
Scientific Overview: Currently expanders are at the center of a great deal of research involving mutually beneficial interactions between computer science, number theory, combinatorics, group theory, and geometry. The workshop will bring together researchers from these fields to survey the progress made, outline the challenges ahead, and generate further collaborations.
Organizing Committee: Alexander Gamburd, Alexander Lubotzky, Audrey Terras, and Avi Wigderson
Information: An application/registration form is available at http://www.ipam.ucla.edu/programs/eg2008/. The application part is for people requesting financial support to attend the workshop. If you don't intend to do this, you may simply register. Applications received by December 1, 2007, will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.

*18–22 **Workshop on Algorithms (part of thematic programme Algorithms: New Directions and Applications**, Crown Hotel, Napier, New Zealand.
Description: Main aim of this workshop is to facilitate interaction between local and overseas researchers in algorithms.
Speakers: Five International Invited Speakers (S. Linton (St. Andrews), M. Langston (Tennessee), M. Mitzenmacher (Harvard), B. McKay (Australian National), D. Welsh (Oxford)) will give expository talks. Shorter contributed talks will also be scheduled.
Themes: Main themes of the thematic programme are: analysis of algorithms, randomized algorithms, approximation algorithms, fixed-parameter complexity, the relations between these, and applications to problems of interest to New Zealand researchers.
Sponsor: New Zealand Institute for Mathematics and its Applications.
Information: Participation is limited to 60 people. Those interested should indicate this interest at the URL given; accommodation is in short supply in Napier at this time (summer); email: mcw@cs.auckland.ac.nz; http://www.cs.otago.ac.nz/algorithmics/activities/febmeeting.html.

March 2008

*13–15 **The 42nd Annual Spring Topology and Dynamical Systems Conference**, The University of Wisconsin Milwaukee, Milwaukee, Wisconsin.
Description: We plan the traditional four special sessions, session organizers follow. Continuum Theory (This session is dedicated to Tom Ingram, on the occasion of his 70th birthday): Veronica Martinez-de-la-Vega (UNAM), chair; David Ryden (Baylor); Janusz Prajs (Cal. State Sacramento). Dynamical Systems: Marcy Barge (Montana), co-chair; John Smillie (Cornell Univ.), co-chair; Bev Diamond (College of Charleston). General/Set Theoretic Topology: Ken Kunen (Madison), co-chair; Arnold Miller (Madison), co-chair. Geometric Topology & Geometric Group Theory: Ross Geoghegan (SUNY Binghamton), chair. The Milwaukee Local Organizing Committee consists of Ric Ancel, Karen Brucks, Craig Guilbault, Chris Hruska, Suzanne Hruska, Boris Okun (UWM), Paul Bankston (Marquette), Lois Kailhofer (Alverno College).
Information: email: shruska@msm.umr.edu; http://www.math.uwm.edu/Events/stdc2008/.

*28–29 **The 34th Annual New York State Regional Graduate Mathematics Conference**, Syracuse University, Syracuse, New York.
Description: The aim of this conference is to allow graduate students to present their research and be exposed to research being done in other areas. This year's Opening Address will be given on Friday, March 28, by Joseph Silverman of Brown University, and the Keynote Address will be given on Saturday, March 29, by Noam Elkies of Harvard University.

Information: Graduate students wishing to attend this conference or give a talk are encouraged to contact us by email at tsbleier@syr.edu; http://webwork.syr.edu/~mgo/index.php?n=Conference.Conference.

*31–April 5 **International Workshop on Multi-Rate Processes and Hysteresis MURPHYS2008**, University College Cork, Cork, Ireland.
Organizing Committee: M. Mortell (Cork, Ireland) and A. Pokrovskii (Cork, Ireland, a.pokrovskii@ucc.ie).
Scientific Committee: R. O'Malley (USA), V. Sobolev (Russia).
Topics: Singular Perturbations, Hysteresis, Economic Dynamics, Laser Dynamics, Chemical Kinetics, Control, Bioinformatics, Systems Biology.

April 2008

*11–13 **The Eleventh Rivière-Fabes Symposium on Analysis and PDE**, University of Minnesota, Minneapolis, Minnesota.
Information: Annually held symposium in memory of Nestor M. Rivière and Eugene B. Fabes. http://www.math.umn.edu/conferences/riv_fabes/.

May 2008

*5–June 27 **Mathematical Imaging and Digital Media**, Institute for Mathematical Sciences, National University of Singapore, Singapore.
Description: Despite the distinctiveness of the two diversified fields, mathematical imaging and digital media share many commonalities when it comes to the use of mathematical theory and computational tools. The purpose of this program is to conduct multidisciplinary studies involving mathematical perspectives and foundation of imaging science and digital media.
Themes: The focus will be on the following themes: Mathematical Imaging and Digital Media; Mathematical methods for computer graphics, computer vision, mesh generation, image restoration and reconstruction, image enhancement, image segmentation, object detection, image decomposition, image representation, image compression. Wavelet Theory and Applications: Sparse data representation and approximation by wavelets and redundant systems, noise removal, stochastic wavelet analysis, inverse problems via wavelet methods.
Organizing Committee: Co-chairs: Tony Chan (University of California, Los Angeles), Zuowei Shen (National University of Singapore). Members: Say Song Goh (National University of Singapore), Hui Ji (National University of Singapore), Seng Luan Lee (National University of Singapore), Andy M. Yip (National University of Singapore).
Information: email: imssec@nus.edu.sg. For enquiries on scientific aspects of the program, please email Zuowei Shen at matzuows@.nus.edu.sg;http://www.ims.nus.edu.sg/Programs/imaging08/index.htm.

*13–17 **Spectral geometry and related topics**, University of Potsdam, Germany.
Description: International meeting on spectral geometry and related areas such as geometric analysis, global differential geometry, index theory, gauge theory and conformal geometry.
Main speakers: K. Akutagawa, B. Ammann, U. Bunke, A. Grigoryan, N. Higson, J. Lohkamp, R. Mazzeo, D. Ruberman, D. Schüth, B. Wilking.
Information: email: hanke@mathematik.uni-muenchen.de; http://specgeo08.math.uni-potsdam.de/.

*19–24 **Lie Theory and Geometry: The Mathematical Legacy of Bertram Kostant**, Pacific Institute of Mathematical Sciences, Vancouver, Canada.
Description: The plan of the conference is to consider recent advances in Lie theory, concentrating on connections with geometry. Among the topics that will receive special attention are: invariant theory, symplectic geometry, representation theory of real Lie groups, Kac-Moody Lie algebras and associated groups and flag varieties, quantum groups, quiver varieties, quantum cohomology of flag varieties, Dirac cohomology and Gelfand-Zeitland theory.
Principal Organizers: Jim Carrell bk08@pims.math.ca and Shrawan Kumar bk08@pims.math.ca.
Principal Speakers: A. Alekseev (Geneva), M. Brion (Grenoble), P. Etingof (MIT), V. Ginzburg (Chicago), I. Gordon (Edinburgh, V. Guillemin (MIT), A. Joseph (Weizmann Inst.), V. Kac (MIT), M. Kashiwara (Kyoto), A. Knutson (UCSD), J. Lepowsky (Rutgers), H. Nakajima (Tokyo), A. Okounkov (Princeton), D. Peterson (Vancouver), K. Reitsch (London), J.-P. Serre (Paris), B. Speh (Cornell), D. Vogan (MIT), N. Wallach (UCSD).
Information: For further information (accomodations etc.), please see the conference website: http://www.pims.math.ca/~dxu/08kostant/. There will be a limited amount of funds available for grad students and post docs. If you would like to apply for support, please contact one of the principal organizers.

*26–30 **ICCA8: 8th International Conference on Clifford Algebras and their Applications in Mathematical Physics**, UNICAMP, Campinas, Brazil.
Description: ICCA8 will be a continuation of a 20 year old sequence of international conferences devoted to the mathematical aspects of Clifford algebras and their varied applications. ICCA8 will be arranged in invited plenary talks (50 min), selected plenary talks (50 min) and regular talks (25 min). The list of the invited speakers who already confirmed their presence is available at the conference website: http://www.ime.unicamp.br/~icca8. Registration for ICCA8 is open from August 01, 2007 to January 31, 2008. Instructions and deadlines can be found at the conference website.
Information: http://www.ime.unicamp.br/~icca8.

June 2008

*17–22 **Differential Equations and Topology**, Lomonosov Moscow State University, Moscow, Russia.
Description: In commemoration of the 100th Anniversary of the birthday of Lev Semenovich Pontryagin (1908-1988), an outstanding mathematician of the 20th century, the Steklov Mathematical Institute of the Russian Academy of Sciences together with Moscow (Lomonosov) State University are organizing an international conference "Differential Equations and Topology". The goal of the conference is to give a detailed overview of recent achievements in the fields of mathematics related to the works of L.S. Pontryagin.
Topics: Differential Equations (Chairman: Academician Dmitrii V. Anosov); Optimal Control and Differential Games (Chairman: Academician Arkady V. Kryazhimskiy);Topology (Chairman: Academician Sergey P. Novikov).
Information: http://pont2008.cs.msu.ru; email: pont2008@cs.msu.ru.

*18–21 **Conference on Algebra and its Applications, in honor of S. K. Jain's 70th birthday**, Ohio University, Athens, Ohio.
Description: The Conference is dedicated to recent developments in classical Ring Theory, Module Theory, Representation Theory, Group Algebras, Rings with Polynomial Identities, and related topics including applications. http://www.math.ohiou.edu/~algebra/conference/ou.html.

July 2008

*2–4 **The 2008 International Conference of Applied and Engineering Mathematics (ICAEM 2008)**, Imperial College London, London, United Kingdom.
Description: The topics of the ICAEM'07 include, but are not limited to, the following: Linear algebra and applications: matrix theory, tensor analysis, combinatorial linear algebra, numerical linear analysis, computational linear algebra, markov chains, iterative methods, large-scale systems; numerical analysis: Numerical methods for ordinary and partial differential equation; computational programming of numerical algorithms; finite elements; scientific computing;

error analysis; stability problems; convergence analysis; non-linear systems; chaos systems; dynamical systems; simulation; differential equations and applications: ordinary differential equations; partial differential equations; stochastic differential equations; difference equations; integral equations; variation methods; nonlinear systems; perturbation problems; probabilities and statistics: probability theory; stochastic process; applied statistics; mathematical statistics; estimation theory; identification; simulation; operations research and optimization: mathematical programming; stochastic modeling; decision theory; game theory; queueing theory; reliability theory; routing theory; transportation problems; financial mathematics; inventory control; scheduling; optimization theory; linear programming; quadratic programming; convex programming; nonlinear programming; stochastic programming; combinatorial programming; discrete mathematics and control: methods of algorithmic analysis; algorithms; combinatorial problems; graph theory; coding; cryptology; signal processing; real time systems; network optimization; control theory.

Information: email: wce@iaeng.org; http://www.iaeng.org/WCE2008/ICAEM2008.html.

* 7–9 **SIAM Conference on Imaging Science (IS08)**, Town & Country Resort and Convention Center, San Diego, California.

Description: Current developments in the technology of imaging have led to an explosive growth in the interdisciplinary field of imaging science. With the advent of new devices capable of seeing objects and structures not previously imagined, the reach of science and medicine has been extended in a multitude of different ways. The impact of this technology has been to generate new challenges associated with the problems of formation, acquisition, compression, transmission, and analysis of images. By their very nature, these challenges cut across the disciplines of physics, engineering, mathematics, biology, medicine, and statistics. While the primary purpose of this conference is to focus on mathematical issues, the biomedical aspects of imaging will also play an important role.

Information: http://www.siam.org/meetings/is08/.

* 7–11 **Spring Meeting of the Swiss Mathematical Society: Conference on Complex Analysis 2008–In honour of Linda Rothschild**, University of Fribourg, Switzerland.

Description: Complex Variables and Connections with PDEs and Geometry.

Information:http://www.unifr.ch/math/events/ComplexAnalysis08.

* 13–16 **CTAC08: The 14th Biennial Computational Techniques and Applications Conference**, Australian National University, Canberra, ACT, Australia.

Description: CTAC'08 will also be honouring Professor Ian Sloan on his 70th birthday. About the CTAC Meetings: CTAC is organized by the special interest group in computational techniques and applications of ANZIAM, the Australian and New Zealand Industrial & Applied Mathematics Division of the Australian Mathematical Society. The meeting will provide an interactive forum for researchers interested in the development and use of computational methods applied to engineering, scientific and other problems. The CTAC meetings have been taking place biennially since 1981, the most recent being held in 2006 at James Cook University, Queensland. CTAC'08 is the 14th meeting in the series and is hosted by the Mathematical Sciences Institute, Australian National University.

Information: http://www.maths.anu.edu.au/events/ctac08/.

August 2008

* 19–22 **Duality and Involutions in Representation Theory**, National University of Ireland, Maynooth, Co. Kildare, Ireland.

Organising Committee: Rod Gow (University College Dublin), John Murray (National University of Ireland Maynooth), Rachel Quinlan (National University of Ireland Galway).

Invited Speakers: Christine Bessenrodt (Hannover), Everett Dade (Illinois), Burkhard Kulshammer (Jena), Gabriele Nebe (RWTH Aachen), Geoffrey Robinson (Aberdeen), Wolfgang Willems (Magdeburg).

Information: Maynooth is 15 miles due West of Dublin. http://www.maths.nuim.ie/conference/.

New Publications Offered by the AMS

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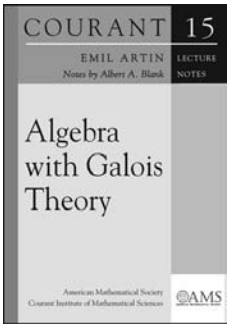
Algebra and Algebraic Geometry



Algebra with Galois Theory

Emil Artin

Notes by Albert A. Blank

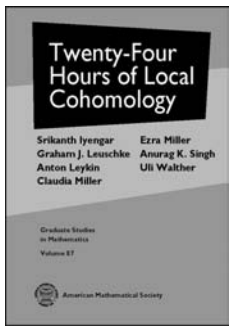
The present text was first published in 1947 by the Courant Institute of Mathematical Sciences of New York University. Published under the title *Modern Higher Algebra. Galois Theory*, it was based on lectures by Emil Artin and written by Albert A. Blank. This volume became one of the most popular in the series of lecture notes published by Courant. Many instructors used the book as a textbook, and it was popular among students as a supplementary text as well as a primary textbook. Because of its popularity, Courant has republished the volume under the new title *Algebra with Galois Theory*.

Titles in this series are co-published with the Courant Institute of Mathematical Sciences at New York University.

Contents: Groups; Rings and fields; Polynomials. Factorization into primes. Ideals; Solution of the general equation of nth degree. Residue classes. Extension fields. Isomorphisms; Galois theory; Polynomials with integral coefficients; The theory of equations.

Courant Lecture Notes, Volume 15

December 2007, 126 pages, Softcover, ISBN: 978-0-8218-4129-7, LC 2007060799, 2000 *Mathematics Subject Classification:* 12-01, 12F10, **AMS members US$23**, List US$29, Order code CLN/15



Twenty-Four Hours of Local Cohomology

Srikanth B. Iyengar, *University of Nebraska, Lincoln, NE*, **Graham J. Leuschke**, *Syracuse University, NY*, **Anton Leykin**, *Institute for Mathematics and Its Applications, Syracuse, NY*, **Claudia Miller**, *Syracuse University, NY*, **Ezra Miller**, *University of Minnesota, Minneapolis, MN*, **Anurag K. Singh**, *University of Utah, Salt Lake City, UT*, and **Uli Walther**, *Purdue University, West Lafayette, IN*

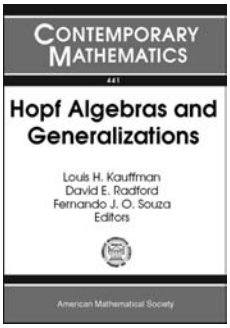
This book is aimed to provide an introduction to local cohomology which takes cognizance of the breadth of its interactions with other areas of mathematics. It covers topics such as the number of defining equations of algebraic sets, connectedness properties of algebraic sets, connections to sheaf cohomology and to de Rham cohomology, Gröbner bases in the commutative setting as well as for D-modules, the Frobenius morphism and characteristic p methods, finiteness properties of local cohomology modules, semigroup rings and polyhedral geometry, and hypergeometric systems arising from semigroups.

The book begins with basic notions in geometry, sheaf theory, and homological algebra leading to the definition and basic properties of local cohomology. Then it develops the theory in a number of different directions, and draws connections with topology, geometry, combinatorics, and algorithmic aspects of the subject.

Contents: Basic notions; Cohomology; Resolutions and derived functors; Limits; Gradings, filtrations, and Gröbner bases; Complexes from a sequence of ring elements; Local cohomology; Auslander-Buchsbaum formula and global dimension; Depth and cohomological dimension; Cohen-Macaulay rings; Gorenstein rings; Connections with sheaf cohomology; Projective varieties; The Hartshorne-Lichtenbaum vanishing theorem; Connectedness; Polyhedral applications; D-modules; Local duality revisited; De Rham cohomology; Local cohomology over semigroup rings; The Frobenius endomorphism; Curious examples; Algorithmic aspects of local cohomology; Holonomic rank and hypergeometric systems; Injective modules and Matlis duality; Bibliography; Index.

Graduate Studies in Mathematics, Volume 87

December 2007, 282 pages, Hardcover, ISBN: 978-0-8218-4126-6, LC 2007060786, 2000 *Mathematics Subject Classification:* 13A35, 13D45, 13H10, 13N10, 14B15; 13H05, 13P10, 13F55, 14F40, 55N30, **AMS members US$44**, List US$55, Order code GSM/87



Hopf Algebras and Generalizations

Louis H. Kauffman and **David E. Radford**, *University of Illinois at Chicago, IL*, and **Fernando J. O. Souza**, *Universidade Federal de Pernambuco, Recife, PE, Brazil*, Editors

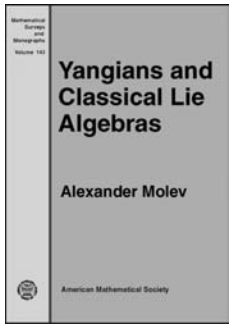
Hopf algebras have proved to be very interesting structures with deep connections to various areas of mathematics, particularly through quantum groups. Indeed, the study of Hopf algebras, their representations, their generalizations, and the categories related to all these objects has an interdisciplinary nature. It finds methods, relationships, motivations and applications throughout algebra, category theory, topology, geometry, quantum field theory, quantum gravity, and also combinatorics, logic, and theoretical computer science.

This volume portrays the vitality of contemporary research in Hopf algebras. Altogether, the articles in the volume explore essential aspects of Hopf algebras and some of their best-known generalizations by means of a variety of approaches and perspectives. They make use of quite different techniques that are already consolidated in the area of quantum algebra. This volume demonstrates the diversity and richness of its subject. Most of its papers introduce the reader to their respective contexts and structures through very expository preliminary sections.

Contents: **B. Day**, **E. Panchadcharam**, and **R. Street**, Lax braidings and the Lax centre; **G. Karaali**, Dynamical quantum groups–The super story; **Y. Kashina**, Groups of grouplike elements of a semisimple Hopf algebra and its dual; **S.-H. Ng** and **P. Schauenburg**, Higher Frobenius-Schur indicators for pivotal categories; **F. Panaite**, Doubles of (quasi) Hopf algebras and some examples of quantum groupoids and vertex groups related to them; **P. Schauenburg**, Central braided Hopf algebras; **M. D. Staic**, A note on anti-Yetter-Drinfeld modules; **M. Takeuchi**, Representations of the Hopf algebra $U(n)$.

Contemporary Mathematics, Volume 441

October 2007, 174 pages, Softcover, ISBN: 978-0-8218-3820-4, LC 2007060772, 2000 *Mathematics Subject Classification:* 16W30, 16W35, 16W50, 16W55, 16G99, 17B37, 18D10, 18D35, 20G42, 81R50, **AMS members US$47**, List US$59, Order code CONM/441



Yangians and Classical Lie Algebras

Alexander Molev, *University of Sydney, Australia*

The Yangians and twisted Yangians are remarkable associative algebras taking their origins from the work of St. Petersburg's school of mathematical physics in the 1980s. The general definitions were given in subsequent work of Drinfeld and Olshansky, and these algebras have since found numerous applications in and connections with mathematical physics, geometry, representation theory, and combinatorics.

The book is an introduction to the theory of Yangians and twisted Yangians, with a particular emphasis on the relationship with the classical matrix Lie algebras. A special algebraic technique, the R-matrix formalism, is developed and used as the main instrument for describing the structure of Yangians. A detailed exposition of the highest weight theory and the classification theorems for finite-dimensional irreducible representations of these algebras is given.

The Yangian perspective provides a unifying picture of several families of Casimir elements for the classical Lie algebras and relations between these families. The Yangian symmetries play a key role in explicit constructions of all finite-dimensional irreducible representations of the orthogonal and symplectic Lie algebras via weight bases of Gelfand-Tsetlin type.

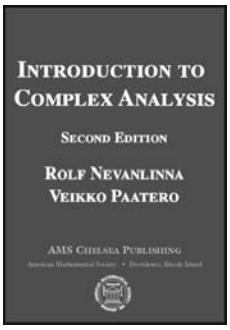
Contents: Yangian for $\mathfrak{gl}_N$; Twisted Yangians; Irreducible representations of $Y(\mathfrak{gl}_N)$; Irreducible representations of $Y(\mathfrak{g}_N)$; Gelfand-Tsetlin bases for representations of $Y(\mathfrak{gl}_N)$; Tensor products of evaluation modules for $Y(\mathfrak{gl}_N)$; Casimir elements and Capelli identities; Centralizer construction; Weight bases for representations of $\mathfrak{g}_N$; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 143

November 2007, 400 pages, Hardcover, ISBN: 978-0-8218-4374-1, LC 2007060781, 2000 *Mathematics Subject Classification:* 17B37, 81R50; 17B10, 17B20, 81R10, 05E10, 05E15, **AMS members US$79**, List US$99, Order code SURV/143

Analysis

COURSE ADOPTION



Introduction to Complex Analysis

Second Edition

Rolf Nevanlinna and **Veikko Paatero**

It really is a gem, both in terms of its table of contents and the level of discussion. The exercises also look very good.
*—**Clifford Earle, Cornell University***

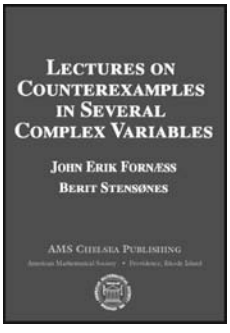
This book has a soul and has passion.
*—**William Abikoff, University of Connecticut***

This classic book gives an excellent presentation of topics usually treated in a complex analysis course, starting with basic notions (rational functions, linear transformations, analytic function), and culminating in the discussion of conformal mappings, including the Riemann mapping theorem and the Picard theorem. The two quotes above confirm that the book can be successfully used as a text for a class or for self-study.

Contents: The concept of an analytic function; General properties of rational functions; Linear transformations; Mapping by rational functions of second order; The exponential function and its inverse. The general power; The trigonometric functions; Infinite series with complex terms; Integration in the complex domain. Cauchy's theorem; Cauchy's integral formula and its applications; The residue theorem and its applications; Harmonic functions; Analytic continuation; Entire functions; Periodic functions; The Euler Γ-function; The Riemann ζ-function; The theory of conformal mapping; Index.

AMS Chelsea Publishing

October 2007, 350 pages, Hardcover, ISBN: 978-0-8218-4399-4, LC 2007022850, 2000 *Mathematics Subject Classification:* 30-01, **AMS members US$44**, List US$49, Order code CHEL/310.H



Lectures on Counterexamples in Several Complex Variables

John Erik Fornæss and **Berit Stensønes**, *University of Michigan, Ann Arbor, MI*

Counterexamples are remarkably effective for understanding the meaning, and the limitations, of mathematical results. Fornæss and Stensønes look at some of the major ideas of several complex variables by considering counterexamples to what might seem like reasonable variations or generalizations. The first part of the book reviews some of the basics of the theory, in a self-contained introduction to several complex variables. The counterexamples cover a variety of important topics: the Levi problem, plurisubharmonic functions, Monge-Ampère equations, CR geometry, function theory, and the $\bar{\partial}$ equation.

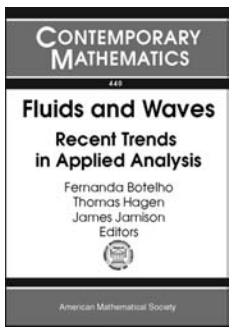
The book would be an excellent supplement to a graduate course on several complex variables.

Contents: Some notations and definitions; Holomorphic functions; Holomorphic convexity and domains of holomorphy; Stein manifolds; Subharmonic/Plurisubharmonic functions; Pseudoconvex domains; Invariant metrics; Biholomorphic maps; Counterexamples to smoothing of plurisubharmonic functions; Complex Monge Ampère equation; H^∞-convexity; CR-manifolds; Pseudoconvex domains without pseudoconvex exhaustion; Stein neighborhood basis; Riemann domains over $\mathbb{C}^n$; The Kohn-Nirenberg example; Peak points; Bloom's example; D'Angelo's example; Integral manifolds; Peak sets for A(D); Peak sets. Steps 1–4; Sup-norm estimates for the $\bar{\partial}$-equation; Sibony's $\bar{\partial}$-example; Hypoellipticity for $\bar{\partial}$; Inner functions; Large maximum modulus sets; Zero sets; Nontangential boundary limits of functions in $H^\infty(\mathbb{B}^n)$; Wermer's example; The union problem; Riemann domains; Runge exhaustion; Peak sets in weakly pseudoconvex boundaries; The Kobayashi metric; Bibliography.

AMS Chelsea Publishing

November 2007, 247 pages, Hardcover, ISBN: 978-0-8218-4422-9, LC 2007026106, 2000 *Mathematics Subject Classification:* 32-01; 32D05, 32E05, 32A38, 32U05, 32V40, 32F45, **AMS members US$35**, List US$39, Order code CHEL/363.H

Applications



Fluids and Waves

Recent Trends in Applied Analysis

Fernanda Botelho, **Thomas Hagen**, and **James Jamison**, *University of Memphis, TN*, Editors

This volume contains a series of articles on wave phenomena and fluid dynamics, highlighting recent advances in these two areas of mathematics. The collection is based on lectures presented at the conference "Fluids and Waves—Recent Trends in Applied Analysis" and features a rich spectrum of mathematical techniques in analysis and applications to engineering, neuroscience, physics, and biology. The mathematical topics discussed range from partial differential equations, dynamical systems and stochastic processes, to areas of classical analysis.

This volume is intended as an introduction to major topics of interest and state-of-the-art analytical research in wave motion and fluid flows. It is helpful to junior mathematicians to stay abreast of new techniques and recent trends in these areas of mathematics. The articles here also provide a unique scientific basis for recent results and new links between current research themes. In summary, this book is a guide for experts in one field to the issues of the other, and will challenge graduate students to investigate these areas of analysis in further detail.

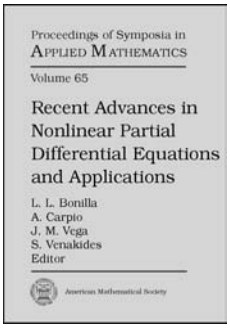
Contents: K. T. Andrews, **S. Anderson**, **R. S. R. Menike**, **M. Shillor**, **R. Swaminathan**, and **J. Yuzwalk**, Vibrations of a damageable

string; **G. Avalos** and **R. Triggiani**, The coupled PDE system arising in fluid/structure interaction. Part I: Explicit semigroup generator and its spectral properties; **V. Barbu**, **Z. Grujić**, **I. Lasiecka**, and **A. Tuffaha**, Existence of the energy-level weak solutions for a nonlinear fluid-structure interaction model; **A. Biswas** and **D. Swanson**, Gevrey regularity of solutions to the 3D Navier-Stokes equations; **P. C. Bressloff**, Stimulus-induced bumps in two-dimensional neural field theory; **S. N. Chandler-Wilde** and **M. Lindner**, Wave problems in unbounded domains: Fredholmness and the finite section method; **S. Coombes** and **M. R. Owen**, Exotic dynamics in a firing rate model of neural tissue with threshold accommodation; **M. H. Garzon**, **D. R. Blain**, and **M. West**, Embedded models of self-assembly of DNA complexes; **M. He**, A parameter property of integrodifferential equations with memory; **J. M. Lavine**, **E. C. Eckstein**, and **J. A. Goldstein**, Stochastic models with negative friction for intermittent rolling of biological mimetics; **J. A. H. Murdock**, Multi-parameter oscillatory connection functions in neural field models; **N. Popović**, Front speeds, cut-offs, and desingularization: A brief case study; **J. M. Rodriguez** and **M. H. Garzon**, Neural networks can learn to approximate autonomous flows; **C. M. Schober**, Rogue waves, non-Gaussian statistics and proximity to homoclinic data; **H. Schurz**, Nonlinear stochastic wave equations in $\mathbb{R}^1$ with power-law nonlinearity and additive space-time noise; **J. Tolosa**, The method of Lyapunov functions of two variables; **J. Zhu**, Analysis of map formation in visual perception.

Contemporary Mathematics, Volume 440

September 2007, 287 pages, Softcover, ISBN: 978-0-8218-4247-8, LC 2007060773, 2000 *Mathematics Subject Classification:* 76-06, 92-06, 76Dxx, 92Bxx; 92C20, 35Qxx, **AMS members US$63**, List US$79, Order code CONM/440

Differential Equations



Recent Advances in Nonlinear Partial Differential Equations and Applications

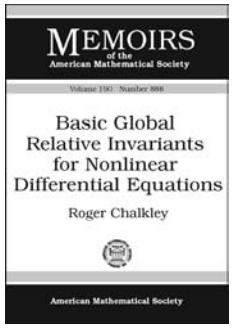
L. L. Bonilla, *Universidad Carlos III de Madrid, Leganés, Spain*, **A. Carpio**, *Universidad Complutense de Madrid, Spain*, **J. M. Vega**, *Universidad Politécnica de Madrid, Spain*, and **S. Venakides**, *Duke University, Durham, NC*, Editors

The articles of this book are written by leading experts in partial differential equations and their applications, who present overviews here of recent advances in this broad area of mathematics. The formation of shocks in fluids, modern numerical computation of turbulence, the breaking of the Einstein equations in a vacuum, the dynamics of defects in crystals, effects due to entropy in hyperbolic conservation laws, the Navier–Stokes and other limits of the Boltzmann equation, occupancy times for Brownian motion in a two dimensional wedge, and new methods of analyzing and solving integrable systems are some of this volume's subjects. The reader will find an exposition of important advances without a lot of technicalities and with an emphasis on the basic ideas of this field.

Contents: S. Klainerman, Null hypersurfaces with finite curvature flux and a breakdown criterion in general relativity; **D. Christodoulou**, The formation of shocks in 3-dimensional fluids; **F. A. Grünbaum** and **C. McGrouther**, Occupation time for two dimensional Brownian motion in a wedge; **R. Buckingham**, **A. Tovbis**, **S. Venakides**, and **X. Zhou**, The semiclassical focusing nonlinear Schrödinger equation; **Y. Li**, An extension to a classical theorem of Liouville and applications; **A. S. Fokas**, From Green to Lax via Fourier; **J. Jimenéz**, Untangling wall turbulence through direct simulations; **L. L. Bonilla** and **A. Carpio**, Defects, singularities and waves; **C. D. Levermore**, Fluid dynamics from Boltzmann equations; **F. Golse**, From the Boltzmann equation to the incompressible Navier-Stokes equations; **C. M. Dafermos**, Hyperbolic conservation laws with involutions and contingent entropies.

Proceedings of Symposia in Applied Mathematics, Volume 65

November 2007, 217 pages, Hardcover, ISBN: 978-0-8218-4211-9, LC 2007060794, 2000 *Mathematics Subject Classification:* 35Lxx, 35Qxx, 37-XX, 44-XX, 70-XX, 74-XX, 76-XX, 82-XX, 83-XX, **AMS members US$39**, List US$49, Order code PSAPM/65



Basic Global Relative Invariants for Nonlinear Differential Equations

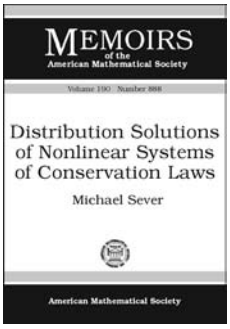
Roger Chalkley, *University of Cincinnati, OH*

Contents: *Part 1. Foundations for a General Theory:* Introduction; The coefficients $c^*_{i,j}(z)$ of (1.3); The coefficients $c^{**}_{i,j}(\zeta)$ of (1.5); Isolated results needed for completeness; Composite transformations and reductions; Related Laguerre-Forsyth canonical forms; *Part 2. The Basic Relative Invariants for $Q_m = 0$ when $m \geq 2$:* Formulas that involve $L_{i,j}(z)$; Basic semi-invariants of the first kind for $m \geq 2$; Formulas that involve $V_{i,j}(z)$; Basic semi-invariants of the second kind for $m \geq 2$; The existence of basic relative invariants; The uniqueness of basic relative invariants; Real-valued functions of a real variable; *Part 3. Supplementary Results:* Relative invariants via basic ones for $m \geq 2$; Results about Q_m as a quadratic form; Machine computations; The simplest of the Fano-type problems for (1.1); Paul Appell's condition of solvability for $Q_m = 0$; Appell's condition for $Q_2 = 0$ and related topics; Rational semi-invariants and relative invariants; *Part 4. Generalizations for $H_{m,n} = 0$:* Introduction to the equations $H_{m,n} = 0$; Basic relative invariants for $H_{1,n} = 0$ when $n \geq 2$; Laguerre-Forsyth forms for $H_{m,n} = 0$ when $m \geq 2$; Formulas for basic relative invariants when $m \geq 2$; Extensions of Chapter 7 to $H_{m,n} = 0$, when $m \geq 2$; Extensions of Chapter 9 to $H_{m,n} = 0$, when $m \geq 2$; Basic relative invariants for $H_{m,n} = 0$ when $m \geq 2$; *Additional Classes of Equations:* The class of equations specified by $y''(z)\, y'(z)$; Formulations of greater generality; Invariants for simple equations unlike (29.1); Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 190, Number 888

October 2007, 365 pages, Softcover, ISBN: 978-0-8218-3991-1, LC 2007060779, 2000 *Mathematics Subject Classification:* 34A34;

34M15, **Individual member US$59**, List US$99, Institutional member US$79, Order code MEMO/190/888



Distribution Solutions of Nonlinear Systems of Conservation Laws

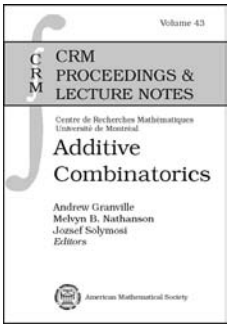
Michael Sever, *The Hebrew University, Jerusalem, Israel*

Contents: General distribution solutions; Delta-shocks; Singular shocks; Bibliography.

Memoirs of the American Mathematical Society, Volume 190, Number 889

October 2007, 163 pages, Softcover, ISBN: 978-0-8218-3990-4, LC 2007060778, 2000 *Mathematics Subject Classification:* 35L65, 35L67, **Individual member US$40**, List US$66, Institutional member US$53, Order code MEMO/190/889

Discrete Mathematics and Combinatorics



Additive Combinatorics

Andrew Granville, *Université de Montréal, QC, Canada*, **Melvyn B. Nathanson**, *City University of New York, Lehman College, Bronx, NY*, and **József Solymosi**, *University of British Columbia, Vancouver, BC, Canada*, Editors

One of the most active areas in mathematics today is the rapidly emerging new topic of "additive combinatorics". Building on Gowers' use of the Freiman–Ruzsa theorem in harmonic analysis (in particular, his proof of Szemerédi's theorem), Green and Tao famously proved that there are arbitrarily long arithmetic progressions of primes, and Bourgain and his co-authors have given non-trivial estimates for hitherto untouchably short exponential sums. There are further important consequences in group theory and in complexity theory and compelling questions in ergodic theory, discrete geometry and many other disciplines. The basis of the subject is not too difficult: it can be best described as the theory of adding together sets of numbers; in particular, understanding the structure of the two original sets if their sum is small. This book brings together key researchers from all of these different areas, sharing their insights in articles meant to inspire mathematicians coming from all sorts of different backgrounds.

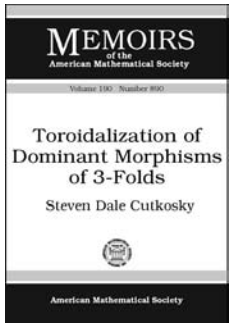
Titles in this series are co-published with the Centre de Recherches Mathématiques.

Contents: **A. Granville**, An introduction to additive combinatorics; **J. Solymosi**, Elementary additive combinatorics; **A. Balog**, Many additive quadruples; **E. Szemerédi**, An old new proof of Roth's theorem; **P. Kurlberg**, Bounds on exponential sums over small multiplicative subgroups; **B. Green**, Montréal notes on quadratic Fourier analysis; **B. Kra**, Ergodic methods in additive combinatorics; **T. Tao**, The ergodic and combinatorial approaches to Szemerédi's theorem; **I. Z. Ruzsa**, Cardinality questions about sumsets; **E. S. Croot III** and **V. F. Lev**, Open problems in additive combinatorics; **M.-C. Chang**, Some problems related to sum-product theorems; **J. Cilleruelo** and **A. Granville**, Lattice points on circles, squares in arithmetic progressions and sumsets of squares; **M. B. Nathanson**, Problems in additive number theory. I; **K. Gyarmati**, **S. Konyagin**, and **I. Z. Ruzsa**, Double and triple sums modulo a prime; **A. A. Glibichuk** and **S. V. Konyagin**, Additive properties of product sets in fields of prime order; **G. Martin** and **K. O'Bryant**, Many sets have more sums than differences; **G. Bhowmik** and **J.-C. Schlage-Puchta**, Davenport's constant for groups of the form $\mathbb{Z}_3 \oplus \mathbb{Z}_3 \oplus \mathbb{Z}_{3d}$; **S. D. Adhikari**, **R. Balasubramanian**, and **P. Rath**, Some combinatorial group invariants and their generalizations with weights.

CRM Proceedings & Lecture Notes, Volume 43

October 2007, 335 pages, Softcover, ISBN: 978-0-8218-4351-2, LC 2007060834, 2000 *Mathematics Subject Classification:* 11-02; 05-02, 42-02, 11P70, 28D05, 37A45, **AMS members US$79**, List US$99, Order code CRMP/43

Geometry and Topology



Toroidalization of Dominant Morphisms of 3-Folds

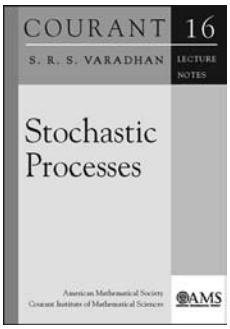
Steven Dale Cutkosky, *University of Missouri, Columbia, MO*

Contents: Introduction; An outline of the proof; Notation; Toroidal morphisms and prepared morphisms; Toroidal ideals; Toroidalization of morphisms from 3-folds to surfaces; Preparation above 2 and 3-points; Preparation; The τ invariant; Super parameters; Good and perfect points; Relations; Well prepared morphisms; Construction of τ-well prepared diagrams; Construction of a τ-very well prepared morphism; Toroidalization; Proofs of the main results; List of technical terms; Bibliography.

Memoirs of the American Mathematical Society, Volume 190, Number 890

October 2007, 222 pages, Softcover, ISBN: 978-0-8218-3998-0, LC 2007060777, 2000 *Mathematics Subject Classification:* 14E05, 14J30; 14B25, 14B05, **Individual member US$46**, List US$76, Institutional member US$61, Order code MEMO/190/890

Probability



Stochastic Processes

S. R. S. Varadhan, *Courant Institute of Mathematical Sciences, New York, NY*

This is a brief introduction to stochastic processes studying certain elementary continuous-time processes. After a description of the Poisson process and related processes with independent increments as well as a brief look at Markov processes with a finite number of jumps, the author proceeds to introduce Brownian motion and to develop stochastic integrals and Itô's theory in the context of one-dimensional diffusion processes. The book ends with a brief survey of the general theory of Markov processes.

The book is based on courses given by the author at the Courant Institute and can be used as a sequel to the author's successful book *Probability Theory* in this series.

Titles in this series are co-published with the Courant Institute of Mathematical Sciences at New York University.

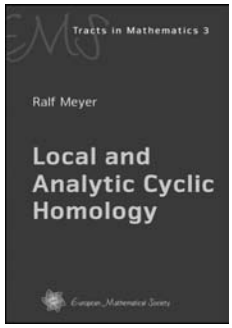
Contents: Introduction; Processes with independent increments; Poisson point processes; Jump Markov processes; Brownian motion; One-dimensional diffusions; General theory of Markov processes; Appendix A. Measures on Polish spaces; Appendix B. Additional remarks; Bibliography; Index.

Courant Lecture Notes, Volume 16

November 2007, 126 pages, Softcover, ISBN: 978-0-8218-4085-6, 2000 *Mathematics Subject Classification:* 60G05, 60G07, **AMS members US$23**, List US$29, Order code CLN/16

New AMS-Distributed Publications

Algebra and Algebraic Geometry



Local and Analytic Cyclic Homology

Ralf Meyer, *University of Göttingen, Germany*

Periodic cyclic homology is a homology theory for non-commutative algebras that plays a similar role in non-commutative geometry as de Rham cohomology for smooth manifolds. While it produces good results for algebras of smooth or polynomial functions, it fails for bigger algebras such as most Banach algebras or C*-algebras. Analytic and local cyclic homology are variants of periodic cyclic homology that work better for such algebras. In this book, the author develops and compares these theories, emphasizing their homological properties. This includes the excision theorem, invariance under passage to certain dense subalgebras, a Universal Coefficient Theorem that relates them to K-theory, and the Chern–Connes character for K-theory and K-homology.

The cyclic homology theories studied in this text require a good deal of functional analysis in bornological vector spaces, which is supplied in the first chapters. The focal points here are the relationship with inductive systems and the functional calculus in non-commutative bornological algebras.

Some chapters are more elementary and independent of the rest of the book and will be of interest to researchers and students working on functional analysis and its applications.

This item will also be of interest to those working in analysis.

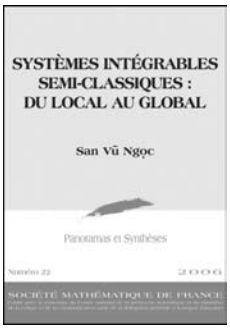
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Bornological vector spaces and inductive systems; Relations between entire, analytic, and local cyclic homology; The spectral radius of bounded subsets and its applications; Periodic cyclic homology via pro-nilpotent extensions; Analytic cyclic homology and analytically nilpotent extensions; Local homotopy invariance and isoradial subalgebras; The Chern–Connes character; Appendix. Background material; Bibliography; Notation and symbols; Index.

EMS Tracts in Mathematics

July 2007, 368 pages, Hardcover, ISBN: 978-3-03719-039-5, 2000 *Mathematics Subject Classification:* 19-02, 46-02, 46L80, 46A17, 46H30, 19D55, 19K35, **AMS members US$62**, List US$78, Order code EMSTM/3

Differential Equations



Systèmes Intégrables Semi-Classiques: du Local au Global

San Vũ Ngọc, *Université de Grenoble I, St. Martin d'Heres, France*

This book presents a panorama of finite dimensional completely integrable Hamiltonian systems, in which classical aspects and quantum aspects will be living side by side, with similar appearances.

Classical mechanics is considered from the viewpoint of the geometric study of the singular Lagrangian foliation, whose regular leaves are the famous Liouville tori. Singularities are tackled using local and semi-global normal forms, which involve topological and symplectic invariants. Some relationships with toric varieties are explored.

Quantum integrable systems are treated in the framework of semiclassical microlocal analysis. Pseudo-differential calculus and Fourier integral operators offer efficient tools for discovering how the geometric features of these systems influence their spectral properties.

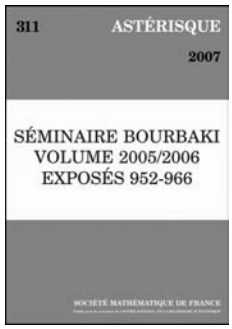
A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: Introduction; Introduction à l'analyse semi-classique; Exemples fondamentaux de systèmes intégrables; Théorie locale; Théorie semi-globale; Théorie globale; Bibliographie; Liste des figures; Index.

Panoramas et Synthèses, Number 22

June 2007, 156 pages, Softcover, ISBN: 978-2-85629-221-1, 2000 *Mathematics Subject Classification:* 37J35, 70H06, 58K45, 58J40, 53Dxx, 81Q10, 34C20, 81S10, **Individual member US$47**, List US$52, Order code PASY/22

Number Theory



Séminaire Bourbaki

Volume 2005/2006 Exposés 952-966

As in the preceding volumes of this seminar, one finds here fifteen survey lectures on topics of current interest: two lectures on algebraic geometry, three on partial differential equations, one on Arakelov geometry, one on p-adic analytic geometry, one on Galois representations, one on number theory, one on p-divisible groups, one on graph theory, one on operator algebras, one on representation theory, one on singular integral operators, and one on dynamical systems.

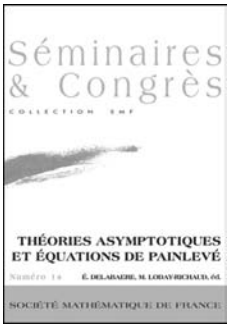
This item will also be of interest to those working in differential equations.

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: *Novembre 2005:* **M. Brion**, Compactification de l'espace des modules des variétés abéliennes principalement polarisées; **N. Burq**, Explosion pour l'équation de Schrödinger au régime du "log log"; **D. Huybrechts**, Projectivity of Kähler manifolds – Kodaira's problem; **C. Soulé**, Genres de Todd et valeurs aux entiers des dérivées de fonctions L; **J.-P. Wintenberger**, La conjecture de modularité de Serre : le cas de conducteur 1; *Mars 2006:* **G. Cornuéjols**, Le théorème fort des graphes parfaits; **A. Ducros**, Espaces analytiques p-adiques au sens de Berkovich; **E. Kowalski**, Écarts entre nombres premiers successifs; **N. Lerner**, The verification of the Nirenberg–Treves conjecture; **S. Vaes**, Rigidity results for Bernoulli actions and their von Neumann algebras; *Juin 2006:* **M. Christ**, Modulation invariant and multilinear singular integral operators; **C. Gruson**, Sur les représentations de dimension finie de la super algèbre de Lie $\mathfrak{gl}(m,n)$; **W. Messing**, Travaux de Zink; **I. Rodnianski**, The wave map problem. Small data critical regularity; **J.-C. Yoccoz**, Ensembles de Julia de mesure positive et disques de Siegel des polynômes quadratiques.

Astérisque, Number 311

June 2007, 401 pages, Softcover, ISBN: 978-2-85629-230-3, 2000 *Mathematics Subject Classification:* 11H55, 14D22, 14H10, 14H40, 14K10, 14M25, 35B30, 35B35, 35B65, 32J27, 14F35, 32J25, 14K22, 14G40, 11F11, 11F80, 05C17, 14G22, 14G20, 11N05, 11N13, 11N35, 11N36, 11P32, 35S05, 47G30, 46L35, 37A20, 46L10, 32B20, 42A20, 42B25, 17B10, 14M15, 20G05, 14F30, 14L05, 35L05, 35Q99, 37F50, **Individual member US$114**, List US$127, Order code AST/311



Théories Asymptotiques et Équations de Painlevé

Éric Delabaere and **Michèle Loday-Richaud**, *Université d'Angers, France*, Editors

The major part of this volume is devoted to the study of the sixth Painlevé equation through a variety of approaches, namely elliptic representation, the classification of algebraic solutions and so-called "dessins d'enfants" deformations, affine Weyl group symmetries and dynamics using the techniques of Riemann–Hilbert theory and those of algebraic geometry.

Discrete Painlevé equations and higher order equations, including the mKdV hierarchy and its Lax pair and a WKB analysis of perturbed Noumi–Yamada systems, are given a place of study, as well as theoretical settings in Galois theory for linear and non-linear differential equations, difference and q-difference equations with applications to Painlevé equations and to integrability or non-integrability of certain Hamiltonian systems.

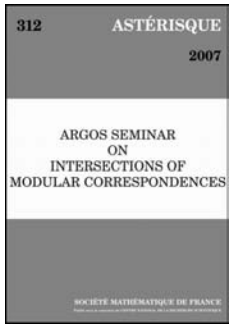
This item will also be of interest to those working in algebra and algebraic geometry.

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: P. Boalch, Six results on Painlevé VI; **P. A. Clarkson**, Special polynomials associated with rational and algebraic solutions of the Painlevé equations; **P. A. Clarkson**, **N. Joshi**, and **M. Mazzocco**, The Lax pair for the mKdV hierarchy; **R. Conte**, **M. Musette**, and **C. Verhoeven**, Painlevé property of the Hénon–Heiles Hamiltonians; **D. Guzzetti**, The elliptic representation of the sixth Painlevé equation; **M. Inaba**, **K. Iwasaki**, and **M.-H. Saito**, Dynamics of the sixth Painlevé equation; **K. Kajiwara**, **T. Masuda**, **M. Noumi**, **Y. Ohta**, and **Y. Yamada**, Point configurations, Cremona transformations and the elliptic difference Painlevé equation; **A. V. Kitaev**, Remarks toward a classification of $RS_4^2(3)$-transformations and algebraic solutions of the sixth Painlevé equation; **J. Morales-Ruiz**, A remark about the Painlevé transcendents; **A. Ramani**, **B. Grammaticos**, and **T. Tamizhmani**, On the alternate discrete Painlevé equations and related systems; **J. Sauloy**, Isomonodromy for complex linear q-difference equations; **Y. Takei**, On a local reduction of a higher order Painlevé equation and its underlying Lax pair near a simple turning point of the first kind; **H. Umemura**, Galois theory and Painlevé equations; **C. Zhang**, Solutions asymptotiques et méromorphes d'equations aux q-différences; Programme; Liste des participants.

Séminaires et Congrès, Number 14

July 2007, 363 pages, Softcover, ISBN: 978-2-85629-229-7, 2000 *Mathematics Subject Classification:* 12H05, 12H10, 13B05, 14D20, 17B65, 30E05, 30E99, 33D10, 33E17, 34M15, 34M55, 34M60, 37J30, 39A10, 39A13, 39A20, 39B22, 40G10, 58H05; 14E07, 14H52, 14N20, 32G34, 32S40, 33E17, 34E20, 34M35, 34M40, 34M55, 37J35, **Individual member US$99**, List US$110, Order code SECO/14



Argos Seminar on Intersections of Modular Correspondences

Ulrich Görtz, *Universität Bonn, Germany*, and **Michael Rapoport**, *Universität Bonn, Germany*, Editors

This volume contains the written account of the Bonn Seminar on Arithmetic Geometry 2003/2004. It gives a coherent exposition of the theory of intersections of modular correspondences. The focus of the seminar is the formula for the intersection number of arithmetic modular correspondences due to Gross and Keating. Other topics treated are Hurwitz's theorem on the intersection of modular correspondences over the field of complex numbers and the relation of the arithmetic intersection numbers to Fourier coefficients of Siegel–Eisenstein series.

Also included is background material on one-dimensional formal groups and their endomorphisms and on quadratic forms over the ring of p-adic integers.

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: G. Vogel, Modular polynomials; **U. Görtz**, A sum of representation numbers; **U. Görtz**, Arithmetic intersection numbers; **T. Wedhorn**, The genus of the endomorphisms of a supersingular elliptic curve; **V. Meusers**, Lubin–Tate formal groups; **E. Viehmann** and **K. Ziegler**, Formal moduli of formal $\mathcal{O}_K$-modules; **S. Wewers**, Canonical and quasi-canonical liftings; **V. Meusers**, Canonical and quasi-canonical liftings in the split case; **E. Viehmann**, Lifting endomorphisms of formal $\mathcal{O}_K$-modules; **I. Vollaard**, Endomorphisms of quasi-canonical lifts; **I. Bouw**, Invariants of ternary quadratic forms; **M. Rapoport**, Deformations of isogenies of formal groups; **S. Wewers**, An alternative approach using ideal bases; **T. Wedhorn**, Calculation of representation densities; **M. Rapoport** and **T. Wedhorn**, The connection to Eisenstein series; Index.

Astérisque, Number 312

June 2007, 210 pages, Softcover, ISBN: 978-2-85629-231-0, 2000 *Mathematics Subject Classification:* 11G18, 11E08, 11F03, 11F30, 11F32, 11G15, 14B12, 14G35, 14K07, 14K22, 14L05, **Individual member US$61**, List US$68, Order code AST/312

Director *of the* Cryptologic Research Institute

Applications are invited for the position of **Director of the Cryptologic Research Institute (CRI)**, a new research institute of the Communications Security Establishment (CSE) to be located in Ottawa, Ontario, Canada. The aim of the CRI is to bring together talented mathematicians from various disciplines to conduct fundamental research in areas of mathematics of interest to CSE.

The Director of the CRI will:

1. help recruit and then lead a team of about 25-50 academic and government staff;
2. provide a strong and innovative vision for the future growth of the CRI; and
3. liaise with other research organizations.

A successful candidate will have:

1. a proven ability to lead and inspire research groups;
2. a world renowned reputation in some aspect of mathematics, statistics, or data mining;
3. visibility within, and respect of, the mathematical community;
4. administrative experience at least equivalent to chairing a mathematical department; and
5. strong interpersonal skills.

The position is for a 3-year fixed term, running from September 2008 to September 2011, with some part time involvement from April 2008 to September 2008.

A detailed description of the Director position can be obtained by contacting Dr. Drew Vandeth at **Drew.Vandeth@cse-cst.gc.ca**.

Applicants must have Canadian, British, or American citizenship and be able to obtain a security clearance.

Please communicate interest in this position to Drew.Vandeth@cse-cst.gc.ca. Applications will receive fullest consideration if received by December 1st, 2007 and applications will remain open until the position is filled. The Communications Security Establishment subscribes to employment equity.

Directeur(trice) *de* l'Institut de recherche cryptologique

Nous acceptons les candidatures pour le poste de **directeur ou directrice de l'Institut de recherche cryptologique (IRC)**, le nouvel institut de recherche du Centre de la sécurité des télécommunications (CST) qui ouvrira ses portes à Ottawa, en Ontario (Canada). L'IRC a pour objectif de rassembler des mathématiciens de talent de diverses spécialités qui effectueront de la recherche fondamentale en mathématiques dans des domaines d'intérêt pour le CST.

Le directeur ou la directrice de l'IRC aura les tâches suivantes :

1. aider à recruter environ 25-50 universitaires ou employés du gouvernement, puis diriger cette équipe;
2. offrir une vision neuve et solide pour assurer la croissance de l'IRC dans l'avenir;
3. assurer la liaison avec d'autres organismes de recherche.

Le candidat ou la candidate idéal(e) aura les qualités suivantes :

1. capacité indiscutable de diriger et d'inspirer les groupes de recherche;
2. renommée internationale dans le domaine des mathématiques, des statistiques ou de l'exploration de données;
3. présence au sein de la communauté mathématique et respect de cette communauté;
4. expérience administrative équivalant au minimum à la direction d'un département de mathématiques;
5. grandes aptitudes interpersonnelles.

Ce poste est à durée déterminée pour trois ans ferme, allant de septembre 2008 à septembre 2011. Le candidat ou la candidate retenu(e) devra également commencer à temps partiel entre avril et septembre 2008.

Vous pouvez vous procurer une description plus détaillée de ce poste auprès de Drew Vandeth, Ph. D. à l'adresse suivante : **Drew.Vandeth@cse-cst.gc.ca**.

Les candidats et candidates doivent avoir la citoyenneté canadienne, britannique ou américaine et être admissible à une habilitation de sécurité.

Veuillez nous faire part de votre intérêt pour ce poste à l'adresse suivante : Drew.Vandeth@cse-cst.gc.ca. Les candidatures reçues avant le 1er décembre 2007 feront l'objet d'un examen approfondi. Le concours sera ouvert jusqu'à ce que le poste soit doté. Le Centre de la sécurité des télécommunications souscrit au principe d'équité en matière d'emploi.

Classified Advertisements

Positions available, items for sale, services available, and more

CALIFORNIA

CALIFORNIA INSTITUTE OF TECHNOLOGY
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. You may also apply online at `mathjobs.org`.

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CALIFORNIA INSTITUTE OF TECHNOLOGY
Harry Bateman Research Instructorships in Mathematics

Description: Appointments are for two years. The academic year runs from approximately October 1 to June 1. Instructors are expected to teach one course per quarter for the full academic year and to devote the rest of their time to research. During the summer months there are no duties except research.

Eligibility: Open to persons who have recently received their doctorates in mathematics.

Application information: Please apply online at `mathjobs.org`. To avoid duplication of paperwork, your application may also be considered for an Olga Taussky and John Todd Instructorship.

Caltech is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.

000079

CALIFORNIA INSTITUTE OF TECHNOLOGY
Scott Russell Johnson Senior Postdoctoral Scholar in Mathematics

Description: There are three terms in the Caltech academic year. The fellow is expected to teach one course in two terms each year, and is expected to be in residence even during terms when not teaching. The initial appointment is for three years with an additional three-year terminal extension expected.

Eligibility: Offered to a candidate within six years of having received the Ph.D. who shows strong research promise in one of the areas in which Caltech's mathematics faculty is currently active.

Deadline: January 1, 2007.

Application information: Please apply online at `mathjobs.org`. To avoid duplication of paperwork, your application may also be considered for an Olga Taussky and John Todd Instructorship and a Harry Bateman Research Instructorship.

Caltech is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.

000080

CALIFORNIA INSTITUTE OF TECHNOLOGY
Olga Taussky and John Todd Instructorships in Mathematics

Description: Appointments are for three years. There are three terms in the Caltech academic year, and instructors are expected to teach one course in all but two terms of the total appointment. These two terms will be devoted to research. During the summer months there are no duties except research.

Eligibility: Offered to persons within three years of having received the Ph.D. who show strong research promise in one of the areas in which Caltech's mathematics faculty is currently active.

Deadline: January 1, 2008.

Application information: Please apply online at `mathjobs.org`. To avoid duplication of paperwork, your application may also be considered for a Harry Bateman Research Instructorship.

Caltech is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.

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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 2007 rate is $110 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.

Upcoming deadlines for classified advertising are as follows: December 2007 issue–October 1, 2007; January 2008 issue–October 26, 2007; February 2008 issue–November 28, 2007; March 2008–December 28, 2007; April 2008 issue–January 28, 2008; May 2008–Feb. 28, 2008.

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 20904. Advertisers will be billed upon publication.

SAN DIEGO STATE UNIVERSITY
Department of Mathematics and Statistics

The Department of Mathematics and Statistics invites applications for a tenure-track assistant professor position in applied mathematics, beginning in fall 2008. Preference may be given to candidates in research areas that include but are not limited to dynamical systems, nonlinear waves, communication systems, climate dynamics, asymptotics, and linear algebra. Candidates must have a Ph.D. in mathematics or a closely related field, and demonstrate excellent teaching skills and outstanding research potential. The successful candidate will have the opportunity to participate in our joint Ph.D. program in computational science, as well as in our MA and MS programs in pure and applied mathematics. Salary will be competitive.

Applications should include a cover letter, curriculum vita, a description of research program, a statement of teaching philosophy, and three letters of recommendation. Send to: Antonio Palacios, Applied Mathematics Search Committee Chair, Department of Mathematics and Statistics, San Diego State University, San Diego, CA 92182-7720. Applications received by January 18, 2008, will be given full consideration.

SDSU is a Title IX, Equal Opportunity Employer and does not discriminate against individuals on the basis of race, religion, national origin, sexual orientation, gender, marital staus, age, disability, or veteran status, including veterans of the Vietnam era.

000127

UNIVERSITY OF CALIFORNIA AT BERKELEY
Department of Mathematics Tenured or Tenure-Track Positions

Pending budget approval, we invite applications for three positions effective July 1, 2008, at either the tenure-track (assistant professor) or tenured (associate or full professor) level, in pure or applied mathematics.

Tenure-track applicants are expected to have demonstrated outstanding research potential, normally including major contributions beyond the doctoral dissertation. Such applicants should send a resume, and reprint or 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. It is the responsibility of the tenure-track applicants to make sure that letters of evaluation are sent. All letters of evaluation are subject to Berkeley campus policies on confidentiality of letters of evaluation, a summary of which can be found at http://math.berkeley.edu/employment_academic.html.

Tenure applicants are expected to demonstrate leadership in research and should send a curriculum vitae, list of publications, a few selected reprints or preprints, and the names and addresses of three references to The Vice Chair for Faculty Affairs at the above address. Applicants should indicate whether they are applying for an associate professor or a full professor position. The department will assume responsibility to solicit letters of evaluation and will provide evaluators with a copy of the summary of policies on confidentiality of letters of evaluation.

All applicants are requested to use the AMS standardized application form and to indicate their subject area using the AMS subject classification numbers. The form is the Academic Employment in Mathematics, Application Cover Sheet. It is available courtesy of the American Mathematical Society.

Applications for both tenure-track and tenure applications must be postmarked by December 1, 2007. Applications postmarked after the deadline will not be considered. The University of California is an Equal Opportunity, Affirmative Action Employer.

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UNIVERSITY OF CALIFORNIA AT BERKELEY
Department of Mathematics Charles B. Morrey Jr. Assistant Professorships

We invite applications for these special (non-tenure-track) positions effective July 1, 2008. The terms of these appointments may range from two to three years. Applicants should have a recent Ph.D., or the equivalent, in an area of pure or applied mathematics. 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 at http://math.berkeley.edu/employment_academic.html. 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. It is available courtesy of the American Mathematical Society.

Applications must be postmarked by December 1, 2007. Applications postmarked after the deadline will not be considered. The University of California is an Equal Opportunity, Affirmative Action Employer.

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UNIVERSITY OF CALIFORNIA AT BERKELEY
Department of Mathematics Temporary Postdoctoral Positions

Several temporary positions beginning in Fall 2008 are anticipated for new and recent Ph.D.'s of any age, in any area of pure or applied mathematics. The terms of these appointments may range from one to three years. Applicants for NSF or other postdoctoral fellowships are encouraged to apply for these positions. Mathematicians whose research interests are close to those of regular department members will be given some preference. Applicants should send a resume and 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 at http://math.berkeley.edu/employment_academic.html. 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. It is available courtesy of the American Mathematical Society.

Applications must be postmarked by December 1, 2007. Applications postmarked after the deadline will not be considered. The University of California is an Equal Opportunity, Affirmative Action Employer.

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UNIVERSITY OF CALIFORNIA, DAVIS
POSTDOC POSITIONS IN MATHEMATICS
Department of Mathematics

The Department of Mathematics at the University of California, Davis, is soliciting applications for a few postdoctoral positions starting July 1, 2008. The areas of specialization are open. To be considered for the Arthur J. Krener Assistant Professor position, the department seeks applicants with excellent research potential in areas of faculty interest and effective teaching skills. Applicants are required to have completed their Ph.D. by the time of their appointment, but no earlier than July 1, 2004. The annual salary of this position is $50,900. The teaching load is three quarter-long courses. Arthur J. Krener appointments are renewable for a total of up to three years, assuming satisfactory performance in research and teaching. Applicants for the VIGRE Fellow position must be U.S. citizens, nationals, or permanent residents and have received their Ph.D. no earlier than January 1, 2006. Applicants in all research areas are encouraged to apply. The current annual salary for VIGRE Fellows is $56,956. The teaching load is three quarter-long courses. VIGRE Fellow

appointments are renewable for a total of up to three years, assuming satisfactory performance in research and teaching. Additional information about the department may be found at http://math.ucdavis.edu/. Our postal address is Department of Mathematics, University of California, One Shields Avenue, Davis, CA 95616-8633. Applications will be accepted until the positions are filled. To guarantee full consideration, the application should be received by November 30, 2007. To apply: submit the AMS Cover Sheet and supporting documentation electronically through http://www.mathjobs.org/. UC Davis is an Affirmative Action/Equal Employment Opportunity Employer and is dedicated to recruiting a diverse faculty community. We welcome all qualified applicants to apply, including women, minorities, individuals with disabilities and veterans.

000128

UNIVERSITY OF CALIFORNIA, DAVIS
FACULTY POSITIONS IN MATHEMATICS
Department of Mathematics

The Department of Mathematics at the University of California, Davis, is soliciting applications for three tenure-track assistant professor positions starting July 1, 2008. The department has identified the following priority areas: mathematical physics, optimization, mathematical finance, and probability, but outstanding candidates in all areas of mathematics may be considered. Minimum qualifications for these positions include a Ph.D. degree or its equivalent in the mathematical sciences and great promise in research and teaching. Duties include mathematical research, undergraduate and graduate teaching, and departmental and university service. Additional information about the department may be found at http://math.ucdavis.edu/. Our postal address is Department of Mathematics, University of California, One Shields Avenue, Davis, CA 95616-8633. Applications will be accepted until the positions are filled. To guarantee full consideration, the application should be received by November 30, 2007. To apply: submit the AMS Cover Sheet and supporting documentation electronically through http://www.mathjobs.org/. UC Davis is an Affirmative Action Equal Employment Opportunity Employer and is dedicated to recruiting a diverse faculty community. We welcome all qualified applicants to apply, including women, minorities, individuals with disabilities and veterans.

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UNIVERSITY OF CALIFORNIA,
LOS ANGELES
Department of Mathematics
2008-2009 Faculty Positions

The Mathematics Department is in a period of increased hiring of tenured and tenure-track faculty. Subject to administrative approval, we expect to make several regular appointments in a wide range of possible fields. We will also be making temporary and visiting appointments beginning in the academic year 2008-09 in the following categories:

(1) Tenure-Track/Tenured Faculty Position.

(2) E. R. Hedrick Assistant Professorships. Salary is $55,400. Appointments are for three years. The teaching load is four quarter courses per year.

(3) Research Assistant Professorships in Computational and Applied Mathematics (CAM). The salary is $55,400, and appointments are for three years. The teaching load is normally reduced to two or three quarter courses per year by research funding as available.

(4) Assistant Adjunct Professorships in the Program in Computing (PIC). Applicants for these positions must show very strong promise in teaching and research in an area related to computing. The teaching load is four one-quarter programming courses each year and one seminar every two years. Initial appointments are for one year and possibly longer, up to a maximum service of four years. The salary is $59,100.

(5) Assistant Adjunct Professorships and Research Postdocs. Normally appointments are for one year, with the possibility of renewal. Strong research and teaching background required. The salary range is $50,900-$55,400. Teaching load for adjuncts is five quarter courses per year.

If you wish to be considered for any of these positions you must submit an application via http://www.mathjobs.org. Submit the AMS Cover Sheet and supporting documentation electronically.

For fullest consideration, an application must be submitted on or before December 12, 2007. Ph.D. is required for all positions.

The University of California asks that applicants complete the Equal Opportunity Employer survey for Letters and Science at the following URL: http://cis.ucla.edu/facultysurvey/.

Under Federal law, the University of California may employ only individuals who are legally authorized to work in the United States as established by providing documents specified in the Immigration Reform and Control Act of 1986.

UCLA is an Equal Opportunity/Affirmative Action Employer.

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UNIVERSITY OF CALIFORNIA,
SAN DIEGO
Department of Mathematics

The Department of Mathematics at the University of California, San Diego, is seeking outstanding candidates to fill approximately 6 tenure-track/tenured positions to start July 2008. The level for the large majority of these positions is at the assistant professor level, however, one or two positions are available for distinguished mathematicians with exceptional research records of the highest caliber.

Applicants for all positions must possess a Ph.D. and should have outstanding accomplishments in both research and teaching. We encourage applications from any area of pure mathematics, applied mathematics, or statistics. Level of appointment will be based on qualifications with appropriate salary per UC pay scales. To receive full consideration, applications should be submitted online through http://www.mathjobs.org/ by November 1, 2007. For further instructions and information, see http://www.math.ucsd.edu/about/employment/faculty.

In compliance with the Immigration Reform and Control Act of 1986, individuals offered employment by the University of California will be required to show documentation to prove identity and authorization to work in the United States before hiring can occur. UCSD is an Equal Opportunity/Affirmative Action Employer with a strong institutional commitment to the achievement of diversity among its faculty and staff.

All applications should include the following items: 3 reference letters (writers should upload their reference letters to: mathjobs.org or send them under separate cover; at least one letter should address teaching experience in some depth), cover letter, curriculum vitae, publications list, research statement, teaching statement, and optionally a statement about contributions to diversity.

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UNIVERSITY OF CALIFORNIA,
SANTA CRUZ
Mathematics Department

The Mathematics Department at the University of California, Santa Cruz, solicits applications for two tenure-track (assistant professor) positions in the areas of low dimensional topology or algebraic geometry, pending administrative approval. Duties include mathematical research, undergraduate and graduate teaching and departmental and university service. The standard teaching load is four one-quarter courses per year. The department invites applications from all qualified mathematicians. Colleagues who can contribute to the diversity and excellence of the academic community through their research, teaching, service

and/or leadership are particularly encouraged to apply. Rank & Salary: assistant professor (9 month basis, step and salary commensurate with qualifications and experience). Minimum Qualifications: Ph.D. or equivalent in mathematics; demonstrated achievements or potential for excellence in research, teaching, professional service and leadership. Position Available: July 1, 2008. Closing Date: Positions are open until filled. Screening will begin with applications postmarked by November 15, 2007. To ensure full consideration, applications and letters of recommendation must arrive by the initial screening date. Applicants must submit hard copies of the AMS Cover Sheet, a curriculum vitae, a research statement, a teaching statement, and four letters of recommendation (at least one letter must address teaching experience and ability). (Letters of recommendation will be treated as confidential documents). Please direct your letter writers to the UCSC Confidentiality Statement at: http://ahr.ucsc.edu/academic_policies_and_procedures/cappm/confstm.htm.

All applications should be sent to: Faculty Recruitment Committee, Mathematics Department, University of California, 1156 High Street, Santa Cruz, CA 95064. Please refer to position #839-08 in your reply. Inquiries [not applications] can be sent to mathrcr@ucsc.edu. UCSC is an EEO/AA employer. See http://www.math.ucsc.edu/about/jobs.html for a complete job description.

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CONNECTICUT

FAIRFIELD UNIVERSITY
Department of Mathematics

The Department of Mathematics and Computer Science at Fairfield University invites applications for three tenure-track assistant professorships, to begin in September 2008. A doctorate in mathematics is required. A solid commitment to teaching, and strong evidence of research potential, are essential. We are looking for (1) one person who will be expected to conduct research with undergraduate students and (2) two people who will be expected to teach some courses in our graduate program. Graduate courses include, but are not limited to, year-long sequences in abstract and linear algebra, applied mathematics, financial mathematics, real and complex analysis, and probability and statistics. In addition, the successful candidates will share a willingness to participate in the university's core curriculum, which includes two semesters of mathematics for all undergraduates.

Fairfield University, the Jesuit University of Southern New England, is a comprehensive university with about 3,200 undergraduates and a strong emphasis on liberal arts education. The department offers a BS and an MS in mathematics. The MS program is an evening program and attracts students from various walks of life—secondary school teachers, eventual Ph.D. candidates, and people working in industry, among others. The teaching load is 3 courses/9 credit hours per semester and consists predominantly of courses at the undergraduate level.

Fairfield offers competitive salaries and compensation 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/mathhire. 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. Please indicate in your cover letter the position for which you are applying. Full consideration will be given to complete applications received by January 15, 2008. We will be interviewing at the Joint Mathematics Meetings in San Diego, January 6-9. Please let us know if you will be attending.

000135

YALE UNIVERSITY
J. Willard Gibbs
Assistant Professorships
in Mathematics 2008-09

The Gibbs Assistant Professorships are intended primarily for men and women who received the Ph.D. degree and show definite promise in research in pure or applied mathematics. Appointments are for three years. The salary will be at least $65,000. Each recipient of a Gibbs Assistant Professorship will be given a moving allowance based on the distance to be moved.

The teaching load for Gibbs Assistant Professors will be kept light, so as to allow ample time for research. This will consist of three one-semester courses per year. Part of the duties may consist of a one-semester course at the graduate level in the general area of the instructor's research. Inquiries and applications should be addressed to: gibbs.committee@math.yale.edu or:

The Gibbs Committee
Department of Mathematics
Yale University
P.O. Box 208283
New Haven, Connecticut 06520-8283

Applications and supporting material must be received by January 1, 2008. Offers expected to be made in early February.

Yale University is an Affirmative Action/Equal Opportunity Employer. Applications from women and underrepresented minority scholars are especially encouraged.

000101

GEORGIA

GEORGIA INSTITUTE OF TECHNOLOGY
School of Mathematics

The School of Mathematics at Georgia Tech is now in the fourth year of an ambitious faculty recruitment program—one which will be sustained over a five-year period. During the first three years, ten appointments were made, including four tenured appointments, two at the full professor level and two at the associate professor level. Building on past successes, this recruiting effort is intended to make rapid advances in the scope and quality of our research and graduate education programs. Candidates will be considered at all ranks, with priority given to those candidates who (1) bring exceptional quality research credentials to Georgia Tech; (2) complement existing strengths in the School of Mathematics; (3) reinforce bridges to programs in engineering and the physical, computing and life sciences; (4) have strong potential for external funding; and (5) have a demonstrated commitment to high quality teaching at both the undergraduate and graduate levels. Consistent with these priorities, candidates will be considered in all areas of pure and applied mathematics and statistics. Candidates should arrange for a resume, at least three letters of reference, and a summary of future research plans to be sent to the Hiring Committee, School of Mathematics, Georgia Institute of Technology, Atlanta, GA, 30332-0160, USA. Candidates for associate and full professor positions should also submit a statement outlining their vision for service as a senior faculty member at Georgia Tech. Review of applications will begin in September 2007, and the roster of candidates being considered will be updated on a monthly basis. Georgia Tech, an institution of the University System of Georgia, is an Equal Opportunity/Affirmative Action Employer.

000102

ILLINOIS

NORTHWESTERN UNIVERSITY
Department of Mathematics
2033 Sheridan Road
Evanston, Illinois 60208-2730
Boas Assistant Professor

Applications are solicited for up to three Ralph Boas assistant professorships of three years each starting September 2008. These are non-tenure-track positions with a teaching load of four quarter courses per

year. We invite applications from qualified mathematicians in all fields.

Applications should be made electronically at http://www.mathjobs.org and should include (1) the American Mathematical 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. Inquiries may be sent to: boas@math.northwestern.edu.

Applications are welcomed at any time, but the review process starts December 1, 2007. Northwestern University is an Affirmative Action, Equal Opportunity Employer committed to fostering a diverse faculty; women and minority candidates are especially encouraged to apply.

000065

NORTHWESTERN UNIVERSITY
Department of Mathematics
2033 Sheridan Road,
Evanston, Illinois 60208-2730

Applications are invited for anticipated tenured or tenure-track positions starting September 2008. Priority will be given to exceptionally promising research mathematicians. We invite applications from qualified mathematicians in all fields.

Applications should be made electronically at http://www.mathjobs.org and should include (1) the American Mathematical 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. Inquiries may be sent to: boas@math.northwestern.edu.

Applications are welcome at any time. Northwestern University is an Affirmative Action, Equal Opportunity Employer committed to fostering a diverse faculty; women and minority candidates are especially encouraged to apply.

000066

UNIVERSITY OF CHICAGO
Department of Mathematics

1. L.E. Dickson Instructor: This is open to mathematicians who have recently completed or will soon complete a doctorate in mathematics or a closely related field, and whose work shows remarkable promise in mathematical research and teaching. The appointment typically is for two years, with the possibility of renewal for a third year. The teaching obligation is up to four one-quarter courses per year. For applicants who are U.S. citizens or permanent residents, there is the possibility of reduced teaching and resources for summer support and travel from the department's VIGRE grant.

2. Assistant Professor: This is open to mathematicians who are further along in their careers, typically two or three years past the doctorate. These positions are intended for mathematicians whose work has been of outstandingly high caliber. Appointees are expected to have the potential to become leading figures in their fields. The appointment is generally for three years, with a teaching obligation of three one-quarter courses per year.

Applicants will be considered for any of the positions above which seem appropriate. Complete applications consist of (a) a cover letter, (b) a curriculum vitae, (c) three or more letters of reference, at least one of which addresses teaching ability, and (d) a description of previous research and plans for future mathematical research. Applicants are strongly encouraged to include information related to their teaching experience, such as a teaching statement or evaluations from courses previously taught, as well as an AMS cover sheet. If you have applied for an NSF Mathematical Sciences Postdoctoral Fellowship, please include that information in your application, and let us know how you plan to use it if awarded.

Applications must be submitted online through http://www.mathjobs.org. Questions may be directed to: apptsec@math.uchicago.edu. We will begin screening applications on December 3, 2007. Screening will continue until all available positions are filled. The University of Chicago is an Equal Opportunity/Affirmative Action Employer.

000055

INDIANA

UNIVERSITY OF NOTRE DAME
Department of Mathematics
Notre Dame NSF-SUMR
Instructorship in Mathematics

The Department of Mathematics of the University of Notre Dame invites applications from recent doctorates (since 2005) 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 considered. The position is for a term of three years beginning August 22, 2008; 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 applicants should provide evidence of prior experience mentoring undergraduates. the salary will be competitive with those of distinguished instructorships at other AMS Group I universities, and the position includes $10,000 per year of summer research 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". Applications, including a curriculum vitae and a completed AMS standard cover sheet, should be filed through MathJobs (http://www.MathJobs.org). Applicants should also arrange for at least three letters of recommendation to be submitted through the MathJobs system. These letters should address the applicant's research accomplishments 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 December 1, 2007. Information about the department is available at http://math.nd.edu.

000100

UNIVERSITY OF NOTRE DAME
NOTRE DAME, IN 46556
Department of Mathematics

The Department of Mathematics of the University of Notre Dame invites applications from recent doctorates (since 2007) in mathematical logic for a postdoctoral position. Candidates in any area of mathematical logic compatible with the research interests of the logicians in the department will be considered. The position is contingent upon the availability of funding and, if funded, will extend for a term of three years beginning August 22, 2008. It is not renewable and is not tenure track; the teaching load is one course per semester. The salary will be competitive with those of distinguished instructorships at other AMS Group I universities, and the position includes summer research support for each of the first two summers and some discretionary funding each year. Applications, including a curriculum vitae and a completed AMS standard cover sheet, should be filed through MathJobs (http://www.MathJobs.org). Applicants should also arrange for at least three letters of recommendation to be submitted through the MathJobs system. These letters should address the applicant's research accomplishments 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 December 1, 2007. Information about the department is available at http://math.nd.edu.

000106

LOUISIANA

LOUISIANA STATE UNIVERSITY
Assistant/Associate/Full Professor (Tenured and/or Tenure-track/One or two positions)
Department of Mathematics/Center for Computation & Technology

The Department of Mathematics at Louisiana State University (LSU) in partnership with the Center for Computation & Technology (CCT) at LSU invites applications for anticipated assistant/associate/full professor (tenured and/or tenure-track) positions in scientific computing starting in the fall of 2008. These hires are part of a university-wide initiative to build an interdisciplinary cluster group in scientific computation. Faculty may be hired in mathematics, computer science, electrical and computer engineering, or potentially other departments. The standard teaching load for Math/CCT faculty is six hours per year or one class per semester. Required qualifications: Ph.D. or equivalent degree in mathematics or a related field. Additional qualifications desired: Excellent research record; interested in interdisciplinary research; strong commitment to teaching; ability to interact with the numerical PDE group in the department of mathematics headed by Susanne C. Brenner; ability to contribute to application areas of the CCT, (these areas include photonics, materials science, fluid dynamics, climate and ocean modeling, flow through porous media, astrophysics and relativity, structural engineering, electromagnetism, and computer science).

The CCT, http://www.cct.lsu.edu/, directed by physicist and computer scientist Edward Seidel, is an innovative and interdisciplinary research center for advancing computational sciences, technologies and the disciplines they touch. It is funded by the state of Louisiana with an annual budget of nine million dollars. Faculty members holding joint appointments at CCT are expected to have or develop their own high-profile, interdisciplinary research programs that complement existing CCT projects.

Salary and rank will be commensurate with qualifications and experience. An offer of employment is contingent on a satisfactory pre-employment background check. Application deadline is November 21, 2007, or until candidates are selected. Applications should include the AMS Standardized Application Form (indicating areas of specialty and level of position sought), and enclose a full resume (including email address), statements on research and teaching philosophy, and four or more letters of recommendation. Minorities and women are strongly encouraged to apply. Final selection is contingent on anticipated program funding. To apply, we request that applicants use the secure AMS online application system at http://www.mathjobs.org/jobs or you may write to:

Hiring Committee
Department of Mathematics
Louisiana State University
Ref: Log #1032
Baton Rouge, LA 70803
email: profjobs@math.lsu.edu

LSU is an Equal Opportunity/Equal Access Employer.

000131

LOUISIANA STATE UNIVERSITY
Postdoctoral Researcher (Mathematics/One or more positions)
Department of Mathematics/Center for Computation and Technology

The Department of Mathematics at Louisiana State University in partnership with the Center for Computation and Technology (CCT) invites applications for anticipated postdoctoral researcher (mathematics) positions. Positions are contingent on NSF VIGRE or other available funding. Applications are invited for a postdoctoral researcher in scientific computing/numerical analysis. The teaching duties are the equivalent of one course each semester. Required qualifications: Ph.D. or an equivalent degree in mathematics or a related area. Additional qualifications desired: Mathematical scientists, who have potential for research excellence; 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.

Application deadline is February 1, 2008, or until candidates are selected. An offer of employment is contingent on a satisfactory pre-employment background check. 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, or you may write to:

Hiring Committee
Department of Mathematics
Louisiana State University
Ref: Log #1034
Baton Rouge, LA 70803
email: profjobs@math.lsu.edu

LSU is an Equal Opportunity/Equal Access Employer.

000132

LOUISIANA STATE UNIVERSITY
Assistant/Associate Professor (One or more positions)
Department of Mathematics

Applications are invited for anticipated assistant or associate professor positions in the Department of Mathematics at Louisiana State University. The department will continue to expand its professorial faculty over the next several years. Applications are invited for positions in the areas of geometric analysis, geometry and topology, algebra, analysis, applied mathematics, and combinatorics.

Required qualifications: Ph.D. or an equivalent degree in mathematics; research excellence; commitment to graduate and undergraduate education. Salary and rank will be commensurate with qualifications and experience. Application deadline is November 21, 2007, or until candidates are selected. An offer of employment is contingent on a satisfactory pre-employment background check. Applications should include the AMS Standardized Application Form (indicating areas of specialty and level of position sought), a full resume (including email address), a statement on research and one 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, or you may write to:

Hiring Committee
Department of Mathematics
Louisiana State University
Ref: Log #1031
Baton Rouge, LA 70803
email: profjobs@math.lsu.edu

LSU is an Equal Opportunity/Equal Access Employer.

000133

LOUISIANA STATE UNIVERSITY
Postdoctoral Researcher (One or more positions)
Department of Mathematics

The Department of Mathematics at Louisiana State University invites applications for anticipated postdoctoral researcher positions in mathematics. Positions are contingent on NSF VIGRE or other available funding. Applications are invited for positions in the areas of geometric analysis, geometry and topology, algebra, analysis, applied mathematics, and com-

binatorics. The teaching duties are the equivalent of one course each semester.

Required qualifications: Ph.D. or an equivalent degree in mathematics. Additional qualifications desired: Mathematicians with potential for research excellence; commitment to graduate and undergraduate education. Application deadline is February 1, 2008, or 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 or you may write to:

Hiring Committee
Department of Mathematics
Louisiana State University
Ref: Log #1033
Baton Rouge, LA 70803
email: profjobs@math.lsu.edu

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000134

MARYLAND

JOHNS HOPKINS UNIVERSITY
Department of Mathematics

Subject to availability of resources and administrative approval, the Department of Mathematics solicits applications for two non-tenure-track J. J. Sylvester Assistant Professors for the 2008-2009 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 16, 2007, will be given priority. The Johns Hopkins University is an Affirmative Action/Equal Opportunity Employer. Minorities and women candidates are encouraged to apply.

000052

JOHNS HOPKINS UNIVERSITY
Department of Mathematics

Subject to availability of resources and administrative approval, the Department of Mathematics solicits applications for two tenure-track assistant professors for the 2008-2009 academic year. The assistant professorship is a three-year position. 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 16, 2007, will be given priority. The Johns Hopkins University is an Affirmative Action/Equal Opportunity Employer. Minorities and women candidates are encouraged to apply.

000053

MASSACHUSETTS

BOSTON COLLEGE
Department of Mathematics

The Department of Mathematics at Boston College invites applications for a postdoctoral position beginning September 2008. This position is intended for a new or recent Ph.D. with outstanding potential in research and excellent teaching. This is a 3-year visiting assistant professor position, and carries a 2-1 annual teaching load. Research interests should lie within geometry, topology, number theory, representation theory or cognate areas. Candidates should expect to receive their Ph.D. prior to the start of the position and have received the Ph.D. no earlier than spring 2007. Applications must include a cover letter, description of research plans, curriculum vitae, and four letters of recommendation, with one addressing the candidate's teaching qualifications. Applications received no later than January 1, 2008, will be assured our fullest consideration. Please submit all application materials through MathJobs.org. If necessary, printed materials may otherwise be sent to: Search Committee, Department of Mathematics, Boston College, Chestnut Hill, MA 02467-3806. Applicants may learn more about the department, its faculty, and its programs at http://www.bc.edu/math. Electronic inquiries concerning this position may be directed to math-search@bc.edu. Boston College is an Affirmative Action/Equal Opportunity Employer. Applications from women, minorities and individuals with disabilities are encouraged.

000120

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mathematics

The Mathematics Department at MIT is seeking to fill positions at the level of assistant professor or higher for September 2008. Appointments are based on exceptional research contributions in pure mathematics. Appointees will be expected to fulfill teaching duties and pursue their own research program. We request that applications and other materials, including (a) curriculum vitae, (b) research description, and (c) three letters of recommendation, be submitted online at: http://www.mathjobs.org. Applications should be complete by **December 1, 2007**, to receive full consideration. We request that your letters of reference be submitted by the reviewers online via mathjobs. We will also accept recommendations either as PDF attachments sent to: kimm@math.mit.edu, or as paper copies mailed to: Pure Mathematics Committee, Room 2-263, Department of Mathematics, MIT, 77 Massachusetts Ave., Cambridge, MA 02139-4307. Please do not mail or email duplicates of items already submitted via mathjobs.

MIT is an Equal Opportunity, Affirmative Action Employer.

000082

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mathematics
C. L. E. Moore Instructorships in Mathematics

These positions for September 2008 are open to mathematicians who show definite promise in research. Appointees will be expected to fulfill teaching duties and pursue their own research program. We request that applications and other materials, including (a) curriculum vitae, (b) research description, and (c) three letters of recommendation, be submitted online at: http://www.mathjobs.org. Applications should be complete by **December 1, 2007**, to receive full consideration. We request that your letters of reference be submitted by the reviewers online via mathjobs. We will also accept recommendations either as PDF attachments sent to: kimm@math.mit.edu, or as paper copies mailed to: Pure Mathematics Committee, Room 2-263, Department of Mathematics, MIT, 77 Massachusetts Ave., Cambridge, MA 02139-4307. Please do not mail or

email duplicates of items already submitted via mathjobs.

MIT is an Equal Opportunity, Affirmative Action Employer.

000083

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mathematics
Applied Mathematics

The applied mathematics group at MIT is seeking to fill combined teaching and research positions at the level of instructor, assistant professor or higher, beginning September 2008. Appointments are mainly based on exceptional 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 description, and (c) three letters of recommendation, be submitted online at: http://www.mathjobs.org, and preferably well in advance of our deadline of **January 1, 2008**, since we will begin our deliberations in December. We request that your letters of reference be submitted by the reviewers online via mathjobs. We will also accept recommendations either as PDF attachments sent to: applied@math.mit.edu, or as paper copies mailed to: Applied Mathematics Committee, Room 2-345, Department of Mathematics, MIT, 77 Massachusetts Ave., Cambridge, MA 02139-4307. Please do not mail or email duplicates of items already submitted via mathjobs.

MIT is an Equal Opportunity, Affirmative Action Employer.

000084

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mathematics: Statistics

The Department of Mathematics at MIT is seeking to fill combined teaching and research positions at the level of instructor, assistant professor, or higher in STATISTICS or APPLIED PROBABILITY beginning September 2008. Appointments are mainly based on exceptional research qualifications. We request that applications and other materials, including (a) curriculum vitae, (b) research description, and (c) three letters of recommendations, be submitted online at: http://www.mathjobs.org. Applications should be complete by **January 1, 2008**, to receive full consideration. We request that your letters of reference be submitted by the reviewers online via mathjobs. We will also accept recommendations either as PDF attachments sent to: kimm@math.mit.edu, or as paper copies mailed to: Committee on Statistics, Room 2-263, Department of Mathematics, MIT, 77 Massachusetts Ave., Cambridge, MA 02139-4307. Please do not mail or email duplicates of items already submitted via mathjobs.

MIT is an Equal Opportunity, Affirmative Action Employer.

000085

WILLIAMS COLLEGE
Department of Mathematics

The Williams College Department of Mathematics and Statistics invites applications for one tenure-track position in mathematics, beginning fall 2008, at the rank of assistant professor (in an exceptional case, a more advanced appointment may be considered). We are seeking a highly qualified candidate who has demonstrated excellence in teaching and research, and who will have a Ph.D. by the time of appointment.

Williams College is a private, residential, highly selective liberal arts college with an undergraduate enrollment of approximately 2,000 students. The teaching load is two courses per 12-week semester and a winter term course every other January. In addition to excellence in teaching, an active and successful research program is expected.

To apply, please send a vita and have three letters of recommendation on teaching and research sent to the Hiring Committee, Department of Mathematics and Statistics, Williams College, Williamstown, MA 01267. Teaching and research statements are also welcome. Evaluation of applications will begin on or after November 15 and will continue until the position is filled. Williams College is dedicated to providing a welcoming intellectual environment for all of its faculty, staff, and students; as an EEO/AA employer, Williams especially encourages applications from women and minorities. For more information on the Department of Mathematics and Statistics, visit http://www.williams.edu/Mathematics.

000124

MICHIGAN

MICHIGAN TECHNOLOGICAL UNIVERSITY
Department of Mathematical Sciences
Tenure-track Faculty Position in Statistics and Probabiiity

Applications are invited for one or more tenure-track positions in statistics and probability. Areas of particular interest are statistical genetics, biostatistics, survival analysis, computational statistics, and applied probability. Appointment is anticipated at the rank of assistant professor, although highly qualified candidates may be considered for appointment at the rank of associate professor. The Department of Mathematical Sciences has 7 statistics faculty (35 faculty total) and offers BS, MS and Ph.D. programs in statistics. Faculty are expected to develop and maintain strong research programs, direct graduate students in their thesis research, seek external funding, and be dedicated to excellence in teaching and education. Teaching loads are very competitive. The position starts 18 August 2008, 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 December 1, 2007, and continue until the position is filled. Qualified individuals should submit a letter of application, a curriculum vitae, a description of proposed research program, a statement of teaching interests, and arrange to have at least three letters of recommendation sent to: Search Committee, Statistics and Probability Position, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295 or to mathdept@mtu.edu (electronic submissions in PDF format are encouraged). Michigan Technological University is an Equal Opportunity Educational Institution/Equal Opportunity Employer/Affirmative Action Employer.

000144

MICHIGAN TECHNOLOGICAL UNIVERSITY
Department of Mathematical Sciences
Tenure-track Faculty Position in Computational Mathematics

Applications are invited for one or more tenure-track positions in the area of computational mathematics. Of particular interest are candidates with experience in multiscale modeling and simulation and/or stochastic PDEs, although applications in all areas of computational mathematics will be considered. Individuals with strong interdisciplinary research interests and applications to biology, materials science, fluid mechanics, and/or financial mathematics are encouraged to apply. Appointment is anticipated at the rank of assistant professor, although highly

qualified candidates may be considered for appointment at the rank of associate professor. The Department of Mathematical Sciences has 35 faculty members and offers BS, MS and Ph.D. programs in applied mathematics, statistics and discrete mathematics. Faculty are expected to develop and maintain strong research programs, direct graduate students in their thesis research, seek external funding, and be dedicated to excellence in teaching and education. The position starts 18 August 2008, and candidates must complete all requirements for the Ph.D. in mathematics, applied mathematics, or a related field by that date. Review of applications will begin 1 January 2008 and continue until the position is filled. Qualified individuals should submit a letter of application, a curriculum vitae, a description of proposed research program, a statement of teaching interests, and arrange to have at least three letters of recommendation sent to: Search Committee, Computational Mathematics Position, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295 or mathdept@mtu.edu (electronic submissions in PDF format are encouraged). Michigan Technological University is an Equal Opportunity Educational Institutional/Equal Opportunity Employer/Affirmative Action Employer.

000145

MINNESOTA

UNIVERSITY OF MINNESOTA
Dunham Jackson Assistant Professor

This is a three-year appointment from fall semester 2008, through spring semester 2011, 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, 2008. Salary is competitive. For full consideration, applications and all supporting materials must be submitted electronically through: http://www.mathjobs.org by December 1, 2007. Applications received after the deadline will be considered as positions remain. No paper submission is needed unless the candidate is unable to submit electronically. In which case letters may be sent 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, 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 149251. 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.

000071

UNIVERSITY OF MINNESOTA
School of Mathematics

The School of Mathematics of the University of Minnesota is seeking outstanding candidates for 2-3 tenured or tenure-track faculty positions starting fall semester 2008. Particular attention will be given to applicants at the assistant or associate professor level with strong interests in geometry, probability, and scientific computation. Candidates should have a Ph.D. or equivalent degree in mathematics or a closely related field and excellent records in both research and teaching.

For full consideration, applications and all supporting materials must be submitted electronically through: http://www.mathjobs.org by December 1, 2007. Applications received after the deadline will be considered as positions remain. No paper submission is needed unless the candidate is unable to submit electronically. In which case letters should be sent 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, one of which should address teaching ability, description of research and a teaching statement. Reference letter writers should be asked to submit their letters on line 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 149255. 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.

000072

UNIVERSITY OF MINNESOTA
School of Mathematics

The School of Mathematics of the University of Minnesota in conjunction with the Institute for Mathematics and its Applications (IMA) seeks an outstanding mathematical scientist with a record of interdisciplinary research for a faculty position, anticipated to be at the tenure or tenure-track level depending on qualifications. The IMA is a partnership of the National Science Foundation, the University of Minnesota, and a consortium of affiliated institutions. Since its founding in 1982, the IMA has established itself as a leading research institute for mathematics and its applications, and the successful candidate will enjoy the benefits of its extraordinary scientific environment. In addition to faculty duties in the School of Mathematics, the successful candidate will support the activities of the IMA through mentorship, program participation and planning, and interaction with visitors, and have teaching load set accordingly.

Candidates should have a Ph.D. or equivalent terminal degree in mathematics or closely related field and excellent records in both research and teaching. For full consideration, applications and all supporting materials should be submitted electronically through the AMS mathjobs website at http://www.mathjobs.org by December 1, 2007. Applications will be reviewed from that date and continue until the position is filled. 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, 127 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455. Applicants must include the following: Cover letter, curriculum vitae,

at least 4 letters of recommendation, one of which should address teaching ability, and description of research. 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 Postings". Enter the Requisition Number 149253. 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 materials to this site.

The University of Minnesota is an Equal Opportunity Employer and Educator

000073

NEW HAMPSHIRE

DARTMOUTH COLLEGE
John Wesley Young Research Instructorship

The John Wesley Young Instructorship is a postdoctoral, two- to three-year appointment intended for promising Ph.D. graduates with strong interests in both research and teaching and whose research interests overlap a department member's. Current research areas include applied mathematics, combinatorics, geometry, logic, non-commutative geometry, number theory, operator algebras, probability, set theory, and topology. Instructors teach four ten-week courses distributed over three terms, though one of these terms in residence may be free of teaching. The assignments normally include introductory, advanced undergraduate, and graduate courses. Instructors usually teach at least one course in their own specialty. This appointment is for 26 months with a monthly salary of $4,667 and a possible 12 month renewal. Salary includes two-month research stipend for instructors in residence during two of the three summer months. To be eligible for a 2008–2011 instuctorship, candidate must be able to complete all requirements for the Ph.D. degree before September 2008. Applications may be obtained at http://www.math.dartmouth.edu/recruiting/ or http://www.mathjobs.org—Position ID: 237-JWY. General inquiries can be directed to Annette Luce, Department of Mathematics, Dartmouth College, 6188 Kemeny Hall, Hanover, New Hampshire 03755-3551. At least one referee should comment on applicant's teaching ability; at least two referees should write about applicant's research ability. Applications received by January 5, 2008, receive first consideration; applications will be accepted until position is filled. Dartmouth College is committed to diversity and strongly encourages applications from women and minorities.

000142

NEW JERSEY

INSTITUTE FOR ADVANCED STUDY, SCHOOL OF MATHEMATICS
Department of Mathematics

The School of Mathematics has a limited number of memberships, some with financial support for research in mathematics and computer science at the Institute during the 2008-09 academic year. Candidates must have given evidence of ability in research comparable at least with that expected for the Ph.D. degree.

During the 2008-09 year, Alice Chang of Princeton University will lead a special program on geometric partial differential equations. The emphasis will be on nonlinear partial differential equations with applications to problems in differential, conformal and convex geometry. Topics covered will include Yamabe type equations, Q-curvature equations, fully non-linear equations in conformal and convex geometry, construction of conformal invariants and operators, problems in conformally compact Einstein manifolds, measure and probability theory approaches to the Ricci Tensor. Partial differential equations continue to be one of the central tools for studying geometric and even topological questions, and one goal of this program will be to bring researchers in geometry and PDE together to study problems of common interest in areas such as those mentioned above.

Recently the school has established the von Neumann Early Career Fellowships. Six of these fellowships will be available for the 2008-09 academic year. To be eligible for the von Neumann Fellowships, applicants should be at least 5 years following the receipt of their Ph.D. but not yet eligible to receive their first paid sabbatical.

The Veblen Research Instructorship is a three-year position which the School of Mathematics and the Department of Mathematics at Princeton University established in 1998. Three-year instructorships will be offered each year to candidates in pure and applied mathematics who have received their Ph.D. within the last three years. The first and third year of the instructorship will be spent at Princeton University and will carry regular teaching responsibilities. The second year will be spent at the Institute and dedicated to independent research of the instructor's choice.

Application materials may be requested from Applications, School of Mathematics, Institute for Advanced Study, Einstein Drive, Princeton, NJ 08540; email: applications@math.ias.edu. Application forms may be downloaded via a Web connection to http://www.math.ias.edu. Application deadline is December 1.

The Institute for Advanced Study is committed to diversity and strongly encourages applications from women and minorities.

000068

PRINCETON CONSULTANTS
New York, New Jersey

If you are looking for a career environment that is dedicated to the highest quality in software development and the best in high-end strategy, process, and organizational consulting, you may be looking for Princeton Consultants.

Princeton Consultants is a premier consulting firm with offices in New York City and Princeton, New Jersey. We provide a blend of information technology and management consulting for many world-class companies in the insurance/financial services, transportation/logistics, and pharmaceutical/healthcare areas. Please visit our website at http://www.Princeton.com.

We are seeking candidates who:

∗ Are recent graduates with distinction from top academic institutions.

∗ Have strong experience with software development (Java, C++, C#, ASP, .NET).

∗ Have excellent interpersonal and communication skills.

∗ Have an interest in understanding and optimizing businesses—strategy, processes, organization, and technology.

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Jim Weitzul. Ph.D.
Director of Recruiting
email: Jweitzul@princeton.com

Princeton Consultants is proud to be an Equal Opportunity Employer.

000123

NEW YORK

CLARKSON UNIVERSITY
Division of Mathematics and Computer Science

The Division of Mathematics and Computer Science (www.clarkson.edu/mcs) invites applications for two tenure-track positions in applied mathematics starting in August 2008. One position will be filled

at the associate or full professor level, the other is expected to be filled at the assistant professor level.

We are especially interested in candidates with expertise in computational areas of applied mathematics, including statistics, or dynamical systems, but all areas of applied mathematics will be considered. Responsibilities will include teaching undergraduate and graduate level mathematics courses, and directing graduate students. For the assistant professor level, minimum requirements 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. For the senior position, research, including a record of funding, and teaching records commensurate with such an appointment will be required.

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/EOE Employer. (Pos. # 13-07, senior, Pos. # 14-07, junior)

000122

THE COURANT INSTITUTE
Department of Mathematics

The Courant Institute Department of Mathematics anticipates having a small number of faculty positions in mathematics to begin in September 2008. Appointments may be made at either a junior or senior level. These positions will be in a range of areas in computational, applied and pure mathematics; two particular areas of interest are computational statistics and atmosphere ocean science. Some may be multidisciplinary appointments that are joint with a science department from the Faculty of Arts and Sciences. Applications and supporting documents should be received by January 4th, 2008. For more information please visit http://www.math.nyu.edu/jobs/.

The Courant Institute/New York University is an Equal Opportunity/Affirmative Action Employer.

000109

THE COURANT INSTITUTE
Department of Mathematics

The Courant Institute is a center for advanced training and research in the mathematical sciences. It has long been an international leader in mathematical analysis, differential geometry, probability theory, applied mathematics, and scientific computation, with special emphasis on partial differential equations and their applications. Its scientific activities include an extensive array of research seminars and advanced graduate courses.

Each year a limited number of Courant Institute Instructorships in the Department of Mathematics are awarded to postdoctoral scientists. These appointments carry a light teaching load of one course per semester and ordinarily are for a three-year term. These positions are primarily for recent Ph.D.'s, and candidates must have a degree in mathematics or some affiliated field.

For more information please visit: http://www.math.nyu.edu/visiting_faculty. Applications and supporting documents are due by December 15th, 2007, for appointments to begin the following academic year.

The Courant Institute at New York University is an Equal Opportunity/Affirmative Action Employer.

000110

UNIVERSITY AT BUFFALO
SUNY
Department of Mathematics

The Department of Mathematics anticipates the appointment of several tenure-track assistant professors, effective August 2008. Salary will be competitive. We seek candidates in the field of applied mathematics, particularly with an interest in scientific computing, modeling and simulation, applied probability and stochastic processes. Applicants should have excellent research accomplishments and potential, a Ph.D. in the mathematical sciences and a strong commitment to teaching.

A complete application consists of: electronic application, a curriculum vitae and a statement of research interests. These materials can be electronically submitted through the following link: https://www.ubjobs.buffalo.edu/applicants/jsp/shared/frameset/Framesetjsp?time=1188313507684.

Four letters of recommendation can be mailed under separate cover to the following address:

Search Committee
Department of Mathematics
University at Buffalo, SUNY
Mathematics Buildin g 244
Buffalo, NY 14260-2900

The deadline for applications is December l, 2007. No paper applications will be accepted.

The University at Buffalo is an Equal Opportunity Employer/Recruiter. We are interested in identifying prospective minority and women candidates. No person, in whatever relationship with the University at Buffalo, shall be subject to discrimination on the basis of age, color, creed, handicap, marital status, national origin; race, religion, sex, sexual orientation or veteran status.

000125

NORTH CAROLINA

NORTH CAROLINA STATE UNIVERSITY
Department of Mathematics

Applications are invited for one tenure-track assistant professorship beginning fall 2008. 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 the 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. Applications received by December 15, 2007, will be given priority.

000129

NORTH CAROLINA STATE UNIVERSITY
Department of Mathematics

Applications are invited for a tenure-track assistant professorship in the area of partial differential equations beginning fall 2008. 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. Many members of the department participate in interdisciplinary programs and research groups on campus and in the broader Research Triangle community. More in-

formation 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 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. Applications received by December 15, 2007, will be given priority.

000130

OHIO

CASE WESTERN RESERVE UNIVERSITY
Mathematics Department

Department of Mathematics, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio, 44106-7058. Tenure-track and temporary positions. Open rank, however appointment at the rank of assistant professor is strongly preferred. Tenure-track in area of numerical analysis/scientific computing to enhance department program. Also NSF funded postdoc in area of functional analysis/convexity. For more information, see http://www.case.edu/artsci/math/employment.htm. The successful tenure-track candidate will hold the Ph.D. or equivalent and have, relative to career stage, a distinguished record of publication, research, service, and teaching. Compensation commensurate with qualifications. Applications will be considered on receipt; applications will be accepted until position is filled. Electronic applications to: James Alexander, math-faculty-position@cwru.edu, consisting of a letter of application, AMS cover sheet, CV, and have three letters of reference sent. CWRU is a recipient of an NSF ADVANCE institutional transformation grant to increase the participation of women in science and engineering. Case Western Reserve University is committed to diversity and is an Affirmative Action, Equal Opportunity Employer. Applications from women and minorities are especially encouraged.

000138

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 2008. The position focuses on statistics with a preference for the areas of biostatistics, multivariate analysis, and nonparametrics. Candidates must have a Ph.D. in statistics or in mathematics with emphasis in statistics. Candidates must have a commitment to teaching statistics courses and mathematics courses, advising, curriculum development, and research supervision at the undergraduate and graduate levels. The successful candidate will be expected to develop an ongoing research agenda. The candidate will have opportunities to support the masters programs in applied mathematics and financial mathematics. The candidate can develop research opportunities through the University of Dayton Research Institute as well as through doctoral programs in the professional schools. To receive full consideration, all materials must be received by January 14, 2008. A complete application consists of a resume, three letters of recommendation, a statement of research 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. Peter Hovey, Chair of the Statistics Search Committee, Department of Mathematics, University of Dayton, Dayton, OH 45469-2316, email: Peter.Hovey@notes.udayton.edu. See also: 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.

000111

OKLAHOMA

OKLAHOMA STATE UNIVERSITY
Department of Mathematics
Stillwater, OK 74078-1058

Applications are invited for a tenure-track faculty position as assistant professor in mathematics education beginning fall 2008. Especially well qualified applicants will be considered for appointment at the rank of associate professor. Applicants should have a Ph.D. degree in mathematics education including at least the equivalent of a Masters degree in mathematics or a Ph.D. in mathematics, and demonstrated potential for productive research in K–16 mathematics teaching and learning that is competitive for external funding. Candidates should also be committed to excellence in undergraduate and graduate education; the usual teaching load is 6 hours per semester.

All applicants should submit a curriculum vita, abstracts of completed research in mathematics education, and a statement regarding teaching experience, and have 4 letters of recommendation sent to the address below. One letter of recommendation should appraise the applicant's teaching abilities. Applicants should use the AMS standardized form: Academic Employment in Mathematics, Application Cover Sheet, and indicate their subject area using the AMS subject classification numbers. Full consideration will be given to applications received by December 1, 2007. Electronic applications are encouraged; information about this may be found at: http://www.math.okstate.edu/~jobs/.

Oklahoma State University is located in Stillwater in North Central Oklahoma, about an hour by car from both Tulsa and Oklahoma City. The department boasts a dynamic faculty with 32 tenured or tenure-track members engaged in mathematics research and education. An active Ph.D. program, support for colloquium and other visitors, as well as involvement of undergraduates in research experiences, create a lively atmosphere in the department. The department has received national recognition for the faculty's contributions to mathematical research and education. More information on the department is available at http://www.math.okstate.edu/.

Oklahoma State University is an Equal Opportunity/Affirmative Action Employer. Women and minorities are encouraged to apply.

000105

OREGON

UNIVERSITY OF OREGON
Department of Mathematics

The University of Oregon Department of Mathematics seeks applicants for two full-time tenure-related positions at the rank of assistant professor, in any area of pure or applied mathematics, including statistics and mathematics education. Minimum qualifications are a Ph.D. in mathematics, statistics, or closely related field, an outstanding research record and evidence of teaching ability. See job announcement at http://hr.uoregon.edu/jobs for more information. Applicants will please provide a standard AMS cover page, CV, and three letters of recommendation. We strongly prefer applications and letters to be submitted electronically at MathJobs.org. Application materials may also be mailed directly to: Search Committee, Department of Mathematics, 1222 University of Oregon, Eugene, OR 97403-1222. Deadline for applications: December 14, 2007. Candidates should have the ability

to work effectively with a diverse community. The University of Oregon is an EO/AA/ADA institution committed to cultural diversity.

000119

PENNSYLVANIA

UNIVERSITY OF PITTSBURGH
Department of Mathematics
Representation Theory/Algebraic Geometry/ Number Theory/Combinatorics

The Mathematics Department of the University of Pittsburgh invites applications for a tenure-track or tenured position in representation theory/algebraic geometry/number/theory/combinatorics to begin in the fall term 2008, pending budgetary approval. The appointment is at the assistant professor level or above, depending on the credentials of the applicant. We seek excellence in teaching and research so applicants should demonstrate substantial research accomplishment and dedication to teaching. Send a vita, three letters of recommendation, a research statement and evidence of teaching accomplishments to: Search Committee in Algebra, Department of Mathematics, University of Pittsburgh, Pittsburgh, PA 15260. Review of completed files will begin on November 30, 2007, and continue until the position is filled. The University of Pittsburgh is an Affirmative Action, Equal Opportunity Employer. Women and members of minority groups under-represented in academia are especially encouraged to apply.

000116

UNIVERSITY OF PITTSBURGH
Department of Mathematics
Probability, Stochastic Analysis, Mathematical Finance

The Mathematics Department of the University of Pittsburgh invites applications for a tenure-track in probability, stochastic analysis, or mathematical finance to begin in the fall term 2008, pending budgetary approval. The appointment is at the assistant professor level. We seek excellence in teaching and research so applicants should demonstrate substantial research accomplishment and dedication to teaching. Send a vita, three letters of recommendation, a research statement, and evidence of teaching accomplishments to: Search Committee in Probability, Stochastic Analysis, aand Mathematical Finance, Department of Mathematics, University of Pittsburgh, Pittsburgh, PA 15260. Review of completed files will begin on November 30, 2007, and continue until the position is filled. The University of Pittsburgh is an Affirmative Action, Equal Opportunity Employer. Women and members of minority groups underrepresented in academia are especially encouraged to apply.

000117

RHODE ISLAND

BROWN UNIVERSITY
Department of Mathematics

The Mathematics Department at Brown University invites applications for one position at the level of tenured associate or full professor to begin July 1, 2008, in the area of analysis, broadly construed. [Exceptional candidates with less experience may also be considered for a tenure-track associate professor position.] Candidates should have a distinguished research record and a strong commitment to excellence in undergraduate and graduate teaching. Preference will be given to applicants with research interests consonant with those of the present members of the department. For more information see: `http://www.math.brown.edu/faculty/faculty.html`. Qualified individuals are invited to send a letter of application and a curriculum vitae to: Senior Search Committee, Department of Mathematics, Box 1917, Brown University, Providence, Rhode Island 02912. Applicants for full professor should include the names of five references who would be contacted at the appropriate time by the Search Committee. Applicants for associate professor should have three letters of reference sent at the time of application. Applications received by November 15, 2007, will receive full consideration, but the search will remain open until the position is closed or filled. For further information or inquiries, write to: `srsearch@math.brown.edu`. Brown University is an Equal Opportunity/Affirmative Action Employer and encourages applications from women and minorities.

000062

BROWN UNIVERSITY
Department of Mathematics

J. D. Tamarkin Assistant Professorship: One or two three-year non-tenured nonrenewable appointments, beginning July 1, 2008. The teaching load is one course one semester, and two courses the other semester and consists of courses of more than routine interest. Candidates are required to have received a Ph.D. degree or equivalent by the start of their appointment, and they may have up to three years of prior academic and/or postdoctoral research experience.

Applicants should have strong research potential and a commitment to teaching. Field of research should be consonant with the current research interests of the department. For full consideration, a curriculum vitae, an AMS Standard Cover Sheet, and three letters of recommendation must be received by December 1, 2007. All inquiries and materials should be addressed to: Junior Search Committee, Department of Mathematics, Box 1917, Brown University, Providence, RI 02912. To access the AMS Standard Cover Sheet, visit our website: `http://www.math.brown.edu/juniorsearch.html`. Email inquiries should be addressed to: `juniorsearch@math.brown.edu`. Brown University is an Equal Opportunity/Affirmative Action Employer and encourages applications from women and minorities.

000063

SOUTH CAROLINA

UNIVERSITY OF SOUTH CAROLINA
Department of Mathematics

Applications are invited for the following positions in mathematics. The department seeks accomplished individuals in pure or applied mathematics who mesh well with current strengths. Fields of particular interest include algebra, analysis, computational science, financial mathematics, and number theory. The beginning date for all positions is August 16, 2008.

The department has openings for tenure-track positions as assistant professors. Candidates should be mathematicians, who will have completed a doctorate and who have begun to amass a substantial record in research and teaching.

Outstanding candidates will be considered for Palmetto Assistant Professorships in Mathematics, which 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. During the initial three-year appointment, the teaching load for a Palmetto Assistant Professor is one course per semester, there is one month of summer support each year, and there is a $10,000 annual supplement, half of which may be used as a research salary supplement to the base salary.

The department anticipates openings for visiting assistant professors for mathematicians with a doctorate who show strong research potential and who demonstrate excellence in teaching.

For full consideration, all supporting material should be submitted electronically through `http://www.mathjobs.org` by December 10, 2007. The supporting material should include a detailed vita with a summary of research accomplishments and goals, a completed AMS Standard Cover Sheet, and four letters of recommendation. One letter should appraise the applicant's teaching abilities. In addition, a cover letter should be submitted through `mathjobs.org` addressed to: Hiring Committee, Department of Mathematics, University of South Carolina, Columbia, SC 29208. The email address

hiring@math.sc.edu can be used for further inquiries.

Information about the department can be found on the Web at http://www.math.sc.edu. The University of South Carolina is an Affirmative Action, Equal Opportunity Employer. Women and minorities 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.

000121

TENNESSEE

UNIVERSITY OF TENNESSEE
Department of Mathematics

The Department of Mathematics of The University of Tennessee seeks to fill one tenure-track assistant professor position in differential geometry, including: geometric analysis, Riemannian geometry, geometric variational problems, and related evolution equations.

A Ph.D. is required. Some postdoctoral experience is desirable, though not required. Substantial research promise and dedication to excellent teaching are paramount. Employment begins August 1, 2008.

Applicants should arrange to have a vita, at least three reference letters, a research statement (including future plans and abstracts of finished papers), and evidence of quality teaching mailed to Differential Geometry Search, Department of Mathematics, The University of Tennessee, Knoxville, TN 37996-1300. Electronic application materials will not be accepted. Use of the AMS application form is appreciated. Review of applications will begin December 1, 2007, and will continue until the position is filled. Please see our website: http://www.math.utk.edu for information about the department.

The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA institution in the provision of its education and employment programs and services. All qualified applicants will receive equal consideration for employment without regard to race, color, national origin, religion, sex, pregnancy, marital status, sexual orientation, age, physical or mental disability, or covered veteran status.

000136

VANDERBILT UNIVERSITY
Non-Tenure-Track Assistant Professor Positions

We invite applications for several visiting and non-tenure-track assistant professor positions in the research areas of the Mathematics Department beginning fall 2008. These positions will have variable terms, but most will be two- to three-year appointments with a 2-2 teaching load.

We are looking for individuals with outstanding research potential and a strong commitment to excellence in teaching. Submit your application and supporting materials electronically through the AMS website Mathjobs.org via the url http://www.mathjobs.org/jobs. Alternatively, application materials may be sent to: NTT Appointments Committee, Vanderbilt University, Department of Mathematics, 1326 Stevenson Center, Nashville, TN 37240. These materials should include a letter of application, a curriculum vitae, a publication list, a research statement, four letters of recommendation and the AMS Cover Sheet. One of the letters must discuss the applicant's teaching qualifications. Reference letter writers should be asked to submit their letters online through MathJobs.org. Evaluation of the applications will commence on December 1, 2007, and continue until the positions are filled. For information about the Department of Mathematics at Vanderbilt University please consult the web at http://www.math.vanderbilt.edu/.

Vanderbilt is an Equal Employment Opportunity/Affirmative Action Employer. Women and minorities are especially invited to apply.

000139

VANDERBILT UNIVERSITY
Tenure-Track or Tenured Faculty Positions

The Department of Mathematics at Vanderbilt University invites applications for the following positions beginning fall 2008:

1) One tenured position at the level of associate professor or full professor with preference in the areas of number theory, arithmetic geometry or algebraic geometry.

2) One tenure-track position at the level of assistant professor. Candidates from any area of pure or applied mathematics are encouraged to apply, but priority will be given to applicants in the research areas of the department or number theory, arithmetic geometry and algebraic geometry.

We are looking for individuals with an outstanding record in research and demonstrated excellence in teaching. Salaries are competitive and are based on credentials. Qualified candidates should submit their application materials electronically through the AMS website Mathjobs.org via the url http://www.mathjobs.org/jobs. Alternatively, application materials may be sent to: Faculty Hiring Committee, Vanderbilt University, Department of Mathematics, 1326 Stevenson Center, Nashville, TN 37240. These materials should include a letter of application, a curriculum vitae, a publication list, a description of current and planned research, four letters of recommendation and the AMS Cover Sheet. One of the letters must discuss the applicant's teaching qualifications. Reference letter writers should be asked to submit their letters online through MathJobs.org. Senior applicants should also include five names of suggested reviewers. Evaluation of the applications will commence on December 1, 2007, and continue until the positions are filled. For information about the Department of Mathematics at Vanderbilt University please consult the Web at http://www.math.vanderbilt.edu/.

Vanderbilt is an Equal Employment Opportunity/Affirmative Action Employer. Women and minorities are especially invited to apply.

000140

TEXAS

BAYLOR UNIVERSITY
Department of Mathematics

The Department of Mathematics invites applications for a tenure-track position at the assistant professor level, starting in August 2008. Salary and benefits are competitive. Excellence in teaching and research is essential. Strong potential for obtaining extramural funding is desirable. Special consideration will be given to strong applicants with research interests in the general areas of analysis, topology, algebra, and numerical linear algebra. Exceptional scholars in any area of specialization are strongly encouraged to apply. An application must include a current curriculum vitae and statements describing interests and goals in research and in teaching. In addition, at least three recent letters of reference must be made available on MathJobs.org or be sent directly to the search committee. An applicant who has received the doctoral degree within the last four years is encouraged to include a copy of the doctoral transcript. Applications will be reviewed beginning November 1, 2007. To ensure full consideration, an application should be received by November 15, 2007, but applications will be accepted until the position is filled or the search is terminated. Baylor University has approximately 14,000 students. The department has 30 faculty members and offers B.A., B.S., M.S., and Ph.D. degrees. The university provides generous benefits including tuition remission for qualified family members. Please visit the Baylor websites: http://www.baylor.edu and http://www.baylor.edu/math/ for further information about the university and the department. Baylor University is affiliated with the Baptist General Convention of Texas. As an Affirmative Action/Equal Employment Opportunity Employer, Baylor encourages minorities, women, veterans, and persons with disabilities to apply. Applicants are encouraged to submit all application

materials online through MathJobs.org via the URL: http://www.mathjobs.org/jobs. Alternatively, send all materials to: Mathematics Search Committee, Baylor University, One Bear Place #97328, Waco, TX 76798-7328; email: Math_Search@baylor.edu.

000091

BAYLOR UNIVERSITY
Department of Mathematics

The Department of Mathematics invites applications for a postdoctoral position, starting in August 2008. This position may be renewable annually to a maximum of three years and is not a tenure-track position. Customarily, the teaching load is two three-hour courses each semester. Salary and benefits are competitive. Excellence in teaching and research is essential. The department seeks candidates whose research interests are compatible with those of current faculty. Active research areas in the department are in the general areas of algebra, analysis, differential equations, mathematical physics, numerical analysis, representation theory, and topology. An application must include a current curriculum vitae and statements describing interests and goals in research and in teaching. In addition, at least three recent letters of reference must be made available on MathJobs.org or be sent directly to the search committee. An applicant who has received the doctoral degree within the last four years is encouraged to include a copy of the doctoral transcript. Applications will be reviewed beginning November 1, 2007. To ensure full consideration, an application should be received by November 15, 2007, but applications will be accepted until the position is filled or the search is terminated. Baylor University has approximately 14,000 students. The department has 30 faculty members and offers B.A., B.S., M.S., and Ph.D. degrees. Please visit the Baylor websites: http://www.baylor.edu and http://www.baylor.edu/math/ for further information about the university and the department. Baylor University is affiliated with the Baptist General Convention of Texas. As an Affirmative Action/Equal Employment Opportunity Employer, Baylor encourages minorities, women, veterans, and persons with disabilities to apply. Applicants are encouraged to submit all application materials online through MathJobs.org via the URL: http://www.mathjobs.org/jobs. Alternatively, send all materials to: Mathematics Search Committee, Baylor University, One Bear Place #97328, Waco, TX 76798-7328; email: Math_Search@baylor.edu.

000092

TEXAS A&M UNIVERSITY
The Department of Mathematics

The Department of Mathematics anticipates several openings for tenured, tenure-eligible, and visiting faculty positions beginning fall 2008. The field is open, but we particularly seek applications from individuals whose mathematical interests would augment and build upon existing strengths both within the Mathematics Department as well as other departments in the university. Salary, teaching loads and start-up funds are competitive. For a tenured position the applicant should have an outstanding research reputation and would be expected to fill a leadership role in the department. An established research program, including success in attracting external funding and supervision of graduate students, and a demonstrated ability and interest in teaching are required. Informal inquiries are welcome. For an assistant professorship, we seek strong research potential and evidence of excellence in teaching. Research productivity beyond the doctoral dissertation will normally be expected. We also have several visiting positions available. Our visiting assistant professor positions are for a three-year period and carry a three course per year teaching load. They are intended for those who have recently received their Ph.D. and preference will be given to mathematicians whose research interests are close to those of our regular faculty members. Senior visiting positions may be for a semester or one year period. The complete dossier should be received by December 15, 2007. Early applications are encouraged since the department will start the review process in October, 2007. Applicants should send the completed "AMS Application Cover Sheet", a vita, and arrange to have letters of recommendation sent to: Faculty Hiring, Department of Mathematics, Texas A&M University, College Station, Texas 77843-3368. Further information can be obtained from: http://www.math.tamu.edu/hiring.

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 the needs of dual career couples.

000050

UTAH

UNIVERSITY OF UTAH
Department of Mathematics

The Department of Mathematics at the University of Utah invites applications for the following positions:

Full-time tenure-track or tenured appointments at the level of assistant, associate, or full professor. Special consideration will be given to candidates in the area of statistics.

Three-year Scott, Wylie, Burgess, and VIGRE Assistant Professorships, depending on funding availability.

IGERT and RTG Postdoctoral Fellowships. IGERT fellowship applicants should have a background in mathematical biology; while RTG fellowship applicants should have a background in applied and computational mathematics and have interests in working in mathematical biology. These postdoctoral fellowships are 3-year positions. See http://www.math.utah.edu/research/mathbio/opportunities.html.

Please see our website at http://www.math.utah.edu/positions for information regarding available positions, application requirements and deadlines. Applications must be completed through the website http://www.mathjobs.org.

The University of Utah is an Equal Opportunity, Affirmative Action Employer and encourages applications from women and minorities, and provides reasonable accommodation to the known disabilities of applicants and employees.

The University of Utah values candidates who have experience working in settings with students from diverse backgrounds, and possess a strong commitment to improving access to higher education for historically underrepresented students.

000067

WASHINGTON

PACIFIC LUTHERAN UNIVERSITY
Department of Mathematics

We seek to fill one tenure-track assistant professorship in mathematics beginning September 2008. Candidates for this position must have a deep interest in mathematics education. A terminal degree in either mathematics education or mathematics is required as is evidence of exemplary teaching. Duties include teaching six 4-credit undergraduate mathematics courses per year, scholarship, and service to the department and the university. An ideal candidate will be able to teach our methods course for future secondary teachers and our mathematics course for future elementary teachers, which blends content and pedagogy. The candidate should be well versed in the NCTM Standards for School Mathematics. Experience working in and with K-12 schools is highly desirable. An application should include a letter addressing your qualifications and scholarly interests, a vita, a statement of teaching philosophy in an undergraduate program, official transcripts of graduate and undergraduate work, evidence of effective teaching (such as student evaluations), and three or more letters of recommendations (at least two of which address teaching qualifications). Send your application to: Mei Zhu, Chair of the Search Committee, Department of Mathematics, Pacific Lutheran

University, Tacoma, WA 98447. First consideration will be given to applications received by December 1, 2007. Applications close on February 15, 2008. Pacific Lutheran University is a comprehensive university, located 40 miles south of Seattle. It is comprised of the College of Arts and Sciences (Divisions of Humanities, Social Sciences, Natural Sciences) and four professional schools—Arts, Business, Education and Movement Studies, and Nursing. The university has 3,600 students. The university's primary mission is to educate students for lives of thoughtful inquiry, service, leadership, and care. It serves a diverse clientele and endorses the goals of equal opportunity and affirmative action. PLU is affiliated with the Evangelical Lutheran Church in America and enjoys a healthy and progressive relationship with it. The Lutheran identity of the institution is taken seriously as a resource for sustaining rigorous, critical education. The university cultivates freedom of inquiry and teaching as part of its commitment to its Lutheran heritage. For further information visit our website at http://www.plu.edu/~math.

000126

UNIVERSITY OF WASHINGTON
Department of Mathematics

Applications are invited for a non-tenure-track acting assistant professor position. The appointment is for a period of up to three years to begin in September 2008. Applicants are required to have a Ph.D. by the starting date, and to be highly qualified for undergraduate and graduate teaching and independent research.

Applications should include the American Mathematical Society's Cover Sheet for Academic Employment, a curriculum vitae, statements of research and teaching interests, and three letters of recommendation. Applications should be sent to: Appointments Committee Chair (AAP position), Department of Mathematics, Box 354350, University of Washington, Seattle, WA 98195-4350. Priority will be given to applicants whose complete applications, including recommendations, are received by December 15, 2007.

The University of Washington is building a culturally diverse faculty and strongly encourages applications from female and minority candidates. The University is an Equal Opportunity/Affirmative Action Employer.

000107

UNIVERSITY OF WASHINGTON
Department of Mathematics

Applications are invited for a full-time tenure-track assistant professor position at the Department of Mathematics of the University of Washington, to begin in September 2008. Applicants are required to have a Ph.D., and an established research record in mathematics. Duties include undergraduate and graduate teaching, independent research, and service. In exceptional circumstances, appointment at the associate professor or professor level may be considered for candidates who have demonstrated a commitment to mentoring underrepresented students in the sciences.

Applications should include the American Mathematical Society's Cover Sheet for Academic Appointment, a curriculum vitae, statements of research and teaching interests, and three letters of recommendation. Applications should be sent to: Appointments Committee Chair, Department of Mathematics, Box 354350, University of Washington, Seattle, WA 98195-4350. Priority will be given to applicants whose complete applications, including recommendations, are received by November 15, 2007.

The University of Washington is building a culturally diverse faculty and strongly encourages applications from female and minority candidates. The university is an Equal Opportunity/Affirmative Action Employer.

For more information about the position or institution/company: http://www.math.washington.edu/.

000103

WASHINGTON STATE UNIVERSITY
Assistant Professor in Discrete Mathematics

Assistant professor in the Department of Mathematics at Washington State University beginning August 16, 2008. A Ph.D. in mathematics or a related field, earned by August 16, 2008, is required. Preferred qualifications include expertise in discrete mathematics, ability to utilize research in applied areas such as cryptology.

Tenure-track position. Salary is commensurate with training and experience.

Application screening begins November 10, 2007. For a complete Notice of Vacancy, see http://www.math.wsu.edu/positions/welcome.php, or email: kmcauley@math.wsu.edu. EEO/AA.

000104

WEST VIRGINIA

WEST VIRGINIA UNIVERSITY
Eberly College of Arts and Sciences
Department of Mathematics

The Department of Mathematics solicits applications and nominations for a clinical assistant professor to support its teaching mission and its research goals in mathematics education. This position is non-tenure-track but promotion-eligible. Promotion for clinical assistant professors is based primarily on significant contribution in teaching and service. The teaching assignment will be two or three courses per semester (approximately 40 of the position). The balance of the assignment will be working with the department and the Institute for Math Learning to develop and oversee a support program for mathematics service courses through elementary differential equations. Components may include working with course coordinators to design and administer a homework feedback system, facilitating out-of-class review sessions and/or group discussions, training and mentoring teaching assistants, working with other learning centers on campus to coordinate math tutoring (e.g., exchange tutors, provide tutor training, etc.), and aiding in research on pedagogical issues and other scholarly work related to the success of support programs and teaching methods. This position requires a doctorate in mathematics or a related area completed by the time of appointment.

West Virginia University is a Research-High Activity University enrolling over 25,000 students. The Department of Mathematics has 25 full-time faculty members and approximately 30 M.S. and Ph.D. students. The University is located in Morgantown, an award-winning city with a metropolitan population of 80,000, diverse cultural and recreational opportunities, excellent medical facilities, and a favorable location.

Applicants should provide a letter of application that addresses the goals of the position, a statement of teaching philosophy, a vita, and three letters of reference. Please have documentation and letters of reference sent to:

Department of Math P.O. Box 6310
West Virginia University
Morgantown, WV 26506-6310
IMLjob@math.wvu.edu.

Applications will be reviewed as they are received. Priority review will be given to applications received through January 15. Preferred starting date is August 16, 2008.

West Virginia University is an Equal Opportunity/Affirmative Action Employer. Minority, disabled, and women candidates are urged to apply.

000137

CANADA

UNIVERSITY OF ALBERTA
Department of Mathematical and Statistical Sciences
Tenure Track Position, Mathematical Finance

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a tenure-track position in the area of mathematical finance. We primarily seek candidates at the assistant professor level, but exceptional candidates at a more senior level will be considered.

The successful candidate will have established accomplishments and outstanding promise in research, as well as a strong commitment to graduate and undergraduate teaching. Candidates must hold a Ph.D. degree. We offer an excellent research

environment with a normal teaching load of three courses per year. A close fit with some of the existing research being presently conducted in the department is an asset.

Alberta is one of the leading mathematics departments in Canada and has strong connections with other mathematical institutes, such as the Pacific Institute for the Mathematical Sciences (PIMS), Mathematics of Information Technology and Complex Systems (MITACS), and the Banff International Research Station (BIRS). For more information about the department, please visit our website at: http://www.math.ualberta.ca/.

Applications should include a curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable candidate is found. Early applications are encouraged.

Interested applicants may apply to:

Arturo Pianzola, Chair
Department of Mathematical and Statistical Sciences
University of Alberta
Edmonton, Alberta, Canada T6G 2G1;
email: chairsec@math.ualberta.ca

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens or permanent residents cannot be found, other individuals will be considered.

The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.

000112

UNIVERSITY OF ALBERTA
Department of Mathematical and Statistical Sciences
Max Wyman Assistant Professorship in Mathematical Biology

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a Max Wyman Assistant Professorship in Mathematical Biology. This is a three-year fixed-term position. The position offers an excellent research and teaching environment with a reduced teaching load (averaging two one-semester courses per year). A startup research grant is included with the position.

We are looking for a person with a Ph.D., an excellent research record in mathematical biology, and strong communication and teaching skills. Candidates are expected to develop an independent research program, and will be eligible to apply for federal research funds. They are expected to participate in graduate training and to be active in the Centre for Mathematical Biology (http://www.math.ualberta.ca/~mathbio). All aspects of mathematical biology will be considered. Current interests within the department include ecology, epidemiology, medicine, and physiology.

Alberta is one of the leading mathematics departments in Canada and has strong connections with other mathematical institutes, such as the Pacific Institute for the Mathematical Sciences (PIMS), Mathematics of Information Technology and Complex Systems (MITACS), and the Banff International Research Station (BIRS).

Applications should include a curriculum vitae, research and teaching profiles outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable applicant is found. Early applications are encouraged.

For more information about the department and the University of Alberta, please visit our webpage (http://www.math.ualberta.ca).

Interested applicants may apply to:

Arturo Pianzola, Chair
Department of Mathematical and Statistical Sciences
University of Alberta
Edmonton, Alberta, Canada T6G 2G1;
email: chairsec@math.ualberta.ca.

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens or permanent residents cannot be found, other individuals will be considered.

The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.

000113

UNIVERSITY OF ALBERTA
Department of Mathematical and Statistical Sciences
Tenure-Track Position, Mathematical Biology

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a tenure-track position in the area of mathematical biology. We primarily seek candidates at the assistant professor level, but exceptional candidates at a more senior level will be considered.

We seek an individual who will fit into our applied mathematics program (dynamical systems, differential equations, numerical methods, fluid dynamics, and probability), and who complements the department's existing expertise in the mathematical modeling of cell biology, ecology, epidemiology, and physiology. Candidates must have a Ph.D. degree in mathematics or cognate discipline, an excellent research record in mathematical biology, strong communication and teaching skills, and leadership potential. Postdoctoral experience is an asset.

The successful candidate will develop an independent research program, supervise graduate students, and teach at both the graduate and undergraduate levels. We offer an excellent research environment with a normal teaching load of three courses per year. For more information about the department, please visit our website at: http://www.math.ualberta.ca/.

Candidates have the opportunity to join the Centre for Mathematical Biology and participate in its activities. For more information about the Centre for Mathematical Biology, see http://www.math.ualberta.ca/~mathbio.

Applications should include a curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable candidate is found. Early applications are encouraged.

Interested applicants may apply to:

Arturo Pianzola, Chair
Department of Mathematical and Statistical Sciences
University of Alberta
Edmonton, Alberta, Canada T6G 2G1;
email: chairsec@math.ualberta.ca.

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens or permanent residents cannot be found, other individuals will be considered.

The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.

000114

UNIVERSITY OF TORONTO
Department of Mathematics

The Department of Mathematics at the University of Toronto anticipates faculty openings at various levels of seniority over the next several years, including:

COXETER ASSISTANT PROFESSORSHIPS and POSTDOCTORAL FELLOWSHIPS: The department invites applications for Coxeter Assistant Professorships (non-tenure stream) and Postdoctoral Fellowships (Code: CAP). Applicants must demonstrate

strength in teaching and significant research promise. The appointments are effective July 1, 2008, and are contractually-limited term appointments for a term of up to three years. Preference will be given to recent Ph.D.'s whose applications are received by December 15, 2007.

TENURE-STREAM POSITIONS: The department anticipates having a number of tenure-stream positions over the next several years. Applicants must demonstrate excellent accomplishments and outstanding promise in research and strong commitment to graduate and undergraduate teaching. Preference will be given to researchers in the areas of analysis (Code: ANA), algebraic geometry (Code: ALG), and applied mathematics/scientific computation (Code: APM). However, exceptional candidates in all fields of pure or applied mathematics are encouraged to apply (Code: OTHER). The possibility also exists for a joint position between the Departments of Mathematics and Computer Science (Code: CSM). Preference will be given to applications received by November 15, 2007.

Application material for all positions must include the candidate's Curriculum Vitae and list of publications. Applicants must arrange for a minimum of four letters of reference to be provided to the department, at least one of which primarily addresses the candidate's teaching. Candidates are encouraged to supply a cover letter specifying the code of the position(s) for which they wish to apply and specifying whether the candidate is a Canadian citizen/permanent resident. Candidates are also encouraged to supply a research statement, a teaching statement, and the AMS cover sheet. Online applications through http://www.mathjobs.org/jobs are preferred. Applications can alternately be sent directly to the Appointments Committee, Department of Mathematics, University of Toronto, 40 St. George Street Room 6290, Toronto Ontario M5S 2E4, Canada.

The University of Toronto offers the opportunity to teach, conduct research, and live in one of the most diverse cities in the world. The University of Toronto is strongly committed to diversity within its community and especially welcomes applicants from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversification of ideas. All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be given priority.

000146

SINGAPORE

NATIONAL UNIVERSITY OF SINGAPORE (NUS)
Department of Mathematics

The Department of Mathematics at the National University of Singapore (NUS) invites applications for tenured, tenure-track and visiting (including postdoctoral) positions at all levels, beginning in August 2008.

NUS is a research intensive university that provides quality undergraduate and graduate education. The Department of Mathematics, which is one of the largest in the university, has about 70 faculty members and teaching staff whose expertise cover major areas of contemporary mathematical research.

We seek promising scholars and established mathematicians with outstanding track records in any field of pure and applied mathematics. The department offers internationally competitive salaries with start-up grants for research. The teaching load is particularly light for young scholars, in an environment conducive to research with ample opportunities for career development.

Research areas which the department plans to expand in the near future include (but are not limited to): All areas of pure mathematics (especially analysis) financial mathematics, mathematical imaging, probability & stochastic analysis, scientific computing.

Application materials should be sent to:

Search Committee
Department of Mathematics
National University of Singapore
2 Science Drive 2, Singapore 117543
Republic of Singapore

In addition, applicants should submit electronically a PDF-file to search@math.nus.edu.sg. Inquiries may also be sent to this link.

Please include the following supporting documentation in the application:

1) an American Mathematical Society Standard Cover Sheet; 2) a detailed CV including publications list; 3) a statement of research accomplishments and plan; 4) a statement (max. of 2 pages) of teaching philosophy and methodology. Please attach evaluation on teaching from faculty members or students of your current institution, where applicable; 5) at least three letters of recommendation including one which indicates the candidate's effectiveness and commitment in teaching.

Review process will begin at the end of November and will continue until positions are filled. For further information about the department, please visit http://www.math.nus.edu.sg.

000077

SWITZERLAND

ETH ZÜRICH
Department of Mathematics
Postdoctoral positions

The Department of Mathematics at ETH Zürich invites applications for two one to two years postdoctoral positions with term running from September 2008 till August 2009 or 2010. Preference will be given to applicants no more than 5 years past the Ph.D. In accordance with the commitment of the ETH Zürich to increasing the number of women in academic positions, female scientists are specifically encouraged to apply. To be assured of full consideration, applications should be received by November 30, 2007, since 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 1) 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. 2) A list of publications. 3) A survey of past research activities and a description of current research interests. You should also arrange to have three letters of recommendation sent directly to us. It is very much in your interest to have these letters of recommendation arrive by the time the selection process begins. Applications and letters of recommendation should be sent to:

Search Committee
Department of Mathematics
ETH Zentrum/HG G33.3
CH-8092 Zürich/Switzerland

000118

TAIWAN

NATIONAL CHUNG CHENG UNIVERSITY
Department of Mathematics
Regular and Visiting Positions

The department of mathematics invites applications for regular and visiting positions at either the level of assistant professor or above effective August 1, 2008.

Applications are invited in all areas of Mathematics: **global analysis**, **differential equations and statistics** are among the priorities. A degree of Ph.D. is required. Applicants should send a complete curriculum vitae, three letters of reference, transcripts (if necessary), and a professional statement describing their philosophy about both teaching and research. Applications received by January 31, 2008, will be given full consideration. Send all materials to Dr. Ching-An Wang, Chair, Department of Mathematics, National Chung Cheng University, Ming-Hsiung, Chia-Yi, Taiwan R.O.C., 62117.

Additional departmental information is available on our website: http://www.math.ccu.edu.tw; fax: 886-5-272-0497; email: director@math.ccu.edu.tw.

000115

AMERICAN MATHEMATICAL SOCIETY

COMPLETE YOUR Legacy ...

Become a member of the Thomas S. Fiske Society

You have been building your legacy through research, education, and service to the profession. The **Thomas S. Fiske Society** provides an opportunity to complete your legacy by supporting the future of mathematics through planned giving.

In 1888, Thomas S. Fiske, along with two friends, founded the organization we know as the American Mathematical Society. The **Thomas S. Fiske Society** (Fiske Society) honors individuals who have included a gift to the AMS in their will, living trust, life insurance policy, retirement plan, or other planned-giving vehicle.

For more information about planned giving and Thomas S. Fiske, please visit **www.ams.org/giving-to-ams.**

Development Office
Email: development@ams.org
Phone: (401) 455-4000
Toll free in the US and Canada (800) 321-4267
Postal mail: 201 Charles Street,
Providence, RI 02904-2294

AMS
American Mathematical Society
www.ams.org

Meetings & Conferences of the AMS

IMPORTANT INFORMATION REGARDING MEETINGS PROGRAMS: AMS Sectional Meeting programs do not appear in the print version of the *Notices.* However, comprehensive and continually updated meeting and program information with links to the abstract for each talk can be found on the AMS website. See `http://www.ams.org/meetings/`. Final programs for Sectional Meetings will be archived on the AMS website accessible from the stated URL and in an electronic issue of the *Notices* as noted below for each meeting.

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: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: Expired

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/sectional.html`.

Invited Addresses

Sergey Gavrilets, University of Tennessee, *Mathematical models of speciation.*

Daniel K. Nakano, University of Georgia, *Bridging algebra and geometry via cohomology.*

Carla D. Savage, North Carolina State University, *The mathematics of lecture hall partitions.*

Sergei Tabachnikov, Pennsylvania State University, *Ubiquitous billiards.*

Special Sessions

Advances in Algorithmic Methods for Algebraic Structures, **James B. Hart**, Middle Tennessee State University.

Applied Partial Differential Equations, **Yuri A. Melnikov**, Middle Tennessee State University, and **Alain J. Kassab**, University of Central Florida.

Billiards and Related Topics, **Sergei Tabachnikov**, Pennsylvania State University, and **Richard Schwartz**, Brown University.

Combinatorial Enumeration, Optimization, Geometry, and Statistics, **Nicholas A. Loehr**, College of William and Mary, **Gabor Pataki**, University of North Carolina, Chapel Hill, **Margaret A. Readdy**, University of Kentucky and M.I.T., **Carla D. Savage**, North Carolina State University, and **Ruriko Yoshida**, University of Kentucky.

Combinatorial Methods in Continuum Theory (dedicated to Jo Heath, Auburn University, on the occasion of her retirement), **Judy A. Kennedy**, University of Delaware and Lamar University, **Krystyna M. Kuperberg**, Auburn University, and **Van C. Nall**, University of Richmond.

Differential Equations and Dynamical Systems, **Wenzhang Huang** and **Jia Li**, University of Alabama, Huntsville, and **Zachariah Sinkala**, Middle Tennessee State University.

Financial Mathematics, **Abdul Khaliq**, Middle Tennessee State University.

Graph Theory, **Rong Luo**, **Don Nelson**, **Chris Stephens**, and **Xiaoya Zha**, Middle Tennessee State University.

Lie and Representation Theory, **Terrell L. Hodge**, Western Michigan University, **Daniel K. Nakano**, University of Georgia, and **Brian J. Parshall**, University of Virginia.

Mathematical Modeling in Biological Systems, **Terrence J. Quinn**, Middle Tennessee State University.

Mathematical Tools for Survival Analysis and Medical Data Analysis, **Curtis Church**, Middle Tennessee State University, **Chang Yu**, Vanderbilt University, and **Ping Zhang**, Middle Tennessee State University.

Nonlinear Partial Differential Equations and Applications, **Emmanuele DiBenedetto**, **Mikhail Perepelitsa**, and **Gieri Simonett**, Vanderbilt University.

Physical Knots and Links, **Yuanan Diao**, University of North Carolina at Charlotte, and **Claus Ernst**, Western Kentucky University.

Recent Advances in Algebraic Topology, **Mark W. Johnson**, Pennsylvania State University, Altoona, and **Donald Yau**, The Ohio State University at Newark.

Splines and Wavelets with Applications, **Don Hong**, Middle Tennessee State University, and **Qingtang Jiang**, University of Missouri-St. Louis.

Using National Assessment of Educational Progress (NAEP) Data to Enhance Assessment and Inform Instruction, **Michaele F. Chappell**, Middle Tennessee State University, and **Judith H. Hector**, Walters State Community College.

Wellington, New Zealand

Victoria University of Wellington

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*: June 2007
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: October 31, 2007
For abstracts: October 31, 2007

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/internmtgs.html`.

AMS Invited Addresses

Marston Conder, University of Auckland, *Chirality*.

Rodney G. Downey, Victoria University of Wellington, *Practical FPT and foundations of kernelization*.

Michael H. Freedman, Microsoft Research, *Physically motivated questions in topology: Manifold pairings*.

Bruce J. Kleiner, Yale University, *Bilipschitz embedding in Banach spaces*.

Gaven J. Martin, Massey University, *Curvature and dynamics*.

Assaf Naor, Microsoft Research/Courant Institute, *The story of the sparsest cut problem*.

Theodore A. Slaman, University of California Berkeley, *Effective randomness and continuous measures*.

Matthew J. Visser, Victoria University of Wellington, *Emergent spacetimes, rainbow geometries, and pseudo-Finsler geometries*.

AMS Special Sessions

Computability Theory, **Rodney G. Downey** and **Noam Greenberg**, Victoria University of Wellington, and **Theodore A. Slaman**, University of California Berkeley.

Dynamical Systems and Ergodic Theory, **Arno Berger**, University of Canterbury, **Rua Murray**, University of Waikato, and **Matthew J. Nicol**, University of Houston.

Geometric Numerical Integration, **Laurent O. Jay**, The University of Iowa, and **Robert McLachlan**, Massey University.

Group Theory, Actions, and Computation, **Marston Conder**, University of Auckland, and **Russell Blyth**, Saint Louis University.

History and Philosophy of Mathematics, **James J. Tattersall**, Providence College, **Ken Pledger**, Victoria University of Wellington, and **Clemency Williams**, University of Canterbury.

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, **Alica Miller**, University of Louisville, and **Vladimir Pestov**, University of Ottawa.

Integrability of Continuous and Discrete Evolution Systems, **Mark Hickman**, University of Canterbury, and **Willy A. Hereman**, Colorado School of Mines.

Mathematical Models in Biomedicine, **Ami Radunskaya**, Pomona College, **James Sneyd**, University of Auckland, **Urszula Ledzewicz**, University of Southern Illinois at Edwardsville, and **Heinz Schaettler**, Washington University.

Matroids, Graphs, and Complexity, **Dillon Mayhew**, Victoria University of Wellington, and **James G. Oxley**, Louisiana State University.

New Trends in Spectral Analysis and Partial Differential Equations, **Boris P. Belinskiy**, University of Tennessee, Chattanooga, **Anjan Biswas**, Delaware State University, and **Boris Pavlov**, University of Auckland.

Quantum Topology, **David B. Gauld**, University of Auckland, and **Scott E. Morrison**, University of California Berkeley.

Special Functions and Orthogonal Polynomials, **Shaun Cooper**, Massey University, **Diego Dominici**, SUNY New Paltz, and **Sven Ole Warnaar**, University of Melbourne.

University Mathematics Education, **Patricia Cretchley**, University of Southern Queensland, **Derek Holton**, University of Otago, **William G. McCallum**, University of Arizona, and **Tim Passmore**, University of Southern Queensland.

Water-Wave Scattering Focusing on Wave-Ice Interactions, **Michael H. Meylan**, Massey University, and **Malte Peter**, University of Bremen.

San Diego, California

San Diego Convention Center

January 6–9, 2008

Sunday – Wednesday

Meeting #1035

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: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: Expired

Program Updates/Other Organizations

MAA Sessions

Becoming a Teacher of College Mathematics: Research on Mathematics Graduate Students' Professional Development, Tuesday, 9:00 a.m.–10:20 a.m., organized by **Kevin E. Charlwood**, Washburn University. During the past several decades there has been an increase in discussion about mathematics graduate student teaching assistants' (TAs') contributions to undergraduate instruction and their needs for teaching-related professional development (PD). In addition to publication of resources for PD activities and programs, a community of educational researchers with interests in TAs has begun examining the factors that shape TAs' professional lives, their teaching practices, and their development as teachers of college mathematics. In this special session, several mathematics education researchers will report findings for their inquiry in this area. The session will include reports on the design and evaluation of particular PD programs as well as reports from studies that examine the TAs' experiences and teaching practices. Invited speakers will include those who have published their findings in this area. The session is sponsored by the AMS-MAA Committee on Teaching Assistants and Part-time Instructors (TA/PTI).

Association for Symbolic Logic

Invited Addresses will be given by **Gregory L. Cherlin**, Rutgers University, *Title to be announced*; **Ilijas Farah**, York University, *Title to be announced*; **Pavel R. Hrubes**, Czech Academy of Sciences, *Proof complexity after NP ≠ coNP*; **Victor Marek**, University of Kentucky, *Answer set programming*; **Jan Reimann**, University of California Berkeley, *Title to be announced*; **Simon R. Thomas**, Rutgers University, *A descriptive view of geometric group theory*.

New York, New York

Courant Institute of New York University

March 15–16, 2008

Saturday – Sunday

Meeting #1036

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: January 2008
Program first available on AMS website: January 31, 2008
Program issue of electronic *Notices*: March 2008
Issue of *Abstracts*: Volume 29, Issue 2

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: November 27, 2007
For abstracts: January 22, 2008

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/sectional.html`.

Invited Addresses

Weinan E, Princeton University, *Title to be announced*.

Ilya Kapovich, University of Illinois at Urbana-Champaign, *Title to be announced*.

Ovidiu Savin, Columbia Univeristy, *Title to be announced*.

Ravi Vakil, Stanford University, *Title to be announced*.

Special Sessions

Algebraic Combinatorial Geometry (Code: SS 3A), **Julianna Tymoczko**, University of Iowa, and **Linda Chen**, Ohio State University.

Buckminster Fuller's Synergetics and Mathematics (Code: SS 5A), **Christopher J. Fearnley** and **Joe Clinton**, Synergetics Collaborative.

Geometric Topology (Code: SS 7A), **Marco Varisco**, Binghamton University, SUNY, and **David Rosenthal**, St. John's University.

Isoperimetric Problems and PDE (Code: SS 6A), **Bernd Kawohl**, University of Cologne, and **Marcello Lucia**, City University of New York.

L-Functions and Automorphic Forms (Code: SS 1A), **Alina Bucur**, Institute for Advanced Study, **Ashay Venkatesh**, Courant Institute of Mathematical Sciences, **Stephen D. Miller**, Rutgers University, and **Steven J. Miller**, Brown University.

Mathematics of Multiscale Phenomena (Code: SS 4A), **Peter McCoy** and **Reza Malek-Madani**, U.S. Naval Academy.

Nonlinear Elliptic Equations and Geometric Inequalities (Code: SS 2A), **Fengbo Hang**, Princeton University, and **Xiaodong Wang**, Michigan State University.

Nonlinear Waves and their Applications (Code: SS 8A), **Edward D. Farnum**, Kean University, and **Roy Goodman**, New Jersey Institute of Technology.

Northeast Hyperbolic Geometry (Code: SS 9A), **Ara Basmajian**, Hunter College and Graduate Center of the City University of New York, and **Ed Taylor**, Wesleyan University.

Baton Rouge, Louisiana

Louisiana State University, Baton Rouge

March 28–30, 2008

Friday – Sunday

Meeting #1037

Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of *Notices*: February 2008
Program first available on AMS website: February 14, 2008
Program issue of electronic *Notices*: March 2008
Issue of *Abstracts*: Volume 29, Issue 2

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: December 11, 2007
For abstracts: February 5, 2008

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/sectional.html`.

Invited Addresses

Maria Chudnovsky, Columbia University, *Title to be announced.*

Soren Galatius, Stanford University, *Title to be announced.*

Zhongwei Shen, University of Kentucky, *Title to be announced.*

Mark Shimozono, Virginia Polytechnic Institute & State University, *Title to be announced.*

Special Sessions

Actions of Quantum Algebras (Code: SS 8A), **Lars Kadison**, University of Pennsylvania, and **Alexander Stolin**, University of Gothenburg/Chalmers University of Technology.

Algebraic Geometry of Matrices and Determinants (Code: SS 14A), **Zachariah C. Teitler**, Texas A&M University, and **Kent M. Neuerburg**, Southeastern Louisiana University.

Arrangements and Related Topics (Code: SS 15A), **Daniel C. Cohen**, Louisiana State University.

Current Challenges in Financial Mathematics (Code: SS 10A), **Arkadev Chatterjea**, Kenan-Flagler Business School, The University of North Carolina at Chapel Hill, and **Ambar Sengupta**, Louisiana State University.

Cycles, K-Theory, and A^1-Homotopy (Code: SS 19A), **Seva Joukhovitski** and **Marco Schlichting**, Louisiana State University.

Elementary Mathematics from an Advanced Perspective (Code: SS 11A), **James J. Madden**, Louisiana State University, and **Kristin L. Umland**, University of New Mexico.

Gauge Theory in Smooth and Symplectic Topology (Code: SS 21A), **Scott J. Baldridge** and **Brendan E. Owens**, Louisiana State University.

Geometric Group Theory (Code: SS 13A), **Noel Brady**, University of Oklahoma, **Tara E. Brendle**, Louisiana State University, and **Pallavi Dani**, University of Oklahoma.

Geometric and Combinatorial Representation Theory (Code: SS 7A), **Pramod N. Achar** and **Daniel S. Sage**, Louisiana State University.

Harmonic Analysis and Partial Differential Equations in Real and Complex Domains (Code: SS 3A), **Loredana Lanzani**, University of Arkansas, and **Zhongwei Shen**, University of Kentucky.

Knot and 3-Manifold Invariants (Code: SS 6A), **Oliver T. Dasbach** and **Patrick M. Gilmer**, Louisiana State University.

Lie Groups and Holomorphic Function Spaces: Analysis, Geometry, and Mathematical Physics (Code: SS 20A), **Brian C. Hall**, University of Notre Dame, and **Jeffrey J. Mitchell**, Robert Morris University.

Lie Groups, Lie Algebras, and Their Representations (Code: SS 18A), **Mark C. Davidson**, Louisiana State University, and **Ronald Stanke**, Baylor University.

Mathematical Modeling in Biology (Code: SS 9A), **Hongyu He**, Louisiana State University, **Sergei S. Pilyugin**, University of Florida, and **Jianjun Tian**, College of William and Mary.

Matroid Theory (Code: SS 17A), **Bogdan S. Oporowski** and **James G. Oxley**, Louisiana State University.

Nonlinear Evolution Equations of Mathematical Physics (Code: SS 5A), **Jerry L. Bona**, University of Illinois at Chicago, and **Michael M. Tom**, Louisiana State University.

Number Theory and Applications in Other Fields (Code: SS 12A), **Jorge Morales**, Louisiana State University, **Robert Osburn**, University College Dublin, and **Robert V. Perlis** and **Helena Verrill**, Louisiana State University.

Radon Transforms, Tomography, and Related Geometric Analysis (Code: SS 16A), **Fulton B. Gonzalez**, Tufts University, **Isaac Pesenson**, Temple University, **Todd Quinto**, Tufts University, and **Boris S. Rubin**, Louisiana State University.

Recent Advances in Knot Theory: Quandle Theory and Categorified Knot Invariants (Code: SS 4A), **Sam Nelson**,

Pomona College, and **Alissa S. Crans**, Loyola Marymount University.

Structural Graph Theory (Code: SS 2A), **Maria Chudnovsky**, Columbia University.

Wavelets, Frames, and Multi-Scale Constructions (Code: SS 22A), **Palle E. T. Jorgensen**, University of Iowa, **David R. Larson**, Texas A&M University, **Gestur Olafsson**, Louisiana State University, and **Darrin Speegle**, Saint Louis University.

White Noise Distribution Theory and Orthogonal Polynomials (Code: SS 1A), **Jeremy J. Becnel**, Stephen F. Austin State University, and **Aurel I. Stan**, The Ohio State University at Marion.

Bloomington, Indiana

Indiana University

April 5–6, 2008

Saturday – Sunday

Meeting #1038

Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: February 2008
Program first available on AMS website: February 21, 2008
Program issue of electronic *Notices*: April 2008
Issue of *Abstracts*: Volume 29, Issue 3

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: December 18, 2007
For abstracts: February 12, 2008

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/sectional.html`.

Invited Addresses

Shi Jin, University of Wisconsin, *Title to be announced.*

Michael J. Larsen, Indiana University, *Title to be announced.*

Mircea Mustata, University of Michigan, *Title to be announced.*

Margaret H. Wright, New York University-Courant Institute, *Title to be announced.*

Special Sessions

Algebraic Aspects of Coding Theory (Code: SS 5A), **Heide Gluesing-Luerssen**, University of Kentucky, and **Roxana Smarandache**, San Diego State University.

Algebraic K-theory and Nil groups in Algebra and Topology (Code: SS 20A), **James F. Davis**, Indiana University, and **Christian Haesemeyer**, University of Illinois at Chicago.

Applications of Ring Spectra (Code: SS 16A), **Randy McCarthy**, University of Illinois at Urbana-Champaign, and **Ayelet Lindenstrauss**, Indiana University.

Birational Algebraic Geometry (Code: SS 3A), **Mircea I. Mustata**, University of Michigan, and **Mihnea Popa**, University of Illinois at Chicago.

Combinatorial Representation Theory, Topological Combinatorics, and Interactions Between Them (Code: SS 13A), **Patricia Hersh**, Indiana University, **Cristian P. Lenart**, State University of New York at Albany, and **Michelle Wachs**, University of Miami.

Combinatorial and Geometric Aspects of Commutative Algebra (Code: SS 1A), **Juan Migliore**, University of Notre Dame, and **Uwe Nagel**, University of Kentucky.

D-modules (Code: SS 14A), **Mathias Schulze**, Oklahoma State University, and **Hans Ulrich Walther**, Purdue University.

Discrete Structures in Conformal Dynamics and Geometry (Code: SS 11A), **Kevin M. Pilgrim**, Indiana University, and **William J. Floyd**, Virginia Polytech Institute & State University.

Finite Element Methods and Applications (Code: SS 9A), **Nicolae Tarfulea**, Purdue University Calumet, and **Sheng Zhang**, Wayne State University.

Geometry and Dynamics (Code: SS 7A), **Chris Connell**, **David M. Fisher**, and **Marlies Gerber**, Indiana University.

Graph Theory (Code: SS 17A), **Jozsef Balogh**, University of Illinois at Urbana-Champaign, **Hemanshu Kaul**, Illinois Institute of Technology, and **Tao Jiang**, Miami University.

Harmonic Analysis and Related Topics (Code: SS 8A), **Ciprian Demeter**, Institute for Advance Study, and **Nets Katz**, Indiana University.

Hyperbolic and Kinetic Equations (Code: SS 2A), **Shi Jin**, University of Wisconsin, and **Marshall Slemrod**, University of Wisconsin.

Mathematical Modeling of Cell Motility: From Molecular Events to Mechanical Movement (Code: SS 18A), **Anastasios Matzavinos**, Ohio State University, and **Nicoleta Eugenia Tarfulea**, Purdue University Calumet.

Minimal and CMC Surfaces (Code: SS 19A), **Bruce Michael Solomon** and **Matthias Weber**, Indiana University, and **Adam Weyhaupt**, Southern Illinois University.

Operator Algebras and Applications (Code: SS 12A), **Hari Bercovici**, Indiana University, **Marius Dadarlat**, Purdue University, and **Mihai Popa**, Indiana University.

Probability and Spatial Systems (Code: SS 10A), **Russell D. Lyons**, Indiana University, and **Alexander Holroyd**, University of British Columbia.

Recent Advances in Classical and Geophysical Fluid (Code: SS 15A), **Roger Temam** and **Shouhong Wang**, Indiana University.

Some Mathematical Problems in Biology, from Macromolecules to Ecosystems (Code: SS 6A), **Santiago David Schnell**, Indiana University, and **Roger Temam**, Indiana University.

Weak Dependence in Probability and Statistics (Code: SS 4A), **Richard C. Bradley** and **Lahn T. Tran**, Indiana University.

Claremont, California

Claremont McKenna College

May 3–4, 2008
Saturday – Sunday

Meeting #1039
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of *Notices*: March 2008
Program first available on AMS website: March 20, 2008
Program issue of electronic *Notices*: May 2008
Issue of *Abstracts*: Volume 29, Issue 3

Deadlines
For organizers: Expired
For consideration of contributed papers in Special Sessions: January 15, 2008
For abstracts: March 11, 2008

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Invited Addresses

Michael Bennett, University of British Columbia, *Title to be announced.*

Chandrashekhar Khare, University of Utah, *Title to be announced.*

Huaxin Lin, University of Oregon, *Title to be announced.*

Anne Schilling, University of California Davis, *Title to be announced.*

Special Sessions

Diophantine Problems and Discrete Geometry (Code: SS 3A), **Matthias Beck**, San Francisco State University, and **Lenny Fukshansky**, Texas A&M University.

Dynamical Systems and Differential Equations (Code: SS 1A), **Adolfo Rumbos**, Pomona College, **Mario Martelli**, Claremont McKenna College, and **Alfonso Castro**, Harvey Mudd College.

Hopf Algebras and Quantum Groups (Code: SS 5A), **Gizem Karaali**, Pomona College, **M. Susan Montgomery**, University of Southern California, and **Serban Raianu**, California State University Dominguez Hills.

Operators, Functions and Linear Spaces (Code: SS 2A), **Asuman G. Aksoy**, Claremont McKenna College, **Stephan R. Garcia**, Pomona College, **Michael Davlin O'Neill**, Claremont McKenna College, and **Winston C. Ou**, Scripps College.

Recent Developments in Riemannian and Kaehlerian Geometry (Code: SS 4A), **Hao Fang**, University of Iowa, **Zhiqin Lu**, University of California, Irvine, **Dragos-Bogdan Suceava**, California State University Fullerton, and **Mihaela B. Vajiac**, Chapman University.

Rio de Janeiro, Brazil

Instituto Nacional de Matemática Pura e Aplicada (IMPA)

June 4–7, 2008
Wednesday – Saturday

Meeting #1040
First Joint International Meeting between the AMS and the Sociedade Brasileira de Matemática.
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: February 2008
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: November 1, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/internmtgs.html.

AMS Invited Addresses

Ruy Exel, University Federal de Santa Catarina, *Title to be announced.*

Velimir Jurdjevic, University of Toronto, *Title to be announced.*

Andre Nachbin, Institute for Pure-Applied Mathematics, Rio de Janeiro, *Title to be announced.*

Richard M. Schoen, Stanford University, *Title to be announced.*

Ivan P. Shestakov, University of Sao Paulo, *Title to be announced.*

Amie Wilkinson, Northwestern University, *Title to be announced.*

Vancouver, Canada

University of British Columbia and the Pacific Institute of Mathematical Sciences (PIMS)

October 4–5, 2008
Saturday – Sunday

Meeting #1041
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of *Notices*: August 2008
Program first available on AMS website: August 21, 2008
Program issue of electronic *Notices*: October 2008

Issue of *Abstracts*: Volume 29, Issue 4

Deadlines

For organizers: March 9, 2008
For consideration of contributed papers in Special Sessions: June 17, 2008
For abstracts: August 12, 2008

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Invited Addresses

Richard Kenyon, University of British Columbia, *Title to be announced.*

Alexander S. Kleshchev, University of Oregon, *Title to be announced.*

Mark Lewis, University of Alberta, *Title to be announced.*

Audrey A. Terras, University of California San Diego, *Title to be announced.*

Middletown, Connecticut

Wesleyan University

October 11–12, 2008

Saturday – Sunday

Meeting #1042

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: August 2008
Program first available on AMS website: August 28, 2008
Program issue of electronic *Notices*: October 2008
Issue of *Abstracts*: Volume 29, Issue 4

Deadlines

For organizers: March 11, 2008
For consideration of contributed papers in Special Sessions: June 24, 2008
For abstracts: August 19, 2008

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Special Sessions

Algebraic Geometry (Code: SS 1A), **Eyal Markman** and **Jenia Tevelev**, University of Massachusetts, Amherst.

Kalamazoo, Michigan

Western Michigan University

October 17–19, 2008

Friday – Sunday

Meeting #1043

Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: August 2008
Program first available on AMS website: September 4, 2008
Program issue of electronic *Notices*: October 2008
Issue of *Abstracts*: Volume 29, Issue 4

Deadlines

For organizers: March 17, 2008
For consideration of contributed papers in Special Sessions: July 1, 2008
For abstracts: July 26, 2008

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Invited Addresses

M. Carme Calderer, University of Minnesota, *Title to be announced.*

Alexandru Ionescu, University of Wisconsin, *Title to be announced.*

Boris S. Mordukhovich, Wayne State University, *Title to be announced.*

David Nadler, Northwestern University, *Title to be announced.*

Huntsville, Alabama

University of Alabama, Huntsville

October 24–26, 2008

Friday – Sunday

Meeting #1044

Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of *Notices*: August 2008
Program first available on AMS website: September 11, 2008
Program issue of electronic *Notices*: October 2008
Issue of *Abstracts*: Volume 29, Issue 4

Deadlines

For organizers: March 24, 2008
For consideration of contributed papers in Special Sessions: July 8, 2008
For abstracts: September 2, 2008

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Invited Addresses

Mark Behrens, Massachusetts Institute of Technology, *Title to be announced.*

Anthony Michael Bloch, University of Michigan, Ann Arbor, *Title to be announced.*

Roberto Camassa, University of North Carolina, Chapel Hill, *Title to be announced.*

Mark V. Sapir, Vanderbilt University, *Title to be announced.*

Shanghai, People's Republic of China

Fudan University

December 17–21, 2008

Wednesday – Sunday

Meeting #1045

First Joint International Meeting between the AMS and the Shanghai Mathematical Society
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: June/July 2008
Program first available on AMS website: Not applicable
Program issue of electronic *Notices*: Not applicable
Issue of *Abstracts*: Not applicable

Deadlines

For organizers: February 1, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/internmtgs.html.

Invited Addresses

L. Craig Evans, University of California Berkeley, *Title to be announced.*

Zhi-Ming Ma, Chinese Academy of Sciences, *Title to be announced.*

Richard Schoen, Stanford University, *Title to be announced.*

Richard Taylor, Harvard University, *Title to be announced.*

Xiaoping Yuan, Fudan University, *Title to be announced.*

Weiping Zhang, Chern Institute, *Title to be announced.*

Special Sessions

Nonlinear Systems of Conservation Laws and Related Topics, **Gui-Qiang Chen**, Northwestern University, and **Shuxing Chen** and **Yi Zhou**, Fudan University.

Quantum algebras and Related Topics, **Naihuan N. Jing**, North Carolina State University, **Quanshui Wu**, Fudan University, and **James J. Zhang**, University of Washington.

Recent Developments in Nonlinear Dispersive Wave Theory, **Jerry Bona**, University of Illinois at Chicago, **Bo Ling Guo**, Institute of Applied Physics and Computational Mathematics, **Shu Ming Sun**, Virginia Polytech Institute and State University, and **Bingyu Zhang**, University of Cincinnati.

Washington, District of Columbia

Marriott Wardman Park Hotel and Omni Shoreham Hotel

NEW DATES!!!

January 5–8, 2009

Monday – Thursday
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: Bernard Russo
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

Urbana, Illinois

University of Illinois at Urbana-Champaign

March 27–29, 2009

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: August 29, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Special Sessions

Geometric Group Theory (Code: SS 2A), **Sergei V. Ivanov**, **Ilya Kapovich**, **Igor Mineyev**, and **Paul E. Schupp**, University of Illinois at Urbana-Champaign.

q-Series and Partitions (Code: SS 1A), **Bruce Berndt**, University of Illinois at Urbana-Champaign.

Raleigh, North Carolina

North Carolina State University

April 4–5, 2009

Saturday – 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: 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
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: September 25, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Waco, Texas

Baylor University

October 16–18, 2009

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: March 17, 2009
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Boca Raton, Florida

Florida Atlantic University

October 30 – November 1, 2009

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 30, 2009
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Riverside, California

University of California

November 7–8, 2009

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: April 6, 2009
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 of Industrial and Applied Mathematics (SIAM).
Associate 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

Lexington, Kentucky

University of Kentucky

March 27–28, 2010
Saturday – 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, 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).
Associate 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

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

AMS SHORT COURSE

Applications of Knot Theory

January 4-5, 2008
San Diego, California

Organizers:

Dorothy Buck
Department of Mathematics
and Centre for Bioinformatics
Imperial College London

Erica Flapan
Department of Mathematics
Pomona College

Over the past twenty years, knot theory has rekindled its historic ties with biology, chemistry, and physics. While the original motivation for understanding and classifying knots came from chemistry, knot theory remained a primarily pure field of mathematics until the 1980s, when chemists, biologists, and physicists began searching for more sophisticated descriptions of entanglements of natural phenomena—from strings to small organic compounds to DNA.

This AMS Short Course will introduce knot theory, and some of its recent applications in molecular biology, chemistry, and physics. No prior knowledge of knot theory, biology, chemistry, or physics is assumed— there will be introductory talks on the first day. Speakers will survey their own work in these areas, as well as describing new avenues for interested researchers (and their students) to explore.

The Short Course will conclude with a panel discussion of the putative trajectories of these applications of knot theory, and summarize the major open problems and challenges. References will be available in advance and lecture notes published afterwards.

List of speakers:

Colin Adams (Williams College)
Dorothy Buck (Imperial College London)
Erica Flapan (Pomona College)
Lou Kauffman (University of Illinois at Chicago)
Ned Seeman (New York University)
Jon Simon (University of Iowa)

Advance registration fees:

member/nonmember	**$94/125**
Student/unemployed/emeritus	**$42**

On-site registration fees:

member/nonmember	**$125/155**
student/unemployed/emeritus	**$63**

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

Baltimore, Maryland

Baltimore Convention Center

January 15–18, 2014, *Wednesday – Saturday*
Joint Mathematics Meetings, including the 120th Anual Meeting of the AMS, 97th 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, with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
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: April 1, 2013
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Joint Meetings Advance Registration/Housing Form

Note: Write your name as you would like it to appear on your badge (no titles, please). Badges and programs can only be mailed to home addresses. If you would like your registration materials mailed to you on December 13, please register by November 15, provide your home address, and check this box: ☐ **I want my materials mailed to the following address on 12/13/07.**
☐ **I do not want my materials mailed. I will pick them up onsite.**

Name _____

Mailing Address _____

_____

Telephone: _____ Fax: _____

In case of emergency (for you) at the meeting, call: Day #: _____ Evening #: _____

Email Address _____

Affiliation for name badge _____

Nonmathematician guest badge name _____ (please note charge below)

Acknowledgment of this registration will be sent to the email address listed, unless you check this box: Send by U.S. Mail ☐

Membership
✓ all that apply. First column is eligible for member registration fee

❑ AMS	❑ ASA
❑ MAA	❑ AWM
❑ ASL	❑ NAM
❑ CMS	❑ YMN
❑ SIAM	

Registration Fees

Joint Meetings	**by Dec 14**	**at mtg**	**Subtotal**
❑ Member AMS, ASL, CMS, MAA, SIAM	US $214	US $279	
❑ Nonmember	US $332	US $431	
❑ Graduate Student	US $ 44	US $ 54	
❑ Undergraduate Student	US $ 23	US $ 29	
❑ High School Student	US $ 5	US $ 10	
❑ Unemployed	US $ 43	US $ 53	
❑ Temporarily Employed	US $172	US $200	
❑ Developing Countries Special Rate	US $ 43	US $ 53	
❑ Emeritus Member of AMS or MAA	US $ 43	US $ 53	
❑ High School Teacher	US $ 43	US $ 53	
❑ Librarian	US $ 43	US $ 53	
❑ Nonmathematician Guest	US $ 15	US $ 15	

$ _____

AMS Short Course: *Applications of Knot Theory (1/4–1/5)*

❑ Member of AMS or MAA	US $ 94	US $125	
❑ Nonmember	US $125	US $155	
❑ Student, Unemployed, Emeritus	US $ 42	US $ 63	

$ _____

MAA Short Course: *Combinatorics: Past, Present, Future. (1/4–1/5)*

❑ 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 #_____
Price: US $60 for each minicourse.
(For more than 2 minicourses, call or email the MMSB.) $ _____

Employment Center
Applicant résumé forms and employer job listing forms will be on the AMS website at www.ams.org/emp-reg/.

Employer—First Table		US $245	US $325
❑ Computer-scheduled ❑ Self-scheduled ❑ Combination Interview			
Employer— Each Additional Table		US $ 95	US $125
❑ Computer-scheduled ❑ Self-scheduled ❑ Combination Interview			
❑ Employer—Posting Job Description 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 (1/7)	US $50.00	#____Regular	#____Veg	#____Kosher
NAM Banquet (1/8)	US $49.00	#____Regular	#____Veg	#____Kosher
AMS Banquet (1/9)	US $52.00	#____Regular	#____Veg	#____Kosher

$ _____

Other Events
❑ AMS Workshop on Grant Writing (1/6) (no charge)
❑ Graduate Student/First Time Attendee Reception (1/6) (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

Registration & Event Total (total from column on left) $ _____

Hotel Deposit (only if paying by check) $ _____

Total Amount To Be Paid **$** _____

(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: _____

❑ Purchase order # _____ (please enclose copy)

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.
❑ I would like to receive promotions for future JMM meetings.
❑ Please ✓ this box if you have a disability requiring special services.
❑ **Please do not include my name on any promotional mailing list.**

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:*

Résumés/job descriptions printed in the *Winter Lists*	**Oct. 24, 2007**
To be eligible for the room lottery and the raffle:	**Oct. 31, 2007**
For housing reservations, badges/programs mailed:	**Nov. 15, 2007**
For housing changes/cancellations through MMSB:	**Dec. 7, 2007**
For advance registration for the Joint Meetings, Employment Center, Short Courses, MAA Minicourses, & Tickets:	**Dec. 14, 2007**
For 50% refund on banquets, cancel by:	**Dec. 21, 2007***
For 50% refund on advance registration, Minicourses & Short Courses, cancel by:	**Dec. 28, 2007***

***no refunds after this date**

San Diego 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 at the following hotels must be made 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 10.6% sales tax. **Guarantee requirements: First night deposit by check (add to payment on reverse of form) or a credit card guarantee.**

❑ Deposit enclosed (see front of form) ❑ Hold with my credit card Card Number _____ Exp. Date _____ Signature _____

Date and Time of Arrival _____ **Date and Time of Departure** _____

Name of Other Room Occupant _____ **Arrival Date** _____ **Departure Date** _____ **Child (give age(s)**_____

Order of choice	Hotel	Single	Double 1 bed	Double 2 beds	Triple 2 beds	Triple 2 beds w/cot	Triple - king or queen w/cot	Quad 2 beds	Quad 2 beds w/cot	Suites Starting rates
	San Diego Marriott Hotel & Marina (hqtrs)									
	Cityview	US $172	US $172	US $172	US $192	US $192	US $192	US $212	US $212	N/A
	Bayview	US $192	US $192	US $192	US $212	US $212	US $212	US $232	US $232	US $685
	Student	US $138	US $138	US $138	US $158	US $158	US $158	US $178	US $178	N/A
	Horton Grand Hotel	US $155	US $155	US $155 (very limited)	US $175 (very limited)	N/A	N/A	US $195 (very limited)	N/A	US $215
	Student	US $145	US $145	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Hilton San Diego Gaslamp Quarter	US $150	US $150	US $150	US $170	N/A	US $190	US $190	N/A	US $489
	Student	US $140	US $140	US $140	US $160	N/A	US $180	US $180	N/A	N/A
	Embassy Suites-Cityview Suites	US $149	US $149	US $149	US $169	No rollaways; have sleeper sofa	No rollaways; have sleeper sofa	US $189	N/A	all suites
	Bayview Suites	US $169	US $169	US $169	US $189	No rollaways; have sleeper sofa	No rollaways; have sleeper sofa	US $209	N/A	all suites
	Student Suites	US $135	US $135	US $135	US $145	No rollaways; have sleeper sofa	No rollaways; have sleeper sofa	US $155	N/A	all suites
	Omni San Diego	US $140	US $140	US $140	US $160	N/A	US $185	US $180	N/A	Jr. Suite: US $399; 1BR US $499
	Student	US $125	US $125	US $125	US $145	N/A	US $170	US $165	N/A	N/A
	Holiday Inn on the Bay-Cityview	US $135	US $135	US $135	US $150	N/A	US $160	US $165	N/A	N/A
	Bayview	US $165	US $165	US $165	US $180	N/A	US $190	US $195	N/A	US $338
	Student	US $125	US $125	US $125	US $140	N/A	US $150	US $155	N/A	N/A
	Holiday Inn Express	US $129	US $129	US $129	US $144	N/A	N/A	US $159	N/A	US $239
	Student	US $119	US $119	US $119	US $134	N/A	N/A	US $149	N/A	N/A
	Courtyard Marriott Downtown	US $109	US $109	US $109	US $119	N/A	King only-US $119	US $129	N/A	US $169
	Rodeway Inn and Suites	US $91	US $91	US $91	US $101	$121	US $121	US $111	US $131	N/A
	500 West Hotel	US $49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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:_____

Email confirmations (no paper) will be sent by the Hilton, Embassy Suites, Holiday Inns, Horton, Marriott (hqtrs), Omni & Rodeway Inn. **Please provide your email address:**_____

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.

Meetings and Conferences of the AMS

Associate Secretaries of the AMS

Western Section: Michel L. Lapidus, Department of Mathematics, University of California, Surge Bldg., Riverside, CA 92521-0135; e-mail: lapidus@math.ucr.edu; telephone: 951-827-5910.

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: susan@math.nwu.edu; telephone: 312-996-3041.

Eastern Section: Lesley M. Sibner, Department of Mathematics, Polytechnic University, Brooklyn, NY 11201-2990; e-mail: lsibner@duke.poly.edu; telephone: 718-260-3505.

Southeastern Section: Matthew Miller, Department of Mathematics, University of South Carolina, Columbia, SC 29208-0001, e-mail: miller@math.sc.edu; telephone: 803-777-3690.

2009 Washington, DC, Meeting: Bernard Russo, Department of Mathematics, University of California, Irvine, CA 92697-3875, e-mail: brusso@math.uci.edu; telephone: 949-824-5505.

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:

Important Information Regarding AMS Meetings

Potential organizers, speakers, and hosts should refer to page 78 in the the January 2007 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.

IMA INSTITUTE FOR MATHEMATICS AND ITS APPLICATIONS

Membership opportunities

in connection with the 2008-2009 thematic program on

MATHEMATICS AND CHEMISTRY

IMA NEW DIRECTIONS RESEARCH 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 2008-2009 academic year immersed in the thematic program at the IMA. Research Professors will enjoy an excellent research environment and stimulating scientific program connecting Mathematics and Chemistry and related areas of mathematics with a broad range of fields of application. New Directions Research Professors are expected to be resident and active participants in the program, but are not assigned formal duties. Deadline January 15, 2008.

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 and Chemistry. IMA postdoctoral fellowships run one to two years, at the option of the holder, starting September 1, 2008. Deadline January 4, 2008.

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 September 1, 2008. 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 scientists. Deadline January 4, 2008.

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 2008-2009 thematic program. The residency should fall in the period September 2008 through June 2009 (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.

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