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Notices

of the American Mathematical Society

September 2007 **Volume 54, Number 8**

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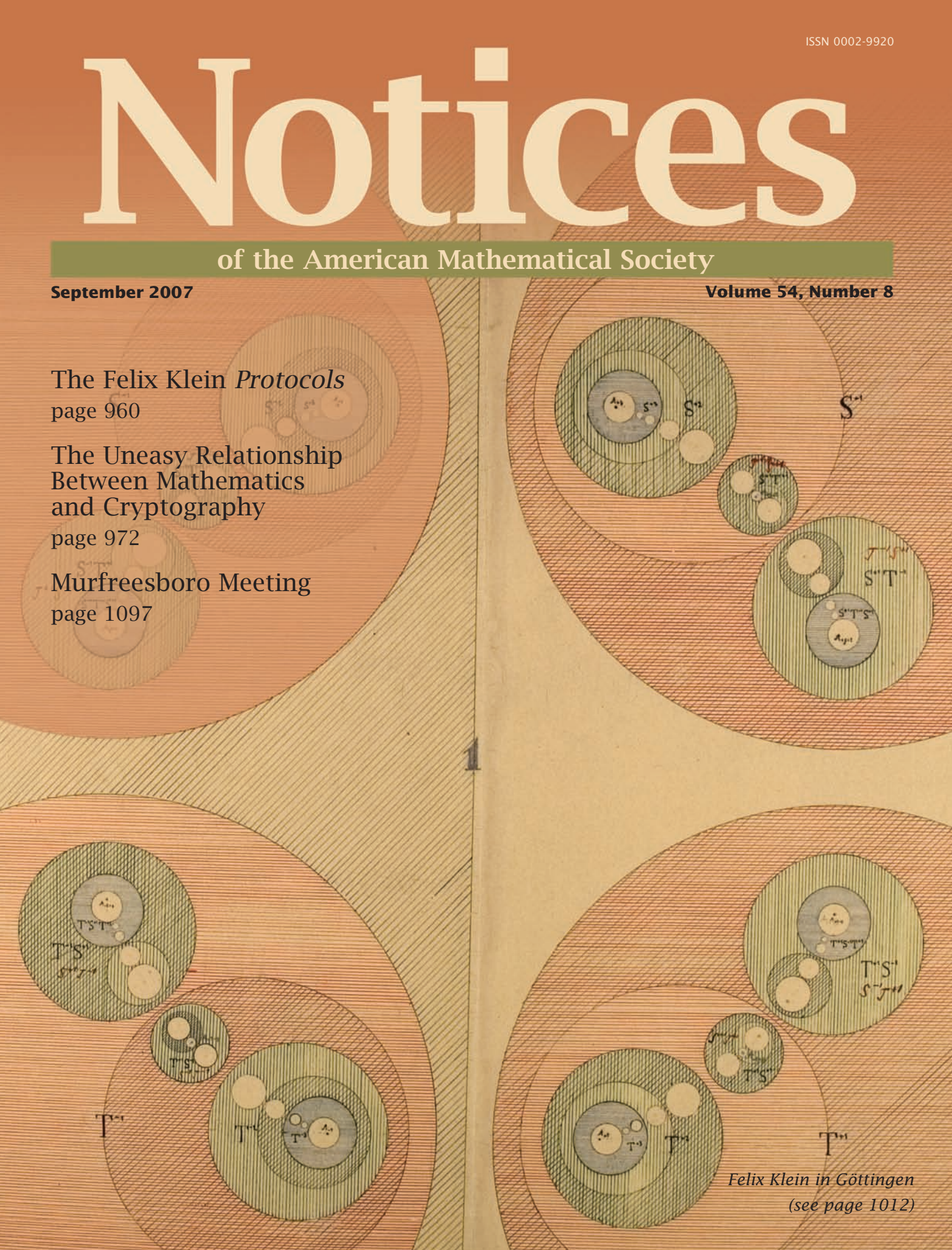


Felix Klein in Göttingen
(see page 1012)

About the Cover

Felix Klein in Göttingen

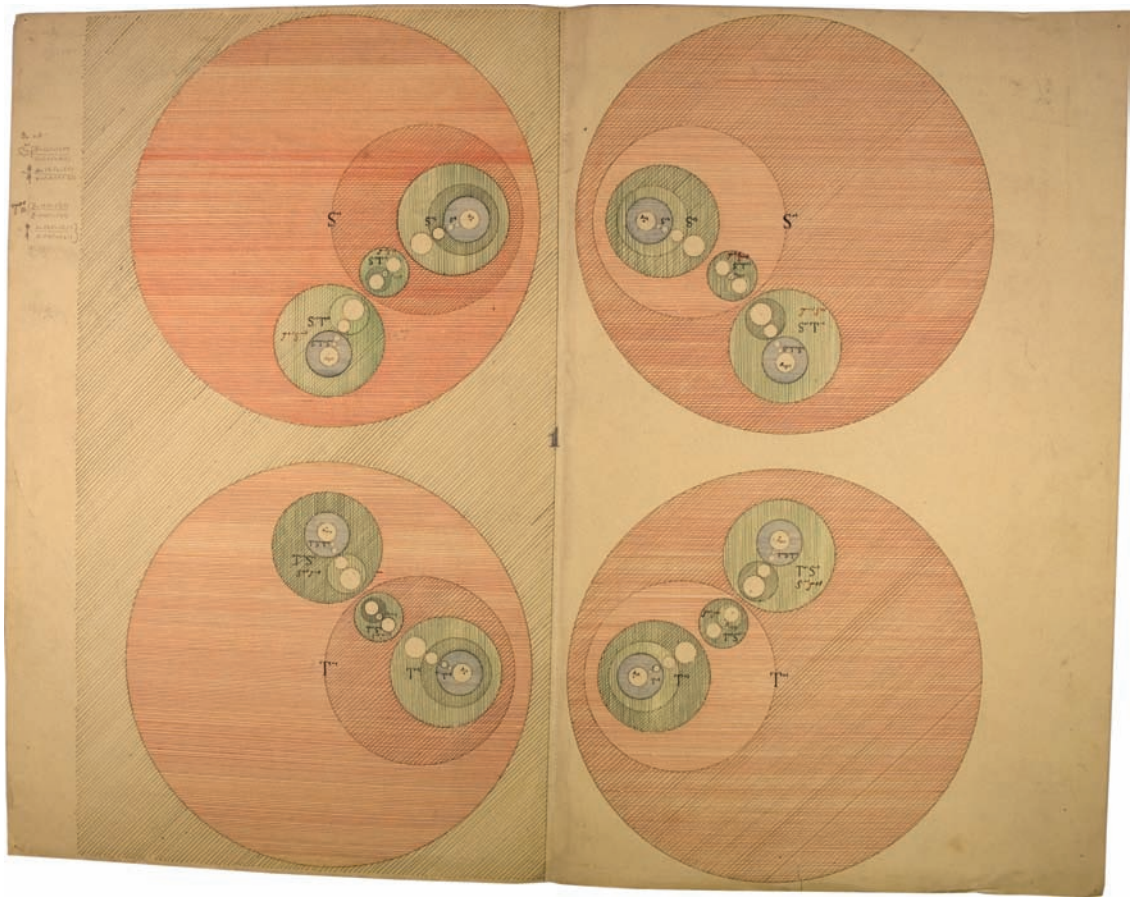
This month's cover accompanies the article by Eugene Chislenko and Yuri Tschinkel. Their article describes the archive of notes from Klein's seminar over several years, but Göttingen possesses other legacies of Klein (not to speak of Gauss, Dirichlet, Minkowski, Hilbert, or Siegel). Among them is a portfolio of drawings discovered by S. J. Patterson on his arrival there many years ago, stored in the cupboards underneath the glass cabinets containing the famous collection of mathematical models. Among several drawings, the cover illustration is distinguished by its use of color in cross-hatching. It depicts the geometry of a Schottky group with two generators. A note written in the margin, possibly by Klein, specifies the generators S and T of the group as Möbius transformations. The transformation S has attracting fixed point 2.5 + 6.5i, repelling -2.5 + 6.5i, and multiplier 4/9, while T has conjugate fixed points and the same multiplier.

It is not at all clear who produced the diagram, or for what it was used. The cover drawing is similar to illustrations in the classic text by Fricke and Klein on automorphic functions, but I am not aware that it was in fact published anywhere. Taking color as well as the amount of hard work involved into account, one would have to look at Chapter 4 of the recent book *Indra's Pearls* by Mumford, Series, and Wright to see something quite so impressive.

Patterson speculates that it was Otto Neugebauer who was responsible for preserving the portfolio when the Mathematical Institute moved into its present building in 1929. He writes, "Neugebauer seems to have been the one who recognized that what was merely old in 1929 would eventually be of historical interest"—something for us all to keep in mind.

Our thanks to David Wright, who went to some trouble to interpret the diagram and verify its correctness by reproducing it with modern software.

—Bill Casselman, Graphics Editor
*(*notices-covers@ams.org*)*



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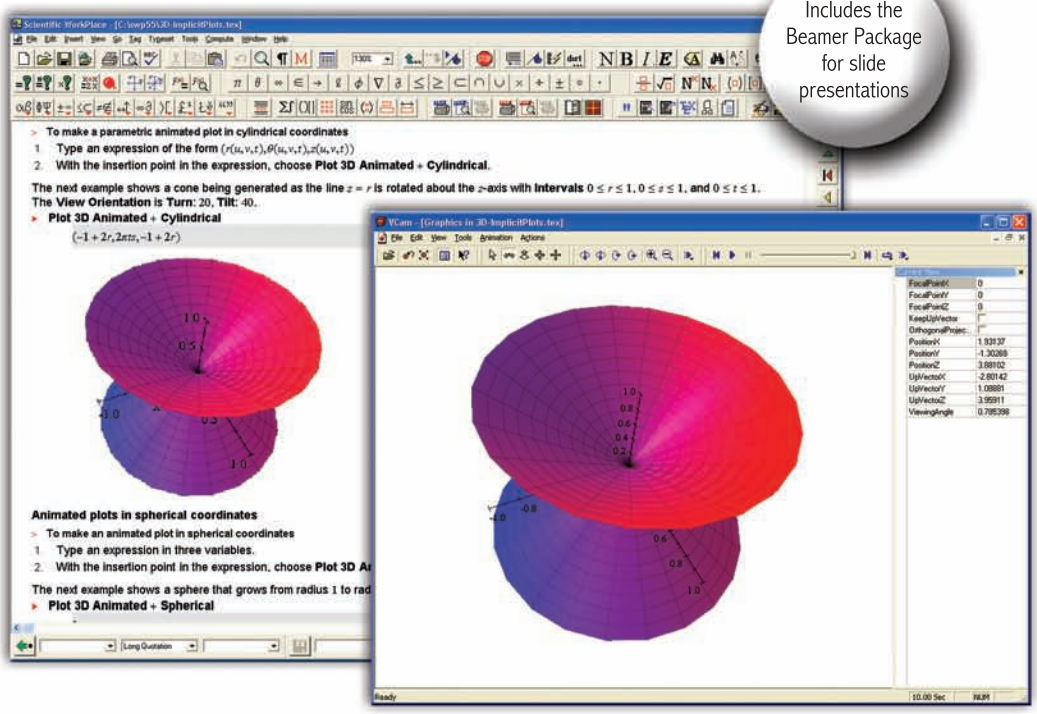

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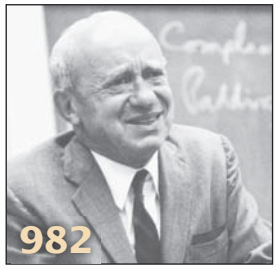

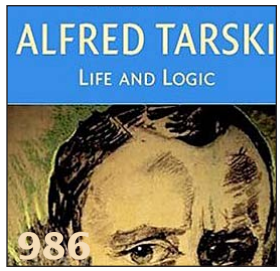

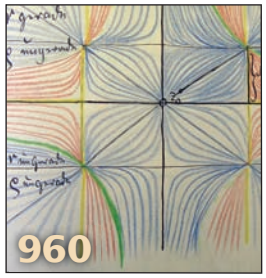

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The Klein *Protocols* are the handwritten records of the Göttingen seminar lectures of Felix Klein and his school. These rare documents, a centerpiece of the Göttingen Mathematical Institute's archive, have recently become available digitially. In this article, the authors take readers on an annotated tour of the *Protocols*.

972 The Uneasy Relationship Between Mathematics and Cryptography

Neal Koblitz

The worlds of academic mathematical research and commercial and governmental application, with their occasionally distinct values and practices, meet and sometimes clash in the study and implementation of cryptosystems. The author describes his own experiences, and those of mathematical colleagues, in this intersection.

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From the AMS Secretary

Special Section—2007 American Mathematical Society Election 1036

What Does a Mathematician Look Like?

The stereotype of an American mathematician is someone who solved the Rubik's cube at eight, took calculus at fourteen, and was tackling serious mathematics at sixteen. And he's a guy.

We all know people like this. But most of us don't fit the stereotype. We came to mathematics by different paths. We needed time to think about our lives, ourselves, and that stereotype. And some of us are women.

G. H. Hardy famously wrote "Mathematics is a young man's game." American culture is a youth culture. The culture of mathematics celebrates youth and precocity. But the idea that for mathematics one has to start early, that mathematicians get old fast, and that if you're over thirty you've missed the boat, is a myth. Most mathematicians, if they produce after writing their dissertations, continue to produce throughout their professional lives. And most mathematicians were not prodigies.

For women this is especially true. For an extreme example consider Alice Roth, whose fruitful and important career had to wait until she retired from high school teaching ("Alice in Switzerland: The Life and Mathematics of Alice Roth", by U. Daepp, P. Gorkin, P. Gauthier, G. Schmieder, *Mathematical Intelligencer*, vol. 27, no. 1, 2005). Consider also Harriet Moser, who completed her doctorate at sixty-four ("An Interview with Harriet Moser", Joan Birman, *Newsletter of the Association for Women in Mathematics*, March-April, 2005). There are many others who chose math only late in their college careers or after. Women often take longer than men to discover their love for mathematics and still go on to become fine mathematicians.

American society tells women that they aren't mathematicians. Nearly 60 percent of college undergraduates are women, but only 16 percent of tenured mathematics faculty members are women. In hundreds of subtle ways, girls are told they shouldn't expect to excel in mathematics. It's not surprising, therefore, that they don't. But the culture doesn't have to be that way. It's not that way in every country—in the Philippines, for example, half the mathematics Ph.D.'s and more than half the tenured mathematics faculty are women.

The impact of culture on performance is addressed in the pioneering work of Claude Steele. In a series of experiments, Steele and his students detailed the power of expectations and culture on women and minorities. They have shown in repeated studies, for example, the achievement of women on mathematics tests can be significantly better when no men are around. See "Stereotype threat and women's math performance", by S. J. Spencer, C. M. Steele, and D. M. Quinn, *Journal of Experimental Social Psychology*, **35**, 4–28; and "A Threat in the Air: How Stereotypes Shape Intellectual Identity and Performance", by Claude Steele, *The American Psychologist* **52**, pp. 613–629.

Our educational apparatus works well for those who fit the stereotype. It works less well for others. In particular, many women face a double hurdle. They are discouraged early by society's expectations for women. Then after a few years, when they have found themselves and their love of mathematics, they are discouraged by society's expectations for older students.

There are outstanding programs for women who are on track. The EDGE program and the Carleton and George Washington summer programs for women in mathematics offer such students courses, confidence, and community. What is needed is a program for women who are off the track. What is needed is a program that will give talented women with energy and drive a chance to get back in the game. Smith College will start such a program this fall.

The Center for Women in Mathematics at Smith College is offering the nation's first post-baccalaureate program in mathematics. It is for women who have graduated without majoring in mathematics or women whose backgrounds are otherwise not sufficient for graduate school. It's a place for these women to take courses, to build skills, and to gain confidence before moving on to graduate study in mathematics. It is, in fact, an alternative culture, a vertically integrated community of women: undergraduates, BAs, graduate students, Smith alumnae mathematicians, and both female and male Smith mathematics faculty.

Yes, we marvel at the prodigies whose unwavering interest and aptitude in mathematics are evident from the start. But we must also open our minds to the vast numbers of students—women and minorities (and others from all walks of life)—who can be mathematicians but may not make that choice until late in their college careers or after.

—Ruth Haas
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Department of Mathematics
Smith College

Letters to the Editor

Review Journal for Older Books

I propose establishing a mathematical book review journal that only reviews books written more than fifty years ago.

Let me illustrate why by means of an example. Weinstock (*Am. J. Phys.* **50**(7), July 1982) claimed that an "examination of Newton's *Principia* reveals a fallacy in its purported proof of the ... fact that an inverse-square central force acting on a particle requires that the particle move in a conic-section orbit," and that "the body of Newton scholars ... missed the fallacy for nearly three centuries." In fact, Weinstock says that he "detected not even a timid tweet from any whistle blown to call attention to the actual *fallacy* embodied in the *Principia ... not since Johann* Bernoulli's in 1710." Apparently, Weinstock did not read the classical German literature, where the "mistake" was clearly recognised and understood again and again (e.g., Suter, *Geschichte der mathematischen Wissenschaften*, vol. 2, p. 164; Fleckenstein, "Johann I Bernoulli als Kritiker der 'Principia' Newtons," *Elemente der Mathematik* **1**, 1946, p. 101).

In my view, this episode is symptomatic of two modern evils. First, we as a community encourage disrespect for classical knowledge. I once overheard a graduate student express dissatisfaction that a Galois theory course worked over the complex number since "one never uses $\mathbb{C}$ anyway." We made these people. We could show our students how complex numbers were the heart and soul of virtually all algebra, geometry, and analysis throughout the 19th century. But we don't. We hurry them into research and this is what we get. Second, "everybody writes and nobody reads" (Erdős attributes this saying to Fejér; *Coll. Math. J.* **12**(4), 1981).

My proposed book review journal would strive to cure both these ills by reverting Weinstock's analysis that a modern scholar "has more interesting, more urgent, more rewarding ways to spend time and energy than to hack away painfully through the turgid exposition of a classic treatise" and that "that sort of effort is accordingly consigned to a future that never arrives" to say that there is nothing more interesting, more urgent, more rewarding than to study a classic treatise and that that sort of effort was carried out in a past that is now long gone.

—*Vicktor Blåsjö*
Marlboro College
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(Received May 13, 2007)

Complex History

Complex numbers and linear fractional mappings are of frequent use. Most students are familiar with these notions; they are usually taught with a few historical references. From that last point of view, the following facts may be of some interest.

1) Linear fractional maps are sometimes called Möbius maps and "homographies" by the French mathematicians. In fact, Euler introduced this mapping in his paper "De projectione geographica superficiei sphaericae"; it appeared in the *Acta academiae scientiarum Petropolitanae*, 1777 : I, 1778, pp. 133–142 (vol. 28, Series prima, p. 286). He wrote:

> For that reason, to the function $\Delta(z)$, let us give such a general form
>
> $$\frac{a+bz}{c+dz};$$
>
> (Hanc ob causam functioni $\Delta : z$ talem formam generalem tribuamus)
>
> $$\frac{a+bz}{c+dz};$$

It is a trivial but pleasant remark that since Euler the notation has not been changed. Euler adds all at once:

> [b]ut for z let us take the last form given above, which was $z = \text{tang } \frac{1}{2}v(\cos t \pm \sqrt{-1}\sin t)$
>
> (at vero pro z sumamus formam postremam supra expositam, qua erat $z = \text{tang } \frac{1}{2}v(\cos t \pm \sqrt{-1}\sin t)$).

Almost in the beginning of his article, Euler uses the following terms:

> This point in the plane must be so determined by two orthogonal coordinates x and y, so that... $x = \Delta(\text{tang } \frac{1}{2}v(\cos t + \sqrt{-1}\sin t)) + \Delta(\text{tang } \frac{1}{2}v(\cos t - \sqrt{-1}\sin t))$, $y\sqrt{-1} = \Delta(\text{tang } \frac{1}{2}v(\cos t + \sqrt{-1}\sin t)) - \Delta(\text{tang } \frac{1}{2}v(\cos t - \sqrt{-1}\sin t))$, where it is manifest that if the undefined letter of the function Δ were omitted, [these formulae] would give the construction of the hemisphere either boreal or austral.
>
> (id punctum in plano per binas coordinates orthogobales x et y ita determinari debeat, ut sit...)

2) At the end of the seventeenth century, a polynomial was said to be a "complex quantity" ("une quantité complexe" in Bossut's treatise of Algebra). So has been understood the polynomial $ax + by$ where $a = 1, b = \sqrt{-1}$. (Recall that the term imaginary, introduced by Descartes in his *Geometry* (1637) (from the fact that for instance the intersection of a line with a circle might not be visible at all), is not at all convenient for naming $\sqrt{-1}$.) In fact the first person who introduced an example of such a number was the physician Nicolas Chuquet in 1484. I bet that his paper fell into the hands of another physician, Gerolimo Cardano: he uses exactly the same words as Chuquet to describe these "impossible numbers". That is why I use the terminology "Chuquet-Cardan numbers" instead of "complex numbers":

I don't [want to] put in the mind that these numbers are awfully complex and dangerous entities.

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Reed Ends Arms Fair Business

A recent article by Allyn Jackson ["Jumping Ship: 'Topology' Board Resigns", May 2007] made reference to a campaign that I've been helping to coordinate. The aim of the campaign was to force Reed Elsevier to stop organising arms fairs. The method of the campaign was to galvanise scientific, academic, and medical opinion against Reed's involvement in this business.

On 1 June, Reed announced that they would withdraw from the "defence industry" during the second half of 2007. The reason that they gave was as follows:

"[I]t has become increasingly clear that growing numbers of important customers and authors have very real concerns about our involvement in the defence exhibitions business. We have listened closely to these concerns and this has led us to conclude that the defence shows are no longer compatible with Reed Elsevier's position as a leading publisher of scientific, medical, legal, and business content."

A substantial number of prominent mathematicians, including Sir Michael Atiyah, participated in the campaign, which included a publishing boycott, an on-line petition, and a number of high-profile open letters from different groups.

Reed's arms fair business turned over more than 20 million pounds last year. Despite this, the pressure that has been brought to bear by the scientific, academic, and medical communities has proved more than Reed could bear.

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(Received June 7, 2007)

Establish a Photo Archive

It seems that the AMS has been passing up an opportunity to build a valuable historical archive of photographs. I discovered this during the past few months when looking for official sources of photographs of distinguished women in mathematics—the AMS did not own a single photograph of any of the 25 women of interest to me. I was stunned, as I thought surely the AMS would at least have been taking photographs at the meetings it sponsors—if you take the photograph, you have the copyright to it. What could be simpler? Surely mathematics departments would be happy to donate hi-res scans of the photographs of their distinguished members, etc. The physicists, on the other hand, have a magnificient collection at the Segre Visual Archives of the Niels Bohr Library and Archives, which is a part of the American Institute of Physics. They say the library and archives also acquire materials that can best be preserved at the American Institute of Physics, including photographs, oral histories, books, AIP and member society archives, etc. Perhaps there is a good reason that the AMS does not maintain an archive, but I do not see it.

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Correction

Jonathan Sondow (Letters to the Editor, May 2007, page 590) was misidentified. He is an alumnus, not an employee, of Princeton University.

—*Andy Magid*

Georgia Tech College of Sciences

Chair, School of Mathematics

The Georgia Institute of Technology invites nominations and applications for the position of Chair and Professor of Mathematics. We are seeking an outstanding scholar and educator with a national presence to lead a vibrant and growing School. Candidates should have a strong commitment to promoting continued growth and quality in the research and educational activities of the School. We also expect creative leadership in faculty and staff development, and promotion and fostering of interdisciplinary efforts.

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College of Sciences Dean's Office,
Georgia Institute of Technology,
Atlanta, GA 30332-0365.

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The Felix Klein *Protocols*

Eugene Chislenko and Yuri Tschinkel

All photographs: Mathematisches Institut Universität Göttingen.

Felix Klein

The Göttingen Archive

Two plain shelves in Göttingen, in the entrance room of the *Mathematisches Institut* library, hold an astounding collection of mathematical manuscripts and rare books. In this locked *Giftschrank*, or "poison cabinet", stand several hundred volumes, largely handwritten and mostly unique, that form an extensive archive documenting the development of one of the world's most important mathematical centers—the home of Gauss, Riemann, Dirichlet, Klein, Hilbert, Minkowski, Courant, Weyl, and other leading mathematicians and physicists of the 19th and early 20th centuries. A recent *Report on the Göttingen Mathematical Institute Archive* [2] cites "a range of material unrivalled in quantity and quality": "No single archive is even remotely comparable", not only because Göttingen was "the leading place for mathematics in the world", but also because "no other community has left such a detailed record of its activity …usually we are lucky to have lecture lists, with no indication of the contents."

The collection runs from early handwritten lectures by Dirichlet, Riemann, and Clebsch, through almost 100 volumes by Hilbert, to volumes of Minkowski, Hasse, and Siegel on number theory, Noether on algebra, and Max Born on quantum mechanics. But the largest and most impressive of its centerpieces is the *Seminar-Protokolle* of Felix Klein: a detailed handwritten registry, spanning over 8,000 pages in 29 volumes, of forty years of seminar lectures by him, his colleagues and students, and distinguished visitors. These *Protocols*, previously unpublished, are now available digitally, as part of a project sponsored by the Clay Mathematics Institute. They constitute one of the richest records of mathematical activity in modern times.

Felix Klein

Felix Klein was one of the central figures in 19th and early 20th century mathematics. Born in Düsseldorf, Germany, in 1849, he studied in Bonn under Plücker, and then worked briefly in Göttingen under Alfred Clebsch and with the young Sophus Lie in Berlin and Paris. Plücker's sudden death and Clebsch's encouragement left him with unfinished projects in geometry, where he made his earliest and most lasting creative achievements. His first major result was the construction of the Klein model of non-Euclidean geometry, establishing that the consistency of non-Euclidean geometry is equivalent to the consistency of Euclidean geometry. This put an end to the long controversy concerning the legitimacy of non-Euclidean geometry. After a brief military service in 1870 and his *Habilitation* in Göttingen in 1871, he "started lecturing on 'Optics' and 'Interactions of Natural Forces', without having studied much physics" [5], p. 1. In 1872, the twenty-three-year-old Klein began

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Figure 1. The *Protocols*.

his first professorship at the University of Erlangen. The main themes of his inauguration speech were: the role of mathematics in the system of the sciences and in society, practical applications, and above all, "the general purpose of mathematics education, and especially the form we aspire to give to it at our universities" [4], p. 4. While at Erlangen he developed his revolutionary *Erlangen Program*, unifying the various geometries of the time by classifying them according to their corresponding groups of transformations. Over the next decade, he continued to do groundbreaking work in group theory, function theory, and related areas. But he still intended "to return one day to physics, and …to science in general", and even worked in a zoology lab for one semester [5], p. 2.

In 1875 Klein married Anne Hegel, granddaughter of the philosopher G. W. F. Hegel. (His notes record the "beginning of an ordered existence.") They moved to Munich, where Klein's duties included the teaching of engineers, which, "since I grew up in an industrial area, called up the most cherished memories of my boyhood" [5], p. 2. In addition he organized geometry classes for future teachers, and "tended a small flock of gifted mathematics students" including Hurwitz, Planck, and Ricci (Figure 2 shows a *Protocol* page with summaries, in each student's own handwriting, of presentations by Planck and by Hurwitz on the distribution of prime numbers). He moved again in 1880, this time to Leipzig in Saxony, where his most creative period would come to an end. Overstrained by an excessive workload and intense competition with Henri Poincaré over automorphic functions, he collapsed in 1882, unable to keep up his series of groundbreaking discoveries:

> Decisive illness: Overexertion as underlying cause. Total breakdown of serious productivity. Impossibility of carrying out academic and organisational work alongside general teaching activity with equal energy… Image of the coat that is too wide for me [6], p. 2.

He would never quite regain the brilliant mathematical creativity of his early years, and in his notes from 1883 he wrote: "My great productivity is entirely over" [8].

Soon, however, Klein entered a second period of great productivity, this time longer and of a different kind. In the fall of 1885 he received a "call" from the University of Göttingen and accepted immediately. In his private notes, he summarized the advantages: "house with garden, lighter duties, Prussia…. Seeking: concentrated scientific existence on the basis of a sensible family life" [8], pp. 4–5.

The Prussian education ministry's attitude at the time was the following ([10], pp. 23–24):

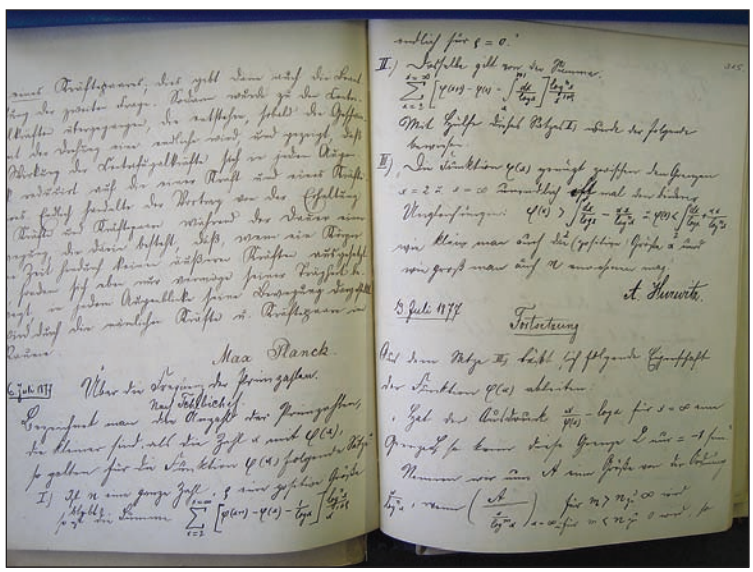


Figure 2. Hurwitz: On the distribution of primes.

> What was previously often impossible, is in Prussia always feasible, with insight, gentleness and love for the education of German youth and love for the nurture of our hallowed science and spiritual labor. … [We have] to confront the caste-egoism of the cliquishly bonded faculty with an iron fist at the demand that their teaching be left to their own discretion without regard for the curricular requirements of their listeners, and at the same time deny the request that all disciplines be represented at all universities for the sake of student attendance. On the contrary—certain subjects should only be covered at one or two German universities, and there exceptionally well. It is and remains nonsense to lecture on Romance philology twenty and more times in front of two or three listeners…. It is also no less inconsiderate of the fame-seeking faculty towards the students to call every small new nuance a new science and even to endow new chairs for it, let alone at several universities.

Prussian education minister Friedrich Althoff, Klein's comrade from their army days in 1870, supported Klein's vision of reviving the great mathematical tradition developed in Göttingen by Gauss, Riemann, and Dirichlet earlier in the century. It was thus decided to concentrate German mathematics and physics in Göttingen. Klein recognized the extraordinary talent of the young David Hilbert and, with Althoff's support, succeeded in hiring him in 1895. Then, in 1902, the two arranged for the establishment of a third chair in pure mathematics, unprecedented in German universities, for Hermann Minkowski. Klein, Hilbert, and Minkowski lived in Göttingen for the rest of their lives, leading a mathematical community that for many was the foremost in the world.

During his tenure in Göttingen, Klein founded the Göttingen Mathematics Association, built up the *Mathematische Annalen* (a journal started by Clebsch) into the leading mathematics journal in the country, edited the monumental *Encyclopedia of the Mathematical Sciences and their Applications*, and played a leading role in Germany's first national association of mathematicians. He cultivated contacts with many leading mathematicians abroad, inviting them to visit as well as traveling himself. He made repeated trips to the United States, and his Evanston Colloquium lectures at the World's Fair in Chicago became a great inspiration to the still nascent American mathematical community. He organized funding for a growing stream of talented American mathematics students to study with him in Göttingen, among them six future presidents of the American Mathematical Society. Klein himself was left deeply impressed by his experience in the United States ([5], p. 4):

> The World's Fair in Chicago in 1893 (where I was sent as commissar of the Ministry of Education) gave me powerful new impulses…. I allowed the conditions confronting me, especially the peculiar American system of education, to make an impression on me. I returned with the vivid conviction that it is our most urgent task to establish direct connections between our university operations and the controlling powers of practical life, first and foremost technology, but also the pressing questions of the general system of education…. I therefore mainly abandoned my own academic work from then on, and directed all of my energy toward establishing a cooperative interaction with others.

Klein began to take an increasing interest in the applications of mathematics and in education reform. By 1898 he had formed the Göttingen Association for the Advancement of Applied Physics and Mathematics, an association that succeeded in doubling the number of professors in mathematics and physics and raised enough funding to establish the Institutes for Applied Electricity, Applied Mathematics and Mechanics, and Geophysics. Among the new faculty were Carl Runge, Ludwig Prandtl, and Emil Wiechert. At the same time, Klein campaigned vigorously for a program of education reforms that became known as the Klein reforms. These included the introduction of the basic concepts of calculus in secondary schools, a lasting change in many countries. In 1908, the International Congress of Mathematicians, in which Klein had played a prominent part for many years, elected him as the first president of the newly founded International Commission on Mathematical Instruction, an organization still active today. He served in that capacity for several years and oversaw several series of publications associated with the commission.

Throughout his career, Klein was a legendary teacher. Harry Walter Tyler, an American who studied with Klein soon after he left Leipzig, wrote back enthusiastically to William Osgood:

> I know of no one who can approach him as a lecturer…. He's certainly acute, fertile in resource, not only understands other people, but makes them understand him, and seems to have a very broad firm grasp of the philosophical relations and bearings of different subjects, as well as great versatility and acquaintance with literature.

This opinion was shared by many of his students, and many of them went on to become prominent in their own right. Among his more than 50 doctoral students are Cole, Fine, Fricke, Furtwängler, Harnack, Hurwitz, Ostrowski, and van Vleck.

Klein retired in 1913, his career spanning almost the entire period of the German Empire, and died in Göttingen in 1925.

The Mathematical *Protocols*

Klein conducted his seminars in both semesters of every year, from the summer semester of 1872 until his retirement in 1913. Presentations made in the seminars were painstakingly recorded in the *Protocol* books, usually by the speaker, just as Göttingen mathematics lecture courses were recorded in other notebooks and placed in the library for students' reference. Klein would later describe the development of his ambitious teaching and research program in his Evanston lectures:

> As regards my own higher lectures, I have pursued a certain plan in selecting the subjects for different years, my general aim being *to gain, in the course of time, a complete view of the whole field of modern mathematics, with particular regard to the intuitional or* (in the highest sense of the term) *geometrical standpoint* [7], p. 96.

Klein's drive toward completeness made him, along with Hilbert and Poincaré, the last of the mathematicians who could claim to have a grasp of the entire field. But his description is of his lecture courses, not of his seminars, for whose breadth and ambition this would be a clear understatement. His forty years of seminars not only covered the major branches of the field, but expanded into mechanics, astronomy, geodesy, hydrodynamics, electricity, elasticity theory, and in the last years before his retirement, the psychology and teaching of mathematics. No wonder the presentations filled over 8,000 pages! David Rowe wrote about the *Protocols*: "Although it would appear that few have perused them since they were first placed there, they are undoubtedly the best single source documenting the rich panoply of ideas that characterized Klein's teaching activity" [13], p. 34 n. 5.

The seminars from Erlangen and Munich show little unity of subject matter. Most of the 1870s seminars are catalogued as "Seminar on Various Topics" or "Seminar on Various Topics in Geometry and Algebra", and the entire record of that decade is contained in the first *Protocol* volume, most of whose entries are summaries a page or two in length. The constant change of topics from week to week can be seen in the presentation list in Klein's first seminar, taught jointly with Clebsch in Göttingen just before Klein's move to his first professorship. The presentations are on:

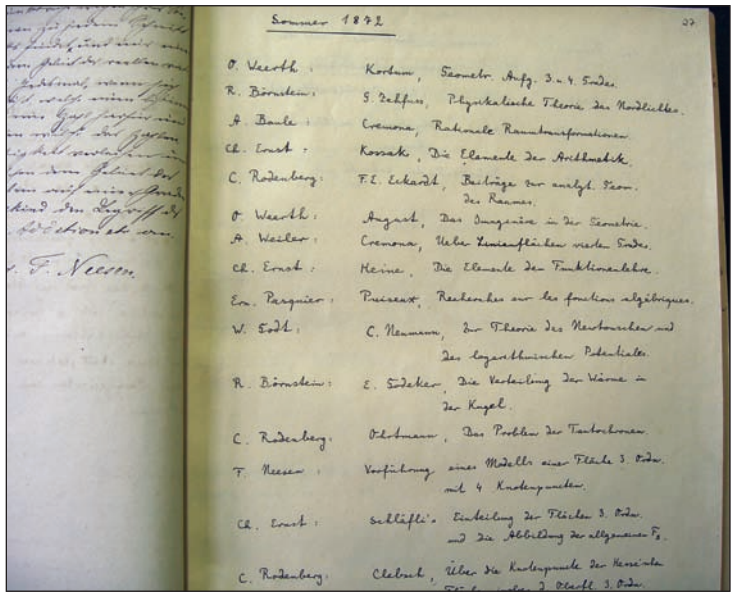


Figure 3. First seminar: Table of contents.

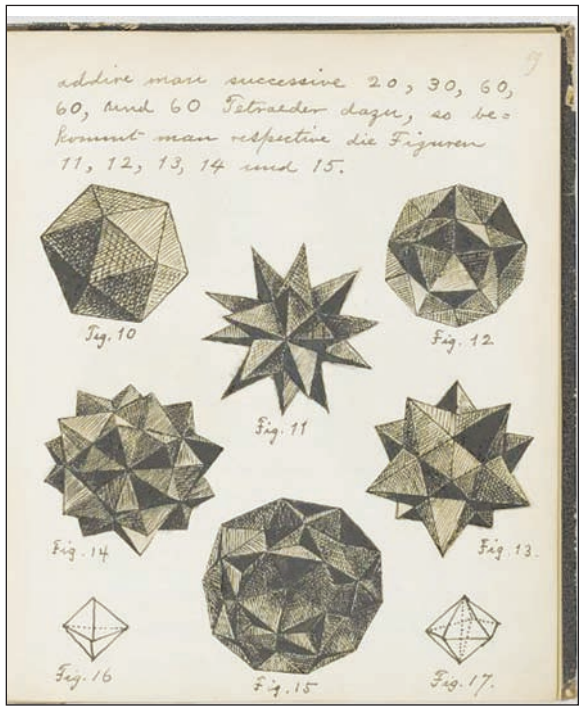
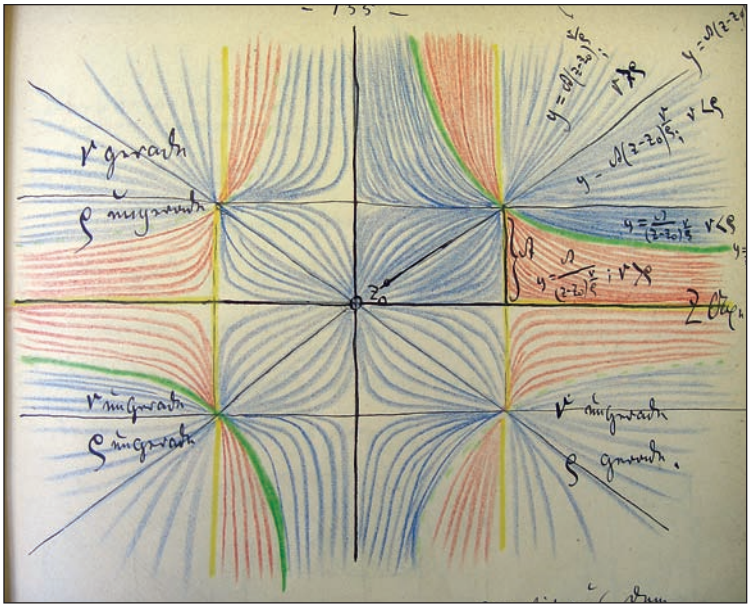


Figure 4. Report on regular solids in 4-dimensional space, November 29, 1880.

- Geometric Problems of the 3rd and 4th Degree,
- The Physical Theory of the Northern Lights,
- Rational Transformations,
- The Elements of Arithmetic,
- Contributions to the Analytic Geometry of Space,
- The Imaginary in Geometry,
- On Scrolls of Degree 4,
- The Elements of Function Theory,
- Investigations on Algebraic Functions,



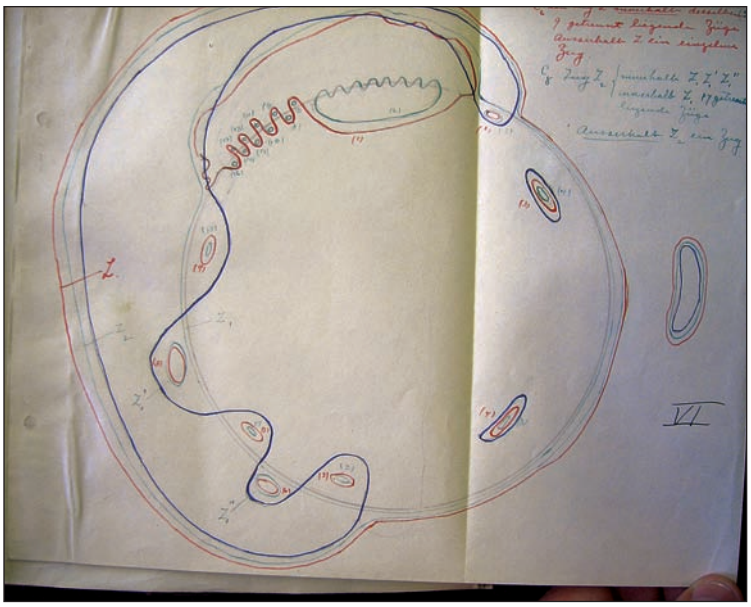


Figure 5. Curves.

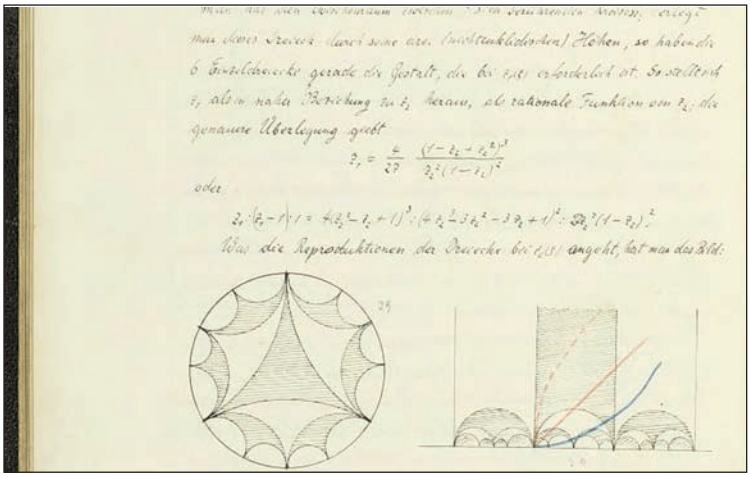


Figure 6. Klein, Hilbert, Minkowski, winter 1905–06.

- On the Theory of Newtonian and Logarithmic Potential,
- The Distribution of Heat in a Sphere,
- The Tautochrone Problem,

and so forth (see Figure 3).

In May 1875 Klein reports on solutions of polynomial equations of degree 5 via elliptic functions; the seminar of 1876 has talks on magnetic curves, reflected light, and the effects of an electric point on an isolated metallic sphere. The seminars of 1877 contain notes on elastic strings, the distribution of heat in solids, Ampère's and Ohm's laws, branching of electric current, and polarized light. The seminars of 1879 have a lecture on the 27 lines of cubic surfaces, reports on Fresnel's wave surface, methods of enumerative geometry, and modular curves.

Soon the seminars become more focused. The seminars of the 1880s are almost exclusively on Klein's own research topics in function theory and group theory. The winter 1882–83 seminar, for example, deals with "Hyperelliptic, abelian and theta functions" and the winter 1885–86 seminar covers "Hyperelliptic functions and the Kummer surface".

The early Göttingen years were a period of transition ([5] p. 3):

> In the presence of Schwarz, there was—I might say: fortunately—at first no way to make a wider impact on the multitude of students in Göttingen. But I used the first years in Göttingen, of course partly to continue my previously started work, but then especially to fill in the gaps in my mathematical-physical training, of which I was vividly aware, and which I had not been able to correct in my previous years of overwork.

Klein's colleague Schwarz had not yet made way for Hilbert, and Klein did not yet feel himself to have enough freedom or experience to rebuild his department as he saw fit. For the next ten years, from 1886 to 1896, he continued to conduct his seminars alone, and though he gave several lecture courses on mechanics, the seminars remained mainly in pure mathematics. In the summer of 1892 the seminar was devoted to number theory: distribution of primes, Diophantus and his works, quadratic and biquadratic reciprocity, reduction theory of quadratic forms, class numbers, representation of integers by quadratic forms (Furtwängler), and composition of quadratic forms and complex multiplication (Epstein). Perhaps the last several of these seminars, as Klein insisted, "should be seen only as offshoots of my activity before 1892" [5], the year Klein intensified his interest in other fields. But "the change", as Klein describes it, "did not arrive in one fell swoop" [5].

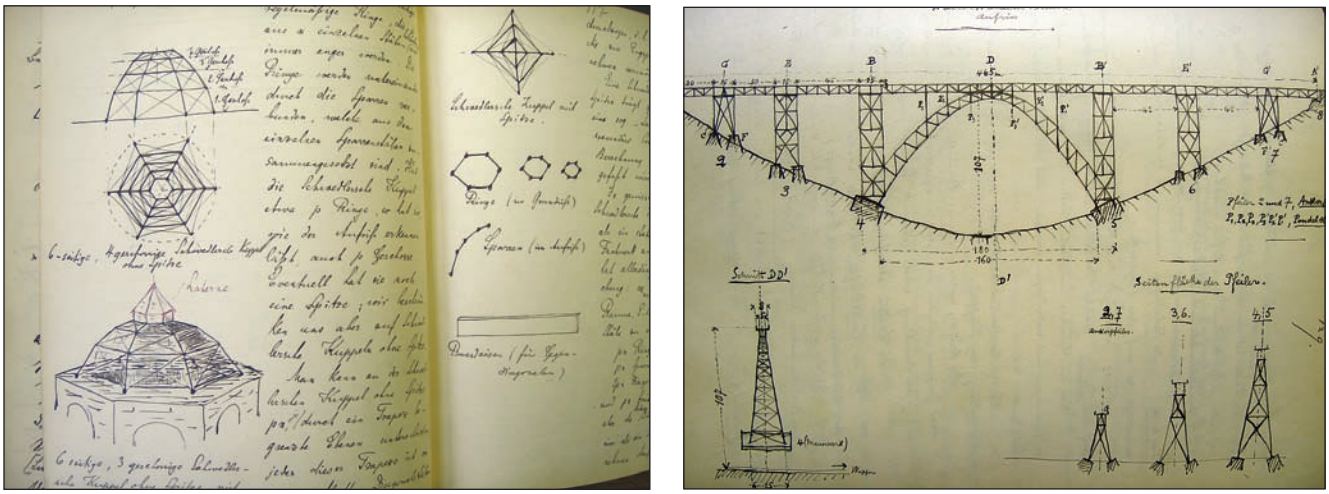


Figure 7. Domes and bridges.

Among the mathematical *Protocols*, an especially interesting seminar is the one conducted by Klein, Hilbert, and Minkowski in the winter 1905–06: Klein lectured throughout, with Töplitz taking notes (see Figure 6). The topic is automorphic functions, with the aim of reporting "coherently" on "my [Klein's] early efforts in this direction and some of the still unsettled questions, as well as on …the progress achieved by Poincaré and its relation to my own ansatz".

The Later *Protocols*: Application and Education

The last fifteen years of *Protocols*, from 1897 to 1912, show expansion in every sense. They fill over half of the *Protocol* volumes, go far beyond the range of subjects in the earlier seminars, and include many collaborations, at a time when Klein was at the peak of his powers as a leader of the international mathematics community. After teaching alone from 1872 to 1896, Klein taught four seminars in a row with Hilbert, and by 1909 he would co-teach five seminars with the physicist Karl Schwarzschild, six together with Ludwig Prandtl and Carl Runge, and, in 1905–7, a series of four seminars with both Hilbert and Minkowski on differential equations and automorphic functions. Meanwhile Klein, having warned against "the danger of a separation between abstract mathematical science and its scientific and technical applications" ([7], p. 50), had also begun to place more and more emphasis on bridging mathematics and the other disciplines. Earlier seminars had already included presentation topics such as "Vibrations of a Violin String", in the winter semester 1877–78, "The Theory of Billiards" in the summer 1887 seminar on the theory of tops, and "The Calculation of Death Charts" in the summer 1893 seminar on probability theory. But these isolated presentations were still the exception. In 1898, after several years of seminars on pure mathematics, Klein and Hilbert jointly taught two seminars on mechanics, with presentations ranging from the more standard theoretical topics to "On the Bicycle" and "On the Theory of Billiards". The summer 1900 seminar "Technical Applications of Elasticity Theory" contains some of the *Protocols*' most meticulously illustrated entries, including presentations on cupolas and on bridges (see Figure 7). A subsequent mechanics seminar in the winter of 1901–02 includes a presentation "On Seismographs", and the winter 1900–01 seminar "Applications of Projective Geometry" includes reports on "Hermann Ritter's Perspectograph", "Hauck-Mauer's Perspective-Drawing Apparatus", "On Painter's Perspective", and "Stereoscopic Vision".

Looking through the volumes from the turn of the century, one finds a recurring interest in ships. The winter semester 1899–1900 seminar, devoted to "The Theory of Ships", includes presentations ranging from fairly abstract to surprisingly specific: "On the Stable Balance of Swimming Bodies", "On the Stability of Ships", "Spatial Contents and Sinking of a Ship", "Sails and Rudders", "Ship Waves in a Canal", and even "On the 'Seiches'", a

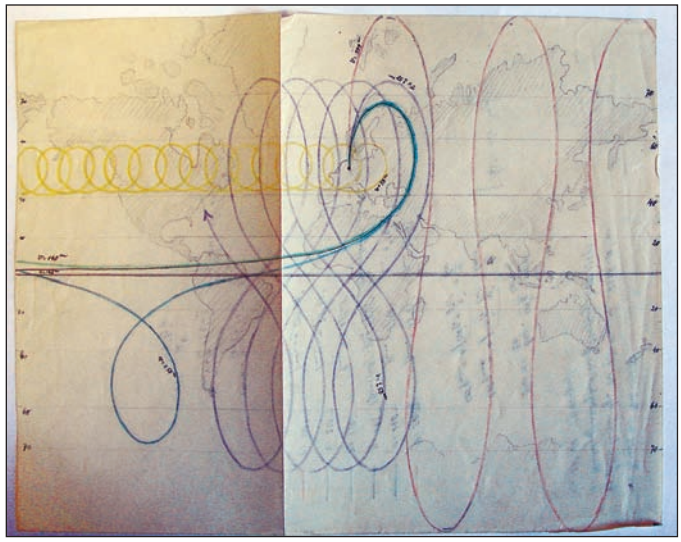


Figure 8. Jetstreams.

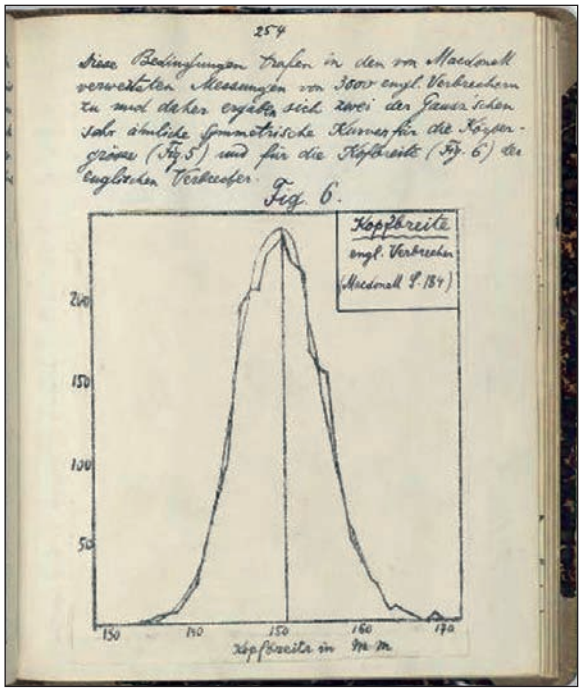


Figure 9. [3], v. 14 p. 254: Head width of English criminals. The discussion starts (on an earlier page) with: The speaker wishes to emphasize that it is quite important to let the facts speak for themselves, before approaching them with any particular interpretation. Since several talks of theoretical content now follow, the speaker believes himself to carry out a rewarding task by reporting straightforwardly on several statistical and anthropological observations from the geometric point of view. The observations concerning humans are twofold: on the one hand as beings endowed with a differentiated psychical capacity, and on the other hand as objects of zoological research in the broadest sense of the word.

discussion of the occasional sudden changes in the water level on Lake Geneva, developing formulas with constant frequency and decreasing amplitude and showing their accord with empirical observations on the lake's shore. The winter 1901–02 seminar on mechanics includes a presentation on "Ship Resistance in a Calm Sea", and the winter 1903–04 seminar on hydrodynamics has one "On Turbines". The entire winter 1907–08 seminar, co-taught with Prandtl, Runge, and Wiechert, is a "Hydrodynamics seminar with special attention to the hydrodynamics of ships". Its presentations on more general topics in hydrodynamics give way to "Ship Waves", "The Theory of Ship Propellers", and "On Ship Resistance in Unbounded Water", continuing through the first half of the next semester with "Ship Oscillation", "Continuation of the Presentation on Ship Resistance", "Lounz's Theory of Turbines", and "Ship Resistance in Canals". One wonders how much the introduction of such topics into the nation's leading mathematics department had to do with the rapid buildup of the German navy in the decade before World War I.[1]

Along with ship theory, the turn-of-the-century seminars show an increased emphasis on air and space. These topics can be found occasionally in the earlier volumes, starting in the very first pages of the *Protocols* with an 1872 presentation on the "Physical Theory of the Northern Lights". But no significant part of any seminar before 1900 is devoted to them. The summer 1902 seminar, by contrast, has astronomy as its general theme, and includes many presentations treating the moon and orbits. The summer 1908 seminar "Dynamic Meteorology", whose first half is the continuation of the winter seminar on ships, includes presentations on the "Thermodynamics of the Atmosphere", treating topics such as humidity, the mixing of air masses, and cloud formation; "The General Circulation of the Atmosphere"; "Cyclones"; and "Helmholtz's Treatment of Atmospheric Movement".

The summer seminar 1911 (joint with Bernstein) was devoted to insurance mathematics, i.e., "death charts" and biometrics, a reccurring theme in the *Protocols*.

The final *Protocol* volume contains four seminars, three of them devoted to the psychology and education of mathematics. By this time Klein was running the International Commission on Mathematics Instruction, and these seminars ran partly in parallel with his efforts there. The winter semester 1909–1910 seminar is titled "Mathematics and Psychology", and listed on the volume's cover as "Psychological Foundations of Mathematics". Klein states in his opening speech to the seminar:

> The general topic is the intersection points of *mathematics* and *philosophy*. The more strictly *logical* questions will be treated in the parallel lecture course by Zermelo; here we shall discuss all of the other mental processes which accompany the logical processes and in part precede them, and which will here be called simply *psychological*.

Klein spends most of his opening lecture laying out a set of suggested presentation topics, which give an indication of his nontechnical interests at the time. He puts forward, with descriptions, six central themes:

1. On the working methods of productive mathematicians

[1] *Berlin's new navy laws, passed in 1898 and 1900, envisioned Germany as a naval superpower equal to Britain, and prefigured an enormous growth in ship production through 1914. See, for example, John Maurer's article on the Anglo-German naval race in the bibliography below, with a discussion of the "dramatic growth of German naval power between 1906 and 1914" ([9, p. 287]).*

2. On the development of basic mathematical intuition in the growing individual
3. The formation and epistemological importance of mathematical axioms
4. On the errors of mathematicians
5. Implications for mathematical instruction
6. On the position of mathematics in the sciences.

The seminar includes many reports and informal discussions, recorded in summary form by Klein himself, on these and other topics, including Klein's recounting of his own mathematical development as well as that of Gauss, Lie, and other mathematicians. Here is one episode from Klein's early years (written down by Klein himself in the third person) [3], v. 29, pp. 7–9:

> Klein had learned the projective way of thinking from Plücker and Clebsch, and had then read Cayley's paper with great enthusiasm in the autumn of 1869. Then in the winter of 1869–70 (in Berlin) he heard from Stolz, who was studying with him there, about the existence of non-Euclidean geometry. It was immediately *self-evident* to him that the two would have to be in correspondence with each other. He presented this view in February 1870 in Weierstrass's mathematics seminar, at the end of a lecture on Cayleyan measurement, in the form of a question. But Weierstrass retorted that these were completely separate areas of the science. After that Klein abandoned the idea for the time being.
>
> It reemerged for him as he was once again with Stolz in the summer of 1871 (this time in Göttingen). Stolz gave him details from Lobachevsky, von Staudt, Beltrami (whom Klein had not read at all at that point; even today he knows them very inadequately). There was everywhere a correspondence with the correctly understood Cayleyan doctrine. On the other hand strong suppression by the view, coming especially from Lotze, that the entire non-Euclidean speculations were nonsense. Out of this back and forth there grew the first publication, which appeared in short form in the *Göttinger Nachrichten* of August 1871 and in full soon thereafter in *Mathematische Annalen* 4.
>
> The paper in *Annalen* VI (1872) shows the great resistance that the line of thought encountered in mathematical circles. Even Cayley has never been able to bring himself around to full agreement. He said at the 1873 meeting of the British Association in Bradford that he views the parallel axiom as "strictly axiomatic", and in Vol. II, p. 605 of his collected works he again remarks that a grounding of the concept of distance in von Staudt's projective coordinate system gives rise to at least the appearance of circular reasoning.
>
> Here, then, is an example in which a mathematical insight is first so to speak pre-formed in an individual, and then, as a result of the resistance it encounters, is felt by the individual to be an advance and is worked out clearly from all sides in a fight against all kinds of objections.
>
> What happens next is that a new generation adopts the result from the start as axiomatic, no longer understands the earlier differences of opinion, and more or less goes back to normal about the whole thing.

Klein, who had much more to say on these topics, made ten of the seminar's presentations himself, and often commented on other presentations and on his own creative process. He summarized his intuitive approach and emphasis on breadth with an example from the theory of functions:

> As for my own work, I have often proceeded in such a way that I viewed the results of two subareas as given and asked what the one means for the other. Compare as typical the use of algebraic invariant theory in my introduction of hyperelliptic and abelian functions …In stating the corresponding theorems, I have let myself be guided in many cases by an indeterminate but, with hindsight, accurate feeling of analogy. I took a special pleasure in this: I did not quite know which invariant of a binary form Sylvester had called a catalecticant, but I reckoned that the first term in the series expansion of certain hyperelliptic Sigmas must be exactly this catalecticant. It was Hilbert who helped me to put things straight, but the theorem, as I had suspected, really was correct.

This intuitive method of analogy did not meet with universal approval. At the 1900 International Congress of Mathematicians in Paris, Poincaré commented on Klein's approach as follows ([11], p. 116):

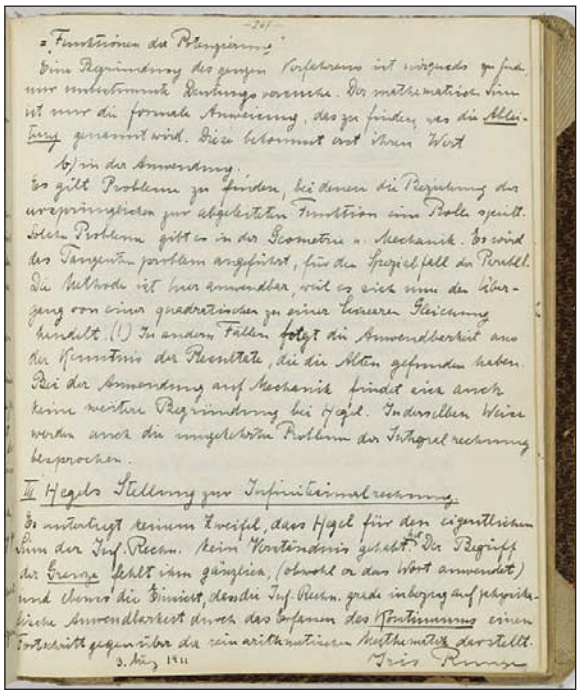


Figure 10. From a sharply critical presentation by Iris Runge, daughter of Carl Runge, on "Infinitesimal Calculus in Hegel": It is beyond any doubt that Hegel had no understanding of the actual meaning of the infinitesimal calculus. He entirely lacked the concept of limit (although he uses the word) and likewise the insight that the infinitesimal calculus represents an advance over purely arithmetic mathematics, especially with respect to physical applications, through its grasp of the continuum.

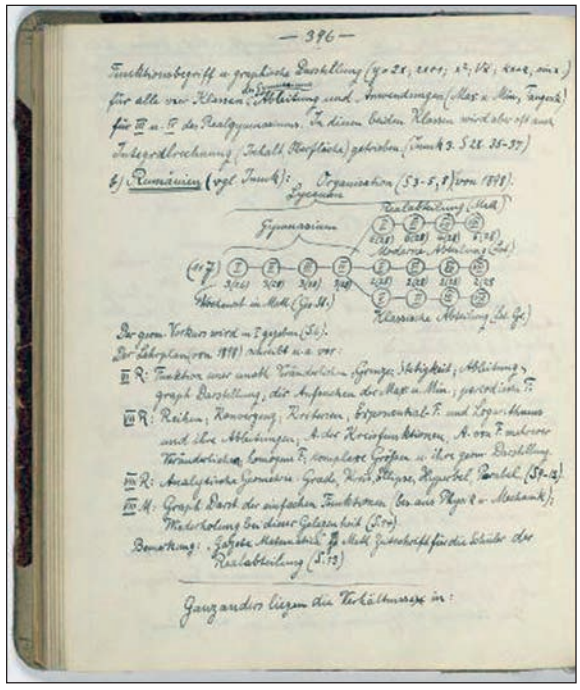


Figure 11. The high school mathematics curriculum in Romania, 1898: VII (age 17), 4 (out of 28) hours of mathematics per week: Series, convergence criteria, the exponential function and logarithm and their derivatives, derivatives of functions of several variables, complex numbers and their geometric representation.

> Look on the other hand at Mr. Klein: he studies one of the most abstract questions in the theory of functions, namely, whether, given a Riemann surface, there is always a function that admits some prescribed singularities: for example two singular logarithmic points with equal residues and of opposite sign. What does the renowned German geometer do? He replaces the Riemann surface by a metallic surface whose electric conductivity varies according to certain laws. He puts the two logarithmic points in contact with the two poles of an electric source. The current will have to pass through, and the manner in which the current is distributed over the surface will define a function whose singularities will be precisely those predicted by the claim.
>
> Without a doubt, Mr. Klein knows full well that he has only given a sketch: nevertheless he has not hesitated to publish it; and he probably expected to find in it if not a rigorous demonstration, then at least some sort of moral certainty. A logician would have rejected such an idea with horror, or rather he would not have had to reject it, since in his mind it could never have been born.

The tension left over from the competition over automorphic functions in the 1880s had not dissipated, and Poincaré's name is conspicuously absent in the psychology and philosophy seminar, despite his series of books on its topics published in the preceding decade. But many other thinkers do make an appearance, among them Aristotle, Kant, Goethe, Schiller, Hegel, Comte, and Spencer.

Klein's students and assistants made presentations including Bernstein on Cantor, Weyl on the role of mathematics in the system of the sciences, Errera on the inner ear and spatial perception, and the occasional pearl of anthropological wisdom:

> Steckel relates some of the observations he believes himself to have made in the East concerning the conduct of members of different races (Germans, Jews, Poles) with regard to mathematical subject matter: Germans calculate $7\frac{1}{4} - \frac{3}{4}$ in the form $= 7 - \frac{1}{2} = 6\frac{1}{2}$, thus grasping the task intuitively; Jews calculate $7\frac{1}{4} = \frac{29}{4}$, therefore $7\frac{1}{4} - \frac{3}{4} = 26/4 = 6\frac{1}{2}$, thus applying general logical rules. Poles

> tend to grasp only the words of the mathematical rules, which is how they then excel in language instruction as well. [3], v. 29, pp. 19–20.

The winter 1910–1911 seminar covers mathematics education, running parallel to Klein's lecture course on the modern development of mathematics education and focusing especially on elementary schools. This seminar is one of the signs of his interest not only in universities, but in education at all levels. Several short presentations, mostly on various aspects of mathematics education in elementary schools (29:76–96), are followed by a unified series of lectures on "Teacher Education", providing a tightly structured overview of the current structure and problems of training mathematics teachers for elementary schools. Rounding out the seminar are similar overviews of conditions in vocational schools, in girls' schools, and in Austria.

The last seminar in the *Protocols*, organized by Klein but led during his illness by his former student Rudolf Schimmack, is an ambitious survey of the state of mathematics education across Europe (summer 1912). The presentations on Germany tend to compare the current system to the past and to other countries. "To What Extent is Euclid's Teaching Continued in Today's German Schoolbooks?" compares Euclid's presentation of his material with contemporary textbooks, particularly the influential ones by Kambly and Berendsen-Gölting, describing a fading but still very noticeable Euclidean influence. "On the Reform Movement in Germany" provides a historical overview of the mathematics education reform movement and an alternative report on Berendsen-Gölting's textbook. There is also a "Comparison of the Organization of Higher Learning in Germany and France", and many presentations on individual foreign countries. England and France receive special attention. "The High School System and Traditional Euclid Lessons in England" describes the structure, history, and recent reforms of English schools and of methods of teaching Euclid, including a discussion of textbooks and examination questions, and is followed by a second report on "Recent Reforms of Geometry Education in England". "The Reform Movement in France" describes a movement away from abstraction and toward concrete examples and applications, and an emphasis on the concept of function. "The New Form of Geometry Education in France" treats in more detail Méray's textbook *Nouveaux éléments de géométrie*, his innovations in treating displacement, translation, rotation, and other basic notions, and his influence, and criticizes him for what it describes as a counterintuitive approach and a lack of economy in treating axioms. Other seminar participants cover "The Question of Geometry Education in Italy", "Reform Efforts in Mathematics Education in Hungarian Middle Schools", and "The Reform Movement in Arithmetic and Algebra Education in the United States and England", and there are also "A Sketch of the School System in Switzerland", a bleak report "On the Organization of Schools in Russia", and a more hopeful report on Finland. "The State of Reform Efforts in Mathematics Education in Some Other Nations" summarizes some advances in Sweden and Romania, but laments that Belgium remains backward in many respects, and Holland "hardly better". Germany receives its share of comparative criticism as well; "The Intuitive Design of Basic Geometry Education", for example, advocates a reorganization of German geometry education into a two-tier approach following that of Austria, so that students who do not reach the higher levels of education still have a thorough and intuitively comprehensible overview of geometry.

Klein's central role in the international reform of mathematics education lends an added importance to the records of his own discussions of education with his students and associates. But it also lends an added importance to the entire set of *Protocols*. While Klein spoke of attaining a view of the whole of mathematics, by the end of his career he had a nearly complete view of mathematics education as well, having toured the school and university systems of many countries and spoken with the leading educators of his time. The gradual rethinking and development of his seminars' structure and scope, of how he ran the seminars, how he assigned topics, what kinds of participation he encouraged, were the result of decades of the most serious and influential thinking about teaching itself. The *Protocol* volumes are, among other things, a career-long, step-by-step record of the development of one of the great modern educators. Even the mere existence of these 29 volumes is a monument to taking teaching seriously, and to believing in the importance of what one's students say.

The *Protocols* themselves have never been published or extensively studied. A recent initiative, supported by the Clay Mathematics Institute, has used the latest in scanning technology to digitize the complete *Protocols* in November of 2006, and to make them available on the internet. Jim Carlson reports on the project in the accompanying sidebar.

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Digitizing the Classics

One thing that modern technology makes possible is public access to the classics of mathematics. Archives such as JSTOR have posted mathematics journals dating back to the 18th century, but they have left largely untouched other important documents—lecture notes, manuscripts, and work books. The Clay Mathematics Institute (CMI) has recently undertaken several initiatives in cooperation with other institutions to digitize and disseminate some of the most important of these. In all cases, CMI has provided some or all of the funding, and in some cases it has helped to organize the work. The first of these projects was the digitization of the oldest extant complete copy of Euclid's *Elements*. This is the d'Orville manuscript, dated to 888 A. D., which was acquired by the Bodleian Library of Oxford University a bit more than 200 years ago. It is an extremely handsome volume, written in an elegant Greek script. The directors of the actual photography were Chet Grycz of Octavo and Richard Ovenden of the Bodleian, roughly dividing the work into photography and preservation. (This sort of work is a specialized art, largely developed within Octavo. Hans Hansen did the technical work.) This took place at Oxford in the fall of 2004. The output was a set of of 386 digital images at very high resolution, in essentially the same format as previous Octavo projects. CMI, the Bodleian Library, and Octavo now maintain copies of the original images for special purposes, but online copies at somewhat lower resolution are available at CMI and the website of the nonprofit organization *Libraries without Walls*, with whom Grycz now works.

The next two projects took place in Göttingen with the help of Yuri Tschinkel. Bernhard Riemann's famous 1859 manuscript "On the number of primes below a fixed bound", was photographed in 2005 by the Niedersächsische Staats- und Universitätsbibliothek Göttingen. This institution preserves many of the most famous mathematical manuscripts, including its best known treasure, Gauss' *Tagebuch*, which is stored in a special safe. Helmut Rohlfing, curator of manuscripts, directed the work. The images produced have been available since then on the CMI website.

Much larger in scope was the digitization of the Klein *Protokolle* at the Mathematisches Institut in Göttingen, described in this issue at length by Tschinkel and his colleague Eugene Chislenko. Technical work was here, too, the responsibility of Grycz and *Libraries without Walls*. The photographer was Ardon Bar Hama. He flew into Göttingen from Israel for three days of intense work, using a Leaf Aptus 75 camera with a digital back, capable of producing single images of 39 MB.

In all these projects as in similar ones involving the Internet, the copying of the works is only a small part of what must be done to make the works truly accessible. Chislenko is now working to edit and annotate the digitized volumes, and is engaged in research in the history of mathematics with this material as the primary source.

There is much more of value to be digitized in Göttingen, for long the home of many of the world's best known mathematicians, starting with Gauss and including more recently Hilbert and Siegel. The most recent CMI digitization project, currently under way with the Staats- und Universitätbibliothek, is the preservation of portions of Riemann's *Nachlass*.

Websites:
`http://www.claymath.org/library/historical`
`http://www.librarieswithoutwalls.org`
For an overview, and for the Klein *Protokolle* in particular
`http://www.librarieswithoutwalls.org/klein.html`.

—James Carlson, president, Clay Mathematics Institute.

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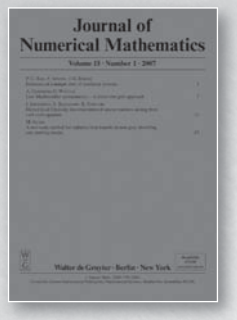

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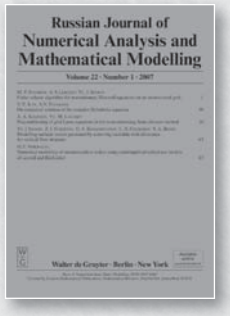

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The Uneasy Relationship Between Mathematics and Cryptography

Neal Koblitz

During the first six thousand years—until the invention of public key in the 1970s—the mathematics used in cryptography was generally not very interesting. Well into the twentieth century cryptographers had little use for any of the concepts that were at the cutting edge of mathematics. Indeed, mathematicians looking at cryptography in those years might have found justification for Paul Halmos' infamous title "Applied Mathematics Is Bad Mathematics."

There were some exceptions. In the 1940s Alan Turing, the father of computer science, worked extensively in cryptography and, in particular, showed how to use sophisticated statistical techniques to crack a code; and Claude Shannon, the father of information theory, worked on the foundations of cryptography.

In the same decade G. H. Hardy wrote in *A Mathematician's Apology* that "both Gauss and lesser mathematicians may be justified in rejoicing that there is one science [number theory] at any rate, and that their own, whose very remoteness from ordinary human activities should keep it gentle and clean." In Hardy's day most applications of mathematics were military, and as a pacifist he was pleased that number theory was studied not for its practical uses, but only for its intrinsic aesthetic appeal.

This image of number theory as "gentle and clean" took a big hit in 1977 when three computer scientists at the Massachusetts Institute of Technology—Ron Rivest, Adi Shamir, and Len Adleman—invented a radically new cryptographic system. An article in *Scientific American* by Martin Gardner described the RSA idea, explained its significance, and caused a sudden upsurge in popular interest in both cryptography and number theory.

In those years RSA was the most important way to achieve what came to be called "public key cryptography". Earlier systems for scrambling messages worked well in military or diplomatic applications, where there was a fixed hierarchy of people who were authorized to know the secret keys. But by the 1970s, with large sections of the economy rapidly becoming computerized, the limitations of classical cryptography were coming to the fore. For example, suppose that a large network of banks wants to be able to exchange encrypted messages authorizing money transfers. In traditional cryptography any pair of banks must have its own secret set of keys that they agree on and exchange using a trusted courier. The number of possible pairs of banks could easily be in the hundreds of millions. So the earlier type of cryptography, called "private key" (or "symmetric key"), becomes extremely unwieldy.

In public key cryptography, the key needed to scramble a message is public information. Each user of the system (for example, each bank) has its own public key, which is listed in a directory much like someone's phone number. Anybody can encrypt a message using the public key. However, the unscrambling process requires knowledge of a totally different key, which the user keeps secret. The procedure for scrambling a message is called a "trapdoor one-way function". This means that once we look up the bank's public key it is computationally easy (with the help of a computer) for us to send it an encrypted message. If, however,

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This article is based on an Invited Address given at the AMS meeting at the Stevens Institute of Technology in Hoboken, NJ, on April 14, 2007. Parts of it are taken from the cryptography chapter of his forthcoming book Random Curves: Journeys of a Mathematician*, to be published by Springer-Verlag.*

we want to go the other way—unscramble the message—this is computationally infeasible unless we possess an additional bit of information, namely the secret key.

Rivest, Shamir, and Adleman devised a clever—but also simple—way to make a trapdoor one-way function using elementary number theory. Their construction is based on multiplication of two large prime numbers p and q to get a composite number $N = pq$. One has to assume that this is a one-way process in the sense that factoring N to get p and q is very hard.

Thus, the security of RSA cryptography was entirely dependent on the presumed difficulty of factoring large integers. For this reason the invention of RSA gave a tremendous stimulus to the study of methods to factor integers, as well as methods to generate large random primes. During the early 1980s the highlights of mathematical cryptography were for the most part in this area—for example, Carl Pomerance's development of improved sieving techniques for index-calculus factorization algorithms, and the Adleman-Pomerance-Rumely deterministic nearly-polytime primality proof by means of Jacobi sums.

In a somewhat different vein Don Coppersmith devised an algorithm that could find discrete logarithms in the multiplicative group of $\mathbb{F}_{2^n}$ in time $\exp\left(n^{1/3+\epsilon}\right)$, which was much faster than earlier index-calculus methods. This also had cryptographic significance, because ElGamal had proposed an alternative to RSA encryption that was based on the presumed difficulty of inverting the function $x \mapsto g^x$ (where g is fixed) in a finite field.

In 1984 Hendrik Lenstra distributed a one-page description of a new method he had developed for factoring large integers using elliptic curves. The clever and elegant algorithm was simple enough that I could understand it from the one-page outline, although a detailed analysis of its running time took many more pages. This was the first time that elliptic curves had been used in cryptography, and when I read the page that Lenstra had sent me I felt that at one stroke he had raised the mathematical sophistication in cryptography to a whole new level.

Shortly after that I left for a semester in the Soviet Union, where no one worked openly on cryptography. I continued to think about the subject, though, and soon it occurred to me that it should be possible to use elliptic curves in an entirely different way from what Lenstra had done, namely, to construct systems based on the hard problem of finding logarithms on the curve. Since I knew no one in the Soviet Union I could talk with about this, I wrote a letter to Andrew Odlyzko, then at Bell Labs, describing my idea for using the elliptic curve group to construct a cryptosystem. Odlyzko was one of the few mathematicians at that time who had done major work in both theoretical and practical areas. Nowadays it's not so unusual to bridge pure and applied mathematics, but in the mid-1980s Odlyzko was unique in this respect among the mathematicians whom I knew personally.

Email didn't yet exist, and letters between the U.S.S.R. and the U.S. took a couple of weeks in each direction. So it wasn't until a month later that I received a reply from Odlyzko. He said that my idea for a new type of cryptography was a good one, and in fact at the same time Victor Miller of IBM was proposing exactly the same thing. The appeal of elliptic curve cryptography (ECC) was that the elliptic curve discrete logarithm problem appeared (and still appears twenty-two years later) to be a substantially more difficult problem than integer factorization.

At first neither Victor nor I imagined that ECC would be of commercial importance; rather, we saw it as a nice theoretical construction to think about. In retrospect, what was surprising was not that I had no notion of commercializing the idea, but that Victor Miller, who worked at IBM, wasn't thinking in practical terms. He didn't even apply for a patent, although then as now IBM's policy was to strongly encourage all its employees to get patents for everything they possibly could, even on the flimsiest of grounds. So the question of turning ECC into a commercial product would wait until other people became interested in it.

After I returned to the U.S., I started attending cryptography conferences. The most important were the annual Crypto meetings held each August in Santa Barbara, California. In the 1980s I found the atmosphere at Crypto to be refreshing and stimulating. It was a truly multidisciplinary meeting, with people from industry, government, and academia in fields ranging from math and computer science to engineering and business.

There was an element of "forbidden fruit" in the first decade of the Crypto conferences. At the beginning of the 1980s the National Security Agency (NSA) had made a heavy-handed (but unsuccessful) attempt to restrict open research in cryptography. Thus, the founding of the Crypto conferences in 1981 was itself an act of defiance.

The free-spirited tone of the meetings in those years reflected the colorful and eccentric personalities of some of the founders of and early researchers in public key cryptography. One such person was Whit Diffie, a brilliant, offbeat, and unpredictable libertarian who in 1976 had coauthored (with Martin Hellman) the most famous paper in the history of cryptography. Diffie used to run the "rump session", where informal, irreverent, and

often humorous presentations were the norm. There was heckling, and at one point Whit had to impose some restrictions on what could be thrown at a speaker (empty beer cans were okay, but not full ones).

The corporate influence was much weaker then. There was a long lag between the invention of public key cryptography and its acceptance in the commercial world; until the late 1980s businesses generally had little interest in the issue of data security. Most researchers in cryptography had never signed a "nondisclosure agreement" limiting what they could say publicly—in fact, most of us had never heard of such a thing.

It was at Crypto where I met Scott Vanstone, a mathematician at the University of Waterloo who led a multidisciplinary group that had implemented improved algorithms for arithmetic in finite fields. With that experience they were well equipped to work on ECC. Vanstone, along with two other Waterloo professors, one in math and one in engineering, formed a company, now called the Certicom Corporation, to develop and market ECC.

Elliptic curves are not the only kind of curves that can be used in cryptography. In 1989, I proposed using the jacobian groups of hyperelliptic curves. In recent years a lot of research, especially in Germany, has been devoted to hyperelliptic curve cryptosystems.

In early September 1998, a few days before I was to leave for a year's sabbatical at the University of Waterloo, I received an email from Joe Silverman, a mathematician at Brown University who had written an excellent two-volume graduate textbook on elliptic curves. His message outlined a new algorithm he was proposing to solve the elliptic curve discrete log problem—in other words, to break elliptic curve cryptography.

Silverman called his algorithm "xedni calculus" because that's "index" spelled backwards. His general idea was to perform steps that are similar to those in index-calculus algorithms, but in the reverse order.

The reason Silverman thought that his algorithm might possibly be efficient was based on a deep and difficult relationship called the Birch and Swinnerton-Dyer Conjecture. Ironically, in a book titled *Algebraic Aspects of Cryptography* that I had published just a few months before, I had included a discussion of this conjecture in a section that I called "Cultural Background". My tone was apologetic to my readers for taking their time with mathematics that, while of great interest to theoreticians, was unlikely, I said, ever to be applied to cryptography. Then within a year I was intensively studying Silverman's attack on ECC that was based precisely on the idea behind that conjecture. This shows that it is unwise to predict that a certain type of mathematics will *never* be used in cryptography.

Scott Vanstone and the others at Certicom were extremely worried about Joe Silverman's algorithm, because they feared that ECC skeptics and competitors—especially people at the RSA company—would seize upon it as an argument against the use of elliptic curves.

The first few months of my sabbatical year were devoted to a thorough analysis of the Silverman algorithm. In October I found a theoretical argument, using the concept of the "height" of points, that showed that for very, very large elliptic curve groups the xedni approach would be extremely inefficient. However, with this general line of reasoning I couldn't be specific about the sizes for which the algorithm would be impractical. It was conceivable, although I thought it unlikely, that the algorithm would not be totally infeasible for curves in the size range that's used in cryptography.

It is important to understand that an asymptotic result—such as my theoretical argument that established the inefficiency of xedni in the limit as the size of the group increases—cannot be relied upon as any kind of guarantee of security. Rather, one must analyze the algorithm for elliptic curves of the size employed in cryptography. The asymptotic argument might be helpful as a guide—and certainly it made us hopeful that we would be able to show that xedni is impractical for the curves used in the real world—but it cannot serve as a substitute for a concrete security analysis. It turned out to be much harder and more time-consuming to carry out this analysis than it had been to come up with the theoretical argument for the asymptotic result.

In order to answer the crucial question of efficiency of xedni for elliptic curves in the practical range, I worked with a multidisciplinary group of young mathematicians and computer scientists at the Centre for Applied Cryptographic Research at Waterloo, especially Edlyn Teske, Andreas Stein, and Michael Jacobson. We were in constant communication with Joe Silverman, who gave us suggestions on how best to test his algorithm. Finally, by mid-December enough computations were in, and Silverman agreed that his algorithm was impractical. In fact, that's an understatement — it turned out that his algorithm was probably the *slowest* one that had ever been thought up to find elliptic curve discrete logarithms.

Nevertheless, it was an elegant idea, and our study of xedni was a stimulating project. Silverman's attempted attack on elliptic curve cryptography illustrated the increasing use of arithmetic algebraic geometry in public key cryptography.

In the 1990s another example of the greater sophistication of mathematical cryptography was the proposal of Gerhard Frey to use Weil descent

to find discrete logs on elliptic curves. Subexponential algorithms for discrete logs on high-genus hyperelliptic curves had already been developed by Adleman and Huang, and Frey's idea was to transfer the discrete log problem on an elliptic curve to one on a high-genus hyperelliptic curve. Frey's proposal was studied by Galbraith, Gaudry, Hess, Menezes, Smart, Teske, and others, and was shown to lead to a faster algorithm in a small number of cases.

Progress was also made in finding very quick methods to count the number of points on a randomly generated elliptic curve. The first step in this direction was taken in a 1985 paper by Schoof, who used division polynomials. Subsequently, better algorithms were devised using modular forms and p-adic techniques.

One indication of the amount of research devoted to cryptographic applications of elliptic curves in recent years is the annual ECC conference series, which is now in its eleventh year (see `http://www.cacr.math.uwaterloo.ca`).

A whole new type of elliptic curve cryptography was developed starting in about 2000, following ideas of Antoine Joux, Dan Boneh, and Matt Franklin. It turned out that the Weil and Tate pairings on elliptic curves could be used to achieve cryptographic functionality that had not been possible before (or had been done inefficiently), notably, identity-based encryption (where one's public key is, say, one's email address) and extra-short digital signatures. Pairing-based cryptography has been an active area of research; in July 2007 the first of a series of conferences devoted entirely to this type of elliptic curve cryptography was held in Japan.

Despite these wonderful examples of applications of interesting mathematics to cryptography, there has also been a downside—in fact, two downsides. That will be the subject of the remainder of this article.

First of all, there has been a bandwagon effect. Once in the 1990s the Canadian Natural Sciences and Engineering Research Council sent me a large proposal to review from a group that was led by a prominent mathematician who claimed that the proposed research would be important for cryptography. After reading the project description, it was clear to me that (1) the proposal was strong from a mathematical standpoint, and (2) they didn't know beans about cryptography. It was sad that some mathematicians seemed to feel pressured into portraying their research as being somehow related to cryptography.

In the late 1980s NSA realized that it had erred in antagonizing the mathematical community several years before, and it wanted to patch up relations. In academia, the best way to mend fences is to give out money. So they set up a system of grants that has become a major source of funding in certain fields, such as number theory.

For the most part it's good when more money comes into mathematics—whatever the motives of the donor. However, there can be subtle negative effects as well. Many years ago William Thurston and others warned us of the dangers of excessive reliance on military funding. And last year in the *Notices* David Eisenbud wrote what I thought was an eloquent rebuttal of the argument (based on the supposed advantages for fund-raising) in favor of an AMS Fellows program.

In the early 1990s I received a proposal for NSA funding for a conference on Drinfeld modules. The conference seemed like a good idea, and my review was generally positive. However, the tone of part of the proposal bothered me. In a section on "the effect of the conference on the competitiveness of American mathematics," the writers had attempted to divide the field between American and "non-American" mathematics and argue for the conference on the grounds that it would increase the competitive standing of the former. I commented:

> Mathematics is perhaps the most international of intellectual disciplines. Interaction and joint work easily cross national boundaries. Thus, it is usually impossible to determine—and serves no useful purpose to try to determine—the proportion of credit to be attributed to each country. Such a chauvinistic tone is not in keeping with the cooperative and international spirit of the mathematical profession…[W]hether they wrote this section out of sincerely felt concern for the "competitiveness of American mathematics" or to cater to what they guessed would be the mindset at NSA, I really hope that in the future they delete such nonsense from project proposals.

Apparently the availability of money from NSA had had a corrupting effect on some mathematicians, who started to think in nationalistic and jingoistic terms so that they could write their proposal in a way that they thought would appeal to NSA.

At the same time that mathematicians were trying to jump on the crypto bandwagon, cryptographers were discovering the power that an aura of mathematical certainty can have in competitive situations. They began to prove mathematical theorems that supposedly guaranteed the security of their system—the idea being to convince outsiders that their system was 100% safe. This is the second "dark side" of the relationship

between math and cryptography that developed as each group was looking for ways to exploit the status of the other group in order to advance its interests. Before explaining this use (or misuse) of mathematics in more detail, I'd like to comment on a clash of research cultures between math and cryptography.

In 1996 I was the program chair of Crypto. To someone trained in mathematics this was an unsettling experience. About two-thirds of the submissions arrived by courier mail within 48 hours of the final deadline. Many had obviously been rushed and were full of typesetting errors. One author had sent me only the odd-numbered pages. A few had violated the requirement of anonymity (there was a policy of double-blind reviews). Several had disregarded the guidelines that had been sent to them. And in many cases the papers had little originality; they were tiny improvements over something the same authors had published the year before or a minor modification of someone else's work.

In some ways the situation has gotten even worse with electronic submissions. Alfred Menezes, the program chair for Crypto 2007, told me that of the 197 submissions, 103 arrived within eleven hours of the deadline and 35 arrived within the very last hour.

Mathematical publishing works differently. In the first place, most articles appear in journals, not conference proceedings—and journals don't have deadlines. In the second place, people in mathematics tend to have a low opinion of authors who rush into print a large number of small articles—the derogatory term is LPU (*least publishable unit*)—rather than waiting until they are ready to publish a complete treatment of the subject in a single article.

Math departments usually believe the

Conjecture. *For the development of mathematics it is better for someone to publish one excellent paper in n years than n nearly worthless papers in one year.*

In certain other fields of science—including, unfortunately, computer science and cryptography—the analogous conjecture, while most likely true, is not widely believed.

Cryptography has been heavily influenced by the disciplinary culture of computer science, which is quite different from that of mathematics. Some of the explanation for the divergence between the two fields might be a matter of time scale. Mathematicians, who are part of a rich tradition going back thousands of years, perceive the passing of time as an elephant does. In the grand scheme of things it is of little consequence whether their big paper appears this year or next. Computer science and cryptography, on the other hand, are influenced by the corporate world of high technology, with its frenetic rush to be the first to bring some new gadget to market. Cryptographers, thus, see time passing as a hummingbird does. Top researchers expect that practically every conference should include one or more quickie papers by them or their students.

In recent years Alfred Menezes and I have written a series of papers that critique the subfield of cryptography known as *provable security*. (See `http://eprint.iacr.org/2004/152.pdf`, `http://eprint.iacr.org/2006/229.pdf`, and `http://eprint.iacr.org/2006/230.pdf`.) Although the papers have been widely downloaded and most of the reaction has been favorable, our work in this area has not been welcomed by everyone. Many specialists in theoretical cryptography have resented our intrusion into their field.

In the 1980s it seemed that all cryptographers were glad to see the influx of mathematicians. Twenty years later, however, I have the impression that some of them wish that we would just go away.

The idea of "provable security" is to give a mathematically rigorous proof of a type of conditional guarantee of the security of a cryptographic protocol. It is *conditional* in that it typically has the form "our protocol is immune from an attack of type X provided that the mathematical problem Y is computationally hard."

Here the word "protocol" means a specific sequence of steps that people carry out in a particular application of cryptography. From the early years of public key cryptography it has been traditional to call two users A and B of the system by the names "Alice" and "Bob." So a description of a protocol might go as follows: "Alice sends Bob…, then Bob responds with…, then Alice responds with…," and so on.

The form that proofs of security take is what is known as a *reduction*. Reductions from one problem to another occur implicitly throughout mathematics; in computer science, reductions are the main tool used to compare and classify problems according to their difficulty.

In provable security papers the authors try to prove that a mathematical problem that is widely believed to be computationally hard, such as factoring large integers or finding elliptic curve discrete logs, *reduces* to a successful attack of a prescribed type on their cryptographic protocol. This means that anyone who could break their cryptosystem could also, with only a little extra effort, solve the supposedly hard math problem. Since that is assumed not to be possible, the conclusion is that the protocol is *provably* secure.

For mathematicians who study the provable security literature, as Menezes and I did, there are several reasons to be uneasy. Most obviously, a provable security theorem applies only to attacks of a specified sort and says nothing about clever

attacks that might not be included in the theorem. Moreover, the result is conditional in a strong sense. Unlike in mathematics, where conditional theorems usually mean something like "assuming that the Riemann Hypothesis is true" (which it almost certainly is), in cryptography the condition is of the sort "assuming that no one finds an improved algorithm for a certain math problem"—and that's anyone's guess. History has not been kind to the latter type of assumption. For example, in the late 1980s and early 1990s the development of the number field sieve for factoring an RSA modulus N resulted in a dramatic decrease of the running time of index-calculus factoring algorithms from $\exp\left((\log N)^{1/2+\epsilon}\right)$ to $\exp\left((\log N)^{1/3+\epsilon}\right)$.

Provable security results are often used to impress outsiders who have little understanding of their true meaning. Suppose that some people are using public key cryptography to protect credit card numbers in e-commerce, maintain confidentiality of medical records, or create digital signatures. How can they be certain that the system is secure? To nonspecialists "provable security" means that there's a guarantee that's every bit as ironclad as a proof of the Pythagorean Theorem. In our view this is very misleading.

There's also a difficulty that comes from the disciplinary culture of cryptography that I commented on before. People usually write papers under deadline pressure—more the way a journalist writes than the way a mathematician does. And they rarely read other authors' papers carefully. As a result even the best researchers sometimes publish papers with serious errors that go undetected for years.

In 1994 two of the leading specialists in the new area of provable security, Mihir Bellare and Philip Rogaway, proposed an RSA-based encryption method that they called OAEP (the O stands for "optimal," a much overused word in the overhyped high-tech world). They held the view that security proofs should be sufficiently detailed so that one can get concrete guarantees for specified key sizes and choices of parameters. Partly because of the security proof that accompanied OAEP, it was adopted for use in a new standard of Visa and MasterCard. It turned out, however, that the proof was fallacious, as Victor Shoup discovered seven years later. This was a bit of a scandal and caused many people to wonder about quality control in provable security papers.

If a careful and astute reader is watching closely—and Alfred Menezes is such a reader—then errors in proofs are discovered much more quickly. A case that in many ways is even more striking than that of OAEP is the recent flap over an "improved" set of key agreement protocols designed by Hugo Krawczyk. In February 2005 Krawczyk, who works for IBM and is a top researcher in provable security, submitted a paper to Crypto 2005 in which he claimed to have found flaws in the Menezes-Qu-Vanstone (MQV) key agreement system. He replaced it with a modified version (HMQV) that he claimed was both more efficient and *provably secure*. If his claims had been valid, this would have been a major embarrassment not only to Menezes and his coauthors, but also to NSA, which had licensed MQV from Certicom and whose experts had studied it carefully.

Krawczyk did not send his paper to Menezes or the other designers of MQV before submitting it, although to do so would be considered a standard courtesy in the scientific world. But what to me seemed more scandalous was that neither did anyone on the Crypto 2005 program committee. They apparently rushed to accept the paper after only a superficial reading. When Menezes finally got a copy of the paper—after it had been accepted by the program committee—he immediately saw that the so-called flaws in MQV that Krawczyk listed either were based on misunderstandings or else were picayune theoretical points that had no practical significance.

More importantly, Menezes found that the paper's main argument was fallacious. Krawczyk claimed that in his modified key agreement system he could increase efficiency by discarding a certain security check (called a "public key validation") that had been put into MQV so as to prevent known attacks. It was his security "proof" that gave him the confidence to do this. But Menezes quickly found that certain of the HMQV protocols succumb to the same attacks that MQV would have if those security checks had not been put in. After seeing that some of the conclusions of Krawczyk's theorems were false, Menezes started reading the "proof" carefully until he came upon a blatant gap in the argument.

Both Krawczyk and the referees on the program committee had been so mesmerized by the "proof" that they failed to use common sense. Anyone working in cryptography should think very carefully before dropping a validation step that had been put in to prevent security problems. Certainly someone with Krawczyk's experience and expertise would never have made such a blunder if he hadn't been over-confident because of his "proof" of security. As with many other over-hyped ideas—fallout shelters in the 1950s, missile shields in the 1980s—"proofs" of the security of a cryptographic protocol often give a false confidence that blinds people to the true dangers.

In our first paper on provable security, Menezes and I objected to the terminology:

> There are two unfortunate connotations of "proof" that come from mathematics and make the word inappropriate in discussions of the security of cryptographic systems. The first is the notion of 100% certainty. Most people

> not working in a given specialty regard a "theorem" that is "proved" as something that they should accept without question. The second connotation is of an intricate, highly technical sequence of steps. From a psychological and sociological point of view, a "proof of a theorem" is an intimidating notion: it is something that no one outside an elite of narrow specialists is likely to understand in detail or raise doubts about. That is, a "proof" is something that a non-specialist does not expect to really have to read and think about.
>
> The word "argument", which we prefer here, has very different connotations. An "argument" is something that should be broadly accessible. And even a reasonably convincing argument is not assumed to be 100% definitive. In contrast to a "proof of a theorem", an "argument supporting a claim" suggests something that any well-educated person can try to understand and perhaps question.

Menezes and I also investigated some subtler problems of interpretation of provable security results. Even when the proofs are correct, they often mask a big "tightness" gap. This means that in the reduction argument the attack on the protocol must be repeated millions of times in order to solve the hard computational problem. In this case the practical guarantee that one gets is very weak. Menezes found some extreme examples of this "nontightness" problem in a few well-known papers on random number generators. In one paper it turned out that, if you carefully follow the authors' argument with recommended parameter values, all they've really proven is that an attacker would need time at least 10^{-40} nanoseconds to break the system. That's much less time than it takes light to travel a micron.

What had happened was that people had made recommendations for parameter values that were based on an asymptotic theorem. That theorem said that in the limit as N approaches infinity, you can securely generate $O(\log \log N)$ pseudorandom bits each time you perform a squaring modulo the composite number N. (Here "securely" means, roughly speaking, that no one can distinguish between the sequence and a truly random one by an algorithm that runs in reasonable time.) However, as I mentioned when discussing Joe Silverman's xedni calculus, it is fallacious to use an asymptotic result as a practical guarantee of security. Rather, one needs to perform a detailed analysis using realistic ranges for the parameters. It is often a lot harder (as it was for xedni) to carry out this concrete analysis than to prove the asymptotic theorem, and sometimes the conclusions are not what one would hope for. In the case of the pseudorandom bit generator the analysis (if one assumes that $\log_2(\log_2 N)$ bits are taken in each iteration, as recommended) leads to an absurd lower bound on the amount of time that an adversary would need in order to successfully attack the generator.

The story of our first paper on "provable security" has an amusing postscript. Just before it was due to appear in *J. Cryptology*—and almost two years after it was accepted for publication—a member of the editorial board objected strongly to its acceptance by the journal. Although it was too late for him to block publication, the editor-in-chief was sufficiently worried that he wrote an unprecedented Editor's Note at the beginning of the January 2007 issue in which he justified his decision to go ahead with publication.

The editorial board member who objected to our article was Oded Goldreich of the Weizmann Institute, who is one of Israel's leading computer scientists and a top name (some would say *the* top name) in theoretical cryptography. When he was unable to prevent our article from appearing in *J. Cryptology*, he posted on the cryptography eprint server a 12-page essay titled "On Post-Modern Cryptography" that lashed out at us on philosophical grounds. (See `http://eprint.iacr.org/2006/461`.) He accused Menezes and me of being "post-modern" and "reactionary" because our criticisms of provable security "play to the hands of the opponents of progress."

The part of our paper that seems to have incensed Goldreich the most was our explanation of why we were not persuaded by certain arguments that he and others had made in order to undermine the so-called "random oracle" assumption. The random oracle assumption relates to what are called "hash functions" (short strings of symbols that act as a sort of "fingerprint" of a message). This assumption essentially says that the fingerprint that a well-constructed hash function gives is in practice indistinguishable from a random string of symbols. This is an intuitively reasonable assumption, and in our paper we argued that all attempts to undermine it—even ones that the authors claimed to be of practical relevance—in fact use constructions that violate basic cryptographic principles and so have no relation to real-world cryptography. We concluded our discussion by saying that "our confidence in the random oracle assumption is unshaken."

Goldreich responded to this by bringing down the wrath of the Old Testament upon us. Accusing us of turning the random oracle into a "fetish", he recounted a story from the Bible that our paper reminded him of (in what follows I've preserved

the emphasis, capitalization, and spelling of the original):

> Indeed, what happened with the Random Oracle Model reminds us of the biblical story of the Bronze Serpent, reproduced next. (See *Numbers* (21:4-8) and *2 Kings* (18:4).) During the journey of the People of Israel in the dessert, the prophet-leader Moses was instructed by the Lord to make a "fiery serpent" as a symbolic mean for curing people that have been bitten by snakes (which were previously sent by the Lord as a punishment for some prior sin). Several hundred years later, the bronze serpent made by Moses has become an object of idol worship. This led the righteous King Hezekiah (son of Ahaz) to issue an order for breaking this bronze serpent to pieces. Let us stress that the king's order was to *destroy an object that was constructed by direct instruction of the Lord*, because this object has become a fetish. Furthermore, this object no longer served the purpose for which it was constructed. This story illustrates the process by which a good thing may become a fetish, and what to do in such a case…. [G]iven the sour state of affairs, it seems good to us to abolish the Random Oracle Model.

Goldreich sees himself as a twenty-first-century righteous King Hezekiah defending the provable security researchers against infidels and postmodern fetishists such as Menezes and me. It is clear from his essay that he had not read our paper carefully before writing his response; nor does he seem to have been aware of our other two posted papers criticizing provable security. But of course it was not necessary to actually read the technical details in our three articles in order to denounce us on religious and philosophical grounds.

The angry reactions of a few researchers who seem to perceive our work as a threat to their interests are not the type of thing one normally encounters in theoretical mathematics, where usually the only issues that could cause someone to object to a paper would be an error or omitted acknowledgment of earlier work (neither of which has been found in any of our three papers on "provable security"). But far from being bothered by the accusations made by Goldreich and others, I am encouraged by them, because they at least show that people are paying attention.

Cryptography has the excitement of being more than just an academic field. Once I heard a speaker from NSA complain about university researchers who are cavalier about proposing untested cryptosystems. He pointed out that in the real world if your cryptography fails, you lose a million dollars or your secret agent gets killed. In academia, if you write about a cryptosystem and then a few months later find a way to break it, you've got two new papers to add to your résumé!

Drama and conflict are inherent in cryptography, which, in fact, can be defined as the science of transmitting and managing information in the presence of an adversary. The "spy vs. spy" mentality of constant competition and rivalry extends to the disciplinary culture of the field. This can get to be excessive—and even childish at times—but it also explains in part why it can be so much fun to do research in cryptography.

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WHAT IS...

a Higgs Bundle?

Steven B. Bradlow, Oscar García-Prada, and Peter B. Gothen

A Higgs bundle is a holomorphic vector bundle together with a Higgs field. Such objects first emerged twenty years ago in Nigel Hitchin's study of the self-duality equations on a Riemann surface and in Carlos Simpson's Ph.D. thesis and subsequent work on nonabelian Hodge theory. Hitchin introduced the term "Higgs field" because of similarities to objects labeled this way in other equations of gauge theory. In those contexts Higgs fields describe physical particles like the Higgs boson. Simpson suggested the shorthand "Higgs bundle" for a bundle together with a Higgs field.

Higgs bundles have a rich structure and play a role in many different areas including gauge theory, Kähler and hyperkähler geometry, surface group representations, integrable systems, nonabelian Hodge theory, the Deligne–Simpson problem on products of matrices, and (most recently) mirror symmetry and Langlands duality. In this essay we will touch lightly on a selection of these topics.

We start with the definition: *A Higgs bundle is a pair (E, ϕ) where E is a holomorphic vector bundle and ϕ, the Higgs field, is a holomorphic 1-form with values in the bundle of endomorphisms of E, satisfying $\phi \wedge \phi = 0$.*

In the simplest examples the bundle is a complex line bundle and the Higgs field is a holomorphic 1-form. To see a nonabelian example, set $E = K^{1/2} \oplus K^{-1/2}$ where $K^{1/2}$ is a complex line bundle whose square is K, the canonical bundle on a Riemann surface (i.e., the bundle of holomorphic 1-forms). A Higgs field on E is then equivalent to a bundle map $\phi : E \longrightarrow E \otimes K$. We obtain a family of Higgs fields on E parameterized by quadratic differentials, i.e., sections a of the line bundle $K^2 \cong \mathrm{Hom}(K^{-1/2}, K^{1/2} \otimes K)$, by setting $\phi = \left(\begin{smallmatrix} 0 & a \\ 1 & 0 \end{smallmatrix}\right)$, where 1 is the identity section of the trivial bundle $\mathrm{Hom}(K^{1/2}, K^{-1/2} \otimes K)$.

We now look at how Higgs bundles emerge in nonabelian Hodge theory. Hodge theory uses harmonic differential forms to represent de Rham cohomology classes on Riemannian manifolds. On a hermitian manifold, say X, $\bar{\partial}$-harmonic forms give analogous representatives for Dolbeault cohomology classes. If the metric on X is Kähler, the real and complex theories are compatible. This relates topological and holomorphic data on X and reveals additional structure on the topological side, i.e., on the cohomology groups $H^k(X; \mathbb{C})$. For $k = 1$ we get

$$H^1(X; \mathbb{C}) \cong H^{0,1}(X) \oplus H^{1,0}(X). \tag{1}$$

On the holomorphic side, $H^{0,1}(X)$ describes deformations of holomorphic line bundles on X. The holomorphic data thus come from a pair (E, ϕ), where E is a line bundle and $\phi \in H^{1,0}(X)$ is a holomorphic 1-form, i.e., it comes from an abelian Higgs bundle. On the topological side, $H^1(X; \mathbb{C})$ models the tangent space to the space of homomorphisms from $\pi_1(X)$ to $\mathbb{C}^*$. This is the same as the space of flat complex line bundles on X.

In the nonabelian theory we replace $\mathbb{C}^*$ by a nonabelian Lie group. For definiteness we take $\mathrm{SL}(n, \mathbb{C})$. The topological side of the Hodge theory now has $\mathrm{SL}(n, \mathbb{C})$-representations of $\pi_1(X)$ or, equivalently, flat complex vector bundles on X. A theorem of Corlette and Donaldson provides the harmonic part of the theory; it says that if the representation of $\pi_1(X)$ is completely reducible, then the corresponding flat bundle, say E, supports a *harmonic metric* (solving an appropriate generalization of Laplace's equation). The holomorphic interpretation uses the fact that flat structures are defined by bundle connections with vanishing curvature. The harmonic metric splits the flat connection into two parts: a skew-hermitian (unitary) part and a hermitian

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part. The anti-holomorphic component of the former defines a holomorphic structure on E; the latter defines a holomorphic endomorphism-valued 1-form, i.e., a Higgs field ϕ. The holomorphic data, i.e. (E, ϕ), thus define a Higgs bundle.

We next explore some features of Higgs bundles, starting with a theorem of Hitchin and Simpson that says that, for a Higgs bundle to admit a harmonic metric as above, it must satisfy a condition called *stability*. Together with Corlette's theorem this establishes a correspondence between stable Higgs bundles on a Kähler manifold and irreducible $\mathrm{SL}(n, \mathbb{C})$-representations of $\pi_1(X)$. This is a Higgs bundle version of a famous theorem of Narasimhan–Seshadri on vector bundles and its generalization by Donaldson and Uhlenbeck–Yau.

A key attribute of Higgs bundles is a $\mathbb{C}^*$-action given by $\lambda(E, \phi) := (E, \lambda\phi)$. Isomorphism classes of Higgs bundles fixed by this action are complex variations of Hodge structure (the focus of Simpson's Ph.D. thesis). Through them Higgs bundles reveal strong restrictions on fundamental groups of compact Kähler manifolds. Using the fact that stable Higgs bundles form a Tannakian category, this $\mathbb{C}^*$-action also reveals a $\mathbb{C}^*$-action on the pro-reductive completion of $\pi_1(X)$.

Another central feature of Higgs bundles is that they have continuous moduli, i.e., they come in families parameterized by the points of a geometric space (in fact a quasi-projective variety) known as a moduli space. One method for constructing such spaces, using Mumford's geometric invariant theory (GIT), depends on a property called stability. When X is a Riemann surface (assumed from now on) the previously mentioned stability property corresponds precisely to the GIT notion. The essence of nonabelian Hodge theory thus amounts to an identification between the moduli space of stable Higgs bundles on the Riemann surface X and the moduli space of irreducible $\mathrm{SL}(n, \mathbb{C})$-representations of its fundamental group. In the abelian counterpart all Higgs bundles are stable and the space of holomorphic 1-forms is dual to the infinitesimal deformation space of a line bundle. Thus the moduli space is the cotangent bundle to the Jacobian variety of X. The corresponding representation space is now the character variety $\mathrm{Hom}(\pi_1(X), \mathbb{C}^*) \cong (\mathbb{C}^*)^{2g}$.

The moduli space has a third description as a space of solutions to the *Hitchin equations*. These are gauge-theoretic equations for the Higgs field, ϕ, and an $\mathrm{SU}(n)$ connection A compatible with the holomorphic structure on the bundle E:

$$F_A + [\phi, \phi^*] = 0$$
$$d''_A \phi = 0.$$

Here F_A is the curvature of A, and $d''_A \phi$ is the anti-holomorphic part of the covariant derivative of ϕ. Hitchin obtained these equations by considering instantons (solutions to the anti-self-duality equations) that are invariant under a two-dimensional group of symmetries on a four-dimensional manifold. The equations express both the flatness of an $\mathrm{SL}(n, \mathbb{C})$-connection $A + \phi + \phi^*$ and the harmonicity condition for a metric in the resulting flat bundle. This links flat bundles and Higgs bundles in the correspondence described earlier.

The four-dimensional origin and basic structure of the equations account for a hyperkähler structure on the moduli space. This is a Riemannian metric that is Kähler with respect to three distinct complex structures defined by operators I, J, and K satisfying the quaternionic relations. The moduli spaces of Higgs bundles on Riemann surfaces are noncompact hyperkähler manifolds. The restriction of the $\mathbb{C}^*$-action to S^1 is Hamiltonian with respect to one of the Kähler forms on the moduli space. The associated symplectic moment map is given by the L^2-norm of the Higgs field. This map constitutes a perfect Bott–Morse function on the moduli space and provides a powerful tool for studying its topology.

In addition to providing a distinguished Morse function, the Higgs field is responsible for another signature feature of the Higgs bundle moduli space M, namely the Hitchin fibration. Since ϕ takes its values in endomorphisms of the bundle fibers, we can compute $\det(\phi - \lambda I)$. The coefficients of this characteristic polynomial define the *Hitchin map*

$$H : M \longrightarrow \bigoplus_{d=2}^{n} H^0(X; K^d).$$

Here K is the canonical bundle on X. The target is a vector space with dimension half that of M and the generic fiber is an abelian variety, in fact the Jacobian of the so-called spectral curve. This is an example of an algebraically completely integrable system.

The Hitchin map has a section whose image is a component of the moduli space of representations of $\pi_1(X)$ in $\mathrm{SL}(n, \mathbb{R})$. It is a $(n^2 - 1)(g - 1)$-dimensional complex cell that for $n = 2$ corresponds to the Teichmüller space of the surface. The Higgs bundles are precisely the rank 2 examples described earlier. Applying the existence theorem for Hitchin's equations to those with $a = 0$ provides a new proof of the uniformization theorem for Riemann surfaces.

Virtually everything described above applies if $\mathrm{SL}(n, \mathbb{C})$ is replaced by a complex semisimple Lie group G. The resulting G-Higgs bundle theory introduces holomorphic tools for studying representations of $\pi_1(X)$ into G and also into the real forms of G. In a sign that they still have much to teach us, Higgs bundles play a role in the recent Kapustin–Witten interpretation via topological field theory of the geometric Langlands correspondence. We end by noting that the Hitchin equations emerge here after imposing a two-dimensional symmetry—much as in Hitchin's original derivation of his equations!

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Alfred Tarski, Friend and Daemon

Benjamin Wells

Engaging Tarski

Alfred Tarski's name stayed with me after I read about the Banach-Tarski paradox in [3] during high school. I then discovered logic (and Tarski's definition of truth) in the last year of college but still considered myself to be a topologist, not from love but from intimate contact in four courses as an undergraduate. So before arriving at UC Berkeley in fall 1962 for graduate work, I thought only vaguely about taking a course with him. But my inclinations were shifting: dutifully registering for fall classes in topological groups and algebraic geometry, I added metamathematics and Tarski's general algebraic systems. The next fall, Tarski offered set theory. These two courses were my only Tarski lectures, but there were numerous seminars. Visitors to Berkeley constantly identified Tarski with whatever topic occupied him so fruitfully and persuasively that year. They might never know that it changed year to year. I witnessed iterations of the two areas mentioned plus cylindric algebras, equational logic, metamathematics of algebras including decision problems, and pervasive model theory, missing only his return to foundations of geometry.

I quickly saw that the way to get Tarski's attention was to correct his boardwork. Precise, accurate, stepwise development without notes was the focus in his classroom, and students' requests for history, motivation, or remedial background were met civilly, in order of declining interest. He later revealed that the clarity of a lecture was the result of two hours' preparation and writing, even rehearsing.

I was Alfred Tarski's last student as determined by date of thesis signature. I did not seek this role. When I had passed doctoral exams in 1963 and sounded Bob Vaught and John Addison on their availability for supervising my research, both said that the department recognized me as Tarski's student. News to me, despite the second opinion. So I called him to learn more about my fate. He acknowledged the claim, "Good," and invited me for the first serious nighttime talk.

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Source of the Title

Throughout cooperation and separation, Alfred and I were friends, cordial and personable, but not really personal. He also established another role, that of daemon in the sense of [4]: a leonine externalized conscience, at least. The scope of this conscience was foremost mathematical, with a hope for political, a goal of cultural, a reservation on philosophical and moral, and a hint of spiritual.

Mathematical Conscience

Those who absorbed an attitude toward mathematics from Tarski gained a more workable system of notation, a less ambiguous vocabulary, and a deeper appreciation for rigor combined with clarity. He demonstrated the value of careful memory; once he wrote a logical formula of maybe a hundred symbols on a scrap of paper for me, then said he had not looked at the formula in thirty years. We also learned lessons on deliberate productivity, attribution, and accuracy. The professional conduct of logic was well defined, and he could be outraged by our departures from it. We learned to bend and to stretch. For some this was not welcome exercise. Tarski and I both persevered, and his contributions to the problems I brought him created a debt still being repaid and a wish list still being satisfied.

Political Conscience

According to [1, p. 326], Tarski gave me a subscription to a political magazine "that was in line with his more conservative views." In fact, it

was *The Progressive*, a liberal magazine although more conservative than some. This exemplifies Tarski's political complexity. He vaguely supported Berkeley's Free Speech Movement but was clearly suspicious of methods, goals, and direction, taking no comfort in my tentative articulation of them. He found Poland to be a good place for increasing the political awareness of his American students. He was amused by my later free speech activity in Warsaw (see [7]) and the sit-in we exchange students made on a Soviet train platform to liberate an improperly detained tape recorder.

Cultural Conscience

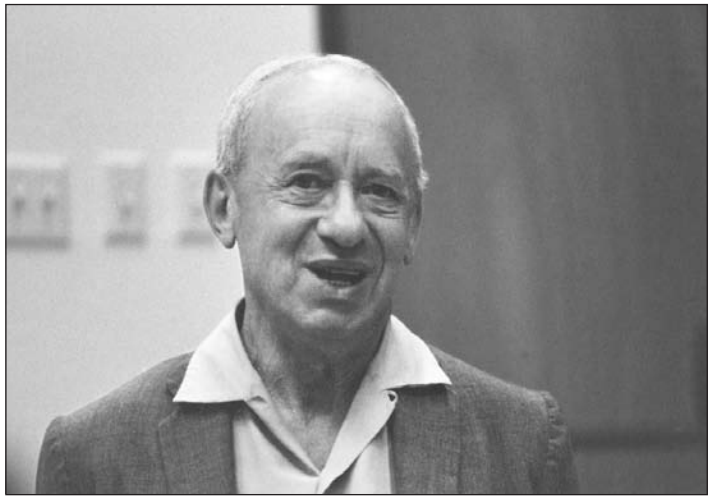
Poland was even better for introducing his students to his culture, and to culture in general. Things Polish were high on the discussion list in Alfred's kitchen after the math ended at 3 or 4 a.m.: he taught me to make *wódka kolorowa* with kumquats, told me he could not pronounce *dżdży* ("rain" in Polish) and thought no one could, appreciated jokes from Poland (not Polish jokes), avidly discussed art, women, mountains, and caves. There were salon evenings at the Tarskis' home where we met their friends far removed from logic: international, sophisticated, intellectual, artistic, always stimulating.

Philosophical and Moral Conscience

Apart from the philosophical embodiment in his logic and mathematics, Alfred did not dwell on philosophy in my hearing. Nor was morality discussed. Some will be aghast at his independence described in [1], while others term these descriptions sanitized. I make no witness in this area, having no direct information. In my experience, Tarski was refined, courteous, and I guess above all discreet. Except for alcohol, tobacco, and kola nut, the only talk of drugs was Witkacy's use while painting the portraits on the walls of the Tarski home. Tarski exuded honesty and a sense of righteousness. From there, he argued, cajoled, almost cudgeled over mathematical faults and against social ills, e.g., vagueness, overreaching, improper attribution, antinepotism, antisemitism, communism, and other public stupidities.

Spiritual Conscience

He lamented C. C. Chang's move from mathematics to mysticism after Chang found his Hindu guru during the 1971 Tarski Symposium. On returning from Poland three years earlier (followed then by a week in India), I had became devoted to the Indian spiritual master Meher Baba, but Alfred later said he felt I would continue to do science, unlike Chang who declared himself to be finished with research. We rarely discussed religion; he did, however, enumerate the diverse religious/ethnic backgrounds in his extended family: one member was of the karaim like Besicovitch, another had become a Buddhist, and more. I asked him what he was; he looked astonished at my ignorance: "Roman Catholic!" He told me that if reincarnation works,[1] then he would like to return as a paleontologist (this contrasts with others' recollections that he would like to be a biologist/botanist if he could do it over). I had put somewhat obscured references to spiritual stories as similes in my dissertation, and he asked that they be removed (most were). I said, "So you want me to take out the religion?" "Exactly," he responded but said his main target was my self-aggrandisement—a spiritual lesson.



Photographs in this article by Steven Givant.

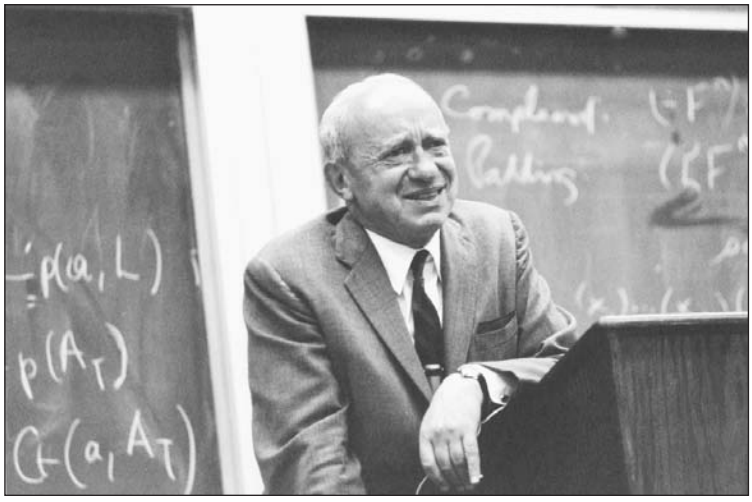
Alfred Tarski at the Tarski Symposium, 1971.

Curiosa

Some Tarski images are indelible. He smoked endless cigarillos in a cold, unventilated basement workroom that reeked of aftershave. He smoked during his lectures, and I saw him inhale the chalk, leaving a white mark on his lips for the rest of the hour. He clutched his briefcase across his chest with both arms, and he drove smartly while looking under the top rim of the steering wheel. Alfred had the nickname "Fredzio" among intimates. He told me that he was called "Dan" in his family; whether it had the Hebrew force of "judge" or the Middle English of "master", it was apt.

His 40-odd-page scrapbook of the political activists Patty Hearst, Angela Davis, and Bernadine Dohrn is accurately described in [1, pp. 327–328].

[1] *In 1965, Tarski said [10], "I represent this very rude, naive kind of antiplatonism, which I could describe as materialism, or nominalism with materialistic taint. It is hard for a man to live his whole life as a mathematician or as one who has a hobby called set theory. Maybe in some future reincarnation (and possible future reincarnation is appropriate to think of at my age) I shall not be such an extreme antiplatonist as now. I imagine I shall not abandon all my tendencies, let's say some rejection of knowledge of priority, some empiricalist tendencies, some physicalist tendencies. Maybe I shall arrive at the conclusion that the existence of classes is not a proper problem, makes no sense, or maybe I shall accept some minor form of platonism."*



Alfred Tarski at the Tarski Symposium, 1971.

However, my reading of Alfred was that, while he was not joking, his attitude was definitely ironic bordering on sarcastic, all the while in dead earnest. That still does not explain his motivation but makes it more likely derisive than celebratory.

Tarski once told me he had talked with Kurt Gödel the night before; Gödel was convinced that Stanford's Paul Cohen had given correct proofs of independence in a manuscript he had sent Gödel. Amazingly, I spotted Cohen on the Berkeley campus a few hours later and could tell him to his great pleasure that Gödel was satisfied.

Tarski did not like computers.[2] He asked me to remove "Recapitulating Turing Machines" from a draft title of my thesis. I told him it gave a flavor of computer science to the work. "Exactly," he replied. Later, he urged, "Since you like computers, maybe you could write a program to check Gödel's incompleteness proof. You know, it is widely accepted, but no one has checked it in every detail." This was eventually carried out by Shankar [5] for Gödel's first theorem (the second remains an open task). The request reflects on Tarski's contention that he almost beat Gödel to the incompleteness results, having to settle for the undefinability of truth as a consolation prize. Logic students can be perennially amused by Gödel's completeness and incompleteness results paired with Tarski's definability and undefinability of truth.

Late and Later Developments

A prelude to my 1967 journey to Warsaw [7] was an exchange of letters with Tarski. Part of Tarski's answer was reconstructed in [1, p. 325] because I thought the letter lost. It is found. The paraphrase was not accurate but close in spirit. He actually wrote: "You will certainly have inspiring scientific contacts in Warsaw. Let me say however that you really could have had more such contacts in the Bay Area than you actually had if you tried hard enough." He continued: "I can assure you that Warsaw is not a monastery and at any rate not a nunnery. … People in that part of the world are claimed to have various secret weapons. Maybe they will make some of them available to you and you will learn how to beat down the intrusion of the outside world. … If the decision were entirely up to me I would probably suppress all my misgivings and have you go to Warsaw, treating the whole adventure as a calculated risk." That risk paid off, in time.

At the end of our time together, he released several students to complete their Ph.D. work with Ralph McKenzie, but he kept me because he liked my results (according to McKenzie). For a puzzling aspect of that liking, see [8] and related papers cited there. The reminiscence [6] covers our last thesis interaction.

When [1] was published, I knew that four hours of taped interview, numerous emails, and joyous conversations with the Fefermans over years would be revived there. I am grateful for the close rendering but much more so for their wonderfully vast, synchronized introduction to the life and work of the Polish king of logic—and to him I am most grateful, this ultimately friendly daemon.

[2] *Despite his aversion to computers and computing, Tarski and his results have inspired many computer scientists. See [1, pp. 229-230] and [2].*

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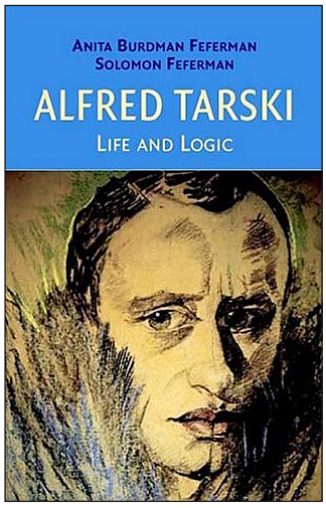

Alfred Tarski. Life and Logic

Reviewed by Hourya Benis Sinaceur

Alfred Tarski. Life and Logic
Anita Burdman Feferman and Solomon Feferman
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Alfred Tarski (1901–1983) is one of the two greatest logicians of the twentieth century, the other being Kurt Gödel (1906–1978). Each began his career in Europe, respectively in Warsaw and Vienna, and came to America shortly before the Second World War. In contrast to the otherworldly Gödel, Tarski was ambitious and practical. He strove for, and succeeded at, building a school of logic at the University of California, Berkeley, that attracted students and distinguished researchers from all over the world.

Tarski was the leader of the "semantic turn" in mathematical logic. This means that he achieved a shift from a view focused on formal systems, axioms, and rules of deduction to a view focusing on the relations between formal systems and their possible interpretations by usual mathematical theories such as real numbers or Cartesian geometry. Hence he gave precise definitions of semantic concepts that had been used informally before. The most important of those concepts are truth, satisfiability, and definability of a formula; logical consequence; and model. Tarski was also the champion of the trend towards reconstructing logical notions by mathematical means. For instance, his decision method for elementary algebra and geometry is indeed a generalization of a Sturm's algorithm for counting the real roots of a polynomial. Tarski was eager to bring to the fore new connections between mathematics and logic and to show how mathematized concepts of logic can help to solve mathematical problems. Thus, Tarski initiated the shift from the foundational aims for which various branches of modern logic were originally developed to heuristic aims for which a new branch would turn out to be especially efficient. Namely, Tarski is the father of model theory, the results and tools of which are nowadays commonly used in various mathematical disciplines (algebra, analysis, geometry, computer science, etc.).

Tarski's views and achievements have also changed the way we think about the nature, scope, and aims of logic. The rich and detailed biography of Tarski written by Anita and Solomon Feferman show us the roots and the full extent of this change.

The Fefermans' biography is an enthralling success story of a self-confident, enterprising, untiring, and entrepreneurial scientist, and a rich and scrupulous account of the numerous achievements accomplished by this powerful logician and his colleagues in philosophy of logic, semantics, set theory, decision procedures, universal algebra, algebraic logic, axiomatic geometry, topology, and model theory.

It is particularly remarkable that the Fefermans were able to reconstruct so vividly Tarski's childhood in Warsaw; the brilliant *gymnasium* and university years; the change of name from Teitelbaum to Tarski (in 1924) and the conversion

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to Christianity (motivated by the desire to apply for an academic position); the leftist and socialist bent; the opposition to Zionism and the search for assimilation despite the prejudices against Jews; the trips to Zacopane, a meeting place for Polish intellectuals in the Tatra mountains—in short, the scientific, political, cultural, and artistic atmosphere that favored the development of Tarski's multifaceted personality and help account for his wide interests and capacities. No less remarkable is the description of Tarski's years in America, from the time he arrived in 1939 to give invited lectures at Harvard University until his death in 1983, i.e., from his first uncertain steps in his profession to the heydays crowning the steadfast efforts to build a prestigious logic group at UC Berkeley. All of the events are described in the same meticulous way. The reader follows month by month or year by year the irresistible, though treacherous, ascension of a strong and passionate character.

"Life and Logic" is the meaningful subtitle of the Fefermans' book. As with the biography of Jean van Heijenoort, which Anita published in 1993, the whole picture, or better the whole colorful and stirring movie about Tarski's great adventure, is composed by intertwining scenes of private life, socio-political data, cultural customs and events, academic affairs, and advances in logic. Thus, fifteen chapters deal with the multidimensional context of Tarski's scientific research and achievements, while six technical "Interludes", spliced between the chapters, give a synthetic account of the main results Tarski and his group obtained. A bibliography of selected works by and on Tarski completes the book.

The benefits of reading this fascinating biography are at least threefold. First, one gets a concrete image and a vivid portrait of one of the two logicians who changed the face of logic in the twentieth century. We learn how high were his scientific ambitions and how large was the realm of his passions: for logic and mathematics naturally, but also for philosophy (with a particular interest in classical Greek philosophy), for poetry, for the arts, and also for climbing mountains and visiting botanical gardens. Behind the demanding logician one discovers the "bon vivant" who smoked immoderately; drank heavily; used drugs for keeping awake and working until dawn; womanized all throughout his life; liked parties; and was always ready for hiking, traveling, meeting new people, and exploring new sights of the world.

The second important benefit is to become acquainted with the many people who played a role in Tarski's life and career and built a large community devoted to various subfields of mathematical logic (mainly model theory, set theory, and algebra of logic). As in a Balzac novel, one is introduced to a whole world, the world of logic and set theory from around 1900 to the 1980s, and from Warsaw, Lvov, and Vienna to Harvard, Princeton, Berkeley, and Stanford, to cite only the main internationally known scientific centers. One meets "mythical" logicians such as Gödel, with whom Tarski shared an interest in completeness, definability, decidability, and recursivity, and many outstanding scholars, such as: Stanisław Lesnievski, Jan Łukasiewicz, Kazimierz Kuratowski, Wacław Sierpiński, Tadeusz Kotarbiński, Léon Chwistek, Adolf Lindenbaum, Andrzej Mostowski, Wanda Szmielew, Samuel Eilenberg, Bertrand Russell, Rudolf Carnap, Willard Van Orman Quine, Evert Beth, Karl Popper, John McKinsey, Paul Cohen, Alonzo Church, Barkley Rosser, Stephen Kleene, Bjarni Jónsson, Louise Chin, Julia Robinson, Leon Henkin, Robert Vaught, Richard Montague, Dana Scott, Solomon Feferman, Jerome Keisler, Patrick Suppes, Georg Kreisel, John Addison, Robert Solovay, Saul Kripke, and others who have left a mark on the fields of logic or mathematics or philosophy. Everyone is more or less briefly described according to the closeness and depth of his connection to Tarski and in view of his more salient traits.

In addition, Tarski's life story is linked with important intellectual movements. First of all, the extraordinary flourishing from about 1900 onwards of mathematical, logical, and foundational studies in Poland at the hands of the masters of the Warsaw-Lvov School (a thorough account of this school and its emergence is to be found in Jan Woleński's *Logic and Philosophy in the Lvov-Warsaw School*, Kluwer, Dordrecht, 1989). The specific humus provided by the Polish in the interplay of mathematics, logic, and philosophy constituted the fertile ground upon which Tarski's logical masterpieces flourished. In writing them Tarski was concerned on the one hand with showing the importance of logic for mathematics and, on the other hand, with articulating the methodology of deductive theories and the conceptual analysis of logical notions which would give instruments for rigorous philosophical work in this area.

The second major movement that affected, and was affected by, Tarski was the Unity of Science movement, launched in 1934 by Otto Neurath, the coauthor (along with Rudolf Carnap and Hans Hahn) of the manifesto of the Vienna Circle. As is well known, the basic assumption of the manifesto was the division of knowledge into empirical and logical statements, any other statement outside of those categories being considered meaningless. The goal was then to obtain a scientific world conception by applying logical analysis to the empirical material. The brilliant Viennese mathematician Karl Menger, who belonged to the Circle, was invited to lecture in Warsaw in the autumn of 1929. He was so impressed by the precise work of the Polish logicians that he invited Tarski to Vienna. There were encounters that would become important for Tarski's influence outside Poland.

Most notably, Carnap attended Tarski's lectures and in the years following their first meeting in 1930, quickly grasped the intrinsic value of the semantical approach, the importance of the theory of truth and of the Tarskian analysis of the concept of logical consequence, and the possible instrumental contribution of semantics to the development of "scientific philosophy". The 1935 Paris Congress of the Unity of Science, where Tarski presented his concepts of truth and consequence, marked the beginning of his international reputation.

The fifth International Unity of Science Congress was held in 1939 at Harvard University. After a long hesitation, Tarski eventually accepted Quine's invitation and left Poland in August without thinking war was imminent. However, before the opening of the Unity of Science Congress on September 3 Warsaw was already under the Germans' bombs. After the end of the congress, Tarski stayed in America, anxious for his family in Poland. He gave a number of lectures at various universities in the Northeast but had to search for regular teaching positions. No permanent appointment could be found for "the great logician" until his move in 1942 to the University of California at Berkeley. His family could not come before January 1946. Then, he began to organize "a systematic study of logic and foundations," as he wrote in 1948 to Heinrich Scholz, who had helped logicians in Poland during the war. That announced the new age, the American period of the spread of Tarski's semantical methods and their algebraic representation. As the Fefermans put it (p. 185): "Although it became common knowledge that doing graduate work and writing a Ph.D. thesis with Tarski was a harrowing experience, his personal magnetism and brilliance, and his passionate belief in the supreme importance of logic, were so strong that he attracted a steady stream of students eager to take up the challenge."

One has to take account of the social and cultural aspects that Tarski infused into his scientific research to understand the scope of his enterprise and the unending energy he expended for realizing it. For him, science, and first of all logic, was a training in right thinking and a means to promote a kind of philosophy freed from metaphysical views. He created in 1956 at UC Berkeley a new Ph.D. program in Logic and Methodology of Science, which is still thriving today. In some sense, it was nothing but pursuing or reviving in a specific way the ideal of the Warsaw-Lvov School of logic and replacing the comprehensive "scientific world conception" of the Vienna Circle by more objective and realistic goals. According to the Fefermans (p. 252), Tarski was developing the research program of the Polish School "along the lines of Carnap's project for *the logical investigation of scientific language and theories as formal objects of study*" (the italics are mine). He was developing a scientific and intellectual movement of his own. He was building "a school of thought" (p. 3). International conferences organized in this perspective were not exclusively restricted to logicians; rather they included mathematicians, physicists, and philosophers of science. After the International Symposium on the Axiomatic Method, with Special Reference to Geometry and Physics, held at Berkeley in December 1957/January 1958, Tarski planned the First International Congress for Logic, Methodology and Philosophy of Science, which was held at Stanford University in August 1960, and inaugurated the series, still continuing, of one such international congress every four years.

Thus Tarski created in Berkeley a "home" for a specific way of doing mathematical logic, with its methods, its standards of rigor, its connections to and its impact upon other disciplines, its own meetings and conferences, its own stories, and its own legend.

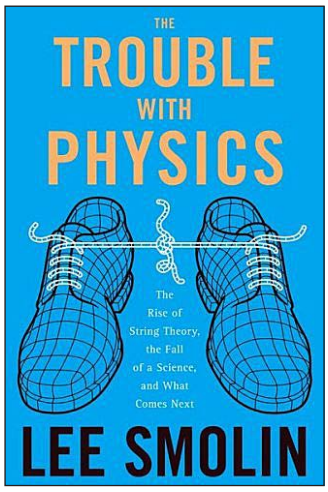
The third benefit of the Fefermans' biography consists in offering an introduction to the main problems and results that Tarski pushed to the forefront of logical research. Written with a minimum of technicalities, the six Interludes meet the demanding standards of the exceptional teacher that Tarski was and serve perfectly the purpose of pedagogical presentation. Simple but self-contained, explaining step-by-step everything that is needed and leaving nothing fuzzy nor obscure, they are easily understandable even by those not previously acquainted with the subject matters. They furnish a beautiful, though partial, survey of a whole century of logic in Europe and America.

Indeed, these Interludes, none of which exceeds fifteen pages, explain very clearly sophisticated results such as the Banach-Tarski paradox; the completeness and decidability of elementary algebra and geometry, which was considered by Tarski and many others as "one of the two most important research contributions in his entire career;" and the definition of truth, the other most important contribution, which has been "recognized as one of the most important examples of conceptual analysis in twentieth-century logic." The Interludes also give a brief but precise account of Tarski's other endeavors. Thus, in Interlude IV we learn in just a few words (p. 191) what the aim was of Tarski's *Cardinal Algebras* (published in 1949) : "to isolate in algebraic form a number of results about finite and infinite cardinal numbers that could be proved with*out* using the Axiom of Choice." The content of *Ordinal Algebras*, published in 1956, is described in a similarly concise way. Interlude V is dedicated to model theory, which is "an *informal* mathematical theory whose subject matter is *formal theories and their models*." One of the main novelties is the introduction by the Polish logician Jerzy Łoś of the mathematical notion of "ultrapower". Tarski, together with Anne Morel and Dana Scott, used

this notion to give (in 1958) a mathematical proof of the compactness theorem for first-order logic, according to which if each finite subset of a set of first-order sentences has a model, then the whole set has a model. The compactness theorem is a consequence of Gödel's completeness theorem, the proof of which was carried out by metamathematical means; i.e., it involved reference to the syntactic notion of sentences of a formal language and to the semantic notion of truth in a model. The new proof of the compactness theorem constituted an important milestone on the road Tarski was constructing for logic and ushered in extensive applications of the ultrapower construction in model theory. Indeed, through such applications Tarski hoped to eventually obtain what he aimed at from the very beginnings of his work: to reach a wider mathematical audience beyond those working in closely aligned areas of logic. Interlude VI is devoted partly to relation algebras and one application, which led Tarski and Steven Givant to conceive of a theory of sets with no use of variables or quantifiers, and partly to *Cylindric Algebras*, whose basic aim is the algebraization of logic. Leon Henkin and Donald Monk collaborated in writing down the two thick volumes published respectively in 1971 and 1985. What is striking is the persistence in these last works of two main components of Tarski's initial global project: one had been, and remained, the elimination of quantifiers, which, at the time of the Warsaw Seminar (1926–28), meant the exclusion of set-theoretical methods; and the other had been, and still remained, the replacement of logical notions by corresponding purely algebraic methods. This is only one illustration, but a very significant one, of the steadiness and coherence of Tarski's scientific views throughout his life.

Even a quick perusal of the authors' Notes and Acknowledgments (pages 381–4) will be enough to provide the reader of this fascinating biography with a sense of the vast amount of archival material, documents, articles, and books that were consulted in writing it. One also learns that about 150 people were interviewed or consulted about details of Tarski's personal, and even intimate, life or about different aspects of the scientific work and events in which Tarski had been involved: teaching, supervising Ph.D. students, giving lectures in American universities and abroad, conducting seminars, writing papers and books, heading international congresses and meetings, promoting wherever he was logic, methodology, and philosophy of science. The Notes (pages 393–408) indicate that the first interviews with people who were close to Tarski took place in 1993, that is to say, eleven years before the book came out. The Fefermans started the job while people who knew Tarski in his early days were still alive. They sought even the slightest information coming from relatives; friends; former students or assistants; secretaries; and scholars and professors of mathematics, logic, and philosophy from all over the world. Moreover, they had been personally well acquainted with Tarski since the beginning of the 1950s. Solomon was his Ph.D. student and his teaching and research assistant until 1956. After moving to Stanford, the Fefermans continued to see Tarski often at meetings and at the regular Stanford-Berkeley logic colloquium, which was started in the 1960s. They were among the friends who celebrated Tarski's eightieth birthday (in 1981) at the Henkins' house.

One can imagine how much patience, stubborn determination, and attention to detail and to the complexity of the facts have been invested in this systematic, substantial, and thorough inquiry. Many facts reported in the biography have been double-, triple- or even multichecked. Reports by different persons on how Tarski behaved and thought might have been very dissimilar or even contradictory. To ensure completeness, the Fefermans offer at times many versions of the same fact or event, with the aim of showing the different—and most of the time not separate—roles Tarski played, including the severe and unbending professor who could be a considerate father figure to his students and possibly a lover for those who were female. The complex and varied portrait the Fefermans have painted is a rigorous attempt at capturing with greatest objectivity the complex socio-psychological facts that can help us understand Tarski's personal leanings, his high professional conscientiousness, his "unending concern for clarity, precision, and rigor," and, last but not least, his strong will to put his mark on his time.



The Trouble with Physics: The Rise of String Theory, the Fall of a Science, and What Comes Next

Reviewed by Brent Deschamp

The Trouble with Physics: The Rise of String Theory, the Fall of a Science, and What Comes Next
Lee Smolin
Houghton Mifflin Company, 2006
US$26.00, 392 pages
ISBN 0-618-55105-0

The Trouble with Physics: The Rise of String Theory, the Fall of a Science, and What Comes Next is a book about the history of physics from Copernicus forward. It is also a book that discusses the current state of physics research, particularly the dominion that string theory holds over the field. The author covers many diverse topics, and, while the title singles out string theory, this is a book about much more.

Smolin starts with the five great unanswered problems in physics today. I replicate them here as they appear in Chapter 1:

> Problem 1: Combine general relativity and quantum theory into a single theory that can claim to be the complete theory of nature (known as quantum gravity).
>
> Problem 2: Resolve the problems in the foundations of quantum mechanics, either by making sense of the theory as it stands or by inventing a new theory that does make sense.
>
> Problem 3: Determine whether or not the various particles and forces can be unified in a theory that explains them all as the manifestation of a single, fundamental entity.
>
> Problem 4: Explain how the values of the free constants in the standard model of particle physics take on the values they do in nature.
>
> Problem 5: Explain dark matter and dark energy, or if they don't exist, determine how and why gravity is modified on large scales.

Smolin goes into some detail about each problem, and with this background he walks the reader through the amazing advances in physics since Copernicus. His tour is guided by the idea that physicists seek to unify both theories and objects in an attempt to come to a better, and one hopes simpler, understanding of the universe. Along the way Smolin spends almost as much time on the ideas that failed as on those that have survived. His reasons become clear later on, but at this point in the book this emphasis shows the path great minds with great ideas have traveled to bring us to modern physics.

He begins with two failures. The first is that sound and light are instances of the same phenomenon, which led to the invention of aether,

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the substance through which sound and light were supposedly transmitted. He moves on to planetary motion and the theory of circles circling circles, or epicycles, and he even spends time talking about Kepler's theory that the orbits of the five known planets were related to the five Platonic solids. With each theory he shows how it was disproved as experiment and evidence began to show otherwise.

He then shows some of the great unifications: Newton's unification of motion and rest; Bruno's unification that the sun and stars are the same thing; Faraday and the understanding that forces and fields are the same; Maxwell's unification of electricity and magnetism; and Einstein's double unifications, of space and time in special relativity, and acceleration and gravity in general relativity. The presentation of these concepts is intended for a general audience. Still, it is done in a manner so that for those of us who understand the concepts these descriptions are not boring.

Among the interesting side notes Smolin presents during this discussion is a hypothesis that arose after the unification of electricity and magnetism: it suggested magnetic lines might be knotted in various ways and that each knot might be associated with a particular atom. Knowing if one knot was the same as another was suddenly of great interest. The theory was wrong, but it led to the establishment of knot theory as a branch of mathematics. The book is filled with such intriguing side notes, and it is clear Smolin knows a great deal about the history of physics.

Throughout these discussions Smolin points out that each unification not only led to a better understanding but also raised new questions—questions no one could have foreseen before the unification. Each of these led to testable hypotheses, and in that way the validity and usefulness of each theory was measured.

Smolin ends the first section of the book by describing the state of physics at the dawn of string theory. This includes a nice discussion of basic quantum theory, symmetry and spontaneous symmetry breaking, along with the gauge principle and the current search for the Higgs boson. He again delves into incorrect theories such as SU(5) and the unsuccessful search for proton decay. His point is that experiments in physics show the correctness/incorrectness of theories. He also spends several chapters discussing supersymmetry, cosmology, supergravity, and quantum gravity theories.

Smolin now turns to string theory. He describes how it began as an ignored idea and slowly expanded into the theory that has dominated particle physics for the last twenty years. He does a good job of explaining the idea that everything is composed of small vibrating strings and that strings propagate through time according to the simple restriction that they minimize the surface area of the tubes they sweep out over time.

String theory unifies all particles and all forces, it connects to symmetry though the existence of gauge fields, it unifies the quantum and relativity, and it reduces twenty basic free variables in the standard model to one variable in string theory. So from the beginning it had great potential in that it helped deal with two of the great problems in physics (1 and 3).

String theory, unfortunately, first existed as hundreds of versions of the same theory, though it was eventually whittled down to only five. At this point a revolution took place in the theory when Edward Witten gave a talk unifying all five theories into a coherent theory, which he called M-Theory.

To listen to string theorists talk to the public it appears as if M-Theory is a solid, existent theory, but Smolin points out that what Witten did is not create a new theory but to point out some of the features such a theory would have to have. This explanation was, to me personally, a great shock since I had always believed M-Theory was a complete theory. Smolin points out other aspects of string theory where public perception does not match reality.

The author also stumbles at this point in his usual careful descriptions for the general public. He talks a great deal about "higher-order terms" while never defining them. My assumption, given his vague description of the mathematics, is that he is trying to talk about convergence of series solutions. Given my own confusion, I can only wonder at what a general audience might make of the following: He states that for string theory to work the higher-order terms need to be finite and that their sum needs to be finite, too. It has been shown that the first two terms in the sum are finite, and many in string theory assumed the rest had been shown to be finite as well. Smolin digs into the past papers on the subject and reveals this has not actually been done in general, but in only one special case. Everyone, including Smolin, had assumed it had been done in general, so a key foundation of string theory seems to be incomplete.

Smolin's other great complaint with string theory is that it is background-dependent, in other words, to begin with a theory of strings one first fixes the background space in which the strings live. Relativity, which string theory supposedly unifies with the quantum, rests on the theory that space is not fixed, and so any theory that fixes space would not be consistent with other, accepted, theories.

Further chapters look into the extra dimensions that seem to come with string theory, the advent of branes, string theory and black holes, cosmological constants, dark energy, the anthropic principle, and the relationship between supersymmetry and

string theory. The final score is that string theory has potential for resolving Problem 3, it has made progress on Problem 1, but it has failed when it comes to the other problems.

For this reason Smolin concludes string theory, as the next great theory in physics, has failed. He also continuously reminds the reader that string theory has never produced results that are experimentally verifiable or falsifiable. The theory stands outside the realm of experiment, and so as a theory of the universe it lacks testability and cannot be seriously considered as a theory for physics.

The next section is a tour of competing theories, with all their strengths and weaknesses—my favorite being: what if special relativity is wrong? Smolin also spends some time talking about his own pet theory, quantum-loop gravity, but it is given the same amount of space as the other theories. With these competing theories Smolin is careful to point out why they are testable—a reason they should be investigated considering the deficiencies of string theory.

These three sections have taken nearly three-quarters of the book, and it's been good reading, but now things get interesting.

It's been difficult to gauge how Smolin feels about string theory up until this last section. He talks about great ideas and the beauty of string theory, but he also is quick to tear it apart. Is this book for or against string theory? I would have guessed it was against it, and the next few chapters would have confirmed this theory.

The first chapter in this last section describes working in physics under the reign of string theory. It describes a world in which some people whole-heartedly believe in string theory and some people study string theory only because it is, as the oft-repeated expression holds, "the only game in town". Smolin points out, "In the last fifteen years, there have been a total of three assistant professors appointed to American research universities who work on quantum gravity other than string theory, and these appointments were all to a single research group." String theory has a stranglehold on the field, and Smolin believes this is wrong.

This chapter also reveals a strange crack in the scientific veneer of the book. For a few pages Smolin whines, much like a kid in high school who doesn't understand why the "cool" kids won't let him sit at their table in the cafeteria, and he also describes a bizarre world that feels almost like *Invasion of the Body Snatchers*—a world in which the vast majority of the field has been strangely brainwashed and a lone few run, chased and persecuted, holding onto the truth.

As strange as these pages were, and as out of place as they felt, I'm slightly glad Smolin let down his guard, dropped the dispassionate scientific mantra, and let us know how he really feels about his field. But again, this doesn't mean he dislikes string theory.

How then, does Smolin really feel?

His point is this: he likes string theory, he's worked in string theory, it's come up with some good ideas, but it simply cannot be "the only game in town". The theory has its limitations, and he feels the physics community is deluding itself by thinking string theory by itself is going to answer the big questions.

Smolin sees the problem two-fold:

(1) Research in string theory is done differently from the research that produced the great theories that came before. Einstein and other visionaries were just that: they dared to see a world that had never before been imagined. While string theory started as a visionary idea, the last twenty years have been spent in refining that idea, and technical proficiency in computation has been valued more than original thinking that might disagree with the party line.

(2) The current tenure system in the United States has only exacerbated this problem. In order to get tenure a physicist needs to have results within five years. This means they cannot be spending those five years thinking outside of the box. They could be, but what if they don't produce anything by then? It's a safer road to work in string theory.

Smolin documents numerous conversations with people who feel this way, and he also points out that even once they have tenure the people who may like to leave string theory really have nowhere to go. Grants go to string theorists, there's a cultural pressure to continue in string theory, and time has already been invested in string-theoretic lines of thought.

Smolin would like to see more balance in his field. He would like to see more than a vast sea of technically proficient physicists (he calls them craftspeople) working on refining one theory; he would like to see visionaries (he calls them seers) who are allowed to dream big and are given the space and time and resources to do so without the usual five-year deadline.

What's fascinating about this dream is that Smolin actually identifies the people in the field, who are, in his estimation, the seers physics needs. The list includes Antony Valentini, Gerard 't Hooft, Julian Barbour, and Roger Penrose. Some of them have shunned academia in order to find the time and freedom to follow their own ideas (Barbour). Of these some have actually had their work accepted by the community and now find themselves with jobs (Valentini), others continue to remain on the fringe and still others have jobs but are taking risks with their careers for the future of their science ('t Hooft and Penrose).

Smolin points out that the seers have always been few in number, but he shows why his field

needs them. He doesn't promote redefining the tenure system, but he does suggest finding room for these people within the system and encouraging them to follow their ideas. He offers a novel criterion for evaluating such candidates: some people in the field should believe the candidate has great potential, and some people should think the candidate's ideas are nonsense. In this way no one group can control who is given a position of this sort.

By the final page I realized Smolin likes string theory; he thinks that it has as much potential as any other theory to generate new ideas that will promote our understanding of the universe, but as a final theory he feels it has failed. For this reason he feels that it should not dominate the field and that other theories should be given just as much consideration and the room in which to explore. Smolin's book leaves the reader thinking long after finishing the last page. And in my estimation, that is what a good book does.

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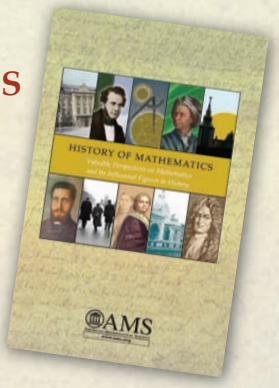

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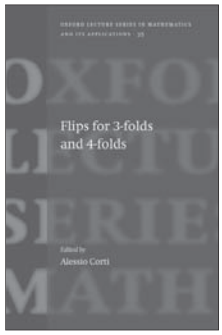

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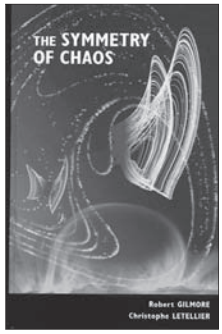

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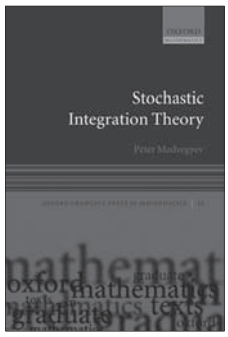

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Interview with Stephen Smale

George Szpiro

Editor's Note: Stephen Smale is one of the most prolific mathematicians of our time and certainly one of the most dazzling. Recipient of a Fields Medal in 1966, he was also known for his anti-Vietnam war protests and the co-founding of the Yippie movement in the late 1960s. At one time he was even subpoenaed by the House Committee on Un-American Activities. He also ran into trouble with the National Science Foundation when he declared publicly that he had done some of his best work on the beaches of Rio.

In May 2007 he was awarded, together with Hillel Furstenberg, the Wolf Prize in mathematics. In Jerusalem for the prize ceremony, Smale granted an interview in which he talked about his work and career. What follows is an edited version of the interview, conducted by George Szpiro, Israel correspondent and mathematics columnist for the *Neue Zürcher Zeitung* (Switzerland). A German version of the interview appeared in that newspaper on June 6, 2007. Szpiro's latest book is *Poincaré's Prize: The Hundred-Year Quest to Solve one of Math's Greatest Problems*, published by Dutton in June 2007.

—Andy Magid

Szpiro: *Professor Smale, why is mathematics important to you?*

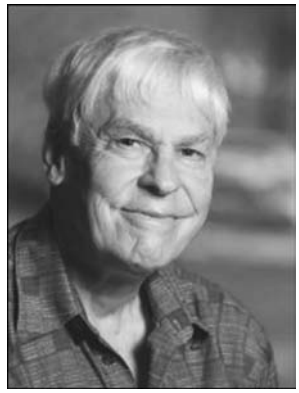
Smale: Oh, that's a tough question. Maybe I'm different from other mathematicians. I consider it as just one important thing to study. I see myself broader, as a scientist, even a little bit of an artist. So mathematics is not the sole motivating thing in my life, far from it. But I do see a beauty in mathematics because of its elegance and its ability to idealize the things you see in everyday life. Understanding the things around you has been the motivating factor for me for the past 40 years.

Szpiro: *So is mathematics a cultural endeavor?*

Smale: Well, I wouldn't say so much cultural, as science in a broad sense. The traditional motivation to do mathematics is to understand physics, but also to understand, say, economic phenomena. I am now trying to understand human vision, trying to develop something like a model for the visual cortex. Maybe it will turn out that there are some universal laws and eventually we will understand how humans learn and think. That's an example of how mathematics can help us understand natural phenomena.

Szpiro: *Why is mathematics so effective in explaining phenomena, as opposed to, say, narratives?*

Smale: Mathematics is a kind of formalized way of thinking. One can be much more precise in mathematics than in literature, express relationships in a more precise way, include magnitudes. And even fuzziness can be incorporated in mathematics by using probabilities. I use that a lot because when moving from physics to vision and biology one has to incorporate some kind of fuzziness. The way I do that is—in the mathematical tradition—by using probability.



Stephen Smale

Mathematics is so effective because one can look for universal laws more easily with mathematics than without. It enables us to abstract the main ideas. With formalization and symbols one is able to see what is universal. The abstraction allows us to see universal ideas. I have been very inspired by Newton who could see a falling apple and the motion of planets and recognize them as part of the same phenomenon. I would like to see a language that allows us to translate what we see and then recognize it as part of a broad phenomenon.

Szpiro: *Kepler's Conjecture was believed to be correct, even before it was proven, and many people believe the Riemann Conjecture to be correct. Why is it so important in mathematics to be rigorous when proving something?*

Smale: Just because a lot of people believe something does not mean it is true. I am in favor of rigorously proving big problems. On the other hand, I am not quite so devoted to the idea that proof is the most essential thing in mathematics. What may be more important are the relationships of the main structures, the concepts, and the development of these concepts. Proofs are often an important part of that but are not the main focus

of my work. I'm rigorous, I try to have things correct, but sometimes proofs are almost secondary to seeing how the main structures are laid out. I look at relationships between mathematics and eventually between parts of the real world.

Szpiro: *Do you accept computer proofs?*

Smale: Since proofs are not the ultimate in mathematics for me, computer proofs are okay. Maybe not as good as a construction, a structured conceptual proof, but okay.

Szpiro: *Your career covered four areas: topology, dynamical systems, mathematical economics, and computer science. Why did you leave topology?*

Smale: In 1961 I did change subjects. I did not change completely, but I did leave topology. I said it publicly. I had proved Poincaré's conjecture in dimensions five and greater and I thought, after that, things were a little anti-climactic. Proofs for the third and fourth dimensions were still missing but it seemed—I won't say I was right—that these were just special cases. So it was more exciting for me to understand the dynamics of a discrete transformation of the two-sphere than working out Poincaré's conjecture.

Szpiro: *Were you convinced at the time that Poincaré's conjecture was correct?*

Smale: Oh no, far from it. I even had a counterexample. But it did not work, I found a mistake. Whenever I work on a mathematical problem I work on both sides of the question because they reinforce each other. If you work only on one side you don't get such a good perspective. One should not have too many pre-conceived ideas. Sometimes you should say "well, if it's not true, how would you go about proving that?" Going back and forth is an important part of proving a theorem.

Szpiro: *What did you do after topology?*

Smale: I had been doing dynamics for some years before that and had some idea about the great problems in dynamics. So I started working on those problems. Then I also did some work in electrical circuit theory, in physics, in mechanics.

Szpiro: *How did you get into economics?*

Smale: Well I was always interested in economics because of my political activities and my contacts with so many Marxists. One day Gérard Debreu, who later received the Nobel Prize for economics, came to me and asked me some mathematical questions about equilibria, and I told him about Sard's theorem, which was relevant to his research. A friendship grew between us. I learned a lot from him and he from me. We never worked together but we talked a lot. In fact, I helped him get the Nobel Prize. Ken Arrow and I nominated him to the Nobel committee.

Szpiro: *Then you left economics and got into the field of algorithms.*

Smale: Yes, after a few years. I had developed algorithms to find economic equilibria. I was not trying to simulate. I was just trying to find an abstract mathematical algorithm; other people simulated it. Given supply and demand, the task was to find the equilibrium prices in the economy. And I was doing it in the general setting of a possible economy. There was another algorithm by Herbert Scarf. I believe mine was faster and more natural. This led to the question, Which was better? So I continued towards computer science in order to understand why one algorithm is better than another.

Szpiro: *Was your algorithm supposed to describe the workings of the economy?*

Smale: No, not really. There are a couple of issues here. One of them is, how the economy works, how prices adjust. For me that was the biggest unsolved problem in economics. I spent time on that and failed. There is another problem. If parameters change, how do economic agents find the changing equilibrium? How do they locate it numerically? And I did the theory, the algorithm, of how to do that.

Szpiro: *Was it your aim to aid a centralized economy find the equilibrium?*

Smale: I was never quite so strong on that. As a student, before I was a Vietnam war protester, I was also a communist, but never because of the economies of Vietnam or Russia. I did not know that much about economics, and I was already somewhat disenchanted by that. As I got older I abandoned Marxism. But it took many years, experience of the world, maturing intellectually, and seeing what was happening. I was never interested in Marxism from the point of view of a planned economy.

Later, I became interested in understanding markets. But I am not a believer in the capitalist system, far from it. Let's say that over the years I became market-oriented. So when I got into algorithms, I was inspired by the market economy; on the assumption that the market gives us equilibria, how does one find them? They are given by equations, and I was providing algorithms for solving these equations.

Szpiro: *What are you working on now?*

Smale: While in Israel [for the Wolf Prize ceremony] I will give three talks. At the Weizman Institute I will talk on the mathematics of vision. It is some kind of visual cortex model, but more universal. Then I go to Haifa University where I will speak on data, the geometry of data. One sees all these data points and wants to find an underlying geometry. So I am going back to topology a little to do that. Data is the main thing one is trying to understand, and I am looking at the geometry, or the topology, of data. It is not quite pattern recognition; my first talk is connected to pattern recognition. All these things are a little bit mixed together but they are different.

Then I will talk in Beersheva on the flocking of birds. It's a big thing in zoology, there are lots of

observational studies. You have a bunch of birds on the ground, and then they suddenly all go up in the air and fly together at the same speed. It has to do with control theory, and robotics people want tiny robots to communicate with each other. They are the same phenomena. So they want to see how they can organize these kinds of common phenomena. A similar phenomenon occurs when a language emerges. The idea is how one can reach common understanding through the senses. In economics it would be the belief in a common price system, a necessary condition for prices to operate. So it goes back to my old question in economics: How do people arrive at a common belief in a price system?

Szpiro: *You have observed mathematics for half a century. Where do you think the field is going?*

Smale: My feeling is that there is a shift in mathematics away from traditional areas of physics. It used to be a big area for mathematics and for thousands of years inspired a lot of mathematics. But mathematicians seem focused too much on physics. I believe that things are changing much more in mathematics than in physics. Like the areas that I work in, like vision and the other questions coming in from biology, statistics, engineering, computer science, and especially computation. A lot of these things influence the way that mathematics is changing. So where is mathematics going? It is leaving physics to a great extent and moving into the areas I just mentioned.

Szpiro: *These are areas of applied mathematics. What about pure mathematics?*

Smale: I am not talking about applied mathematics. I don't believe in that dichotomy. I am talking about using mathematics to understand the world. When developing calculus and differential equations Newton was doing mathematics in order to understand the laws of gravitation. Did he do applied math? I don't think so. Did he do pure math? No. So that's the kind of mathematics I am thinking of. It's not what it was 150 years ago. Problems come down more from computer science, engineering, and biology. But it's mathematics proper, it's not applications.

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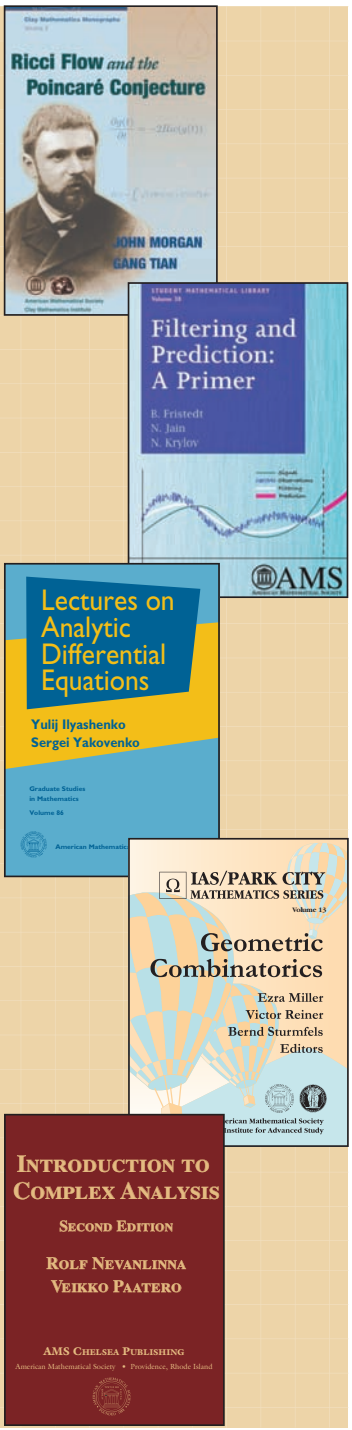

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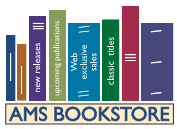

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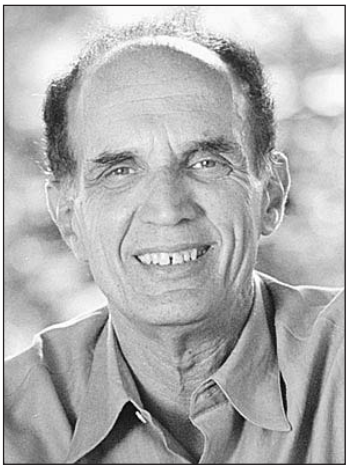
Efron Receives National Medal of Science



Bradley Efron

On May 29, 2007, President George W. Bush announced the recipients of the 2005 National Medal of Science. Among the eight medalists is BRADLEY EFRON, the Max H. Stein Professor and Professor of Statistics and of Health Research and Policy at Stanford University. Efron was cited "for his contributions to theoretical and applied statistics, especially the bootstrap sampling technique; for his extraordinary geometric insight into nonlinear statistical problems; and for applications in medicine, physics and astronomy."

The *Notices* asked Carl Morris of Harvard University to describe briefly Efron's work. Morris responded: "Brad Efron is renowned as a quintessential, theoretical, mathematical, interdisciplinary, and applied statistician. His foreseeing the onset of cheap and fast computation inspired his most famous breakthrough in 1979, the 'bootstrap', which marks the onset of the computer-intensive age in statistics. The bootstrap, further developed in his 1982 and 1993 books, allows data analysts to assess the long-run performances of their statistical procedures, each in the context of the observed data set, by recalculating the statistical procedure on thousands of randomly chosen 'bootstrap samples'.

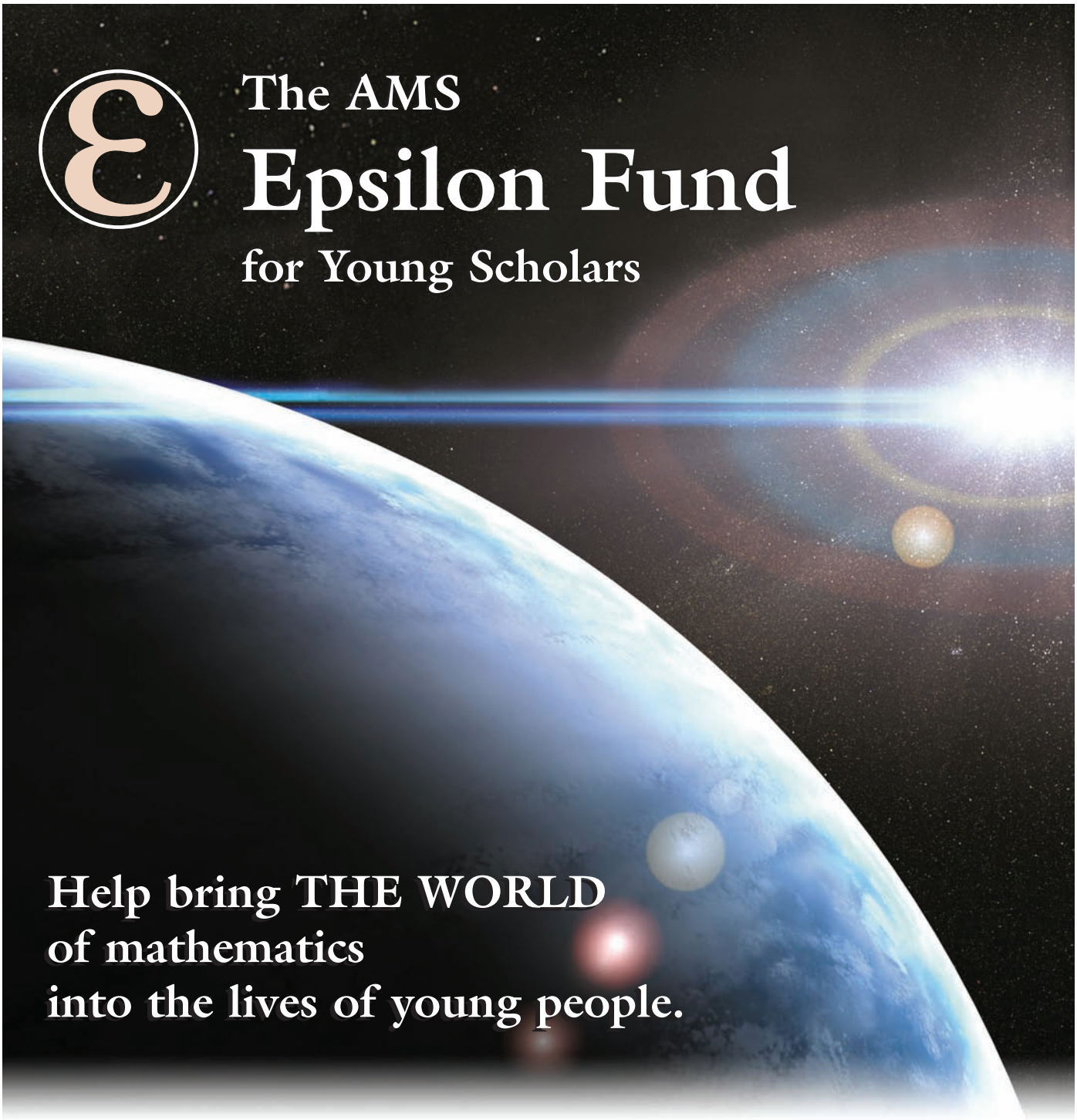
"While Efron's celebrated work on linear and curved exponential families and on statistical information principally has drawn from mathematical statistics, many of his pioneering ideas have stemmed from his regular interactions with real scientific data. These especially include theoretical advances for micro-array, survival, clinical trial, and drug compliance data in biostatistics, and for red-shift measurements in astrophysics. He even has used baseball data and counts on Shakespeare's vocabulary for inspiration and for context when explaining theoretical advances and to understand new models for empirical Bayes and Stein estimation, and for estimating the number of an unseen species."

Born in St. Paul, Minnesota, in 1938, Efron earned his doctorate in statistics from Stanford in 1964 and joined the Stanford faculty in 1965. He received a MacArthur Fellowship in 1983. His other honors include the Wilks Medal, the Parzen Prize, and the Rao Prize, as well as membership in the U.S. National Academy of Sciences and the American Academy of Arts and Sciences. Efron has served as president of both the American Statistical Association and the Institute of Mathematical Statistics. In January 2007 he delivered the lecture "Baseball, Shakespeare, and Modern Statistical Theory" at the Joint Mathematics Meetings in New Orleans.

The National Medal of Science is the country's highest distinction for contributions to scientific research. According to a news release from the Office of Science and Technology Policy, "The National Medal of Science honors individuals for pioneering scientific research in a range of fields, including physical, biological, mathematical, social, behavioral, and engineering sciences, that enhances our understanding of the world and leads to innovations and technologies that give the United States its global economic edge." The National Science Foundation administers the award, which was established by Congress in 1959.

Other mathematical scientists receiving the National Medal of Science in the past decade are: Louis Nirenberg (1995); Richard Karp and Stephen J. Smale (1996); S.-T. Yau (1997); Cathleen S. Morawetz (1998); Felix E. Browder, Ronald Coifman, and Leo Kadanoff (1999); John G. Thompson and Karen K. Uhlenbeck (2000); Calyampudi R. Rao and Elias M. Stein (2001); James G. Glimm and Edward Witten (2002); Carl de Boor and Duncan Luce (2003); and Dennis Sullivan (2004).

—Allyn Jackson



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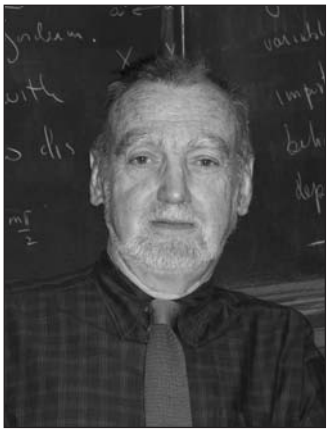
Langlands and Taylor Awarded Shaw Prize



Robert Langlands

Richard Taylor

ROBERT LANGLANDS and RICHARD TAYLOR will share the 2007 Shaw Prize in Mathematical Sciences "for initiating and developing a grand unifying vision of mathematics that connects prime numbers with symmetry." The prize carries a cash award of US$1 million.

The citation for Langlands states: "[He] initiated a unifying vision of mathematics that has greatly extended the legacy of the mathematics of previous centuries, connecting prime numbers with symmetry. This unification, which grew out of the Reciprocity Theory of Gauss and Hilbert, is now referred to as the Langlands program. It provides a direction of research which has guided mathematicians over the past forty years and will continue to do so for years to come."

Born in Canada in 1936, Robert Langlands is a professor in the School of Mathematics at the Institute for Advanced Study (IAS) in Princeton. He attended the University of British Columbia, gaining an undergraduate degree in 1957 and an M.Sc. in 1958. In 1960 he received his Ph.D. from Yale University. He taught at Princeton University and Yale University before moving to the IAS in 1972. He is a Fellow of the Royal Society of London, the Royal Society of Canada, and the U.S. National Academy of Sciences.

The citation for Taylor states: "[He] has made many extraordinary contributions to modern number theory, and more specifically to the framework of the Langlands program, where he has, in recent years, solved several important problems that had been long-standing conjectures."

Born in England in 1962, Richard Taylor is currently the Herchel Smith Professor of Mathematics at Harvard University, a post he has held since 2002. He received his B.A. from Cambridge University in 1984 and his Ph.D. from Princeton University four years later. He taught at Cambridge University from 1989 to 1995 and held the Savilian Chair of Geometry at Oxford University from 1995 to 1996. He is a Fellow of the Royal Society of London.

The Shaw Prize is an international award to honor individuals who are currently active in their respective fields and who have achieved distinguished and significant advances, who have made outstanding contributions in culture and the arts, or who in other domains have achieved excellence. The prize is administered by the Shaw Prize Foundation, based in Hong Kong. Previous recipients of the Shaw Prize in Mathematical Sciences are David Mumford and Wentsun Wu (2006), Andrew Wiles (2005), and Shiing-Shen Chern (2004).

—From Shaw Prize Foundation news releases

A Labor of Love: The Mathematics Genealogy Project

Allyn Jackson

Harry Coonce is an early riser. He gets up between 5:30 a.m. and 6:00 a.m., and the first thing he does is check his email. Then he starts the coffee, and in a little while his wife, Susan Schilling, who is a computer scientist, comes down to join him for a cup. "I got 32 names this morning," Harry tells Susan as he taps away, entering the new information into the database.

Coonce, a mathematician at North Dakota State University, is the managing director of the Mathematics Genealogy Project, a database of mathematics doctorate recipients and their advisors that stretches from Leibniz (Dr. jur, 1666, Universität Altdorf) up to the present day and contains more than 100,000 names. For Coonce, the careful day-to-day tending of the Mathematics Genealogy Project database has simply become a way of life. For mathematicians the world over, the database has become a standard reference tool, made continually more complete and reliable through contributions and corrections of users.

Coonce is a tall, white-haired man who walks with a cane and has a penchant for contrarian humor. Back in the early 1990s, when he first discussed with other mathematicians the idea of a database of mathematics Ph.D.'s, the reaction was: This is not mathematics, it's not mathematics history—and it can't be done. "Well, they were right on that one!" Coonce said. Still, he and his wife started discussing the possibilities. This was just at the time when use of the World Wide Web was spreading throughout the mathematical community, and they realized the Web offered the perfect way to present and share the information. So in the spring of 1996, Coonce sent a letter to the couple of hundred mathematics departments that indicated in the AMS *Professional Directory* that they had a doctoral program. The letter requested the names and dissertation titles of doctorates and the names of their advisors. Only about 25 to 30 percent responded, but that was enough to get started. Most responses came by snail-mail, some by email, some by fax. By September that year Coonce had posted the first batch of 3,500 names. The project gained visibility when he gave a talk about it the following January at the Joint Mathematics Meetings in San Diego.

Coonce was at the time on the faculty of Mankato State University (now called Minnesota State University, Mankato). The department gave some support for students to help him with the Mathematics Genealogy Project, but mostly he paid out of his own pocket. After he retired in 1999 he was able to continue to use an office at the university to work on the project. But by 2002 the university administration wanted him out: According to Coonce one dean flatly said, "This project has no academic value." Coonce put a notice on the Mathematics Genealogy Project website asking people to write to the dean if they disagreed with this assessment. "He was swamped!" Coonce recalled.

But it was clear the project needed a new home, and feelers came from other institutions, one of them being North Dakota State University. Coonce recalled his conversation with the dean there: "I asked for a professorship, an office, a computer, and funding. He said no. How could I pass up a deal like that?" In the end the university offered Coonce an adjunct faculty position and an office, so he bought his own computer and moved in. The best part of the deal was "a marvelous young student, Mitch Keller," said Coonce. "He had all the competencies of a computer geek—a good geek. I'd gone through at least five geeks, all of them good, but every year it was, 'Find a new geek.'" But Keller stayed on. He is now a mathematics graduate student at Georgia Tech and continues to work on the Mathematics Genealogy Project. Coonce says Keller is the one most likely to take over the project when the day comes that Coonce himself can no longer continue to work on it.

Before word really spread about the project, Coonce did whatever he could to get information to add to the database. One source was *Dissertation Abstracts*, which contains titles and abstracts of Ph.D.'s granted in the United States and, importantly for the Mathematics Genealogy Project, began listing the names of advisors around 1995. "Every Friday night about 6:00 p.m. I would load up about twenty-five volumes of *Dissertation Abstracts* and go to my office," Coonce recalled. "I would work through these volumes on the weekend." In 1999 the Mathematical Sciences Research Institute offered Coonce a one-month membership,

Allyn Jackson is senior writer and deputy editor of the Notices. *Her email address is* axj@ams.org.

which allowed him to publicize the project among mathematicians and to make many contacts that were crucial to the project's development, including MSRI director David Eisenbud, whom Coonce said has been a great supporter.

In 2002 Coonce visited the Universität Bielefeld, where Ulf Rehmann set up a mirror site and helped Coonce make contacts with mathematicians in German universities who could contribute information for the database. Coonce got photocopies of listings of new Ph.D.'s from German universities that had appeared in the *Mitteilungen*, the membership publication of the Deutsche Mathematiker Vereinigung (German Mathematical Society). (The *Notices* lists names of new Ph.D.'s at U.S. universities, but, unfortunately for Coonce, the names of the advisors do not appear. There is a spike in the number of entries in the Mathematics Genealogy Project in 1964, the one year when the *Notices* did include advisors' names.) Bit by bit, with information being added from a variety of sources, the database grew.

Now in its eleventh year, the Mathematics Genealogy Project has become so well known that about nine hundred new entries come in each month. Coonce does some vetting of new entries, such as checking whether a new Ph.D.'s advisor is already in the database or in MathSciNet. For Ph.D.'s from U.S. universities, he cross-checks against *Dissertation Abstracts*. Although mistakes inevitably creep in, so many people use the database that many errors are eventually found and corrected. For example, in July 2006, Google cached a Mathematics Genealogy Project entry for Mohammed Javad Larijani, who is the director of the Institute for Studies in Theoretical Physics and Mathematics in Tehran. He has also served in high positions in the Iranian government and has sometimes been confused with his more famous brother, Ali Larijani, the chief nuclear negotiator for the Iranian government. The cached Mathematics Geneaology Project entry for Mohammed Larijani said that he had received a Ph.D. in model theory from the University of California at Berkeley in 1980, under the direction of Robert Vaught. But later in 2006 the entry for Larijani was removed: He had indeed been a graduate student at Berkeley but did not finish a doctorate.

An entry in the Mathematics Genealogy Project contains the name of the doctorate recipient, the name of the doctorate-granting institution, the year the degree was awarded, the title of the thesis, and the name of the thesis advisor. This year, links to individuals' publication lists in MathSciNet have been added. For those whose biographies appear in the MacTutor History of Mathematics website (`http://www-gap.dcs.st-and.ac.uk/~history/`), a link is provided.

In 2006 a novel feature was added: a list of the fifty people who have advised the most Ph.D. students. Topping the list is Ronold Wyeth Percival King, who advised 100 Ph.D. students at Harvard between 1944 and 1984. If his name is not so familiar, that is because King's Ph.D. was in physics and he worked in that field and in electrical engineering. His inclusion in the Mathematics Genealogy Project demonstrates the project's inclusiveness: It accepts entries not only in mathematics but also in closely aligned fields, especially statistics and computer science.

Among the more familiar names in the list of "top 50" advisors is Felix Klein, who had a mere 58 students. But the Mathematics Genealogy Project also lists the number of "descendants"—that is, the number of students, plus the number of students of students, and so forth—and by this statistic, Klein stands out, with a whopping 26,563. Two of Klein's students, David Hilbert and Ferdinand von Lindemann, also made the "top 50" list (Hilbert is surely familiar to *Notices* readers, and Lindemann, of course, is famous for the first proof of the transcendence of π). The Mathematics Genealogy Project website notes that in former times the relationship between advisors and students could be quite different from what it is today, so some of the earlier entries could indicate a mentor/student relationship. Including such entries is justified, because the true goal of the project is to use these relationships to trace the intellectual history of the mathematical sciences.

In addition to the sponsorship of North Dakota State University, the Mathematics Genealogy Project receives support through a grant from the Clay Mathematics Institute and through donations by many individuals. The AMS also gives some modest support, including providing a mirror site and a booth for the Mathematics Geneaology Project at the Joint Mathematics Meetings.

When Coonce shows up at meetings, he is inevitably asked the same question: Are you still running the project? His stock answer is, "No, the project is running me." Why did he stick to it through the years, spending his weekends with *Dissertation Abstracts* and adding entries while sipping his morning coffee? Why did he care so much? His answer is simple: "It's a labor of love."

Mathematics Genealogy Project

The URL for the main site of the Mathematics Genealogy Project is `http://www.genealogy.math.ndsu.nodak.edu/`. There are also mirror sites at the AMS, the Universität Bielefeld, the University of Mississippi, and the Instituto de Matemática Pura e Aplicada in Rio de Janeiro.

Readers are encouraged to check their own information in the Mathematics Genealogy Project and to submit new information. The website has an online submissions form. Information on paper may be sent by postal mail to: Harry B. Coonce, The Mathematics Genealogy Project, P. O. Box 457, Vernon Center, MN 56090.

Mathematics People

Rudich and Razborov Awarded Gödel Prize

STEVEN RUDICH of Carnegie Mellon University and ALEXANDER A. RAZBOROV of the Steklov Mathematical Institute in Moscow were named recipients of the Gödel Prize of the Association for Computing Machinery (ACM) at the ACM Symposium on Theory of Computing, June 11–13, 2007, in San Diego. The Gödel Prize for outstanding papers in the area of theoretical computer science is sponsored jointly by the European Association for Theoretical Computer Science (EATCS) and the Special Interest Group on Algorithms and Computation Theory of the ACM (ACM-SIGACT). The prize carries a cash award of US$5,000.

Rudich and Razborov were recognized for their work on the P vs. NP problem, a classic question concerning computational complexity that underlies the security of ATM cards, computer passwords, and electronic commerce. It is one of the seven Millennium Problems that the Clay Mathematics Institute has offered US$1 million for solving. The P vs. NP question asks whether the class of problems with solutions that can be quickly recognized (complexity class NP) is the same as the class of problems with solutions that can be quickly generated (complexity class P). Rudich and Razborov found that a wide class of proof techniques cannot be used to resolve this challenge unless widely held conventions are violated. These conventions involve well-defined instructions for accomplishing a task that rely on generating a sequence of numbers (known as pseudorandom number generators). They show that other proof techniques need to be applied to address this basic, unresolved challenge. Their findings were published in a paper titled "Natural proofs" in the *Journal of Computer and System Sciences* in 1997.

Rudich is editor of the *Journal of Cryptology*. His research interests are computational complexity theory, cryptography, and combinatorics. He is a magician and also serves as director of Andrew's Leap, a highly selective summer program for Pittsburgh-area high school students interested in math and science.

Razborov is an editor of the journal *Theoretical Computer Science* and was awarded the Nevanlinna Prize of the International Mathematical Union in 1990 for his contributions to complexity theory.

The Gödel prize is named for Kurt Gödel (1906–1978), an Austrian-American mathematician and philosopher who had a major impact on the foundations of computer science and was among the first to puzzle over the P vs. NP problem.

—Elaine Kehoe

Venkatesh Awarded 2007–2008 Salem Prize

AKSHAY VENKATESH of the Courant Institute of Mathematical Sciences, New York University, has been awarded the Salem Prize for 2007–2008 for his contributions to the analytic theory of automorphic forms and its applications to classical and modern problems in number theory, in particular his introduction of novel methods that combine analytic- and ergodic-theoretic techniques to resolve long-standing problems.

The prize committee for the 2007–2008 prize consisted of J. Bourgain, C. Fefferman, P. Jones, N. Nikolski, P. Sarnak, and J.-C. Yoccoz.

The Salem Prize is awarded every year to a young mathematician judged to have done outstanding work in the field of analysis.

—Jean Bourgain, Institute for Advanced Study, Princeton

Ritter Receives 2007 Information-Based Complexity Prize

KLAUS RITTER of Technische Universität Darmstadt has been named the recipient of the 2007 Information-Based Complexity Prize. The prize consists of US$3,000 and a plaque. The award will be presented at the Foundations of Computational Mathematics (FoCM) Conference in Hong Kong in June 2008.

This annual prize is given for outstanding contributions to information-based complexity.

—Joseph Traub, Columbia University

Fearnhead Awarded Adams Prize

PAUL FEARNHEAD of Lancaster University has been awarded the 2007 Adams Prize by the University of Cambridge for major contributions to several areas of computational statistics and population genetics. The selected topic for the prize in 2007 was statistics.

The Adams Prize is awarded each year by the Faculty of Mathematics and St. John's College to a young researcher based in the United Kingdom who is doing first-class international research in the mathematical sciences. The prize is named after the mathematician John Couch Adams and was endowed by members of St. John's College. It is currently worth 13,000 pounds (approximately US$26,000), of which one-third is awarded to the prizewinner on announcement of the prize, one-third is provided to the prizewinner's institution (for research expenses of the prizewinner), and one-third is awarded to the prizewinner on acceptance for publication in an internationally recognized journal of a substantial (normally at least twenty-five printed pages) original survey article of which the prizewinner is an author.

—From a University of Cambridge announcement

Goldin Receives Michler Memorial Prize

REBECCA GOLDIN of George Mason University has received the first annual Rebecca I. Michler Memorial Prize. The prize, given by the Association for Women in Mathematics and Cornell University, gives a midcareer woman mathematician a residential fellowship in the Cornell University mathematics department without teaching duties.

Goldin received her Ph.D. from the Massachusetts Institute of Technology in 1999, under the direction of Victor Guillemin. She received a National Science Foundation Postdoctoral Fellowship, which allowed her to spend two and a half years at the University of Maryland. She is now an associate professor at George Mason University and since 2004 has been director of research at Statistical Assessment Service, a nonprofit organization affiliated with George Mason. Her area of research is symplectic geometry.

The Michler Prize is made possible by a donation from the family of Ruth I. Michler, a mathematician at the University of North Texas whose untimely death in 2000 at the age of thirty-three cut short her promising career.

—From an AWM announcement

Stewart Awarded Peano Prize

IAN STEWART of the Mathematics Institute, University of Warwick, has been awarded the 2006 Premio Peano from the Associazione Subalpina Mathesis in Turin, Italy, for the Italian translation of his book *Letters to a Young Mathematician*.

Stewart is best known for his popular science writing on mathematical themes. He has received the 1999 Communications Award of the Joint Policy Board for Mathematics and the 2000 Gold Medal of the United Kingdom's Institute for Mathematics and Its Applications. He won the 2001 Sunyer i Balaguer Prize jointly with Martin Golubitsky. He was elected a Fellow of the Royal Society in 2001 and won the Public Understanding of Science and Technology Award of the American Association for the Advancement of Science in 2002. From 1990 to 2001 he wrote the "Mathematical Recreations" column in *Scientific American* magazine. He is also a writer of science fiction. His present field of interest is the effects of symmetry on dynamics, with applications to pattern formation and chaos theory in areas including animal locomotion, fluid dynamics, mathematical biology, chemical reactions, electronic circuits, computer vision, quality control of wire, and intelligent control of spring coiling machines.

—Elaine Kehoe

Prizes of the Mathematical Society of Japan

The Mathematical Society of Japan (MSJ) awarded a number of prizes in spring 2007.

KENJI NAKANISHI of Kyoto University received the 2007 Spring Prize for his contributions to the study of nonlinear dispersive equations. The Spring Prize is awarded each year to a mathematician who is not older than forty and has made an outstanding contribution to mathematics.

The 2007 Algebra Prize was awarded to EIICHI BANNAI of Kyushu University for his contribution to the study of algebraic combinatorics and to KOUTA YOSHIOKA of Kobe University for his contribution to the theory of moduli spaces of vector bundles.

The Publication Prize is given for distinguished contributions to the mathematical literature. The awardees for 2007 are: KAORU AOKI, for translations into Japanese of such books as *Fermat's Last Theorem* by Simon Singh and *Kepler's Conjecture* by George G. Szpiro; HIDEO ARAI, of the publisher Iwanami Shoten, for planning, editing, and publishing a number of leading mathematical books; AKIHIRO NOZAKI, a writer whose books are full of humor and clear writing that can be enjoyed by a wide range of readers, from children to mathematicians; the book series Foundation of Differential Geometry by SHOSHICHI KOBAYASHI and KATSUMI NOMIZU, mathematical classics that have changed the idea of differential geometry by putting the concept of "connection" at the core of the theory; and the Oka-Kiyoshi electronic library, based at the library of Nara Women's University, for making publicly available a variety of works by Japanese mathematician Kiyoshi Oka.

The Seki-Takakazu Prize, which honors people and organizations that have supported and encouraged the

development of mathematics in Japan over many years, was awarded for 2007 to the Institut des Hautes Études Scientifiques (IHÉS) for its contributions to establishing strong relationships between mathematicians in Japan and France through its offerings of invaluable research exchange opportunities for the development of mathematics since 1958.

—From a Mathematical Society of Japan announcement

AMS Menger Awards at the 2007 ISEF

The 2007 Intel International Science and Engineering Fair (ISEF) was held May 13–18, 2007, in Albuquerque, New Mexico. This was the fifty-eighth ISEF. More than fifteen hundred 9th through 12th graders from fifty-one countries competed in the fair. Student finalists who compete at the ISEF have gone through a step process to qualify and have won an all-expense-paid trip to the ISEF. They qualified by winning local, regional, and state fairs in the United States or national science fairs abroad. In addition to numerous grand awards presented by the ISEF, seventy-two federal agencies and professional and educational organizations, including the AMS, participated by giving special awards. Prizes awarded by the AMS included cash, certificates, books, and tote bags.

For the AMS this was the twentieth year of participation in the ISEF, and it was the eighteenth year of the presentation of the Karl Menger Awards. The members of the 2006–2007 AMS Menger Prize Committee and AMS Special Award Judges were Dmitry Fuchs, University of California, Davis; David Scott, University of Puget Sound; and Tatiana Shubin, San Jose State University (chair). The panel of judges reviewed all fifty-nine individual and team projects in mathematics and interviewed each student under consideration for a Menger Prize. The AMS gave awards to one first-place winner, two second-place winners, and four third-place winners, and honorable mentions to five others.

The Karl Menger Memorial Prize winners are as follows:

First-Place Award (US$1,000): "The String Topology BV Algebra, Hochschild Cohomology and the Goldman Bracket on Surfaces", DMITRY VAINTROB, 18, South Eugene High School, Eugene, Oregon.

Second-Place Award (US$500): "EASE Polygons Are Not Easy", CHENG-TAO CHUNG, 17, Taipei Municipal Jianguo High School, Taipei, Taiwan, Chinese Taipei; "Short Billiards", DANIEL K. BEZDEK, 17, Notre Dame High School, Calgary, Alberta, Canada.

Third-Place Award (US$250): "A Canon of Canonical Forms", CHRISTOPHER LOPEZ, 17, The Bronx High School of Science, Bronx, New York; "Function Pools", HAGAI HELMAN, 18, Reut School, Jerusalem, Israel; "Endless Propagation: The Arithmetic Rules of Regular Pentagons", ALBERT C. LIU, 16, Municipal Kaohsiung Senior High School, Kaohsiung City, Taiwan, Chinese Taipei; "Ratio of Total Edge Lengths of Two Simplices, Where One Contains Another", NIKITA M. SAVUSHKIN, 16, School #1134, Moscow, Russia.

Honorable Mention Awards: "Recurrence Relation for Congruum Problem Solutions", LADO MESKHISHVILI, 16, Georgian-American High School, Tbilisi, Georgia Republic; "Universal Law for the Transition from Chaos to Periodicity in Nonlinear Physical Systems", ALMAS U. ABDULLA, 13, Palm Bay High School, Melbourne, Florida; "Results in Geometric Inequalities", AVI W. LEVY, 15, West Linn High School, West Linn, Oregon; "Infinite Product Expansions of the nth Root", ARDIT KRONI, 16, Synge Street CBS, Dublin, Ireland; "On Realization of Graphs on the Klein Bottle", ALEXEY S. TELISHEV, 16, Grammar School #77, Naberezhnye Chelny, Tatarstan, Russia.

The first-place winner, Dmitry Vaintrob, also won one of the top three grand awards of US$50,000, plus the Seaborg Award. Earlier he had won first place in the 2006 Siemens competition and third place in the 2006 Intel Competition. His ISEF project demonstrated interrelations between topology, homological algebra, and mathematical physics. For an aspherical manifold X, Dmitry constructed a BV-algebra isomorphism between the cohomology of the free loop space of X and Hochschild cohomology of the group algebra of the fundamental group of X. Dmitry clearly possesses knowledge and insight into a deep and difficult area of mathematics. This knowledge is especially impressive for someone so young. He has great potential to contribute much to mathematics, his chosen field.

Menger Prize winners (l to r): Ardit Kroni, Albert Ciehyang Liu, Avi William Levy, Hagai Helman, Christopher Lopez, Lado Meskhishvili, Committee Chair Tatiana Shubin, Cheng-Tao Chung, Almas U. Abdulla, Daniel Karoly Bezdek, Dmitry Vaintrob, Alexey S. Telishev, Nikita M. Savushkin.

Other winners impressed the panel by the breadth of topics in their projects, including geometry, algebra, set theory, number theory, algorithms, combinatorics, and nonlinear dynamics. Many projects displayed a high level of sophistication; others showed incredible imagination and creativity. The students' enthusiasm was overwhelming, and many of

them continued working on their problems right there in the exhibit hall. They were so eager to share their ideas that interviewers were leaving energized and hopeful that the future of our profession would be ensured by the influx of talented and hard-working young people.

The AMS's participation in the Intel-ISEF is supported in part by income from the Karl Menger Fund, which was established by the family of the late Karl Menger. For more information about this program or to make contributions to the fund, contact the AMS Development Office, 201 Charles Street, Providence, RI 02904-2294; send email to development@ams.org, or telephone 401-455-4111.

—Tatiana Shubin, San Jose State University

Humboldt Foundation Research Awards

The Alexander von Humboldt Foundation grants up to one hundred Humboldt Research Awards annually to scientists and scholars from abroad with internationally recognized academic qualifications. The research award honors the academic achievements of the award winner's lifetime. Award winners are invited to carry out research projects of their own choice in Germany in cooperation with colleagues for periods of between six months and one year. The award amounts to 60,000 euros (approximately US$80,000).

Among those receiving Humboldt Research Awards in 2007 are twenty-one scholars whose work involves the mathematical sciences. Following are their names, home institutions, and the institutions in Germany that they will visit.

SUSANNE BRENNER, Louisiana State University: Humboldt-Universität Berlin; FERDINANDO CICALESE, University of Salerno: Universität Bielefeld; LANE A. HEMASPAANDRA, University of Rochester: Universität Düsseldorf; OLGA HOLTZ, University of California, Berkeley: Technische Universität Berlin; RICHARD D. JAMES, University of Minnesota: Max-Planck-Institut für Mathematik in den Naturwissenschaften; MOSHE JARDEN, Tel Aviv University: Universität Erlangen-Nürnberg; YURI KIFER, Hebrew University of Jerusalem: Humboldt-Universität Berlin; OMAR M. KNIO, Johns Hopkins University: Konrad-Zuse-Zentrum für Informationstechnik; ALEXANDER KOMECH, Universität Wien: Max-Planck-Institut für Mathematik in den Naturwissenschaften and Technische Universität München; MARC LEVINE, Northeastern University: Universität Duisburg-Essen; DILIP MADAN, University of Maryland, College Park: Universität Freiburg; JOSE A. DE LA PEÑA, Universidad Nacional Autónoma de Mexico: Universität Bielefeld; GOPAL PRASAD, University of Michigan: Max-Planck-Institut für Mathematik, Bonn, and Universität Bielefeld; ANDREI S. RAPINCHUK, University of Virginia: Universität Bielefeld; IDUN REITEN, Norwegian University of Science and Technology: Universität Bielefeld; BENJAMIN SCHLEIN, University of California, Davis: Universität München; PETER SCHRÖDER, California Institute of Technology: Technische Universität Berlin; BERND STURMFELS, University of California, Berkeley: Technische Universität Berlin; HENRYK WOZNIAKOWSKI, University of Warsaw: Mathematisches Institut Universität Jena; CHANGCHANG XI, Beijing Normal University: Universität Köln; and JINCHAO XU, Pennsylvania State University: Max-Planck-Institut für Mathematik in den Naturwissenschaften and Universität Heidelberg.

—Elaine Kehoe

Ford Foundation Diversity Fellowships Awarded

The names of the recipients of the Ford Foundation Diversity Fellowships for 2006 have been announced. The Ford Foundation's predoctoral, dissertation, and postdoctoral fellowship programs seek to increase the presence of underrepresented minorities on college faculties. Awardees later serve as role models and mentors for a new generation of scholars. NANCY RODRIGUEZ of the University of California, Los Angeles, was awarded a Predoctoral Fellowship of US$20,000 a year for up to three years. She is a student in the field of applications of mathematics. GRACE MARIE BENIGNO of the University of Maryland has been awarded a Dissertation Fellowship of US$21,000 for one year. Her field is mathematics education.

—From a Ford Foundation announcement

Royal Society of London Elections

Six mathematicians are among those elected as new fellows and foreign members of the Royal Society of London for 2007. They are: GEORGE F. R. ELLIS of the University of Cape Town for his work on relativity and cosmology; NICHOLAS HIGHAM of the University of Manchester for his research on numerical linear algebra; EDWIN A. PERKINS of the University of British Columbia for solving several hard problems concerning the behavior of Brownian motion; TERENCE C.-S. TAO of the University of California, Los Angeles, for his contributions to analysis; TREVOR D. WOOLEY of the University of Bristol for his contributions to analytic number theory, especially additive number theory; and MICHAEL O. RABIN of Harvard University for his foundational role in the creation of complexity theory through his axiomatic treatment of the difficulty of computations.

—From a Royal Society announcement

NORTHWESTERN UNIVERSITY

CALL FOR NOMINATIONS

NEMMERS PRIZE IN MATHEMATICS

$150,000

Northwestern University invites nominations for the Frederic Esser Nemmers Prize in Mathematics to be awarded during the 2007-08 academic year. The award includes payment to the recipient of $150,000. Made possible by a generous gift to Northwestern by the late Erwin Esser Nemmers and the late Frederic Esser Nemmers, the award is given every other year.

Candidacy for the Nemmers Prize in Mathematics is open to those with careers of outstanding achievement in mathematics as demonstrated by major contributions to new knowledge or the development of significant new modes of analysis. Individuals of all nationalities and institutional affiliations are eligible except current or recent members of the Northwestern University faculty and recipients of the Nobel Prize.

The recipient of the 2008 Nemmers Prize in Mathematics will deliver a public lecture and participate in other scholarly activities at Northwestern University for 10 weeks during the 2008-09 academic year.

Nominations for the Frederic Esser Nemmers Prize in Mathematics will be accepted until December 1, 2007. Nominating letters of no more than three pages should describe the nominee's professional experience, accomplishments, and qualifications for the award. A brief *curriculum vitae* of the nominee is helpful but not required. Nominations from experts in the field are preferred to institutional nominations; direct applications will not be accepted.

Nominations may be sent to:

nemmers@northwestern.edu

or

Secretary
Selection Committee for the Nemmers Prizes
Office of the Provost
Northwestern University
633 Clark Street
Evanston, Illinois 60208-1119
U.S.A.

www.northwestern.edu/provost/awards/nemmers

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RECIPIENTS OF THE FREDERIC ESSER NEMMERS PRIZE IN MATHEMATICS

JOHN H. CONWAY
MIKHAEL GROMOV
JOSEPH B. KELLER
ROBERT P. LANGLANDS
YURI I. MANIN
YAKOV G. SINAI
EDWARD WITTEN

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

AMS Scholarships for "Math in Moscow"

The Independent University of Moscow has created a program called Math in Moscow, which offers foreign students (undergraduate or graduate students specializing in mathematics and/or computer science) the chance to spend a semester in Moscow studying mathematics. The AMS provides a small number of scholarships to students to attend the program.

Math in Moscow provides students with a fifteen-week program similar to the Research Experiences for Undergraduates programs that are held each summer across the United States. Math in Moscow draws on the Russian tradition of teaching mathematics, which emphasizes creative approaches to problem solving. The focus is on developing in-depth understanding of carefully selected material rather than broad surveys of large quantities of

material. Discovering mathematics under the guidance of an experienced teacher is the central principle of Math in Moscow. Most of the program's teachers are internationally recognized research mathematicians, and all of them have considerable teaching experience in English, typically in the United States or Canada. All instruction is in English.

With funding from the National Science Foundation (NSF), the AMS awards five US$7,500 scholarships each semester to U.S. students to attend the Math in Moscow program. To be eligible for the scholarships, students must submit applications to *both* the Math in Moscow program and the AMS. An applicant should be an undergraduate mathematics or computer science major enrolled at a U.S. institution. **September 30, 2007**, is the deadline for the spring 2008 semester; **April 15, 2008**, is the deadline for scholarship applications for the fall 2008 semester.

Information and application forms for Math in Moscow are available on the Web at http://www.mccme.ru/mathinmoscow, or by writing to: Math in Moscow, P.O. Box 524, Wynnewood, PA 19096; fax: +7095-291-65-01; email: mim@mccme.ru. Information and application forms for the AMS scholarships are available on the Web at http://www.ams.org/outreach/mimoscow.html or by writing to: Math in Moscow Program, Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence RI 02904-2294; email: student-serv@ams.org.

—AMS announcement

NSF Distinguished International Postdoctoral Research Fellowships

The Distinguished International Postdoctoral Research Fellowships Program of the Mathematical and Physical Sciences (MPS) Directorate of the National Science Foundation (NSF) provides opportunities for postdoctoral investigators to conduct research projects abroad as MPS Distinguished International Postdoctoral Research Fellows (MPS-DRF).

The objective of the program is to provide talented recent doctoral recipients in the mathematical and physical sciences an effective means of establishing international collaborations in the early stages of their careers.

Applicants must be citizens or permanent residents of the United States who have fulfilled the requirements for the doctoral degree between June 1 of the year of submission and September 30 of the year following submission. NSF expects to fund up to twenty awards that will provide up to US$100,000 per year for up to twenty-four months.

The deadline for full proposals is **October 10, 2007**. For technical and scientific information, contact Lynne Walling, Program Director, Division of Mathematical Sciences, Room 1025, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; telephone: 703-292-8104; email: lwalling@nsf.gov. For more detailed information, see the program announcement at http://www.nsf.gov/pubs/2001/nsf01154/nsf01154.txt.

—From an NSF announcement

NSF International Research Fellow Awards

The objective of the International Research Fellowship Program (IRFP) of the National Science Foundation (NSF) is to introduce scientists and engineers in the early stages of their careers to research opportunities abroad. The program provides support for postdoctoral and junior investigators to do research in basic science and engineering for nine to twenty-four months in any country in the world. The goal of the program is to establish productive, long-term relationships between U.S. and foreign science and engineering communities. Applicants must be U.S. citizens or permanent residents who have earned their doctoral degrees within three years prior to the date of application or who expect to receive their degrees by the date of the award.

The deadline for applications is **September 11, 2007**. For further information contact the program officer, Susan Parris, 703-292-8711, sparris@nsf.gov; or visit the website http://www.nsf.gov/pubs/2005/nsf05599/nsf05599.txt.

—From an NSF announcement

AWM Travel Grants for Women

The National Science Foundation (NSF) and the Association for Women in Mathematics (AWM) sponsor travel grant programs for women mathematicians.

AWM Travel Grants enable women to attend research conferences in their fields, thereby providing scholars valuable opportunities to advance their research activities and their visibility in the research community. A travel grant provides full or partial support for travel and subsistence for a meeting or conference in the grantee's field of specialization. The Mathematics Education Research Travel Grants provide full or partial support for travel and subsistence in math/math education research for mathematicians attending a math education research conference or math education researchers attending a math conference.

AWM Mentoring Travel Grants are designed to help junior women develop long-term working and mentoring relationships with senior mathematicians. A mentoring travel grant funds travel, subsistence, and other expenses for an untenured woman mathematician to travel to an institute or a department to do research with a specified individual for one month.

The final deadline for the Travel Grants program for 2007 is **October 1, 2007**; the deadlines for 2008 are **February 1, 2008**; **May 1, 2008**; and **October 1, 2008**. For the Mentoring Travel Grants program the deadline is **February 1, 2008**. For further information and details on applying, see the AWM website, http://www.awm-math.org/travelgrants.html; telephone: 703-934-0163; or email: awm@awm-math.edu. The postal address is: Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.

—From an AWM announcement

Research Experiences for Undergraduates

The Research Experiences for Undergraduates (REU) program supports active research participation by undergraduate students in any of the areas of research funded by the National Science Foundation (NSF). Student research may be supported in two forms: REU supplements and REU sites.

REU supplements may be requested for ongoing NSF-funded research projects or may be included in proposals for new or renewal NSF grants or cooperative agreements.

REU sites are based on independent proposals to initiate and conduct undergraduate research participation projects for a number of students. REU site projects may be based in a single discipline or academic department or on interdisciplinary or multidepartment research opportunities with a strong intellectual focus. Proposals with an international dimension are welcomed. A partnership with the Department of Defense supports REU sites in research areas relevant to defense. Undergraduate student participants supported with NSF funds in either supplements or sites must be citizens or permanent residents of the United States or its possessions.

Students may not apply to NSF to participate in REU activities. Students apply directly to REU sites and should consult the directory of active REU sites on the Web at http://www.nsf.gov/crssprgm/reu/reu_search.cfm. The deadline for full proposals for REU sites is **September 13, 2007**, and **August 18, 2008**. Deadline dates for REU supplements vary with the research program; contact the program director for more information. The full program announcement can be found at the website http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf07569.

—From an NSF announcement

AWM Seeks Executive Director

The Association for Women in Mathematics (AWM) is seeking an executive director to succeed Jennifer Quinn, who in June 2007 accepted a position at the University of Washington, Tacoma.

The AWM seeks an outstanding individual who is passionate about supporting women in mathematics. The part-time position can be combined with an existing academic appointment via course reductions. The AWM office is in the Washington, DC, area, but the geographic base of the executive director can be anywhere in North America.

Nominations, inquiries, and leads may be directed to Cathy Kessel, AWM president, at cbkessel@earthlink.net. For more information on the position and application details, see http://www.awm-math.org/EDsearch. Review of applications will begin immediately and will continue until the position is filled.

—From an AWM announcement

News from AIM

AIM, the American Institute of Mathematics, anticipates renewal of its five-year grant as a mathematical science institute from the National Science Foundation (NSF). The grant renewal will allow AIM to continue its unique style of week-long workshops that emphasize focused collaborative research.

In addition, AIM is pleased to announce a new program called SQuaREs, Structured Quartet Research Ensembles. This program provides both research facilities and financial support for groups of four to eight researchers to dedicate up to two weeks at AIM working on a focused research problem.

To learn more about AIM's programs and application process, please go to http://www.aimath.org/research/. The deadline for proposing a workshop or a SQuaRE is **November 1, 2007**.

Finally, the groundbreaking ceremony for AIM's new facility in Morgan Hill, California, was held on May 31, 2007. It is expected that the first AIM workshop at the Castle will be fall 2009.

—AIM announcement

News from the Fields Institute

The Fall 2007 thematic program of the Fields Institute for Research in the Mathematical Sciences will be *Operator Algebras*, organized by George Elliott (chair, Toronto), Dietmar Bisch (Vanderbilt), Joachim Cuntz (Münster), Kenneth Davidson (Waterloo), Thierry Giordano (Ottawa), and Roland Speicher (Queen's). The speakers in the Distinguished Lecture Series will be Uffe Haagerup (Odense) and (in May 2008) Alain Connes (Collège de France).

A workshop *Noncommutative Dynamics and Applications* took place on July 16–20, and four more are scheduled:

September 17–21, *Free Probability, Random Matrices, and Planar Algebras*

October 29–November 2, *von Neumann Algebras*

November 12–16, *Structure of C*-Algebras*

December 11–15, *Operator Spaces and Quantum Groups*

There will also be four graduate courses: *Introduction to Operator Algebras* (Man-Duen Choi (Toronto), Ken Davidson (Waterloo)); *Structure of C*-Algebras* (George Elliott (Toronto), Chris Phillips (Oregon), Mikael Rordam (Odense)); *Free Probability* (Roland Speicher (Queen's), Jamie Mingo (Queen's)). *Functional Analysis* (Andrew Toms (York)) was held during the summer.

Other Fall events at the Institute:

September 4–7, *Data Assimilation Workshop.*

September 27–28, Distinguished Lecture Series in Statistical Science, Persi Diaconis (Stanford), *Mathematics and Magic Tricks.*

October 30, *The Nathan and Beatrice Keyfitz Lectures in Mathematics and the Social Sciences*, Jon Kleinberg (Cornell).

November 9–10, *Conference in honor of the 60th Birthday of Professor Andreas R. Blass.*

The thematic program for the Winter/Spring 2008 term will be *New Trends in Harmonic Analysis*, organized by Izabella Laba (chair, UBC), Alex Iosevich (Missouri-Columbia), Michael Lacey (Georgia Tech), and Eric Sawyer (McMaster). Workshops planned are:

January 7–11, *Recent Advances in Operator Theory and Function Theory.*

February 18–24, *Harmonic Analysis.*

April 5–13, *Clay-Fields Conference on Additive Combinatorics, Number Theory, and Harmonic Analysis.*

The *Coxeter Lecture Series* will be delivered by Jill Pipher (Brown) and the *Distinguished Lecture Series* by Tim Gowers (Cambridge) (to be confirmed).

Future thematic programs: Fall 2008, *Arithmetic Geometry, Hyperbolic Geometry and Related Topics*; Winter/Spring 2009, *O-Minimal Structures and Real Analytic Geometry*; Winter/Spring 2010, *Financial Mathematics.*

Complete and up-to-date information on Fields Institute activities can be found at `http://www.fields.utoronto.ca`.

—Fields Institute announcement

About the Cover

Felix Klein in Göttingen

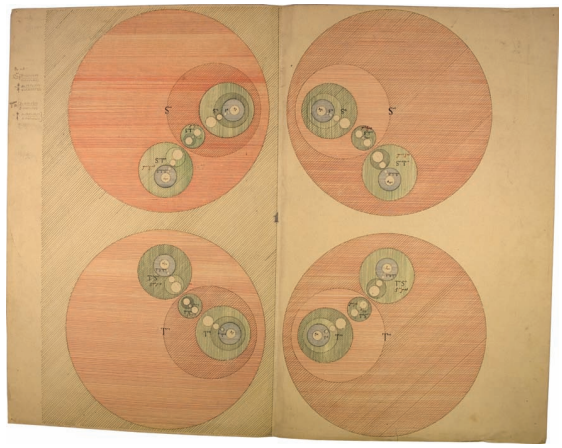
This month's cover accompanies the article by Eugene Chislenko and Yuri Tschinkel. Their article describes the archive of notes from Klein's seminar over several years, but Göttingen possesses other legacies of Klein (not to speak of Gauss, Dirichlet, Minkowski, Hilbert, or Siegel). Among them is a portfolio of drawings discovered by S. J. Patterson on his arrival there many years ago, stored in the cupboards underneath the glass cabinets containing the famous collection of mathematical models. Among several drawings, the cover illustration is distinguished by its use of color in cross-hatching. It depicts the geometry of a Schottky group with two generators. A note written in the margin, possibly by Klein, specifies the generators S and T of the group as Möbius transformations. The transformation S has attracting fixed point 2.5 + 6.5i, repelling -2.5 + 6.5i, and multiplier 4/9, while T has conjugate fixed points and the same multiplier.

It is not at all clear who produced the diagram, or for what it was used. The cover drawing is similar to illustrations in the classic text by Fricke and Klein on automorphic functions, but I am not aware that it was in fact published anywhere. Taking color as well as the amount of hard work involved into account, one would have to look at Chapter 4 of the recent book *Indra's Pearls* by Mumford, Series, and Wright to see something quite so impressive.

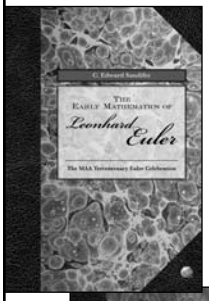
Patterson speculates that it was Otto Neugebauer who was responsible for preserving the portfolio when the Mathematical Institute moved into its present building in 1929. He writes, "Neugebauer seems to have been the one who recognized that what was merely old in 1929 would eventually be of historical interest"—something for us all to keep in mind.

Our thanks to David Wright, who went to some trouble to interpret the diagram and verify its correctness by reproducing it with modern software.

—Bill Casselman, Graphics Editor
(`notices-covers@ams.org`*)*



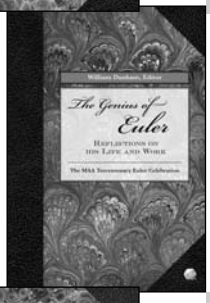
The Mathematical Association of America celebrates *Euler's 300th Birthday* with a collection of five books published in the MAA Spectrum Series.



Spectrum
Catalog Code: EUL-01
416 pp., Hardbound, 2007
ISBN: 978-0-88385-559-1
List: $49.95 MAA Member: $39.95

The Early Mathematics of Leonhard Euler
C. Edward Sandifer

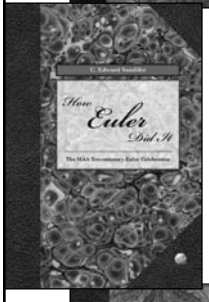
The Early Mathematics of Leonhard Euler gives a portrait of the world's most exciting mathematics between 1725 and 1741, rich in technical detail, woven with connections within Euler's work and with the work of other mathematicians in other times and places.



Spectrum
Catalog Code: EUL-02
324 pp., Hardbound, 2007
ISBN: 978-0-88385-558-4
List: $47.95 MAA Member: $38.50

The Genius of Euler: Reflections on His Life and Work
William Dunham, Editor

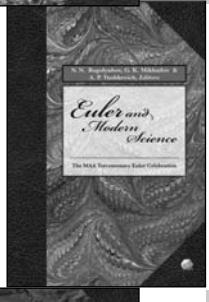
The book is a testimonial to a mathematician of unsurpassed insight, industry and ingenuity—one who has been called "the master of us all." The collected articles, aimed at a mathematically literate audience, address aspects of Euler's life and work, from the biographical to the historical to the mathematical.



Spectrum
Catalog Code: EUL-03
304 pp., Hardbound, 2007
ISBN: 978-0-88385-563-8
List: $51.95 MAA Member: $41.95

How Euler Did It
C. Edward Sandifer

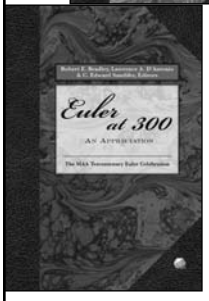
A collection of 40 monthly columns that appeared on MAA Online between November 2003 and February 2007 about the mathematical and scientific work of the great 18th-century Swiss mathematician Leonhard Euler.



Spectrum
Catalog Code: EUL-04
425 pp., Hardbound, 2007
ISBN: 978-0-88385-564-5
List: $59.95 MAA Member: $47.95

Euler and Modern Science
N.N. Bogolyubov, G.K. Mikhaĭlov and A.P. Yushkevich, Editors

We speak of the "Age of Euler." A justification of this term is provided by a list of scientific terms connected with Euler's name and his many contributions to pure mathematics. This collection contains an extensive treatment of Euler's contributions *outside* pure mathematics.



Spectrum
Catalog Code: EUL-05
325 pp., Hardbound, 2007
ISBN: 978-0-88385-565-2
List: $51.95 MAA Member: $41.95

Euler at 300
Robert E. Bradley, Lawrence A. D'Antonio and C. Edward Sandifer, Editors

During the years leading up to Leonhard Euler's tercentenary, at more than a dozen academic meetings across the USA and Canada, mathematicians and historians of mathematics honored Euler in papers detailing his life and work. This book collects more than 20 papers based on some of the most memorable of these contributions.

To order call 1-800-331-1622 or visit www.maa.org.

For Your Information

Lovász to Chair Fields Medal Committee

László Lovász, president of the International Mathematical Union, will chair the selection committee for the 2010 Fields Medals. The medals will be awarded at the International Congress of Mathematicians in Hyderabad, India, in August 2010. The contact information for Lovász is: Eötvös Loránd Tudományegyetem, Számítógéptudományi Tanszék, Pázmány Péter sétány 1/C, H-1117 Budapest, Hungary; email: lovasz@cs.elte.hu.

—Allyn Jackson

Robert Bryant Appointed MSRI Director

Robert Bryant has been appointed director of the Mathematical Sciences Research Institute in Berkeley, CA, effective August 1, 2007. He succeeds David Eisenbud, who started as MSRI director in 1997. Eisenbud has taken up full-time his position as a professor at the University of California, Berkeley.

Bryant received his Ph.D. in 1979 from the University of North Carolina. He is the J. M. Kreps Professor of Mathematics at Duke University. His research centers on nonlinear partial differential equations and differential geometry. Currently an AMS vice president, Bryant has also served on several AMS committees, including the Executive Committee. He served on the MSRI Board of Trustees from 1999 to 2004 (chair 2001–2004).

In the following interview, Bryant talks with Notices *deputy editor Allyn Jackson.*

Notices: *You went to MSRI for the first time in 1983, right after MSRI was founded, and you have been there many times since. What has MSRI meant to you personally in your career as a mathematician?*

Bryant: The MSRI workshops were all important for me. [Shiing-Shen] Chern, who was the director of MSRI for its first few years, organized several workshops along the lines of exterior differential systems in geometry—what you might call the Cartan tradition in geometry—that happened early on in my career. Those workshops had an enormous influence by introducing me to other people who were interested in the same kinds of things but who knew different techniques from what I knew. Of course, that is one of the major purposes of the workshops, to facilitate communication. I got my Ph.D. in 1979, and after a year at the Institute for Advanced Study, I moved to Rice University. While there was a lot of excellent geometry and geometric analysis being done at Rice, I didn't have close collaborators there, and Rice was a ways away from the other centers of geometry. So having a place like MSRI to go to was really important and shaped a lot of my interests. Also of course Chern was there, and he took a big interest in things we were doing. Chern and I were part of a group [with Robert Gardner, Phillip Griffiths, and Hubert Goldschmidt] writing a book on exterior differential systems, and I remember writing a large section of what would be Chapter 7 during my first visit to MSRI.

Notices: *How do you see the role of MSRI in the mathematical community?*

Bryant: It's changed as the years have gone on. Originally its main function was having conferences and workshops and a few extended programs. But once MSRI had its own building—a real home with a real seminar space—it could take on more ambitious projects, like semester-long and year-long programs. A group of people could come together for an entire semester or even a year to do intensive activity in a particular area or research topic that was breaking news and was ripe for progress. MSRI has played an important role in having activities that get people together and allow things to take off.

Notices: *Do any particular examples stand out in your mind?*

Bryant: I remember, early on, the seminar on nonlinear PDE in geometry, which got a lot of people together in, not just classical geometry, but PDE methods too. They were working in rather different areas and might not necessarily have been talking with each other much. The cross-fertilization made a significant difference. For example, some of the advances at that time in regularity theory for harmonic maps were influenced to some extent by that seminar. I also remember that right after Simon Donaldson came out with his fundamental work on gauge theory and 4-manifolds in the early 1980s, he gave a wonderful series of lectures at MSRI. There was an enormous crowd. I remember sitting there in the audience and looking around

and seeing all these great mathematicians hanging on every word. Donaldson's ideas spread very rapidly, and I think those lectures at MSRI played some role in that.

Notices: *How do you see the role of MSRI beyond the math community, within society in general?*

Bryant: Particularly under David Eisenbud's leadership, MSRI has reached out in a lot of new ways, for example by holding education conferences. This has not been viewed as a traditional thing for research institutes to do. But I think educational activities have a great future at MSRI, because we have people on the board who are very concerned about education, and there is a lot of expertise to draw on, from both the mathematical side and the education side. I'd really like to see that go forward.

There have also been very successful public awareness events at MSRI, such as Robert Osserman's conversations with people such as playwright Tom Stoppard. These events help advertise to the general public that there is an intellectual, philosophical component to mathematics that is important. Mathematics is not just a collection of techniques for doing calculations, but it's a way of organizing one's knowledge about the world that provides a useful point of view even if you are not interested in doing calculations. I think having those events has been good for the public and good for MSRI and the mathematics community.

Other things MSRI is involved in include the Math Circles, which are like mathematics clubs for young people. They help encourage young people to develop mathematical ways of thinking and an appreciation for mathematics as an intellectual discipline, not just tricks. I think that's an important thing to be spreading in the culture.

Notices: *Is there a danger MSRI is trying to do too much?*

Bryant: Any organization can lose its focus if it tries to be all things to all people. But our core vision is to help develop research mathematics and at the same time to develop an appreciation for mathematics in the culture. There is not a conflict there. It is true that with our limited resources we can't do everything. For example, our education activities, compared to the total mathematics education activity in this country, are like a drop in an ocean. But I do think it's important to have conversations about just what it is that mathematicians think is so valuable about mathematics that needs to be transmitted. We can help make sure that important intellectual insights are not lost in the clamor about how do you test that students know x or y in mathematics.

In May MSRI had a conference about climate change. It wasn't a discussion about, What should we do about global warming? Instead, it looked at the question, What are the mathematical disciplines that are needed for the study of climate change, and what parts need further development? This includes not only statistical issues and the earth models themselves, and the numerical solution of PDE, but questions of economics and the social sciences. Being able to shine a light on the appropriate use of mathematics from the point of view of people who understand the pitfalls and the strengths of a mathematical stance is a role that MSRI can play and should play—even if we are not focused on numerical methods or number crunching, which is not our forte. To be aware of the foundational issues of using those models is important. MSRI has a collection of meetings along those lines between research mathematicians and practitioners in other fields, and I think it's a very useful service that we can provide.

Notices: *Can you tell me more about your interactions with Chern?*

Bryant: I am a "grandstudent" of Chern's, in the sense that my advisor was his student. In fact, while I was still a graduate student, my advisor, Robby Gardner at UNC, went on sabbatical to Berkeley and took me along with him, and that's when I met Chern for the first time. That was in 1978. Chern was incredibly encouraging. He loved talking to young people and finding out what they were interested in and giving advice—giving really good advice, by the way. It was very affirming to get somebody like that early on who took you seriously even when you were a green graduate student. Later on, even when I would do things that made Chern say, "Well, I just don't think that's very interesting," he still appreciated the source from which it sprang.

Chern had a wonderful sense of how the classical material fit with modern geometry. Of course, he had studied with Élie Cartan himself. Because my advisor had encouraged me to, I had read a lot of Cartan's papers. So I found a ready audience in Chern whenever I was trying to understand something in Cartan's papers or was excited about something I had understood in them. Chern would tell me his own views about that particular paper or what his experiences were. I got from him a sense of how the classical people thought. That's hard to extract from the old papers now, because their mode of thinking was so different. And yet there was tremendous geometric intuition behind it, which is not written down anywhere. But that intuition lived on in Chern, and he was able to transmit a lot of it.

Notices: *It must be special for you to be taking on the directorship of MSRI, since Chern was its first director.*

Bryant: Oh, it is, absolutely. Chern was a cofounder of MSRI, with Cal Moore and Is Singer. Chern had a very strong vision of what MSRI should be, that it should be a place that encouraged young people and promoted mathematics research of the highest caliber. I have been very pleased to see that the postdoc program has been very successful at MSRI, and it's influenced a lot of people early in their careers. I want to make sure that continues. It is an important legacy of Chern's.

I am excited to be taking on the directorship at MSRI. It's going to be a great challenge for me, because I have not done much in an administrative capacity before. I've never even been chair of a department, though I have had some fundraising and administrative experience in other organizations. But, as an intellectual enterprise, I think MSRI has a clear mission and set of goals, and I am excited about being involved in furthering those goals.

—Allyn Jackson

Inside the AMS

Trjitzinsky Memorial Award Presented

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

In the fall of 2006, the AMS chose seven geographically distributed schools to receive one-time awards of US$3,000 each. The mathematics departments at those schools then chose students to receive the funds to assist them in pursuit of careers in mathematics. The schools are selected in a random drawing from the pool of AMS institutional members. Six of the schools were announced in the December 2006 issue of *Notices*; following is the seventh, which chose to announce its award in the spring, with the name of the award winner and a brief biographical sketch.

Swarthmore College: ADAM J. LIZZI. Lizzi is a senior from Lumberton, New Jersey, and is the first in his family to attend college. Although he was accelerated in math from an early age, he came to Swarthmore intending to study classics. He started changing his mind when, as a sophomore, he found that his abstract algebra class was more accessible than the strange dialects he encountered when reading Homer and Sappho. He spent last summer doing research in number theory at Swarthmore. He has played clarinet and has learned enough Japanese to be able to watch television shows and play video games without the aid of translation.

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

—Elaine Kehoe

Web *Notices* Has a New Look

The *Notices* Web pages on the AMS website have been redesigned to provide a new, more attractive look as well as better functionality. The URL `http://www.ams.org/notices` now takes users directly to the table of contents of the current issue. From any webpage in the *Notices* area, one can jump to the table of contents of any issue going back to 1995. In addition, users can now download and browse through the full issue. Contact information, a list of *Notices* editors, instructions for writing and submitting articles, and information about advertising in the *Notices* are available on the *Notices* website.

With the support of AMS membership dues, the *Notices* on the Web is freely accessible to all. Comments and feedback are welcome and may be sent to `notices@ams.org`.

—Allyn Jackson

Subsidized Childcare Services at the Joint Mathematics Meetings

"Love it! And the boys do too!"

The American Mathematical Society and the Mathematical Association of America are pleased to announce that for the fourth year they are offering and significantly subsidizing childcare services at the Joint Mathematics Meetings (JMM), next in San Diego, CA, January 6–9, 2008. The childcare will be offered to parents through KiddieCorp, an organization that has been providing high-quality

programs for children of all ages at meetings throughout the U.S. and Canada since 1986.

Parents registered as participants at JMM can take their children for a fun few days and still enjoy the meeting. While attendees are in sessions, KiddieCorp will engage children in popular tried-and-true games and activities, including arts and crafts, music and movement, board games, storytime, and dramatic play. The program offers theme activities for the older children, specially designed so that children can make friends easily in a comfortable, safe, and happy environment.

The feedback on the service is enthusiastic: "Very convenient and useful. I hope it will continue to be offered." "I really appreciated the service." "Wonderful! Please do it again!"

The dates and times for the program are Sunday through Wednesday, January 6–9, 2008, 8:00 a.m. to 5:00 p.m. each day, and it will be located at the San Diego Marriott Hotel. The childcare services provided at the JMM are for children ages 6 months through 12 years old. Space per day will be limited and is on a space-available basis. Parents are encouraged to bring snacks and beverages for their children, but items such as juice boxes, Cheerios, and crackers will be provided. KiddieCorp can arrange meals for children at cost plus 15%, or parents can be responsible for meals for their children.

Registration will be open in September 2007, with a deadline of **December 9, 2007**. Availability is limited and handled on a first-come, first-served basis. The registration fee is US$30 per family (nonrefundable), plus US$9 per hour per child, US$7 per hour per child for graduate students. Full payment is due at the time of registration with KiddieCorp. To learn more about the service and policies regarding cancellation and late child pick-up fees, and to register, go to `https://www.kiddiecorp.com/jmmkids.htm` or call KiddieCorp at 858-455-1718 to request a form.

Come to the Joint Mathematics Meetings in San Diego, January 6–9: Meet old and new colleagues, attend sessions, visit the exhibits—and bring your children!
`http://www.ams.org/amsmtgs/2109_intro.html`.

—Diane Saxe, Director,
Meetings and Conferences Department, AMS

AMS Committee on Science Policy

The 2007 Committee on Science Policy (CSP) meeting, held Tuesday–Wednesday, April 17–18, included a "Hill Day" of meetings between meeting participants and members of Congress and/or their staffs. These Hill meetings were for advocating increased funding in the fiscal year 2008 federal budget for the National Science Foundation (NSF) and the Office of Science at the U.S. Department of Energy. The CSP meeting included information sessions on the federal budget request for FY2008, an orientation session on how to conduct meetings with congressional offices, and a discussion of the message delivered during meetings. On Wednesday morning participants met over breakfast with newly elected Congressman Jerry McNerney (CA-11). McNerney is a Ph.D. mathematician. What follows are highlights from the presentations at the CSP meeting.

Peter March, Director, Division of Mathematical Sciences, NSF: Peter March gave an overview of the NSF Division of Mathematical Sciences (DMS) and discussed the division's support of core disciplines, collaborative and interdisciplinary activities, workforce programs, research infrastructure, and other foundation-wide initiatives. March also discussed DMS budget trends, award sizes, and funding rates. He talked about how the division fits into the broader context of NSF investment priorities and articulated DMS investment priorities. He concluded his presentation by discussing a new NSF initiative related to the American Competitiveness Initiative: Cyber-enabled Discovery and Innovation (CDI). CDI is set to be funded NSF-wide at US$52 million in the FY2008 budget. DMS will receive US$5.2 million of this amount.

James Turner, Chief Counsel, House Committee on Science and Technology: Jim Turner briefly discussed the federal budget appropriations process. He also talked about what participants could expect from their meetings on Capitol Hill, including such things as the age of congressional staff and their educational backgrounds. He pointed out that there are few members of Congress or staff with science backgrounds and, therefore, it was important to provide anecdotal evidence of how research funding furthers innovation. Turner encouraged all participants to let this experience be a stepping stone to building an ongoing relationship with their members of Congress.

Kei Koizumi, Director, R&D Budget and Policy Program, American Association for the Advancement of Science: Kei Koizumi began his presentation on the FY2008 federal budget request by outlining the composition of the budget and looking at trends in discretionary spending over the past 30-plus years. He pointed out that because of a record federal budget deficit, the president's plan is to balance the budget by 2012, primarily by cutting discretionary spending. The overall FY2008 budget proposes large increases for defense and homeland security, and flat or declining funding for the rest of the federal research and development portfolio. A look at the federal investment in mathematics research specifically shows that despite cuts to overall science and technology, mathematics investments appear to increase at Defense Advanced Research Projects Agency (DARPA) in the U.S. Department of Defense. The DMS at the NSF would increase 8.6% as part of the ACI. The Advanced Scientific Computing Research program in the Office of Science at the U.S. Department of Energy would increase by over 20% as part of the ACI. Investments in the mathematical sciences could also increase in National Institute of General Medical Sciences (NIGMS) and National Institute of Biomedical Imaging and Bioengineering (NIBIB) of the National Institutes of Health.

James Glimm, AMS President, Stony Brook University: Jim Glimm discussed the mathematics of information-driven science, an area with the potential to become a major branch of science in the twenty-first century. He discussed

the characteristics of deductive- and inductive-based science and explained how the two are often intertwined. He also described their differences. Glimm shared with attendees an outline for a special session at the Joint Mathematics Meetings in 2008 that proposes to bring together groups of scientists and mathematicians to discuss the new generation of mathematical challenges arising from massive structures and data sets. The session will include both practitioners and mathematicians who will discuss the need for new mathematical tools and models.

Samuel M. Rankin III, AMS Associate Executive Director: Sam Rankin began his presentation by discussing the message that attendees will convey in their meetings with congressional offices. He detailed a one-page handout that discusses the necessity of investing in mathematics in order to ensure continued U.S. competitiveness in the global economy. This handout also specifies what participants will be asking their members of Congress to do: (1) support an FY2008 budget of at least US$6.43 billion for the NSF and a budget of at least US$223.47 million for the DMS, and (2) support an FY2008 budget of US$4.4 billion for the Office of Science at the U.S. Department of Energy and at least US$340.2 million for the Mathematical, Information, and Computational Sciences Program. Rankin also provided some meeting guidelines to attendees. He discussed the importance of explaining how funding for NSF and the mathematical sciences impacts the state/district of the member of Congress. He encouraged participants to use anecdotes to further exemplify the importance of research funding to the member's state/district. He discussed the fact that there is bipartisan support for innovation and competitiveness among members of Congress and how the case should be made for funding for the mathematical sciences in this context.

David Weinreich, Legislative Assistant, Office of Representative Bob Etheridge (NC-2), and former AMS Congressional Fellow: David Weinreich gave participants practical advice about how to lobby a member of Congress, how to convey the desired message, and what the meeting process would be like. He spoke to such things as being prepared, staying on message, and common courtesies such as being on time and saying "thank you". He talked about the process as being an opportunity to build relationships and stressed the importance of followup.

Capitol Hill Meetings: The twenty-seven CSP committee members and department chairs attending were divided into thirteen teams for the Capitol Hill visits. Each team had two to three members. Sixty-seven meetings were scheduled by the AMS Washington Office from 9:00 a.m. to 5:00 p.m. on Wednesday. Each team had from four to six meetings.

Committee on Science Policy Events at the 2008 Joint Mathematics Meetings: There was much discussion, and several ideas were formulated for the CSP-related activities at the Joint Mathematics Meetings to be held in San Diego in January 2008. CSP is generally involved in a panel discussion as well as in securing a government speaker at the meetings. It was decided that the committee would do only one or the other this year. The topic and format will be determined later.

Date of Next Meeting: The next meeting of the AMS Committee on Science Policy will be held Thursday–Saturday, March 6–8, 2008, in Washington, DC. The meeting will begin with a reception and dinner on Thursday evening and continue through midday Saturday. A day of Capitol Hill visits may be added, separate from the meeting, perhaps on Thursday before the meeting.

—Anita Benjamin, AMS Washington Office

Deaths of AMS Members

JACK BAZER, professor emeritus, from New York, NY, died on March 30, 2007. Born on December 23, 1924, he was a member of the Society for 59 years.

ARTHUR E. BRAGG, from Dover, DE, died on November 22, 2002. Born on January 27, 1926, he was a member of the Society for 46 years.

MILDRED C. BRUNSCHWIG, retired, Brown University, died on October 17, 1992. Born on March 14, 1900, she was a member of the Society for 67 years.

ROBERT A. FULLER, from Marietta, GA, died on September 26, 2006. Born on August 10, 1943, he was a member of the Society for 28 years.

STEVEN P. HAATAJA, assistant professor, from Rapid City, SD, died on December 5, 2006. Born on July 20, 1960, he was a member of the Society for 19 years.

HEINZ G. HELFENSTEIN, retired, from Victoria, Canada, died on December 17, 2006. Born on April 9, 1921, he was a member of the Society for 52 years.

RALPH N. JOHANSON, professor emeritus, from Millis, MA, died on November 21, 2004. Born on November 21, 1914, he was a member of the Society for 65 years.

FRANK B. KNIGHT, professor emeritus, University of Illinois, died on March 19, 2007. Born on October 11, 1933, he was a member of the Society for 51 years.

KENNETH D. MAGILL JR., professor, SUNY at Buffalo, died on February 22, 2007. Born on October 21, 1933, he was a member of the Society for 47 years.

MONROE H. MARTIN, retired professor and director, University of Maryland, College Park, died on March 12, 2007. Born on February 7, 1907, he was a member of the Society for 78 years.

HWANG-WEN PU, professor, Texas A&M University, died on February 20, 2006. Born on September 5, 1930, he was a member of the Society for 42 years.

JOSEPH L. VITTITOW, from Greenville, NC, died on February 9, 2007. Born on December 10, 1957, he was a member of the Society for 5 years.

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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

August 15, 2007: Nominations for SASTRA Ramanujan Prize. See http://www.math.ufl.edu/sastra-prize/.

August 17, 2007: Letters of intent for NSF Focused Research Groups. See http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5671&org=DMS.

September 11, 2007: Applications for NSF Research Fellow Awards. See "Mathematics Opportunities" in this issue.

September 13, 2007: Applications for NSF Research Experiences for Undergraduates (REU) program sites. See "Mathematics Opportunities" in this issue.

September 15, 2007: Nominations for Sloan Research Fellowships. See http://www.sloan.org/programs/fellowship_brochure.shtml.

September 21, 2007: Full proposals for NSF Focused Research

Where to Find It

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

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AMS Email Addresses—*February 2007, p. 271*

AMS Ethical Guidelines—*June/July 2006, p. 701*

AMS Officers 2006 and 2007 (Council, Executive Committee, Publications Committees, Board of Trustees)—*May 2007, p. 657*

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Mathematics Research Institutes Contact Information—*August 2007, p. 898*

National Science Board—*January 2007, p. 57*

New Journals for 2005, 2006—*June/July 2007, p. 767*

NRC Board on Mathematical Sciences and Their Applications—*March 2007, p. 426*

NRC Mathematical Sciences Education Board—*April 2007, p. 546*

NSF Mathematical and Physical Sciences Advisory Committee—*February 2007, p. 274*

Program Officers for Federal Funding Agencies—*October 2006, p. 1072 (DoD, DoE); December 2006, p. 1369 (NSF)*

Stipends for Study and Travel—*September 2007 p. 1024*

Groups. See http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5671&org=DMS.

September 30, 2007: Applications for spring 2008 semester of Math in Moscow. See "Mathematics Opportunities" in this issue.

September 30, 2007: Applications for travel grants to ICME-11. See http://www.nctm.org/icme.aspx or contact Margaret Iding, 116 North Kedzie, Division of Science and Mathematics Education, Michigan State University, East Lansing, MI 48824; telephone: 517-355-1708, ext. 105; fax: 517-432-9868; email: idingm@msu.edu.

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

October 5, 2007: Full proposals for NSF IGERT competition. See http://www.nsf.gov/pubs/2007/nsf07540/nsf07540.htm.

October 10, 2007: Proposals for NSF Distinguished International Postdoctoral Research Fellowships. See "Mathematics Opportunities" in this issue.

October 15, 2007: Preferred deadline for January entrance in junior-year program at the Smith College Center for Women in Mathematics. See http://www.math.smith.edu/center.

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). For brochures or questions, call 301-688-0400 or write to: Mathematical Sciences Program, National Security Agency, Suite 6557, Fort Meade, MD 20755-6557.

October 17, 2007: Applications for NSF Mathematical Sciences Postdoctoral Research Fellowships. See http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5301&org=DMS.

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.

November 1, 2007: Deadline for proposals for AIM workshop or SQuaRE. See "Mathematics Opportunities" in this issue.

December 1, 2007: Applications for AMS Centennial Fellowships. See "Mathematics Opportunities" in this issue.

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

February 1, 2008: Applications for AWM Travel Grants and AWM Mentoring Grants. See "Mathematics Opportunities" in this issue.

April 15, 2008, Applications for fall 2008 semester of Math in Moscow. See "Mathematics Opportunities" in this issue.

May 1, 2008: Applications for AWM Travel Grants. See "Mathematics Opportunities" in this issue.

August 18, 2008: Applications for NSF Research Experiences for Undergraduates (REU) program sites. See "Mathematics Opportunities" in this issue.

October 1, 2008: Applications for AWM Travel Grants. See "Mathematics Opportunities" in this issue.

Conference Board of the Mathematical Sciences

1529 Eighteenth Street, NW
Washington, DC 20036
202-293-1170
http://www.cbmsweb.org/

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Member Societies

American Mathematical Association of Two-Year Colleges (AMATYC)
American Mathematical Society (AMS)
American Statistical Association (ASA)
Association for Symbolic Logic (ASL)
Association for Women in Mathematics (AWM)
Association of Mathematics Teacher Educators (AMTE)
Association of State Supervisors of Mathematics (ASSM)
Benjamin Banneker Association (BBA)
Institute for Operations Research and the Management Sciences (INFORMS)
Institute of Mathematical Statistics (IMS)
Mathematical Association of America (MAA)
National Association of Mathematicians (NAM)
National Council of Supervisors of Mathematics (NCSM)
National Council of Teachers of Mathematics (NCTM)
Society for Industrial and Applied Mathematics (SIAM)
Society of Actuaries (SOA)

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 in this issue.)

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.

Arthur Cayley: Mathematician Laureate of the Victorian Age, by Tony Crilly. Johns Hopkins University Press, December 2005. ISBN 0-801-88011-4.

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.

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.

The Cat in Numberland, by Ivar Ekeland. Cricket Books, April 2006. ISBN-13: 978-0-812-62744-2.

**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.

Descartes: The Life and Times of a Genius, by A. C. Grayling. Walker & Company, November 2006. ISBN 0-8027-1501-X.

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.

The Essential Turing, edited by B. Jack Copeland. Oxford University Press, September 2004. ISBN 0-198-25080-0. (Reviewed November 2006.)

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 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.

King of Infinite Space: Donald Coxeter, the Man Who Saved Geometry, by Siobhan Roberts. Walker & Company, September 2006. ISBN 0-802-71499-4.

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 Man Who Knew Too Much: Alan Turing and the Invention of the Computer, by David Leavitt. Great Discoveries series, W. W. Norton, December 2005. ISBN 0-393-05236-2. (Reviewed November 2006.)

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

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.

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.

Musimathics: The Mathematical Foundations of Music, Volume 1, by Gareth Loy. MIT Press, September 2006. ISBN 0-262-12282-0.

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.

Nonplussed!: Mathematical Proof of Implausible Ideas, by Julian Havil. Princeton University Press, May 2007. ISBN-13: 978-0-691-12056-0.

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.

The Pea and the Sun: A Mathematical Paradox, by Leonard M. Wapner. A K Peters, April 2005. ISBN 1-568-81213-2. (Reviewed October 2006.)

Piano Hinged Dissections: Time to Fold!, by Greg Frederickson. A K Peters, October 2006. ISBN 1-568-81299-X.

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: 978-08027-1532-6.

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.)

The Three Body Problem, by Catherine Shaw. Allison and Busby, March 2005. ISBN 0-749-08347-6. (Reviewed October 2006.)

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 in this issue.)

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.

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: 978-9-812-56279-1.

Stipends for Study and Travel

Graduate Support

American Association for the Advancement of Science

Mass Media Summer Fellowship

(AMS supports at least one Fellow per year under this program)

Description: Fellows work for newspapers, magazines, and radio and television stations. Travel expenses and stipends are paid by the AAAS. Fellows have the opportunity to: observe and participate in the process by which events and ideas become news, improve their communication skills by learning to describe complex technical subjects in a manner understandable by the public, and increase their understanding of editorial decision making and the manner in which information is effectively disseminated. Each fellow will: attend an orientation and evaluation session in Washington, DC; begin the 10-week internship in mid-June; and submit an interim and final report to AAAS to help evaluate the program.
Eligibility: Provides support for 15–20 outstanding graduate students in mathematics, the natural and social sciences, and engineering as reporters, researchers, and production assistants in the mass media. (Exceptional undergraduate or postdoctoral students also considered.)
Grant amount: $450/week stipend for ten weeks.
Deadline: January 15, 2008.
Application information: Stacey Pasco, Manager, Mass Media Program, Mass Media Science and Engineering Fellows Program, American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005; telephone: 202-326-6441; http://www.aaas.org/programs/education/MassMedia/.

American Association of University Women (AAUW) Educational Foundation

Selected Professions Fellowships

Description: These fellowships are awarded to women of outstanding academic ability who are citizens or permanent residents of the U.S. for full-time graduate study in designated fields where women's participation has traditionally been low. Eligible fields currently include mathematics and statistics.
Eligibility: Fellowships are for the final year of the master's degree. Fellowship year is July 1–June 30. Degree must be earned at the end of the fellowship year.
Grant amount: $5,000–$12,000.
Deadline: Must be postmarked by January 10 (applications are available August 1).
Application information: For more information contact: AAUW Educational Foundation, 2201 Dodge Street, Iowa City, IA 52243-4030; tel: 319-337-1716; or visit our website at http://www.aauw.org/.

American Philosophical Society

Lewis and Clark Fund for Exploration and Field Research in Astrobiology

Description: The American Philosophical Society and the NASA Astrobiology Institute have partnered to promote the continued exploration of the world around us through a new program of research grants in support of astrobiological field studies undertaken by graduate students and by postdoctoral and junior scientists and scholars.
Eligibility: Grants will be available to graduate students, postdoctoral students, and junior scientists who wish to participate in field studies for their theses or for other purposes. Undergraduates are not eligible.
Grant amount: Grants will depend on travel costs but will ordinarily be in the range of several hundred dollars to about $5,000.
Deadline: February 15; notification in June.
Application information: For application forms please consult the website at http://www.amphilsoc.org/. Questions may be addressed to Linda Musumeci, Research Administration, at lmusumeci@amphilsoc.org or 215-440-3429.

The American Society of Naval Engineers

Scholarships

Description: Candidate will be applying for either the last year of a full-time or co-op undergraduate program or one year of graduate study leading to a designated engineering degree or physical science degree in an accredited college or university. A scholarship will not be awarded to a doctoral candidate or to a person already having an advanced degree.
Eligibility: Candidate must be a United States citizen; must have demonstrated or expressed a genuine interest in a career in Naval Engineering, e.g., activity in a professional engineering society and extracurricular engineering activities. Graduate student candidate must be a member of ASNE or SNAME. Candidate's academic record, work history, professional promise,

and recommendations of college faculty, employers, and other character references. Financial need may also be considered.

Grant amount: $3,000 per year for undergraduate student; $4,000 per year for graduate student.

Deadline: Go to http://www.navalengineers.org.

Burroughs Wellcome Fund

Career Awards at the Scientific Interface

Description: The complexity inherent in biological research has always provided a fertile field for the development of new mathematical and physical approaches to biological problems. But now, with advances in genomics, quantitative structural biology, and modeling of complex systems, the possibilities for an exciting research career at the interface between the physical/computational sciences and the biological sciences have never been greater. Tackling key problems in biology will require scientists trained in areas such as chemistry, physics, applied mathematics, computer science, and engineering. In recognition of the vital role such cross-trained scientists will play in furthering biomedical science, the Burroughs Wellcome Fund has developed Career Awards at the Scientific Interface. These grants are intended to foster the early career development of researchers with backgrounds in the physical/computational sciences whose work addresses biological questions and who are dedicated to pursuing a career in academic research. Candidates are expected to draw from their training in a scientific field other than biology to propose innovative approaches to answer important questions in the biological sciences. Examples of approaches include, but are not limited to, physical measurement of biological phenomena, computer simulation of complex processes in physiological systems, mathematical modeling of self-organizing behavior, building probabilistic tools for medical diagnosis, developing novel imaging tools or biosensors, applying nanotechnology to manipulate cellular systems, predicting cellular responses to topological clues and mechanical forces, and developing a new conceptual understanding of the complexity of living organisms. Proposals that include experimental validation of theoretical models are particularly encouraged.

Eligibility: Candidates must hold a Ph.D. degree in the fields of mathematics, physics, chemistry (physical, theoretical, or computational), computer science, statistics, or engineering. Exceptions will be made only if the applicant can demonstrate significant expertise in one of these areas, evidenced by publications or advanced course work. Candidates must have completed at least six months but not more than 48 months of postdoctoral training at the time of application and must not hold or have accepted a faculty appointment as a tenure-track assistant professor at the time of application. These awards are open to U.S. and Canadian citizens or permanent residents. Limited eligibility for temporary residents—please see guidelines.

Grant amount: Career Awards at the Scientific Interface provide $500,000 over five years to support up to two years of advanced postdoctoral training and the first three years of a faculty appointment. During both the postdoctoral and the faculty periods, grants must be made to degree-granting institutions in the United States or Canada on behalf of the award recipient.

Deadline: May 1, 2008.

Application information: Full application information is available on the Burroughs Wellcome Fund website at http://www.bwfund.org or write to Burroughs Wellcome Fund, Interfaces Program, 21 T. W. Alexander Dr., P.O. Box 13901, Research Triangle Park, NC 27709-3901.

Florida Education Fund

The McKnight Doctoral Fellowship Program

Description: A McKnight Doctoral Fellowship provides funds for up to twenty-five African American citizens annually to pursue Ph.D. degrees at participating Florida universities. Contingent upon successful academic progress, the maximum length of the award is five years. The Florida Education Fund provides the first three years, and the student's university continues funding at the same level of support for an additional two years.

Eligibility: Applicants must hold or be receiving a bachelor's degree from a regionally accredited college or university.

Grant amount: Up to $5,000 in tuition and fees plus an annual stipend of $12,000. Tuition and fees over $5,000 will be waived.

Deadline: The deadline for applications is January 15 of each year.

Application information: Detailed information and application packets can be obtained by writing or calling: The Florida Education Fund, 201 E. Kennedy Boulevard, Suite #1525, Tampa, FL 33602; 813-272-2772; mdf@fl-educ-fd.org; or visit our website at: http://www.fefonline.org.

Ford Foundation Dissertation Fellowships for Minorities

Description: Approximately 40 dissertation fellowships will be awarded in a national competition administered by the National Research Council (NRC) of the National Academies for the Ford Foundation. The awards will be made to those individuals who, in the judgment of the review panels, have demonstrated superior scholarship and show the greatest promise for future achievement as scholars, researchers, and teachers in institutions of higher education.

Eligibility: Available to minorities who are Ph.D. or Sc.D. candidates at U.S. institutions studying mathematics, engineering, of one of several other fields. The fellowships will be offered on a competitive basis to individuals who are citizens or nationals of the U.S. and who are members of the following groups: Alaska Natives (Eskimo or Aleut), Native American Indians, Black/African Americans, Mexican Americans/

Chicanas/Chicanos, Native Pacific Islanders (Polynesian or Micronesian), Puerto Ricans.
Application information: For more information, contact: Fellowship Office, GR 346A, National Research Council of the National Academies, 550 Fifth Street, NW, Washington, DC 20001; tel: 202-334-2872; email: infofell@nas.edu; website: http://national-academies.org/fellowships/.

Ford Foundation Predoctoral Fellowships for Minorities

Description: Approximately 60 predoctoral fellowships will be awarded in a national competition administered by the National Research Council (NRC) of the National Academies for the Ford Foundation. The awards will be made to those individuals who, in the judgment of the review panels, have demonstrated superior scholarship and show the greatest promise for future achievement as scholars, researchers, and teachers in institutions of higher education.
Eligibility: Available to minorities enrolled in or planning to enroll in research-based doctoral programs in mathematics, engineering, and other fields. The fellowships will be offered on a competitive basis to individuals who are citizens or nationals of the U.S. and who are members of the following groups: Alaska Natives (Eskimo or Aleut), Native American Indians, Black/African Americans, Mexican Americans/Chicanas/Chicanos, Native Pacific Islanders (Polynesian or Micronesian), Puerto Ricans.
Application information: For more information, contact: Fellowship Office, GR 346A, National Research Council of the National Academies, 550 Fifth Street, NW, Washington, DC 20001; tel: 202-334-2872; email: infofell@nas.edu; website: http://national-academies.org/fellowships/.

National Academies

Christine Mirzayan Science and Technology Policy Graduate Fellowship Program

Description: The Christine Mirzayan Science and Technology Policy Graduate Fellowship Program of the National Academies is designed to engage graduate and postdoctoral science, engineering, medical, veterinary, business, and law students in science and technology policy and to familiarize them with the interactions between science, technology, and government. As a result, students develop essential skills different from those attained in academia and make the transition from being a graduate student to a professional.
Eligibility: Applications are invited from graduate students through postdoctoral candidates in any physical, biological, or social science field or any field of engineering, medicine/health, or veterinary medicine, as well as business and law education, and other graduate and professional programs.
Grant amount: There are three 10-week sessions per year beginning in January, June, and September. The grant amount is $4,800 to $5,300 depending on location.
Deadline: Deadline for the receipt of materials is November 1 for the January program, March 1 for the June program, and June 1 for the September program.
Application information: For program details and a link to the online application, please visit the website at http://national-academies.org/policyfellows. For further information, email: policyfellows@nas.edu (preferred) or phone 202-334-2455. Résumés are not accepted.

National Science Foundation

Graduate Research Fellowships

Description: The NSF's Graduate Research Fellowship Program recognizes and supports outstanding graduate students in the relevant science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees. NSF provides three years of financial support which includes a $30,000 annual stipend, and a $10,500 annual cost-of-education allowance.
Eligibility: Applicants must be U.S. citizens, nationals, or permanent residents, and at or near the beginning of graduate studies in an NSF-supported field: Chemistry, Computer and Information Science and Engineering, Engineering, Geosciences, Life Sciences, Mathematical Sciences, Physics and Astronomy, Psychology, and Social Sciences.
Deadline: Applications and deadline information will be available online at http://www.fastlane.nsf.gov/grfp/. Deadlines vary by field and applications must be submitted to NSF by the appropriate deadline.
Application information: Please visit http://www.nsf.gov/grfp for additional information.

The University of Texas at Austin

Description: Graduate students in mathematics, both new and continuing, are eligible for a variety of fellowships, including the Edward Louis and Alice Laidman Dodd Fellowship, David Bruton Jr. Graduate Fellowships in Mathematics, Regents Endowed Graduate Fellowships in Mathematics, Arthur Lefevre Sr. Scholarship in Mathematics, John L. and Anne Crawford Endowed Presidential Scholarship, H. S. Wall Memorial Scholarship in Mathematics, Charles Rubert Scholarship, and University Fellowships. All participants are automatically considered for each of these fellowships and need not apply separately for them. The Graduate Advisor, in consultation with a faculty committee, decides who will be awarded (or, in the case of University Fellowships, who will be nominated for) these fellowships.
Grant amount: The level of stipends varies from $1,000 (which entitles one to pay tuition at the in-state rate) to $34,000.
Application information: Information on our mathematics program can be found at http://www.ma.utexas.edu, or contact Graduate Advisor, Mathematics Department, The University of Texas, Austin, TX 78712-1082. For admission to our graduate program, you should

use the online application at http://www.utexas.edu/student/giac. Applicants admitted to the graduate program must authorize a security sensitive background check.

Zonta International Foundation

Amelia Earhart Fellowship Awards

Description: The Zonta International Amelia Earhart Fellowships were established in 1938 in honor of Amelia Earhart, famed pilot and Zonta club member. The fellowships are granted annually to women pursuing graduate Ph.D./doctoral degrees in aerospace-related sciences and aerospace-related engineering.
Eligibility: Women of any nationality pursuing a Ph.D./doctoral degree who demonstrates a superior academic record in the field of aerospace-related sciences and aerospace-related engineering are eligible.
Grant amount: The fellowship of US$6,000 may be used at any university or college offering accredited post-graduate courses and degrees.
Deadline: November 15. All applicants will be notified of their status by the end of April.
Application information: Complete an official application at http://www.Zonta.org/.

Postdoctoral Support

Air Force Office of Scientific Research

Research Contracts and Grants

Description: Mathematicians and computer scientists are encouraged to submit through their organizations proposals for research support. Research areas include mathematics of dynamics and control, physical mathematics and applied analysis, computational mathematics, optimization and discrete mathematics, signal processing, probability and statistics, software and systems, intelligent software agents, information fusion, and electromagnetics.
Application information: Research proposals should be forwarded to the Mathematics and Space Sciences Directorate, Air Force Office of Scientific Research (AFOSR/NM), 875 North Randolph Street, Suite 325, Room 3112, Arlington, VA 22203; http://www.afosr.af.mil.

American Mathematical Society Centennial Fellowships

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. At most, two fellowships will be awarded for the 2008–09 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 NSF 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 reduction 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 2008–09 is expected to be $70,000, with an additional expense allowance of about $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 electronic mail to prof-serv@ams.org; or call 401-455-4107. Please note that completed applications and references should be sent to the AMS at the address given above, marked "Centennial Fellowships".

American Philosophical Society

Franklin Research Grants

Description: Postdoctoral research grants to aid specific research projects. The purpose of the program is to connect scholars with the objects of their research. Tenable abroad and in the U.S. The Committee meets in January and in March and applicants are notified in February and April.
Eligibility: For candidates with Ph.D. for at least one year.

Grant amount: Up to $6,000. Grants contribute toward travel expenses, food and lodging, and photoduplication. No funds are available for attending conferences or consulting with colleagues.
Deadline: October 1, December 1.
Application information: For application forms please consult the website at http://www.amphilsoc.org/. Questions may be addressed to Linda Musumeci, Research Administrator, at lmusumeci@amphilsoc.org or 215-440-3429.

American Philosophical Society

Lewis and Clark Fund for Exploration and Field Research in Astrobiology

Description: The American Philosophical Society and the NASA Astrobiology Institute have partnered to promote the continued exploration of the world around us through a new program of research grants in support of astrobiological field studies undertaken by graduate students and by postdoctoral and junior scientists and scholars.
Eligibility: Grants will be available to graduate students, postdoctoral students, and junior scientists who wish to participate in field studies for their theses or for other purposes. Undergraduates are not eligible.
Grant amount: Grants will depend on travel costs but will ordinarily be in the range of several hundred dollars to about $5,000.
Deadline: February 15; notification in June.
Application information: For application forms please consult the website at http://www.amphilsoc.org/. Questions may be addressed to Linda Musumeci, Research Administration, at lmusumeci@amphilsoc.org or 215-440-3429.

Fields Institute

Postdoctoral Fellowships

Description: Applications are invited for postdoctoral fellowship positions at the Fields Institute in Toronto for the 2008–09 academic year. The thematic program on Arithmetic Geometry, Hyperbolic Geometry and Related Topics will take place at the Institute July to December 2008 and the thematic program on O-Minimal Structures and Real Analytic Geometry will take place at the Institute from January to 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. One recipient will be awarded the Institute's prestigious Jerrold E. Marsden Postdoctoral Fellowship. Applicants seeking postdoctoral fellowships funded by other agencies (such as NSERC or international fellowships) are encouraged to request the Fields Institute as their proposed location of tenure, and should apply to the Institute for a letter of invitation. Funding is being sought from NSF to support junior U.S. participants in these programs.
Eligibility: Qualified candidates who will have recently completed a Ph.D. in a related area of the mathematical sciences are encouraged to apply.
Deadline: December 7, 2007, although late applications may be considered.
Application information: Please consult http://www.fields.utoronto.ca/proposals/postdoc.html. The Fields Institute is strongly committed to diversity within its community and especially welcomes applications from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversification of ideas.

Ford Foundation Postdoctoral Fellowships for Minorities

Description: Approximately 30 postdoctoral fellowships will be awarded in a national competition sponsored by the Ford Foundation and administered by the National Research Council.
Eligibility: U.S. citizens or nationals who are Native American Indian, Mexican American/Chicana/Chicano, Alaska Native (Eskimo or Aleut), Native Pacific Islander (Polynesian or Micronesian), Black/African American, or Puerto Rican and who are currently in or planning a career in teaching and research at the college or university level.
Application information: For further information and applications, contact: Fellowship Office, GR 346A, National Research Council of the National Academies, 550 Fifth Street, NW, Washington, DC 20001; tel: 202-334-2872; fax: 202-334-3419; email: infofell@nas.edu; website: http://national-academies.org/fellowships.

John Simon Guggenheim Memorial Foundation Fellowships

Description: Fellowships are on an advanced professional level. Approximately 221 awards are made.
Eligibility: U.S. or Canadian citizenship or permanent residence is required. Fellowships are also offered to citizens or permanent residents of Latin America and the Caribbean.
Deadline: Application deadline: October 1 for the U.S. and Canada competition, December 1 for the Latin American and Caribbean competition.
Application information: For more information write to John Simon Guggenheim Memorial Foundation, 90 Park Avenue, New York, NY 10016; tel: 212-687-4470; fax: 212-697-3248; email: fellowships@gf.org; World Wide Web: http://www.gf.org/.

Institute for Advanced Study Memberships

Description: The School of Mathematics will grant a limited number of memberships, some with financial support, for research in mathematics at the Institute during the academic year 2007–08.

Eligibility: Candidates must give evidence of ability in research comparable at least with that expected for the Ph.D. degree.
Deadline: December 1, 2007.
Application information: Application blanks may be obtained from The School of Mathematics, Institute for Advanced Study, Princeton, NJ 08540, and should be returned (whether or not funds are expected from some other source) by December 1. Application forms may be downloaded via a Web connection to http://www.math.ias.edu. An Equal Opportunity/Affirmative Action Employer.

Institute for Mathematics and its Applications (IMA)

General Memberships

Description: The Institute for Mathematics and its Applications at the University of Minnesota announces the availability of general memberships in connection with its 2008–2009 thematic program on *Mathematics and Chemistry*. 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 2008–09 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.
Eligibility: Preference will be given to supplementary support for persons with sabbatical leaves, fellowships, or other stipends. The research interests of General Members must relate to the thematic program and a doctoral degree is normally expected.
Grant amount: Local expenses and travel costs may be requested.
Deadline: Applications may be submitted at any time until the end of the thematic program, and will be considered as long as funds remain available.
Application information: Application forms and instructions are available at http://www.ima.umn.edu/docs/membership/current/genmemapp.html. The IMA website is http://www.ima.umn.edu. Questions should be directed to applications@ima.umn.edu or by phone to 612-624-6066. The University of Minnesota is an Equal Opportunity Educator and Employer.

Institute for Mathematics and its Applications (IMA)

Industrial Postdoctoral Fellowships

Description: The Institute for Mathematics and its Applications at the University of Minnesota announces the availability of industrial postdoctoral fellowships. IMA industrial postdoctoral positions 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.
Eligibility: Documentation of completion of all requirements for a doctoral degree in mathematics or a related area is required by the start of the appointment and within the last three years.
Grant amount: Industrial postdoctoral fellows receive a salary of $50,000 annually, and a travel allowance.
Deadline: January 4, 2008.
Application information: Application forms and instructions are available at http://www.ima.umn.edu/docs/postdocapp.html. The IMA website is http://www.ima.umn.edu. Questions should be directed to applications@ima.umn.edu or by phone to 612-624-6066. The University of Minnesota is an Equal Opportunity Educator and Employer.

Institute for Mathematics and its Applications (IMA)

New Directions Visiting Professorships

Description: The Institute of Mathematics and its Applications at the University of Minnesota provides an extraordinary opportunity for established mathematicians—typically mid-career faculty at U.S. universities—to branch into new directions and increase the impact of their research by spending the 2008–09 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 Visiting Professors are expected to be resident and active participants in the program but are not assigned formal duties.
Eligibility: Established mathematical scientists normally with permanent U.S. university employment.
Grant amount: The New Directions program will supply 50% of academic year salary up to $50,000 maximum.
Deadline: January 15, 2008.
Application information: Application forms and instructions are available at http://www.ima.umn.edu/docs/newdirapp.html. The IMA website is http://www.ima.umn.edu. Questions should be directed to ndprof@ima.umn.edu or by phone to 612-624-6066. The University of Minnesota is an Equal Opportunity Educator and Employer.

Institute for Mathematics and its Applications (IMA)

Postdoctoral Fellowships

Description: The Institute for Mathematics and its Applications at the University of Minnesota announces the availability of postdoctoral fellowships in connection with its 2008–09 thematic program on *Mathematics and Chemistry*. 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. In the second year of the appointment there are a variety of options to enhance career development, including participation in the 2009–10 academic year program on *Mathematics and Chemistry*, teaching, and working on an industrial project.
Eligibility: Documentation of completion of all requirements for a doctoral degree in mathematics or a related area is required by the start of the appointment and within the last three years.
Grant amount: Postdoctoral fellows receive a salary of $50,000 annually, and a travel allowance.
Deadline: January 4, 2008.
Application information: Application forms and instructions are available at http://www.ima.umn.edu/docs/postdocapp.html. The IMA website is http://www.ima.umn.edu. Questions should be directed to applications@ima.umn.edu or by phone to 612-624-6066. The University of Minnesota is an Equal Opportunity Educator and Employer.

Los Alamos National Laboratory

J. Robert Oppenheimer, Richard P. Feynman, and Frederick Reines Distinguished Fellowships

Description: Research opportunities are granted in many areas of chemistry, mathematics, computer science, materials science, biological sciences, environmental science, geoscience, and many engineering fields. Appointments are for three years.
Eligibility: Candidates must be recipients of a doctoral degree within the past five years and must show clear and definite promise of becoming outstanding leaders in scientific research.
Grant amount: Starting salary: $97,000.
Deadline: Submission deadline for sponsored candidates: mid-October each year.
Application information: Los Alamos National Laboratory is an Equal Opportunity Employer. See details and apply online at: http://www.hr.lanl.gov/postdoc/.

Los Alamos National Laboratory

Postdoctoral Appointments and Fellowships

Description: Research opportunities are granted in many areas of chemistry, mathematics, computer science, materials science, biological sciences, environmental science, geoscience, and many engineering fields. Appointments are available for two years, subject to renewal for a third year. A postdoctoral committee meets to review candidates for postdoctoral fellowships in February, May, August, and November.
Eligibility: Candidates must be recipients of a doctoral degree within the past five years.
Grant amount: Starting salary: $64,500–$75,500.
Application information: Los Alamos National Laboratory is an Equal Opportunity Employer. For more information: email: postdoc-info@lanl.gov; tel: 505-667-0872; fax: 505-665-5419; see details and apply online at: http://www.hr.lanl.gov/postdoc/.

Mathematical Sciences Research Institute (MSRI)

Microsoft Research Postdoctoral Grant

Description: The Mathematical Sciences Research Institute announces the availability of a postdoctoral fellowship combined with an internship at Microsoft Research in Redmond, Washington. Because of the variety of mathematical work done at Microsoft Research, no particular fields of mathematics have been specified. However, an essential prerequisite is a strong interest in the applications of mathematics as well as in the research environment at MSRI. This postdoctoral fellowship is normally a two-year award, with the recipient spending one year at MSRI and the second year at Microsoft Research.
Eligibility: For new and recent Ph.D.'s (Ph.D. earned in 2003 or later). Applicants should apply through the usual process for MSRI Postdoctoral Fellowships, indicating their interest in this internship/fellowship and adding relevant documentation. Applications indicating interest in this program will be reviewed by Microsoft Research as well as by MSRI. Further information: http://www.msri.org.
Deadline: Application files must be completed by December 1, 2007.
Application information: Please complete online application form at: http://www.mathjobs.org.

Mathematical Sciences Research Institute (MSRI)

Research Memberships

Description: The Institute will invite about 200 Research Members for stays of 1 month or more during 2008–09, when three semester-long programs will be featured: *Analysis of Singular Spaces* (August 18, 2008 to December 19, 2008), *Ergodic Theory and Additive Combinatorics* (August 18, 2008 to December 19, 2008), and *Algebraic Geometry* (January 12, 2009 to May 22, 2009). Some invitations will be made in other areas, so applications from candidates in all fields are welcome. Further information at http://www.msri.org.
Eligibility: For mathematicians postdoctoral and above.
Grant amount: While there is no set stipend for research members, MSRI may offer partial support toward living and travel expenses. It is expected that Research Members will visit MSRI with partial or full support from other sources.
Application information: Please complete the online application form at: http://www.mathjobs.org.
Deadline: Application files must be complete by December 1, 2007.

Mathematical Sciences Research Institute (MSRI)

Research Professorships

Description: The Institute will appoint about 12 Research Professors for stays of 3 months or more during 2008–09, when three semester-long programs will be featured: *Analysis of Singular Spaces* (August 18, 2008 to December 19, 2008), *Ergodic Theory and Additive Combinatorics* (August 18, 2008 to December 19, 2008), and *Algebraic Geometry* (January 12, 2009 to May 22, 2009). A research professorship award can be made in other areas, so applications from candidates in all fields are welcome. Further information at http://www.msri.org.
Eligibility: For mathematicians with Ph.D.s earned in 2001 or earlier.
Grant amount: The stipend can be at a rate of up to $5,000/month prorated for the duration of residency during the program.
Application information: Please complete the online application form at: http://www.mathjobs.org.
Deadline: Application files must be complete by October 1, 2007.

Mathematical Sciences Research Institute (MSRI)

Postdoctoral Fellowships

Description: The Mathematical Sciences Research Institute announces the availability of 29 postdoctoral fellowships for a semester in conjunction with the 2008–09 one-semester MSRI research programs: *Analysis of Singular Spaces* (Fall 2008), Ergodic Theory and Additive Combinatorics (Fall 2008), and *Algebraic Geometry* (Spring 2009). Candidates with other interests may also apply for a semester fellowship in the Complementary Program. Further information at http://www.msri.org.
Eligibility: For new and recent Ph.D.'s (earned in 2003 or later).
Grant amount: The stipend will be $4,500/month for 5 months for the one-semester programs plus a travel allowance and health insurance coverage.
Application information: Applicants must apply online at: http://www.mathjobs.org. Applicants will submit a CV, two letters of reference and a statement of purpose, in which the specific value of a fellowship at MSRI is detailed.
Deadline: Application files must be complete by December 1, 2007.

The Michigan Society of Fellows

Horace H. Rackham School of Graduate Studies, The University of Michigan

Description: The Michigan Society of Fellows was founded in 1970 through grants from the Ford Foundation and Horace H. Rackham Graduate School for the purpose of promoting academic and creative excellence in the arts, sciences, and professions. The objective of the program is to support individuals selected for outstanding achievement, professional promise, and interdisciplinary interests. We invite applications from qualified candidates for three-year postdoctoral fellowships at the University of Michigan. Fellows are appointed as assistant professors/postdoctoral scholars with departmental affiliations. They spend the equivalent of one academic year teaching; the balance of time is devoted to their own scholarly research and creative work. Applications will be reviewed by Society members and university faculty. Final selections will be made in late January by senior fellows of the society. Seven Fellows will be selected for three-year terms to begin September 1, 2008.
Eligibility: Candidates must have received the Ph.D. degree between June 1, 2005, and September 1, 2008.
Grant amount: The annual stipend will be $50,000.
Deadline: Completed applications due October 1, 2007.
Application information: Please see the application on our website or send requests for application materials to: Michigan Society of Fellows, 3572 Rackham Building, University of Michigan, 915 E. Washington St., Ann Arbor, MI 48109-1070; tel: 734-763-1259; email: society.of.fellows@umich.edu; Web: http://www.rackham.umich.edu/Faculty/society.html.

Michigan State University

MSU Postdoctoral Instructorships

Description: Several two-year positions will be available beginning fall 2008 for new or recent Ph.D.'s who show strong promise in research and teaching. The teaching load is four semester courses per year, and participation in the research activities of the department is expected.
Grant amount: A starting salary of $45,000 per year. Additional income from summer teaching is usually available if desired.
Deadline: Completed applications (including letters of recommendation) received by December 15, 2007, are assured of consideration.
Application information: Applicants should send a vita and a brief statement of research interests and arrange for at least four letters of recommendation, one of which must specifically address their ability to teach, to be sent to the department. Interested applicants should apply online at http://www.mathjobs.org. Women and minorities are strongly encouraged to apply. MSU is an Affirmative Action/Equal Opportunity Institution.

National Center for Atmospheric Research

Advanced Study Program

Description: Postdoctoral fellowships are offered for highly qualified atmospheric scientists and scientists from related disciplines who wish to continue basic research in the atmospheric sciences. Appointments are for a one-year period with a possible extension for an additional year.
Eligibility: For recent recipients of the Ph.D. Applicant must have received Ph.D. after October 1, 2003.

Grant amount: Stipends are $51,000 and are adjusted annually in June.
Deadline: The application deadline is January 6, 2008.
Application information: http://www.asp.ucar.edu; email: asp-apply@ucar.edu; phone: 303-497-1328; or Advanced Study Program, NCAR, ASP, P.O. Box 3000, Boulder, CO 80307-3000.

National Science Foundation

Mathematical Sciences Postdoctoral Research Fellowships (with Research Instructorship Option)

Description: The stipend portion of the awards will consist of support for eighteen academic-year months or their equivalent and six summer months. Awardees have two options for academic year stipends, subject to the constraints that their academic-year support begin by October 1 of the award year and be configured in intervals no shorter than three consecutive months. An awardee may have full-time support for any eighteen academic-year months in a 3-year period (the Research Fellowship Option) or have a combination of full-time and half-time support over a period of three academic years, usually as one academic year full-time and two academic years half-time (the Research Instructorship Option). Summer month stipends are limited to two per calendar year.
Grant amount: Stipend amounts are $4,000 per full-time month and $2,000 per half-time month, plus institutional and special allowances, for a total award of $108,000 to be used within 48 months.
Application information: For further details write to the Mathematical Sciences Infrastructure Program, Division of Mathematical Sciences, Room 1025, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; call 703-306-1870; send an inquiry to email: msprf@nsf.gov; or under "Postdoctoral Fellowships" and other Programs at http://www.fastlane.nsf.gov/.

The NSA Mathematical Sciences Program

Grants for Research in Mathematics

Description: The Mathematical Sciences Program (MSP) makes awards annually in support of self-directed, unclassified research in the following areas of the mathematics: Algebra, Number Theory, Discrete Mathematics, Probability, and Statistics. Proposals for modest support of conferences and workshops in these five areas are also considered. The Program does not entertain proposals that involve cryptology. Research grant support typically includes summer salary for faculty members, a modest amount for graduate student support, travel assistance, and other expenses typically associated with research in the mathematical sciences. Proposals that involve participation by women and other individuals from underrepresented backgrounds are welcomed.
Eligibility: Principal investigators, graduate students, consultants, and all other personnel supported by NSA grants must be U.S. citizens or permanent residents of the United States.
Deadline: Proposal submissions must be postmarked by October 15 each year. Grants begin in the fall of the following year. Potential investigators are welcome to contact the MSP Director prior to the submission date to discuss their proposal ideas.
Application information: For detailed information on types of awards and proposal guidelines, see http://www.nsa.gov/msp/msp00002.cfm. For all other inquiries, contact the program office at 301-688-0400 or send email to program officers at mdwagn4@nsa.gov and rjsmit2@nsa.gov.

National Security Agency

Sabbatical Program

Description: The National Security Agency (NSA) Mathematics Sabbatical program provides support for mathematical scientists to work at the NSA for periods ranging from nine to twenty-four months. Sabbatical visitors have the opportunity to work on mission related problems that involve cryptology, statistics and probability, coding theory, and numerous other subjects. The NSA pays 50% of salary and benefits during academic months and 100% of salary and benefits during summer months of the sabbatical detail. A choice is offered between an allowance for moving expenses and a housing supplement. On average, three sabbatical positions are available per year.
Eligibility: Applicants must be able to obtain a security clearance. Applicants and their immediate family members (including parents and siblings) must be U.S. citizens. All NSA employees are subject to random drug testing.
Deadline: To ensure ample time to complete the security clearance process, the target date for receipt of applications is November 15 each year. Sabbatical details typically start in late summer of the following year.
Application information: To apply, send cover letter and curriculum vitae with list of publications. The cover letter should describe the applicant's research interests, the applicant's programming experience and level of fluency, how the applcant hopes to contribute to NSA's mission, and how an NSA sabbatical would affect teaching and research upon return to academia. Cover letter should also mention how the applicant heard about the NSA Sabbatical Program. For a brochure, contact the Mathematical Sciences Program office at 301-688-0400 or send email to the Director, Dr. Michelle D. Wagner, at mdwagn4@nsa.gov, or to the Program Administrator, Ms. Rosalie (Jackie) Smith, at rjsmit2@nsa.gov.

Radcliffe Institute Fellowship Program

Description: The Radcliffe Institute for Advanced Study is a scholarly community where individuals pursue advanced work across a wide range of academic disciplines, professions, or creative arts. Within this broad purpose, and in recognition of Radcliffe's historic contributions to the education of women, the Radcliffe Institute sustains

a continuing commitment to the study of women, gender, and society.
Eligibility: Radcliffe Institute Fellowships are designed to support scholars and scientists of exceptional promise and demonstrated accomplishment who wish to pursue independent work in academic and professional fields and in the creative arts. Applications are judged on the quality and significance of the proposed project and on the applicant's record of accomplishment and promise. Women and men from across the United States and throughout the world, including developing countries, are encouraged to apply. Proposals are accepted from applicants in any field with the receipt of a doctorate or appropriate terminal degree at least two years prior to appointment or with comparable professional achievement in the area of the proposed project.
Grant amount: Stipends are funded up to $60,000 for one year, with additional funds for project expenses.
Deadline: Applications must be postmarked by December 3, 2007.
Application information: For more information visit http://www.radcliffe.edu/. Write, call, or email for an application: Radcliffe Institute Fellowship Office, 34 Concord Avenue, Cambridge, MA 02138; tel: 617-496-3048; fax: 617-496-5299; or email: science@radcliffe.edu.

Rice University

Griffith Conrad Evans Instructorships

Description: Postdoctoral appointments for two to three years for promising research mathematicians with research interests in common with the active research areas at Rice subject to budgetary authorization. Rice University encourages applications from women and underrepresented minorities.
Deadline: Applications received by December 15, 2007, will receive thorough consideration.
Application information: Inquiries and applications should be addressed to: Chairman, Evans Committee, Department of Mathematics, Rice University, 6100 Main St.-MS 136, Houston, TX 77005.

Sloan Foundation

Research Fellowships

Description: Unrestricted grants made to selected university scientists in chemistry, physics, mathematics, computer science, economics, neuroscience or computational and evolutionary molecular biology, or in a related interdisciplinary field. Candidates do not apply, but are nominated by their department chairman or other senior scientists.
Eligibility: Candidates must be members of the regular (i.e., tenure-track) faculty, in the early stage of their academic career, at a recognized college or university in the United States or Canada.
Deadline: Nominations are due by September 15 for awards to begin the following September.
Application information: For information write to the Sloan Research Fellowships, Alfred P. Sloan Foundation, Suite 2550, 630 Fifth Ave., New York, NY 10111; email: stella@sloan.org; Web: http://www.sloan.org/.

University of Michigan, Ann Arbor

Assistant Professorships and T. H. Hildebrandt Research Assistant Professorships

Description: These positions for up to three years are designed to provide mathematicians with favorable circumstances for academic career development in research and teaching. Assistant Professorships have a teaching responsibility of two courses per semester; T. H. Hildebrandt positions have a responsibility of one course per semester. These positions may be combined with other postdoctoral fellowships and grant funding, giving additional reductions in teaching responsibility.
Eligibility: Preference is given to candidates who receive the Ph.D. degree in 2006 or later and who submit a completed application by December 14, 2007.
Grant amount: Salary is competitive and there are opportunities for supplemental summer salary.
Application information: For information, application, and a list of current tenured mathematics faculty, visit http://www.math.lsa.umich.edu/information/postdoc_positions.shtml. This form may also be obtained by email from math-postdoc-search@umich.edu; or by mail to: Hiring Committee, Department of Mathematics, University of Michigan, 2074 East Hall, 530 Church St., Ann Arbor, MI 48109-1043. The preferred method is applying at the AMS website: http://www.ams.org/employment (math jobs). Please provide evidence of teaching excellence. The University of Michigan is an Equal Opportunity, Affirmative Action Employer. Women and minorities are encouraged to apply. The University is responsive to the needs of dual career couples.

Yale University

Josiah Willard Gibbs Instructorships/Assistant Professorships

Description: Offered to men and women with the doctorate who show definite promise in research in pure or applied mathematics. Applications from women and members of minority groups are welcome. Appointments are for two/three years. The teaching load is kept light to allow ample time for research. This will consist of three one-semester courses. Part of the teaching duties over the term of the appointment may consist of a one-semester course at the graduate level in the general area of the instructor's research.
Grant amount: The 2008–09 salary will be at least $65,000.
Deadline: January 1, 2008.
Application information: Applications are available at http://www.math.yale.edu/. Inquiries and application supporting documents should be sent to the Gibbs Committee, Department of Mathematics, Yale University, P.O. Box 208283, New Haven, CT 06520-8283; via email:

gibbs.committee@math.yale.edu. Yale University is an Affirmative Action/Equal Opportunity Employer.

Travel and Study Abroad

Alexander von Humboldt Foundation

Research Fellowships

Description: The Humboldt Foundation grants up to 600 Humboldt Research Fellowships annually to highly qualified scholars under the age of 40 holding doctorates, enabling them to undertake long-term periods of research (6–24 months) in Germany. Applications are decided upon by a selection committee which is composed of eminent German scholars from all disciplines. Candidates' academic attainments are the only criterion for selection; there are no limitations in respect to specific countries or subjects.

Eligibility: Application requirements include high academic qualifications, academic publications, a specific research plan, and for humanities scholars a good command of the German language. As part of the Humboldt Research Fellowship Program, U.S. citizens and residents from all disciplines may also apply for these variations: Summer Research Fellowship for U.S. Scientists and Scholars (3 months per year in 3 consecutive years), http://www.humboldt-foundation.de/en/programme/stip_aus/tshp2.htm; 2-year Post-Doctoral Fellowship for U.S. Scientists and Scholars (24 consecutive months), http://www.humboldt-foundation.de/en/programme/stip_aus/tshp1.htm.

Grant amount: Monthly stipends range from 2,100 to 3,000 euros. Family allowances, travel expenses, and language courses are covered by the fellowship.

Deadline: Applications may be submitted at any time; however, the actual selection committees meet in March, July, and November. Applications should be submitted 5 months before the meeting at which the candidate wishes to be considered.

Application information: Interested scholars may contact the Alexander von Humboldt Foundation, Jean-Paul-Str. 12, D-53173 Bonn, Germany; tel: +49-228-833-0; fax: +49-228-833-212; email: select@avh.de; homepage: http://www.humboldt-foundation.de; or, American Friends of the Alexander von Humboldt Foundation, 1012–14th Street, NW, Suite 1015, Washington, DC 20005; tel: 202-783-1907; fax: 202-783-1908; email: avh@verizon.net.

Fulbright Teacher Exchange Program

Description: Sponsored by the United States Department of State, this program offers international exchange opportunities for two-year college faculty members and elementary and secondary school teachers and administrators. Currently the program conducts exchanges with over 30 countries in Eastern and Western Europe, Latin America, and Africa. (The list of countries is subject to change.) Most exchanges are for the full academic year; however, some are for a semester or six weeks. In most cases both the U.S. and international teacher remain on the payroll of their respective home institutions. The Fulbright Teacher Exchange Program also offers six- to eight-week summer seminars in Italy and Greece which are open to four-year and two-year college faculty and teachers (grades 9–12) of Latin, Greek, and the Classics.

Eligibility: Eligibility requirements are U.S. citizenship, fluency in English, a bachelor's degree or higher, three years' full-time teaching/administrative experience, a current full-time teaching/administrative position, approval of school administration, and no participation in a Fulbright Program longer than eight weeks in the last two years. In addition to the general eligibility requirements, each applicant must meet the specific subject, level, and language fluency requirements for the countries to which he/she applies; these requirements are detailed in the application booklet.

Deadline: The application deadline is October 15 for the following year's program.

Application information: The application booklet should be requested from the Fulbright Teacher Exchange Program, 600 Maryland Ave., SW, Room 320, Washington, DC 20024-2520; tel: 800-726-0479.

Marshall Scholarships

Description: Marshall Scholarships finance young Americans of high ability to study for a degree in the United Kingdom. The scholarships are tenable at any British university and cover two years of study in any discipline, at either undergraduate or graduate level, leading to the award of a British university degree.

Eligibility: Open only to United States citizens who (by the time they take up their scholarship) hold a first degree from an accredited four-year college or university in the United States with a minimum GPA of 3.7. To qualify for awards tenable from October 2008, candidates must have graduated from their undergraduate college or university after April 2005 (although this restriction may be waived in the case of those wishing to read business studies or an allied subject). N.B. Persons already studying for or holding a British degree or degree-equivalent qualification are **not** eligible to apply for a Marshall Scholarship.

Deadline: October 4, 2007 (although some universities might have earlier internal application deadlines), to commence the following September.

Application information: The application process is all online, interested parties should visit: http://www.marshallscholarship.org. For further information please contact your local British Consulate General: Atlanta, 404-954-7708; Boston, 617-245-4513; Chicago, 312-970-3811; Houston, 713-659-3275, ext. 2118; Los Angeles, 310-996-3028; New York, 212-745-0252; San Francisco, 415-617-1340; Washington, DC, 202-588-7844.

U.S. Department of State Fulbright U.S. Student Program

Fulbright and Related Grants for Graduate Study, Research, and Teaching Assistantships Abroad

Description: For graduate study or research in any field in which the project can be profitably undertaken abroad, or English teaching assistantships in many countries. If an applicant is already enrolled in a U.S. university, he must apply directly to the Fulbright Program adviser on his campus. Unenrolled students may apply directly to the Institute of International Education.
Eligibility: Applicant must be a U.S. citizen, hold a B.A. degree or the equivalent, and have language proficiency sufficient to carry out the proposed study and to communicate with the host country.
Deadline: Application deadline is October 19.
Application information: Further details may be obtained from the U.S. Department of State Fulbright U.S. Student Program, U.S. Student Programs Division, Institute of International Education, 809 United Nations Plaza, New York, NY 10017; tel: 212-984-5330; website: http://www.fulbrightonline.org/us.

Winston Churchill Foundation of the United States

Description: A scholarship program for graduate work for one year in engineering, mathematics, and science at Churchill College, Cambridge University.
Grant amount: Tuition and living allowance worth $44,000–$50,000, depending upon course of study.
Application information: Application forms are available from representatives on campuses of colleges and universities participating in the program. For further information write to the Winston Churchill Foundation, 600 Madison Avenue-16th Floor, New York, NY 10022-1615. Tel: 212-752-3200 or see foundation homepage: http://www.winstonchurchillfoundation.org.

Study in the U.S. for Foreign Nationals

American Association of University Women (AAUW) Educational Foundation

International Fellowships

Description: These are awarded to women of outstanding academic ability who are not citizens or permanent residents of the U.S. for full-time graduate or postgraduate study in the U.S. Six of the 50 to 60 awards are available to members of the International Federation of University Women to study in any country other than their own. Upon completion of studies, fellowship recipients are expected to return to their home countries to pursue professional careers. Previous and current recipients of AAUW fellowships are not eligible.
Eligibility: Applicants must hold the equivalent of a U.S. bachelor's degree by September 30.
Grant amount: The fellowships provide $18,000 for master's/first professional degree, $20,000 for doctoral study, and $30,000 for doctoral study.
Deadline: The deadline is December 1 (postmark deadline). *If an application postmark deadline falls on a weekend or holiday, applications may be postmarked the next business day.
Application information: Apply online at http://www.aauw.org. For more information contact: aauw@act.org or AAUW Educational Foundation, P.O. Box 4030, Iowa City, IA 52243-4030; tel: 319-337-1716; fax: 319-337-1204.

SPECIAL SECTION

2007 American Mathematical Society Election

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2007 AMS Elections

Special Section

List of Candidates–2007 Election

President
(one to be elected)
George E. Andrews
John W. Morgan

Vice President
(one to be elected)
Harold M. Stark
Bernd Sturmfels

Board of Trustees
(one to be elected)
Jean E. Taylor
Karen Vogtmann

Member at Large of the Council
(five to be elected)
José de la Peña
Robert W. Ghrist
Rebecca F. Goldin
Helen G. Grundman
Bryna Kra
Fanghua Lin
M. Ram Murty
Irena Peeva
Joseph H. Silverman
Sarah J. Witherspoon

Nominating Committee
(three to be elected)
Carlos Castillo-Chavez
Percy Deift
Steffen Lempp
Louise Arakelian Raphael
John R. Stembridge
Richard A. Wentworth

Editorial Boards Committee
(two to be elected)
David C. Brydges
Gui-Qiang Chen
Alan W. Reid
Catherine Sulem

Ballots

AMS members will receive email with instructions for voting online by August 24, or a paper ballot by September 20. If you do not receive this information by that date, please contact the AMS (preferably before October 1) to request a ballot. Send email to `ballot@ams.org` or call the AMS at 800-321-4267 (within the U.S. or Canada) or 401-455-4000 (worldwide) and ask to speak with Member Services. The deadline for receipt of ballots is November 2, 2007.

Write-in Votes

It is suggested that names for write-in votes be given in exactly the form that the name occurs in the *Combined Membership List* (`www.ams.org/cml`). Otherwise the identity of the individual for whom the vote is cast may be in doubt and the vote may not be properly credited.

Replacement Ballots

For a paper ballot, the following replacement procedure has been devised: A member who has not received a ballot by September 20, 2007, or who has received a ballot but has accidentally spoiled it, may write to `ballot@ams.org` or Secretary of the AMS, 201 Charles Street, Providence, RI 02904-2294, USA, asking for a second ballot. The request should include the individual's member code and the address to which the replacement ballot should be sent. Immediately upon receipt of the request in the Providence office, a second ballot, which will be indistinguishable from the original, will be sent by first class or airmail. Although a second ballot will be supplied on request and will be sent by first class or airmail, the deadline for receipt of ballots cannot be extended to accommodate these special cases.

Nominations for President and Biographies of Candidates

The next several pages contain biographical information about all candidates. All candidates were given the opportunity to provide a statement of not more than 200 words to appear at the end of their biographical information.

Description of Offices

The **president** of the Society serves one year as president elect, two years as president, and one year as immediate past president. The president strongly influences, either directly or indirectly, most of the scientific policies of the Society. A direct effect comes through the president's personal interactions with both members of the Society and with outside organizations. In addition, the president sits as member of all five policy committees, is the chair of the Council's Executive Committee, and serves ex officio as a trustee. Indirect influence occurs as the president appoints chairs and members of almost all committees of the Society, including the policy committees. The president works closely with all officers and administrators of the Society, especially the executive director and the secretary. Finally, the president nominates candidates for the Nominating Committee and the Editorial Boards Committee. Consequently, the president also has a long-term effect on Society affairs.

The **vice president** and the **members at large of the**

AMS Council serve for three years on the Council. That body determines all scientific policy of the Society, creates and oversees numerous committees, appoints the treasurers and members of the Secretariat, makes nominations of candidates for future elections, and determines the chief editors of several key editorial boards. Typically, each of these new members of the Council also will serve on one of the Society's five policy committees.

The **Board of Trustees**, of whom you will be electing one member for a five-year term, has complete fiduciary responsibility for the Society. Among other activities, the trustees determine the annual budget of the Society, prices of journals, salaries of employees, dues (in cooperation with the Council), registration fees for meetings, and investment policy for the Society's reserves. The person you select will serve as chair of the Board of Trustees during the fourth year of the term.

The candidates for vice president, members at large, and trustee were suggested to the Council either by the Nominating Committee or by petition from members. While the Council has the final nominating responsibility, the groundwork is laid by the **Nominating Committee**. The candidates for election to the Nominating Committee were nominated by the current president, James G. Glimm. The three elected will serve three-year terms. The main work of the Nominating Committee takes place during the annual meeting of the Society, during which it has four sessions of face-to-face meetings, each lasting about three hours. The Committee then reports its suggestions to the spring Council, which makes the final nominations.

The **Editorial Boards Committee** is responsible for the staffing of the editorial boards of the Society. Members are elected for three-year terms from a list of candidates named by the president. The Editorial Boards Committee makes recommendations for almost all editorial boards of the Society. Managing editors of *Journal of the AMS*, *Mathematics of Computation*, *Proceedings of the AMS*, and *Transactions of the AMS*; and Chairs of the *Collquium*, *Mathematical Surveys and Monographs*, and *Mathematical Reviews* editorial committees are officially appointed by the Council upon recommendation by the Editorial Boards Committee. In virtually all other cases, the editors are appointed by the president, again upon recommendation by the Editorial Boards Committee.

Elections to the **Nominating Committee** and the **Editorial Boards Committee** are conducted by the method of approval voting. In the approval voting method, you can vote for as many or as few of the candidates as you wish. The candidates with the greatest number of the votes win the election.

A Note from AMS Secretary Robert J. Daverman

The choices you make in these elections directly affect the direction the Society takes. If the past election serves as a reliable measure, about 17 percent of you will vote in the coming election, which is comparable with voter participation in other professional organizations which allow an online voting option. This is not mentioned as encouragement for you to throw the ballot in the trash; instead, the other officers and Council members join me in urging you to take a few minutes to review the election material, fill out your ballot, and submit it. The Society belongs to its members. You can influence the policy and direction it takes by voting.

Also, let me urge you to consider other ways of participating in Society activities. The Nominating Committee, the Editorial Boards Committee, and the Committee on Committees are always interested in learning of members who are willing to serve the Society in various capacities. Names are always welcome, particularly when accompanied by a few words detailing the person's background and interests. Self-nominations are probably the most useful. Recommendations can be transmitted through an online form (`www.ams.org/committee-nominate`) or sent directly to the secretary (`secretary@ams.org`) or Office of the Secretary, American Mathematical Society, 312D Ayres Hall, University of Tennessee, Knoxville, TN 37996-1330.

PLEASE VOTE.

Nominations for President

Nomination of George Andrews

Richard Askey

Who is George Andrews? According to Freeman Dyson, George Andrews is the chief gardener in Ramanujan's Garden. This is true, but is only part of who George Andrews is. He is a number theorist with an honorary doctorate in physics. He is a long-time user of computers in his own research, who has written about the harm technology can do in mathematics education. He is primarily a problem solver, yet one paper with Rodney Baxter and Peter Forrester has had a major impact in mathematical physics with currently 490 citations in the Web of Science.

George Andrews received his Ph.D. from the University of Pennsylvania with a thesis on mock theta functions, written under Hans Rademacher. Google Scholar shows only three papers mentioning mock theta functions before 1966, when George published his thesis. The first was a paper of G. N. Watson. Next was Hardy's Harvard Tercentenary Lecture which only mentioned Ramanujan's last letter where mock theta functions were partially described and some examples given. The third was a paper written by Leila Dragonette [later Leila Bram] based on her thesis supervised by Rademacher.

These three contained most of what was known about mock theta functions before the 1966 papers of Andrews began a career that seemed to be one of "unfashionable pursuits", to use the title of a paper by Freeman Dyson which first appeared in the *Mathematical Intelligencer* and later as a chapter of his book, "From Eros to Gaia".

The first ten years of George's professional career were marked with many papers on basic hypergeometric functions, another then unfashionable pursuit; some combinatorics which was then starting to become fashionable; and some number theory, which has never gone out of fashion although the parts of it George dealt with were not fashionable then. George spent a year on leave at MIT. At Rota's suggestion, he edited the "Collected Papers" of P. A. MacMahon. He also wrote a book, "The Theory of Partitions", for the *Encyclopedia of Mathematics and Its Applications* series which Rota edited.

George came to the University of Wisconsin-Madison for a year, 1976-77. In the spring he went to Europe for two meetings in France. Since he was not teaching and airfare abroad was less expensive if you spent 21 to 45 days, he also went to Cambridge to look for old work in the Wren Library of Trinity College. This changed his life.

What George found was a bit over 100 pages of mathematical claims in the distinctive handwriting of Srinivasa Ramanujan. These pages had been found by J. M. Whittaker when he went to G. N. Watson's home to look at Watson's papers in preparation for writing an obituary article. To Whittaker, they looked like more of what had been published earlier by the Tata Institute, Ramanujan's *Indian Notebooks*. Robert Rankin and Whittaker deposited these pages at Trinity College. Probably the next person to look at them, after more than ten years, was George.

Unfashionable work sometimes plays a vital role, and in these pages there were some results about mock theta functions. Of course the words "mock theta functions" did not appear, just some series which George recognized. It is very unlikely that anyone else who was alive then would have recognized the real importance of these sheets, which must have been work Ramanujan had done after he returned to India. Ramanujan's only mention of mock theta functions was in his letter to Hardy about nine months after he had returned to India, and he wrote that he had recently found these functions.

George has worked part time for thirty years on the 600-plus results stated or hinted at in what he called Ramanujan's Lost Notebook. In December, 1987, these one-hundred-plus pages plus other unpublished work of Ramanujan were published by Narosa, with an introduction

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by George. Recently the first of what is likely to be four volumes giving proofs of almost all of Ramanujan's claims was published by Springer. Andrews and Bruce Berndt wrote the first volume and will be writing the remaining ones. This late work of Ramanujan may end up being the most important work he did, but time will have to tell since most of it has not really been understood yet. There are some gems in this collection. One led to the discovery of a partition statistic which Dyson had conjectured existed in a paper he wrote as an undergraduate at Trinity College. Ramanujan had proven that the number of partitions of $5n+4$ is always divisible by 5, the number of partitions of $7n+5$ is divisible by 7 and the number of partitions of $11n+6$ is divisible by 11, plus much more. Dyson found a way of breaking the partitions of $5n+4$ into five groups of equal size, and this method worked for $7n+5$, but he was unable to prove this conjecture. However, this method failed for $11n+6$. Dyson called his method of splitting into equal parts the rank, and conjectured that a different way should exist which works for $11n+6$. This he called the "crank". A way of doing the decomposition was found by Andrews and one of his Ph.D. students, Frank Garvan. This is only one of many gems which either have been obtained from the claims in these sheets or will be found when we understand more about what Ramanujan was doing.

Over the thirty years since these sheets were found, Andrews has done a lot of other work. One important result came about when Rodney Baxter solved the hard hexagon model in statistical mechanics, rediscovered the Rogers-Ramanujan identities and proved them, but had some other conjectures he could not prove. Kurt Mahler suggested Baxter write Andrews and ask for help. George was able to prove the remaining identities. This ultimately led to the ABF-model which was introduced in the Andrews, Baxter, Forrester paper mentioned earlier. In a different direction, he has been involved in computer algebra, helping to design a computer algebra package called Omega to work on complicated partition problems. This is joint work with people in Austria.

As a teacher and lecturer, George Andrews is excellent. He is the 2007–2009 George Polya lecturer for the MAA. Earlier he gave the Hedrick Lectures to the MAA, the J. S. Frame Lecture to Pi Mu Epsilon, the award lecture to the U. S. Math Olympiad Team and many other invited lectures. He won the Allegheny Region Distinguished Teaching Award from this MAA section. About ten years ago one of our undergraduates went to Penn State for a semester for their MASS program. When she came back she raved about the course she had taken from George Andrews. She is now chair of a high school mathematics department. Here is what she wrote in reply to my asking for comments.

> "I went to Penn State's MASS Program just so that I could take George Andrews' Number Theory class (because you told me to!), and I was not disappointed. The class was fabulous. Professor Andrews is a master teacher, and I have rarely had so much fun working so hard. He is clearly brilliant, and he made us believe that we too could begin to understand the mathematics that he loved. I can remember being in class, sitting on the edge of my chair, holding my breath in excitement, waiting to see what would come next. I can remember not being able to stop grinning because the work he was doing with us was so beautiful and so much fun. I spent hours upon hours doing anything and everything he asked of us both because I wanted him to be proud of my work and simply because it was so fascinating. One of the things that really stood out to me was how much grace and kindness he had. I've never regretted leaving the world of mathematics and becoming an educator, but a part of me will always wish that I could have studied with him more. When I first became a teacher, I decorated the back wall of my classroom to look like his Number Theory book. It gave me a chance to talk about some fun math with my students, it represented how much fun learning can be, and it reminded me of a wonderful teacher that I want to be more like."

Some of the service George has done at Penn State is chairing the Mathematics Department twice, which I consider cruel and inhuman punishment to have to do this a second time; served on a Dean Selection Committee and a Presidential Selection Committee; and along with many other committees has recently been chair of the Undergraduate Studies Committee in the Mathematics Department. The last is an indication of the importance George Andrews feels about education. He has a family background for this since his mother was a teacher trainer in the earlier part of the last century.

Nationally he has been on the committee which wrote problems for the Putnam Exam; served on the AMS Committee on Libraries, another area of concern for George; the AMS Committee on the History of Mathematics; as well as many others. George is a Member of the National Academy of Sciences, and a Fellow of the American Academy of Arts and Sciences. These are just a couple of indications that his mathematical work has made his "unfashionable pursuit" a thing of the past; it has become fashionable in a number of different areas. A very striking indication of this happened last year when the National Academy of Sciences made the first of an annual award for the best paper which appeared in the Proceedings of the National Academy of Sciences. The award went to a then graduate student in mathematics, Karl Mahlburg. The title of Mahlburg's paper is "Partition congruences and the Andrews-Garvan-Dyson crank". Even more recently, the place where mock theta functions fit into the rest of mathematics has been discovered by Kathrin Bringmann and Ken Ono.

In Dyson's article "Unfashionable Pursuits", he wrote the following: "The leading institutions of higher learning offer security and advancement to those who skillfully follow the fashion, and only a slim chance to those who do not." We have Penn State to thank for hiring someone who worked in an unfashionable field and rapidly recognized the gem they had hired.

The mathematics community needs someone who can explain what mathematics is and why it is important.

George Andrews can do this very well. The AMS needs a strong leader who is wise, is very good at listening to others, and knows how to inspire others to work at their highest level. George Andrews has done this not only with students, but also with colleagues in the mathematics department and with faculty members in other departments. He will do this as president of the American Mathematical Society.

Nomination of John W. Morgan

Hyman Bass and Robion Kirby

John Morgan is a mathematician's mathematician. He exemplifies many of the qualities that mathematicians celebrate—broad scientific vision, creative imagination, technical power and virtuosity, mathematical rigor, clarity and elegance of exposition, intellectual generosity, a gift for high level collaboration, and the sheer good-natured and unpretentious enjoyment of doing mathematics. And he has as well served the profession and demonstrated leadership at high levels with distinction. For example, he served on the Board of Trustees of MSRI, which he chaired during a period of important transition; on the Science Policy Committee of the AMS; on the Steering Committee of the IAS/Park City Institute; on the organizing committees of numerous conferences and congresses; as an editor of several premier journals (for example, the *Journal of the AMS*, *Inventiones*, *Geometry and Topology* [of which he was a founding editor]); and as chair of an outstanding mathematics department. It is hard to imagine anyone better suited to serve as president of the AMS.

How does mathematics advance? First, and perhaps foremost, through the creative insights and genius of mathematicians who solve problems of depth, importance, and pedigree. On this ground alone John Morgan's accomplishments are manifold, as we shall relate below.

But great and important new ideas do not automatically spread quickly or easily to the general mathematical culture, and it is only rarely that their discoverers are the best agents for such dissemination. Moreover, even the completeness and rigor of the new ideas and claims often require processing and elaboration by the broader community to be firmly established. These roles are some of the many ways that John Morgan has, throughout his career, advanced our field in timely and decisive ways. The rapid advancement and assimilation of many of the most significant mathematical developments in topology and geometry of the past several decades owe much to the writings and work of John Morgan. He is, in the words of Lee Shulman, a "steward of the discipline".

At the core of Morgan's mathematical interests are the problems of classifying manifolds—topological, smooth, analytic, and algebraic. A central thread in this century-long development is (are) the Poincaré Conjecture(s)—both the first, and the latest, chapters. The methods and ideas mobilized to treat the various instances of these problems have been absorbed from many of the central domains of mathematics—algebraic and geometric topology, differential geometry, algebraic geometry, Lie groups, geometric group theory, mathematical physics–and, at each turn, Morgan has boldly jumped in and become a leading expert in aspects of each of these areas.

Here are some of the milestones of Morgan's extraordinary career, which is a kind of tour of some of the main currents of contemporary mathematics.

0. Education: John received his Ph.D. at Rice University in 1969 (under Morton Curtis), one year after his B.S. Ed Connell once described teaching mathematics to Morgan as like pouring milk into a pitcher; no resistance. John's early work treated questions of surgery obstructions and transversality.

1. Sullivan's theory: This says, "The DeRham complex encodes all of the real algebraic topology of a smooth manifold." One of the first expositions of this theory was a widely disseminated 1972 set of lecture notes of Morgan and P. Griffiths; they were finally published in 1981, after popular demand.

2. Mixed Hodge structure on open varieties: With P. Deligne, P. Griffiths, and D. Sullivan, Morgan showed that the rational homotopy type of a compact Kähler manifold is a consequence of its cohomology. Morgan went on to establish a generalization of this to arbitrary (non-compact) varieties.

3. The Smith Conjecture: In 1938 Paul Smith proved that the fixed point set of a periodic orientation preserving homeomorphism of S^3, if not empty, is homeomorphic to a circle; and he asked if that circle must be unknotted. This was proved in 1979 for periodic diffeomorphisms. The proof was "assembled", largely through efforts of Morgan, by connecting several results of several authors, from different parts of mathematics: classical PL topology; Thurston's Uniformization Theorem for (closed, irreducible, atoroidal) Haken manifolds, which applies to one case of the Smith Conjecture; an equivariant version of Dehn's Lemma and the Loop Theorem, due to Meeks and Yau, that C. Gordon and R. Litherland showed could settle the remaining case of the Smith Conjecture; and a result on finitely generated subgroups of SL(2, **C**) derived from the Bass-Serre theory of group actions on trees, that was needed in the application of Thurston's Uniformization Theorem. This work was collected in a book edited by Morgan and the first author. A detailed proof of Thurston's theorem was not then publicly available. In an 88-page chapter, Morgan provides a detailed proof of many cases of this result (the other cases being later treated by C. McMullen). Morgan wrote, "Although the general outlines and the grand themes presented in this chapter are due entirely to Thurston, the detailed logical structure

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and explicit formulations of the intermediate results are often our own. They are our attempt at imposing a logical structure, suitable to us, on what we understood Thurston to be saying. As such, the responsibility for the correctness of this detailed matter falls on our shoulders."

4. Group actions on trees: Inspired in part by the application to the Smith Conjecture, Morgan, with Peter Shalen (and others), launched an important new branch of geometric group theory—group actions on Λ-trees—with deep applications to degenerations of hyperbolic structures on manifolds. This area continues actively in geometric group theory to this day. In terms of new concepts and methods, this represents one of the most original phases of Morgan's work. A Λ-tree, where Λ is a totally ordered abelian group, is just an ordinary simplicial tree when $\Lambda = \mathbf{Z}$; in general it is "tree-like", but with edges parametrized by intervals in Λ. An important case is when $\Lambda = \mathbf{R}$. For a hyperbolic n-manifold N with fundamental group Γ, the moduli space $H^n(\Gamma)$ of hyperbolic structures on N can be identified with the "character variety" of conjugacy classes of discrete faithful representations of Γ into SO(n,1). Morgan and Shalen construct a compactification of $H^n(\Gamma)$ whose boundary points correspond to actions of Γ on $\mathbf{R}$-trees. They recover and generalize the Thurston compactification, and obtain compactness criteria for $H^n(\Gamma)$ that are weak generalizations of Mostow Rigidity. Along the way they raise and partially answer some deep questions about group actions on real trees.

5. Smooth classification of 4-manifolds: In 1980 dimension 4 revealed its two faces. Michael Freedman extended the topological solution of the Poincaré Conjecture from higher dimensions to dimension 4. At about the same time, Simon Donaldson, using ideas from gauge theory, showed that, for simply connected smooth 4-manifolds the smooth classification is much more complicated. For example, there are infinite families of the same homotopy type, hence pairwise homeomorphic (by Freedman), yet not diffeomorphic. Morgan, in collaboration with Robert Friedman, Zoltán Szabó, and others, then launched an intense program of research on the Donaldson polynomials and applications to the smooth classification of complex algebraic surfaces. They found 4-manifolds with infinitely many smooth structures, and completed the smooth classification of elliptic surfaces. This work was synthesized in Morgan's book with Friedman, *Smooth 4-manifolds and Complex Surfaces* (1991).

6. Seiberg-Witten invariants: In 1994 the introduction of these monopole invariants provided a powerful new tool for studying 4-manifolds, and largely supplanted the approach to 4-manifolds using Donaldson's invariants. One of the first dramatic applications was the proof, by Morgan, Szabó, and Cliff Taubes, of a generalization of the "Thom Conjecture": *On a compact Kähler surface, a smooth holomorphic curve C with $C \cdot C \geq 0$ minimizes genus among smooth embedded Riemann surfaces in its homology class.* (A special case of this was independently proved by Kronheimer and Mrowka.) Liviu Nicolaescu, in his Featured Review of the above paper, writes, "In this truly remarkable paper, three of the best experts in gauge theory establish a generalization of a long-standing conjecture in 4-manifold topology."

7. Physical intuition for mathematicians: The remarkable confluence of theoretical physics, notably quantum and string theory, with the highest levels of pure mathematics has produced some historic role reversals. Instead of mathematical theorems being used to design experimental tests of physical theory, now physicists are using powerful physical intuition to predict subtle new results in pure mathematics, and then, in the place of physical experiments, mathematicians seek rigorous proofs to mathematically confirm the physicists' predictions. Many mathematicians were naturally eager to gain, in some mathematically friendly way, some of this uncanny physical intuition. To this end, the Institute for Advanced Study organized a remarkable special year (1996–97), making the Institute that year a kind of Mount Olympus of mathematics. John Morgan played an important part in that year, documented in two thick volumes, *Quantum Fields and Strings: A Course for Mathematicians.* In the course of such physically inspired mathematics, Morgan, together with R. Friedman and A. Borel, produced an important memoir precisely describing the moduli spaces of (almost) commuting pairs and triples in a compact connected semi-simple Lie group K; this yielded proofs of conjectures of Witten about flat K-principal bundles over tori of dimensions 2 and 3.

8. The Poincaré Conjecture: At ICM-Madrid in 2006, Grigori Perelman was awarded the Fields Medal for his proof of the original (3-dimensional) Poincaré Conjecture, and even the Geometrization Conjecture of Thurston. Perelman's proof was sketched in three technical papers, addressed to experts, and posted on the arXiv in 2002 and 2003. The approach, due originally to Hamilton, is based on detailed study of the Ricci flow. Several efforts around the world undertook to provide complete and convincing details of this monumental result. It was essential for the Fields Medal that confirmation of Perelman's proof be firmly established. This certification was provided in the ICM presentation of Perelman's work by John Morgan, based on the monograph exposition of the proof that Morgan and Gang Tian had produced. Morgan had given a course of lectures on this at the Park City Institute. The Morgan-Tian book will surely remain a definitive reference for Perelman's results for years to come. (Several others, notably B. Kleiner and J. Lott, contributed generously to the dissemination of details of Perelman's proof. Also Huai-Dong Cao and Xi-Ping Zhu have published a write-up of the proof.)

We find this mathematical trajectory breathtaking. At heart a geometer, Morgan is yet a universal mathematician, always close to the core of mathematics. As president of the AMS he would represent the finest expression of the mathematical spirit.

Biographies of Candidates 2007

Biographical information about the candidates has been supplied and verified by the candidates.

Candidates have had the opportunity to make a statement of not more than 200 words (400 words for presidential candidates) on any subject matter without restriction and to list up to five of their research papers.

Candidates have had the opportunity to supply a photograph to accompany their biographical information.

Candidates with an asterisk (*) beside their names were nominated in response to a petition.

Abbreviations: American Association for the Advancement of Science (AAAS); American Mathematical Society (AMS); American Statistical Association (ASA); Association for Computing Machinery (ACM); Association for Symbolic Logic (ASL); Association for Women in Mathematics (AWM); Canadian Mathematical Society, Société Mathématique du Canada (CMS); Conference Board of the Mathematical Sciences (CBMS); Institute for Advanced Study (IAS), Institute of Mathematical Statistics (IMS); International Mathematical Union (IMU); London Mathematical Society (LMS); Mathematical Association of America (MAA); Mathematical Sciences Research Institute (MSRI); National Academy of Sciences (NAS); National Academy of Sciences/National Research Council (NAS/NRC); National Aeronautics and Space Administration (NASA); National Council of Teachers of Mathematics (NCTM); National Science Foundation (NSF); Society for Industrial and Applied Mathematics (SIAM).

President

George E. Andrews

Evan Pugh Professor of Mathematics, Penn State University.

Born: December 4, 1938, Salem, Oregon, USA.

Ph.D.: University of Pennsylvania, 1964.

AMS Committees: Fellowship Policy, 1989; Library Committee, 1994–1997; History of Mathematics Editorial Board, 1996–2004 (Chair, 1996–2000); AMS-MAA Committee on Research in Undergraduate Mathematics Education, 1998–2001; AMS-MAA-SIAM Committee on Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student, 1998–2001; Editorial Boards Committee, 1999–2002; Contemporary Mathematics Editorial Board, 2005–2008.

Selected Addresses: CBMS Regional Conference, Arizona State University, 1985; Invited Address, American Association for the Advancement of Science, Annual Meeting, 1996; Invited Panelist, Teaching of First Year College-Level Mathematics, ICM, Berlin, 1998; Rademacher Lectures, University of Pennsylvania, 2003; Plenary Speaker, British Mathematics Colloquium, Birmingham, U.K., 2003.

Additional Information: Head, Penn State Mathematics Department, 1980–1982, 1995–1997; Guggenheim Fellowship, 1982–1983; Allegheny Region Distinguished Teaching Award (MAA), 1993; Member, American Academy of Arts and Sciences, 1997; Doctorate in Physics (hon.), Parma U. (Italy), 1998; University of Pennsylvania Centennial Award, 1999; D. Sc. (hon.), U. of Florida, 2002; Member, National Academy of Sciences, 2003; D. Math. (hon.), University of Waterloo (Can.), 2004; MAA Polya Lecturer, 2007–2009.

Selected Publications: 1. with R. J. Baxter and P. J. Forrester, Eight-vertex SOS model and generalized Rogers-Ramanujan-type identities, *J. Stat. Phys.* **35** (1989), 193–266. MR**748075 (86a:82001)**; 2. with K. Ono and J. Jimenez Urroz, q-series identities and values of certain L-functions, *Duke Math. Journal* **108** (2001), no. 3, 395–419. MR**1838657 (2002e:11055)**; 3. with K. Alladi and A. Berkovich, A new four parameter q-series identity and its partition implications, *Invention. Math.* **153** (2003), no. 2, 231–260. MR**1992013 (2004g:05018)**; 4. Partitions with short sequences and mock theta functions, *Proc. Nat. Acad. Sci.* **102** (2005), No. 13, 4666–4671. MR2139704 **(2006a:11131)**; 5. with Bruce Berndt, *Ramanujan's Lost Notebook, Part I*, Springer, New York, 2005. MR**2135178 (2005m:11001)**.

Statement: Mathematics is the natural language of science and technology. The American Mathematical Society is the principal organization in the United States working to advance all aspects of mathematics. It is therefore a very great honor to be nominated for the presidency of the AMS. If elected, I will do everything in my power to aid the Society in contributing to the vitality of mathematics. However, it is clear that in the short span of two years, a President can hope to influence only a few important

matters in any significant way. Here are four issues of great concern to me:

Funding Mathematical Research: Historically, the NSF has played a major role in advancing mathematical research with individual investigator grants. Well-intentioned efforts to maintain grant size have necessarily led to fewer grants than might otherwise be possible. Canada's NSERC spreads its research funds widely by issuing small research grants. When I have served on NSF panels, I have always been saddened by the fact that many meritorious proposals were not supported because of insufficient funds. It appears to me that the Canadians do a better job with smaller grants making a wider impact. I would suggest presenting to the NSF the possibility of launching a pilot program patterned on the NSERC model.

Pure vs. Applied: The AMS has in the past supported a broad view of mathematics, and this needs continued emphasis in the future. In the light of current funding problems, pressures rise to narrow the scope of mathematical endeavors. This tends to reward primarily the currently successful, rather than spreading efforts to advance numerous branches of mathematics. Broad support for both pure and applied work is in the best interests of everyone. Who knows where the next major breakthroughs will emerge?

Mathematics Education: By a variety of measures, most of us are aware of the faltering of mathematics education in primary and secondary schools. The AMS should be in the forefront of promoting programs that assist current and future teachers in gaining the mathematical knowledge necessary for the mathematics they teach, and it should promote programs that assist in apprenticing future teachers to master teachers. In addition, a skeptical eye should be cast on a variety of technological or curricular reforms that promise a royal road to excellence. It is encouraging to note the new guidelines published by the National Council of Teachers of Mathematics; these delineate what students in the early grades need to know. Efforts of this nature should be supported by the AMS.

AMS Fellows Program: I support the decision of the AMS Council to reconsider the establishment of a Fellows Program, and concur with Ron Stern's essay in favor of the program in the August 2006 *Notices*. This program would be a useful mechanism for publicly recognizing the accomplishments of mathematicians, and help us to make the case for the importance of mathematics, particularly to administrators. I believe we should rethink the way in which Fellows would be selected in order to minimize the perception that the program would split the AMS into first and second class citizens. In particular, the original proposal has an "initial implementation" wherein any AMS member who had given either an AMS or ICM invited address or had been awarded an AMS prize would be invited to become a fellow. If this initial mechanism were made one of the permanent components of selection, then some of the concerns about domination by an elite should be mitigated.

John W. Morgan

Professor of Mathematics, Columbia University.

Born: March 21, 1946, Philadelphia, PA, USA.

Ph.D.: Rice University, 1969.

AMS Committees: Science Policy Committee, 1992–1995 (Chair, 1995); Chair, Committee to Select the Veblen Prize, 2001.

Selected Addresses: 45-minute address, International Congress, Berkeley, 1986; Invited Address, Lambda-trees and their application, Joint Summer Meeting, 1990; Special Lecture on the Poincaré Conjecture, Joint Mathematics Meeting, 2005; International Congress, Madrid, Spain, 2006.

Additional Information: Member, Board of Trustees, MSRI, 1986–1994 (Chair, 1989–1994); Member, European Academy of Sciences; Member, Steering Committee of IAS/Park City Summer Institute in Mathematics, 1994–2000 and 2002–2007; Editor, *Journal of the AMS,* 2004–.

Selected Publications: 1. with Z. Szabó and C. Taubes, A product formula for the Seiberg-Witten invariants and the generalized Thom Conjecture, *J. Diff. Geom.*, **44** (1996) No. 4, 706–788. MR**1438191 (97m:57052)**; 2. *Seiberg-Witten Equations and Applications to the Topology of Smooth Four-manifolds*, Lecture Notes in Mathematics, Princeton University Press, 1996. MR**1367507 (97d:57042)**; 3. with R. Friedman and E. Witten, Vector bundles and F-theory, *Comm. Math. Phys.,* **187** (1997), No. 3, 679–743. MR**1468319 (99g:14052)**; 4. with A. Borel and R. Friedman, Almost Commuting Elements in Compact Lie Groups, *Memoirs of the AMS*, **157** (2002), No. 747. MR**1895253 (2003k:22006)**; 5. with Gang Tian, Ricci Flow and the Poincaré Conjecture, DG/0607607 (to appear in the Clay Mathematical Monographs).

Statement: The American Mathematical Society is the largest and most visible mathematics organization in the world. It is devoted to promoting mathematical research and the uses of this research, to strengthening mathematical education, and to fostering an awareness and appreciation of mathematics and its connections to the other sciences and to everyday life. It serves as the public face of mathematics. I would consider it a great honor to serve as the Society's president.

In many important respects, the state of mathematics has never been better. The research enterprise continues at a level of accomplishment and a scope of activity never before seen in history. Long-standing central problems in pure mathematics have been resolved. At the same time, the applications of mathematical research reach ever more areas of human endeavor—for example, biology and finance. Nevertheless, financial support for mathematics has been flat or declining (in real terms) for years. In addition, as mathematics becomes broader and more specialized, it is harder for its practitioners to understand what is being done outside their own specialties. It is even harder for the nonmathematician to have any appreciation of mathematical advances and their significance. The small

number of undergraduate mathematics majors, especially among traditionally under-represented groups, is also cause for concern.

Communicating the nature and significance of mathematical work is in my view of utmost importance in addressing these issues. Communicating and collaborating across mathematical fields is essential to keeping our subject from disintegrating into specialized subdisciplines, uninformed by advances in other areas or by applications to areas outside mathematics. Communicating effectively the power and beauty of our subject to mathematics students and prospective mathematics students, and more generally to all students in our courses, whatever their primary intellectual interest, is essential to maintaining the flow of talented young people into the subject. Communicating our endeavors and successes and the significance of mathematics in modern life to the governmental funding agencies and Congress is essential if we expect to continue to receive their support. Finally, communicating the nature of our subject to nonmathematicians is crucial in the long term if we expect them to understand the role of mathematics in modern life and to believe in the practical effectiveness and the intellectual sweep of our subject.

As the experiences with both Fermat's Last Theorem and the Poincaré Conjecture demonstrate, there is a wide interest in the advances in even the purest areas of mathematics. There is, I believe, a receptive audience among the general public, among our undergraduate students, among other scientists, and among mathematicians themselves for stories about the major conjectures and advances in our subject—provided that these stories are told in a way that is accessible to them and that the stories reveal the power, scope, challenge and beauty of the subject.

If elected president of the Society, I will lead an effort to develop new ways and to enhance existing mechanisms to tell these stories, with the goal of increasing the understanding of the excitement and wonder of mathematics.

Vice President

Harold M. Stark

Professor, Department of Mathematics, University of California, San Diego.

Born: August 6, 1939, Los Angeles, California, USA.

Ph.D.: University of California at Berkeley, 1964.

AMS Offices: Nominating Committee, 1983–1985 (Chair, 1984–1985); AMS Council, 1988–1991; Editorial Boards Committee, 1995–1998 (Chair, 1996–1997).

AMS Committees: Committee to select hour speakers for Annual and Summer Meetings (reorganized as the Program Committee), 1975–1977; Committee to select summer institutes, 1976–1978 (Chair, 1978); Associate Editor, Research Announcements, AMS Bulletin, 1982–1988; Search Committee for new AMS Secretary, 1986; Committee to Select Cole Prize Winner, 1991–1993 (Chair, 1992).

Selected Addresses: Hour talk, Special session in number theory, Annual Meeting, Houston, 1967; 50-minute address, International Congress of Mathematicians, Nice, 1970; Invited address, MAA Annual Meeting, Las Vegas, 1972; Hour talk, Special session on the history of contemporary mathematics, Annual Meeting, 1981; Invited Address, Gauss-Dirichlet conference, Göttingen, 2005.

Additional Information: Elected to American Academy of Arts and Sciences, 1983; William Lowell Putnam Problem Committee, 1984–1987 (Chair, 1987); Board of Trustees, MSRI, 1990–1994; Chair, Department of Mathematics, UCSD, 1990–1994; University of California at Irvine Program Review Committee, 2007; Elected to the National Academy of Sciences, 2007.

Selected Publications: 1. A complete determination of the complex quadratic fields of class-number one, *Michigan Math. J.,* **14** (1967), 1–27. MR**0222050 (36 #5102);** 2. Some effective cases of the Brauer-Siegel theorem, *Inv. Math.*, **23** (1974), 135–152. MR**0342472 (49 #7218);** 3. Values of L-functions at s=1 (IV), first derivatives at s=0, *Adv. Math*, **35** (1980), 197–235. MR**0563924 (81f:10054);** 4. Galois theory, algebraic number theory and zeta functions, *From Number Theory to Physics*, Springer Verlag, Berlin, 1992, 313–393. MR**1221105 (94d:11079);** 5. with Audrey Terras, Zeta functions of finite graphs and coverings (II), *Adv. Math*, **154** (2000), No. 1, 132–195. MR**1780097 (2002f:11123).**

Statement: In my 43 years in the profession, I have seen many changes within the AMS, the profession, and society in general. The all white male model for the faculty of a mathematics department that existed when I began is gone forever. The predominately white male model has not yet been vanquished. Salaries have gone up; housing prices have gone up even more. Mathematicians at the top are doing very well; those in academia at the bottom have temporary jobs teaching large lectures at outrageously low salaries with no benefits. I have seen talented men and women not get tenure and then hang on for years in temporary jobs before washing out. Can't we do better?

We cannot ignore the changes going on around us. In my opinion, high school students entering universities today are, on average, more poorly prepared for university mathematics courses than their predecessors of three and four decades ago. This is not the way things are supposed to be. Our government is not distinguished by its love or understanding of science. Besides its primary mission of advancing mathematical research, the AMS must continue to communicate the beauty and value of mathematics to the public and government.

Bernd Sturmfels

Professor of Mathematics and Computer Science, University of California at Berkeley.
Born: March 28, 1962, Kassel, Germany.
Ph.D.'s: University of Washington, Seattle, 1985 and Technische Universität Darmstadt, Germany, 1985.
AMS Offices: Member of the Council, JAMS representative, 2002–2004.
AMS Committees: Eastern Section Program Committee, 1994–1996; Journal of the AMS, Editorial Board, 1998–2004; Colloquium Lecture Committee, 2005–2008.
Selected Addresses: AMS Invited Address, San Antonio, TX, 1993; DMV Invited Address, German Mathematical Society, Mainz, 1999; CBMS Lectures on Solving Systems of Polynomial Equations, Texas A&M, 2002; Erdös Memorial Lecture, AMS-SMM Joint Meeting, Houston, TX, 2004; MAA-AMS Invited Address, Atlanta, GA, 2005.
Additional Information: Alfred Sloan Research Fellow, 1991–1993; National Young Investigator (NSF), 1992–1997; David and Lucile Packard Fellowship, 1992–1997; MAA Lester Ford Prize for Expository Writing, 1999; Miller Research Professor, UC Berkeley, 2000–2001; John von Neumann Professor, TU Munich, 2003; Hewlett-Packard Research Professor, MSRI Berkeley, 2003–2004; Clay Mathematics Institute Senior Scholar, 2004; MAA Polya Lecturer, 2005–2007; Board of Governors, IMA Minneapolis, 2005–2008; Alexander von Humboldt Senior Fellow, Berlin, Germany, 2007–2008.
Selected Publications: 1. with A. Bjorner, M. Las Vergnas, N. White and G. Ziegler, *Oriented Matroids*, Cambridge University Press, 1993. MR**1744046 (2000j:52016)**; 2. *Gröbner Bases and Convex Polytopes*, AMS, University Lectures, No. 8, Providence, RI, 1996. MR**1363949 (97b:13034)**; 3. with M. Saito and N. Takayama, *Gröbner Deformations of Hypergeometric Differential Equations*, Algorithms and Computation in Mathematics, No. 6, Springer, Heidelberg, 1999. MR**1734566 (2001i:13036);** 4. with E. Miller, *Combinatorial Commutative Algebra,* Graduate Texts in Mathematics, Springer Verlag, New York, 2004. MR**2110098 (2006d:13001);** 5. with L. Pachter, *Algebraic Statistics for Computational Biology*, Cambridge University Press, 2005. MR**2205865 (2006i:92002).**
Statement: The American Mathematical Society plays a fundamental role in supporting research mathematics and the community of mathematicians. It does this through its publications programs, meetings and conferences, employment services, and awarding of prizes and fellowships, and, more recently, through its initiatives in science policy and education. While I am fully dedicated to these important core missions, the following issues seem particularly important to me: 1. Programs aimed at supporting young mathematicians from diverse backgrounds. I have been fortunate to having worked with many extraordinary students and postdocs. The AMS has a special responsibility to attract the best talent to our profession, and this includes women and minorities. 2. We need to be open-minded and confident about our own discipline. Mathematics is a key player in the bigger scientific landscape. My recent interactions with the life sciences led me to believe that the historic division into pure and applied mathematics needs to be re-examined. Emphasizing the unity of mathematics, and the important role it plays in the real world, will actually strengthen rather than undermine the intellectual core and intrinsic beauty of our field. 3. Collaboration with other scientific organizations and policy issues, domestically and internationally. I would like to help in fostering the international collaborations between the AMS and foreign organizations, such as the European Mathematical Society, and in coordinating the efforts by the AMS and other domestic groups (MAA, SIAM, AAAS, etc.) in representing the community of all mathematicians in the society at large.

Trustee

Jean E. Taylor

Visitor, Courant Institute of Mathematical Sciences, NYU, and Professor Emerita, Mathematics Department, Rutgers University.
Ph.D.: Princeton University, 1973.
AMS Offices: Member at Large of the Council, 1984–1988 (Executive Committee, 1986–1988); Vice President, 1994–1996; Trustee, 2003–2008.
AMS Committees: Nominating Committee, Program Committee for National Meetings, Steele Prize Committee, Science Policy Committee, Committee on Meetings and Conferences, Committee on the Profession, and others.
Selected Addresses: AMS Invited Address, 1977; AMS-MAA Invited Address, 1989; MAA Hedrick Lectures, 1998; Plenary Lecturer, Mathematical Challenges Meeting, 2000; AWM Emmy Noether Lecturer, 2003; 16 AMS Special Sessions.
Additional Information: D. Sc. Honoris Causa, Mount Holyoke College; Alfred P. Sloan Foundation Fellow; Fellow of American Academy of Arts and Sciences, Association for Women in Science, and American Association for the Advancement of Science; Member at Large of Board and its Executive Committee, Black Rock Forest Consortium; Scientific Board, American Institute for Mathematics; Editorial Board of Interfaces and Free Boundaries, Experimental Mathematics. Past activities: President, AWM; Board of Directors, Program Committee, and Section A Chair, AAAS; Executive Committee, CBMS.
Selected Publications: 1. The structure of singularities in soap-bubble-like and soap-film-like minimal surfaces, *Ann. of Math. (2),* **103** (1976), No. 3, 489–539. MR**0428181 (55 #1208a)**; 2. with E. Bombieri, Which distributions of matter diffract? An initial investigation. International workshop on aperiodic crystals (Les Houches, 1986), *J. Physique,* **47** (1986), No. 7, C3-19–C3-28. MR**0866320 (88a:52015)**; 3. Motion of curves by crystalline curvature, including triple junctions and boundary points, *Differential Geometry:*

Partial Differential Equations on Manifolds, Proc. Sympos. Pure Math., vol. 54, Part 1, Amer. Math. Soc., Providence, RI, 1993, pp. 417–438. MR**1216599 (94c:53012)**; 4. Some mathematical challenges in materials science, *Bull. Amer. Math. Soc.*, **40** (2003) No. 1, 69–87. MR**1943134 (2004h:74064).**

Statement: I believe in the value of the AMS, and take very seriously (though not always in a serious manner) my responsibility as a Trustee for its financial health and the way it spends its money. Mathematics is in a kind of golden age with regard to public visibility and respect. Long may it last! We need to do our best to encourage this appreciation and use it to increase funding for research in all of mathematics. We need to address the continuing dearth of women in tenured positions in research universities; achieving tenure is the leakiest point in the leaky pipeline. In particular, we should continue to address the difficulties both men and women face in trying to manage career and family and personal health. We should continue fostering interdisciplinary as well as basic mathematics research. Finally, I believe that there are very serious ills in the world, high among them environmental issues such as global warming. Now that my kids are grown (all mathematicians!), I personally am heeding the call of John Holdren, President of AAAS, for scientists to give at least 10% of their time to such issues.

Karen Vogtmann

Professor of Mathematics, Cornell University.

Born: July 13, 1949, Pittsburg, California, USA.

Ph. D.: University of California, Berkeley, 1977.

AMS Offices: Vice President, 2003–2006.

AMS Committees: Fellowship Committee, 1989–1990 (Chair, 1990); Member at Large, Council, 1997–2000; Committee on Meetings and Conferences, 1997–2003 (Chair, 2000–2003); Associate Editor, Research/Expository surveys, *Bulletin of the AMS*, 1998–2000; Executive Committee, 1999–2003; Committee on Education, 2003–2006.

Selected Addresses: Hour Address, AMS Annual Summer Meeting, Salt Lake City, UT, August, 1987; Lecture series, Program for Women in Mathematics, IAS, Princeton, NJ, May, 2005; 45-minute address, International Congress of Mathematicians, Madrid, Spain, August, 2006; AWM Noether Lecture, January, 2007; Minicourse, 20th Birthday Celebration of Outer Space, Luminy, France, February, 2007.

Additional Information: Member of European Mathematical Society and Association for Women in Mathematics.

Selected Publications: 1. with M. Culler, Moduli of graphs and automorphisms of free groups, *Invent. Math.*, **84** (1986), No. 1, 91–119. MR**0830040 (87f:20048);** 2. with A. Hatcher, Cerf theory for graphs, *J. London Math. Soc.*, **58** (1998), No. 3, 633–655. MR**1678155 (2000e:20041);** 3. with L. Billera and S. Holmes, Geometry of the space of phylogenetic trees, *Advances in Applied Math*, **27** (2001), No. 4, 733–767. MR**1867931 (2002k:05229);** 4. with M. R. Bridson, The symmetries of outer space, *Duke Math. J.*, **106** (2001), No. 2, 391–409. MR**1813435 (2001k:20084);** 5. with Jim Conant, Infinitesimal operations on complexes of graphs, *Math. Ann.*, **327** (2003), No. 3, 545–573. MR**2021029 (2004m:17026).**

Statement: The current activities of the American Mathematical Society include the traditional ones of running well-organized meetings and conferences to facilitate mathematical interactions, disseminating and preserving mathematics through its publishing program, cooperating and working with other mathematical and scientific societies in the U.S. and abroad, and honoring outstanding contributions to the field by awarding prizes and sponsoring distinguished lecture series. More recent initiatives include promoting awareness of mathematics and mathematicians in Washington and by the general public, providing Internet tools for research in mathematics, helping to make mathematics literature readily available in every part of the world by supporting efforts to digitize the mathematics literature, actively encouraging the full participation of women and minorities in mathematics and supporting efforts to encourage young people to become seriously interested in mathematics through high school summer programs.

I fully support all of these activities, and believe that the American Mathematical Society is generally doing an excellent job with them. I have enjoyed my experience in various roles in the society leadership, which have included Council member, Executive Committee member, chair of the Committee on Meetings and Conferences, and vice president, and through them have developed a good overall sense of the functioning of the Society. I would be honored to serve now as a Trustee, and will work to ensure that the Society remains financially healthy, capable both of continuing its currently successful programs and of responding to new needs in the mathematics community as they arise.

Member at Large

José A. de la Peña

Professor of Mathematics, Instituto de Matemáticas, Universidad Nacional Autónoma de México.

Born: August 7, 1958, Monterrey, México.

Ph.D.: Universidad Nacional Autónoma de México, 1983.

Selected Addresses: Plenary Speaker, 2nd. Joint Meeting AMS-Sociedad Matemática Mexicana, Guanajuato, México, 1996; Plenary Speaker, Coloquio Latinoamericano de Algebra, Mendoza, Argentina, 2000; Plenary Speaker, Coloquio Latinoamericano de Algebra, Colonia, Uruguay, 2005; Invited Lecturer, Workshop on Representation Theory of Algebras, Torun, Poland, 2007.

Additional Information: President of the Mexican Mathematical Society, 1988–1990; Director of the Instituto de

Matemáticas, Universidad Nacional Autónoma de México, 1996–2004; President of the Mexican Academy of Sciences, 2002–2004; TWAS Award 2002 in Mathematics (given by the Third World Academy of Sciences), Trieste, Italy; National Award in Natural and Exact Sciences (México), 2005; Humboldt Award, Humboldt Foundation, Germany, 2006; Deputy Director for Science at the National Council for Science and Technology, 2007.

Selected Publications: 1. with R. Martínez, Automorphisms of representation finite algebras, *Invent. Math.*, **72** (1983), No. 3, 359–362. MR**0704396 (84h:16018);** 2. with P. Gabriel, Quotients of representation-finite algebras, *Comm. in Algebra*, **15** (1987), No. 1–2, 279–307. MR**0876981 (88c:16025);** 3. with H. Lenzing: Wild canonical algebras. *Math. Z.*, **224** (1997), No. 3, 403–425. MR**1439198 (99a:16012);** 4. with A. Skowronski, Geometric and homological characterizations of polynomial growth strongly simply connected algebras, *Invent. Math.*, **126** (1996), No. 2, 287–296. MR**1411134 (97i:16007);** 5. with D. Eisenbud, Chains of maps between indecomposable modules, *J. Reine Angew. Math.,* **504** (1998), 29–35. MR**1656826 (2000a:16001).**

Statement: Mathematics is a science with a deep impact in education, general knowledge, and other sciences. As a consequence, organized groups of mathematicians, such as the AMS, face many challenges: the development of stronger ties with teachers at all levels, with scientists in academic, industry and government positions and with people in the administration of science; the search for funding opportunities for mathematics; the need to attract more young students to mathematical careers; the search for employment opportunities for young researchers, among others. Working in Mexico, I have been concerned with these problems. I was responsible for the design of the Hall of Mathematics at the Museum of Sciences of the National University; at the Academy of Sciences, we developed a program for training school teachers to teach mathematics in attractive ways, among other actions. Collaboration among individuals and institutions of different countries is of fundamental importance for the development of mathematics around the world. Along the years, I have had a rich experience in research, collaboration with mathematicians of many countries, and supervising the Ph.D. work of students from Germany, Switzerland, Venezuela, Canada and China. In recent years, the Mexican and American communities have developed stronger institutional ties, for example through the organization of the AMS-SMM Joint Meetings. As a member of the Council, I would contribute to enhance actions between the AMS and the Mexican mathematical community.

Robert W. Ghrist

Associate Professor, Mathematics, University of Illinois, Urbana-Champaign; Research Faculty, UIUC Coordinated Science Laboratory; Research Faculty, UIUC Information Trust Institute.

Born: March, 1969, Euclid, Ohio, USA.

Ph.D.: Cornell University, Applied Mathematics, 1995.

AMS Committees: Committee on Committees, 2007–2009.

Selected Addresses: Journée de Rham, Lausanne, 2004; AMS Sectional Meeting, Invited Lecture, Evanston, 2004; National Science Foundation MPS Distinguished Lecture, Arlington, 2004; International Congress of Mathematicians, Dynamical Systems Session, Madrid, 2006; Joint Mathematics Meeting, Current Events Bulletin, New Orleans, 2007.

Additional Information: Excellence in Undergraduate Teaching Award, University of Texas, Austin, Mathematics Department, 1997; National Science Foundation CAREER awardee, 2002; National Science Foundation PECASE (Presidential Early Career Award for Scientists and Engineers) awardee, 2004; Lead Investigator, DARPA program "Sensor Topology and Minimal Planning", 2006–; University Scholar, University of Illinois, Urbana-Champaign, 2007.

Selected Publications: 1. with P. Holmes and M. Sullivan, *Knots and Links in Three-Dimensional Flows*, Lecture Notes in Mathematics, Volume 1654, Springer-Verlag, 1997. MR**1480169 (98i:58199);** 2. with J. B. Van den Berg and R. C. Vandervorst, Morse theory on braids with applications to Lagrangian systems, *Invent. Math.,* **152** (2003), No. 2, 369–432. MR**1974892 (2004e:37025);** 3. with J. Etnyre, Generic hydrodynamic instability for curl eigenfields, *SIAM J. Applied Dynamical Systems*, **4** (2005), No. 2, 377–390. MR**2173533 (2006e:37117);** 4. with V. Peterson, The geometry and topology of reconfiguration, *Advances in Applied Mathematics*, **38** (2007), 302–323; 5. with V. de Silva, Homological sensor networks, *Notices Amer. Math. Soc.*, **54** (2007), No. 1, 10–17. MR**2275921.**

Statement: This is a golden age of mathematical research, in which elegance and depth are paired with a renewed commitment to fundamental impact outside of mathematics. We as mathematicians face the pleasant challenge of transferring the tools and ideas created daily to practitioners and theoreticians in neighboring fields of science, engineering, and more. I believe the AMS has an important role to play in promoting both the beauty and utility of our profession, and in assisting the mathematical community with finding creative opportunities for collaboration and funding of our research.

Rebecca F. Goldin

Associate Professor, Mathematical Sciences, George Mason University.

Born: August 24, 1971, Philadelphia, PA, USA.

Ph.D.: Massachusetts Institute of Technology, 1999.

Selected Addresses: "Hypertoric varieties," International Conference on Toric Topology, Osaka, Japan (2006); "Symplectic Geometry and Orbifolds," University of Florence, Italy (2006); "How to Use (and How Not to Use) Statistics in Reporting," Institute for Humane Studies, Mini-workshop for Journalism Internship Program (2006); "Hypertoric varieties and their orbifold Cohomology," Geometry Seminar, University of Maryland (2006); "Chen-Ruan Cohomology for global quotients by abelian Lie groups," Workshop on Quantum Cohomology of Stacks, Institut Henri Poincaré (2007).

Additional Information: NSF Postdoctoral Fellowship, 1999–2002; NSF Disciplinary Grant in Geometric Analysis, 2003–2007; Currently the Director of Research at Statistical Assessment Service (STATS), a nonprofit media watchdog group affiliated with George Mason University. This work is supported by a Statistical Assessment Service Grant. 2004–current; NSF Disciplinary Grant in Geometric Analysis, 2006–2009; First recipient of the Ruth I. Michler Memorial Prize of the Association for Women in Mathematics (2007).

Selected Publications: 1. An effective algorithm for the cohomology ring of symplectic reductions, *Geom. Funct. Anal.,* **12** (2002), No. 3, 567–583. MR**1924372 (2003m:53148)**; 2. with Tara Holm and Lisa Jeffrey, Distinguishing the chambers of the moment polytope, *Journal of Symplectic Geom.,* **2** (2003), No. 1, 109–131. MR**2128390 (2005j:53093)**; 3. with A. L. Mare, Cohomology of symplectic reductions of generic coadjoint orbits, *Proc. Amer. Math. Soc.*, **132** (2004), No. 10, 3069–3074. MR**2063128 (2005e:53134);** 4. with Shaun Martin, Cohomology pairings on the symplectic reduction of products, *Canad. Math.,* **58** (2006), No. 2, 362–380. MR**2209283**; 5. with Tara Holm and Allen Knutson, Orbifold cohomology of torus quotients, *Duke Math. J.,* to appear.

Statement: The AMS plays a central role within the mathematical community, but it also plays a leadership role in publicizing the importance of mathematics for human progress. The contribution that mathematics makes to how people live and the decisions they make day to day is vastly underestimated, as is its impact on how the government makes laws and how society evolves. Many indicators have highlighted the importance of mathematical sophistication at a high level for an educated public and government, and yet we find ourselves with little ability to communicate the importance of our work to the public at large. As a Council member (and as Director of Research at STATS), I hope to work with the Society towards better funding for mathematics in higher education as well as for grades K–12, and lower tolerance for innumeracy. We need more talented people to choose careers in teaching and research. We need the media to raise public standards by reporting with mathematical sophistication. Mathematicians can communicate the beauty and depth of abstract thinking while also acknowledging the importance of our work to the "real world" and selling it to non-mathematicians. As funding for research and for universities continues to be threatened, we need to vocalize the importance of mathematics and its discoveries. Basic progress depends on it.

Helen G. Grundman

Professor of Mathematics, Department of Mathematics, Bryn Mawr College, Bryn Mawr, PA.

Born: July 16, 1957, W. Reading, PA, USA.

Ph.D.: University of California, Berkeley, 1989.

AMS Committees: Ad-hoc Task Force on Employment, 1991–1992; Presidential Task Force on Membership, 1998–2000; Committee on Professional Ethics, 2004–2007.

Selected Addresses: AMS Special Session on Algebraic Geometry, Denton, TX, 1990; AMS Special Session on Modular Forms and Related Topics, San Antonio, TX, 1993; AMS Special Session on Modular Forms, Elliptic Curves, and Related Topics, Washington, DC, 2000; AMS Special Session on Modular Forms, Elliptic Curves, and Related Topics, Baltimore, MD, 2003; Maine-Quebec Number Theory Conference, Orono, Maine, 2003.

Additional Information: MIT C. L. E. Moore Instructor, 1989–1991; MSRI Postdoctoral Research Fellow, 1994–1995; Bunting Institute of Radcliffe College Science Fellow, 1998–1999; Fibonacci Association Board of Directors, 1998–2006; Council on Undergraduate Research, 1999–2002; NSF Division of Mathematical Sciences Program Director, 2001–2002; Member of AMS, AWM, Fibonacci Association.

Selected Publications: 1. The arithmetic genus of Hilbert modular varieties over non-Galois cubic fields, *J. Number Theory*, **37** (1991), No. 3, 343–365. MR**1096448 (92d:11047); 2.** with T. L. Smith, Automatic realizability of Galois groups of order 16, *Proc. Amer. Math. Soc.,* **124** (1996), No. 9, 2631–2640. MR**1327017 (97f:12005); 3.** with G. Stewart, Galois realizability of non-split group extensions of C_2 by $(C_2)^r$ x $(C_4)^s$ x $(D_4)^t$, *J. Algebra*, **272** (2004), No. 2, 425–434. MR**2028065 (2004j:12004); 4.** with L. E. Lippincott, Computing the arithmetic genus of Hilbert modular fourfolds, *Math. Comp.*, **75** (2006), No. 255, 1553–1560. MR**2219045 (2007b:11056); 5.** Writing a Teaching Philosophy Statement, *Notices Amer. Math. Soc.,* **53** (2006), No. 11, 1329–1333.

Statement: The AMS serves many important roles in the support of mathematics research and education. It is crucial to the well-being of the profession that the AMS continues to promote mathematics, communicating its importance to employers both in and out of academia, to the government, to both governmental and

non-governmental funding agencies, and to the general public at large. At the same time, it needs to continue its part in enhancing mathematicians' abilities to conduct and disseminate their research through sponsoring conferences, publishing high-quality books and journals, and providing state-of-the-art services like MathSciNet. It also needs to continue working with other organizations to improve mathematics education at all levels. Of particular concern is that all talented students, including women, ethnic and economic minorities, and the disabled, are encouraged to pursue mathematics and that they have equal opportunities to learn and succeed. Coupled with this, of course, there must be continued efforts to increase available funding for mathematics graduate students and to expand the employment opportunities for recent mathematics Ph.D.'s. I am excited by the prospect of, if elected, working with others on the AMS Council on these and related issues.

Bryna Kra

Professor, Northwestern University.
Born: October 6, 1966, Boston, MA, USA.
Ph.D.: Stanford University, 1995.
AMS Committees: Selection of speakers for Current Events Bulletin, 2006; Associate Editor, Bulletin of AMS, 2006–.
Selected Addresses: Plenary Talk, Canadian Mathematical Society, Victoria, 2005; AMS Current Events Session, Atlanta, 2005; Invited Address, International Congress of Mathematicians, Madrid, 2006; AMS Invited Address, Cincinnati, 2006; AMS-MAA Invited Address, New Orleans, 2007.

Additional Information: NSF-NATO Postdoctoral Fellow, 1998–1999; Co-organizer of "Harmonic Analysis, Ergodic Theory, and Probability," Stanford, 2005; Co-organizer of AMS Special Session, 2006; AMS Centennial Fellow, 2006–2007; Co-organizer for semester program at MSRI, 2008.
Selected Publications: 1. with B. Host, Nonconventional ergodic averages and nilmanifolds, *Ann. of Math.,* **161** (2005), 397–488. MR**2150389 (2007b:37004);** 2. with B. Host, Convergence of polynomial ergodic averages, *Israel J. Math.*, **149** (2005), 1–19. MR**2191208 (2007c:37004)**; 3. with V. Bergelson and B. Host, Multiple recurrence and nilsequences, *Invent. Math.*, **160** (2005), 261–303. MR**2138068;** 4. with N. Frantzikinakis, Ergodic averages for independent polynomials and applications, *J. Lond. Math. Soc.*, **74** (2006), 131–142. MR**2254556 (2007e:37004);** 5. The Green-Tao Theorem on arithmetic progressions in the primes: An ergodic point of view, *Bull. Amer. Math. Soc.*, **43** (2006), 3–23. MR**2188173 (2006h:11113).**
Statement: The AMS is the principal organization supporting research in mathematics in the United States and is the major advocate both for mathematics and for mathematicians. If elected to serve on the Council, I would try to improve federal and local support for mathematics, broaden the constituency of the AMS by increasing membership among underrepresented groups, and seek creative solutions for communicating with the general public. Most importantly, I would advocate support for research at all levels of mathematics. I would also advocate policies that increase mentoring and support for mathematicians at all stages of their careers, including undergraduates, graduate students, postdocs, mathematicians working at primarily educational institutions, and early and mid-career mathematicians. The AMS must look to the future to serve and advocate for all its constituencies, while preserving the commitment to the highest standards and traditions of research mathematics.

Fanghua Lin

Professor of Mathematics, Courant Institute of Mathematical Sciences, New York University.
Born: March 11, 1959, Ningbo, Zhejiang Province, People's Republic of China.
Ph.D.: University of Minnesota, 1985.
AMS Committees: Centennial Fellowship Committee, 1999–2000.
Selected Addresses: AMS Eastern Sectional Meeting, 1988; International Congress of Mathematicians, 1990; Joint AMS-Hong Kong Mathematical Society Meeting, Hong Kong, 2000; AMS National Meeting, San Diego, 2002.

Additional Information: A. P. Sloan Fellowship, 1988; Presidential Young Investigator Award, 1989; AMS M. Bocher Prize, 2002; Fellow of American Academy of Arts and Sciences, 2004.
Selected Publications: 1. Complex Ginzburg-Landau equations and dynamics of vortices, filaments, and codimension-2 submanifolds, *Comm. Pure Appl. Math.*, **51** (1998), No. 4, 385–441. MR**1491752 (98k:35177); 2.** Gradient estimates and blow-up analysis for stationary harmonic maps, *Ann. of Math. (2)* **149** (1999), No. 3, 785–829. MR**1709303 (2000j:58028);** 3. with Tristan Rivière, Complex Ginzburg-Landau equations in high dimensions and codimension two area minimizing currents, *J. Eur. Math. Soc. (JEMS)*, **1** (1999), No. 3, 237–311. MR**1714735 (2000g:49048); 4.** with Fengbo Hang, Topology of Sobolev mappings II, *Acta Math.*, **191** (2003), No. 1, 55–107. MR**2020419 (2005m:58023); 5.** with Yisong Yang, Existence of energy minimizers as stable knotted solitons in the Faddeev model, *Comm. Math. Phys.*, **249** (2004), No. 2, 273–303. MR**2080954 (2005g:58035).**
Statement: The AMS is run by its members, and I, as many others, have greatly benefited from this society in my professional life. It is therefore a privilege as well as a duty to serve this organization. Mathematics and mathematicians are facing ever greater challenges in our high-tech era. On one hand, there is a fast growing of mathematical knowledge and volumes of publications. On the other hand, there is an increasing need for mathematical expertise and applications in emerging areas of the sciences and inter-disciplinary studies. The need for new breeds of

mathematical professionals who are able to meld both the pure and applied sciences is great. Needless to say, the cross-fertilization of ideas is vital for the integration and health of sciences and mathematics, and it is also a key for ensuring the position of mathematics as fundamental for all sciences and scientific progress.

We face at least two basic tasks: First, we need to attract and help many more young students to study mathematics and to pursue mathematical careers. We need to redefine part of our educational trainings. Second, we must have more interactions among the different branches of mathematics and also among the diverse scientific fields. We should encourage the development of widespread interdisciplinary research, communication, and interaction.

Since my own research has been in both pure mathematics and its applications, and since I have experience training and mentoring many excellent undergraduate, graduate students, and post-docs, I feel that I would be able to contribute to both of these tasks.

M. Ram Murty

Professor and Queen's Research Chair, Queen's University.
Born: October 16, 1953, Guntur, India.
Ph.D.: Massachusetts Institute of Technology, 1980.
Selected Addresses: AMS Invited Address, University of California at Santa Barbara, 2000; The Royal Society of Canada Invited Address, 2001; Gerhard Herzberg Lecture, Carleton University, 2005; Tata Institute for Fundamental Research Public Lecture, 2005; Coleman-Ellis Lecture, Queen's University, 2006.

Additional Information: Fellow, Institute for Advanced Study, 1980–1981, 1983, 1987, 1990, 1995, 2006; Fellow of the Royal Society (Canada), 1990; E. W. R. Steacie Fellow, 1991–1993; Ferran Sunyer Balaguer Prize, 1995; Killam Research Fellow, 1998–2000; Brown University Distinguished Visiting Professor, 1999; Associate Editor, Canadian Journal of Mathematics, 2002–2006; Associate Editor, Canadian Mathematical Bulletin, 2002–2006; Editorial Board, Acta Arithmetica, 2002–2007; Jeffery-Williams Prize, 2003; Vice-President (Ontario), Canadian Mathematical Society, 2004–2007; Fellow of The Fields Institute, 2004; Editorial Board, International Journal of Number Theory, 2005–2007; Adjunct Professor, McGill University, Harish-Chandra Research Institute, Institute for Mathematical Sciences, Chennai, India.
Selected Publications: 1. with R. Balasubramanian, An omega theorem for Ramanujan's function, *Invent. Math.*, **68** (1982), No. 2, 241–252. MR**0666161 (84a:10023a);** 2. with R. Gupta, A remark on Artin's conjecture, *Invent. Math.,* **78** (1984), No. 1, 127–130. MR**0762358 (86d:11003);** 3. with R. Gupta, Cyclicity and generation of points mod p on elliptic curves, *Invent. Math.*, **101** (1990), No. 1, 225–235. MR**1055716 (91e:11065);** 4. with V. Kumar Murty, Mean values of derivatives of modular L-series, *Ann. of Math. (2),* **133** (1991), No. 3, 447–475. MR**1109350 (92e:11050);** 5. Selberg's conjectures and Artin L-functions, *Bull. Amer. Math. Society*, **31** (1994) No. 1, 1–14. MR**1242382 (94j:11116).**
Statement: The primary objective of the AMS in disseminating mathematical knowledge and allowing for the interchange of ideas has a global dimension. In this context, the timely publications of current research and making these widely available at reasonable prices, to young researchers in all parts of the world, is an important task of the AMS that I would strongly support. In addition, mathematics is finding new applications in diverse branches of science and industry. Thus, I support the role of the AMS in this liaison and dialogue.

Irena Peeva

Associate Professor, Cornell University.
Born: Sofia, Bulgaria.
Ph.D.: Brandeis University, 1995.
Additional Information: Sloan Doctoral Dissertation Fellowship, 1994–1995; C. L. E. Moore Instructorship at MIT, 1995–1998; Sloan Research Fellowship, 1999–2001; NSF CAREER Grant, 2004–2009; (Co)organizer of 18 conferences in Commutative Algebra.
Selected Publications: 1. with L. Avramov and V. Gasharov, Complete intersection dimension**,** *Inst. Hautes Études Sci. Publ. Math.*, **86** (1997), 67–114. MR**1608565 (99c:13033); 2.** with V. Gasharov and V. Welker, The lcm-lattice**,** *Math. Res. Let.*, **6** (1999), No. 5-6, 521–532. MR**1739211 (2001e:13018); 3.** with V. Gasharov, Deformations of codimension 2 toric varieties, *Compositio Math.,* **123** (2000), No. 2, 225–241. MR**1794859 (2002f:13060); 4.** with L. Avramov, Finite regularity and Koszul algebras, *Amer. J. Math.*, **123** (2001), No. 2, 275–281. MR**1828224 (2002i:13012); 5.** with M. Stillman, Connectedness of Hilbert schemes, *J. Algebraic Geom.,* **14** (2005), No. 2, 193–211. MR**2123227 (2006a:14003).**
Statement: If elected, I would work hard on the issues that come to the attention of the Council. I am particularly interested in issues related to 1) meetings and conferences, 2) employment opportunities for new and recent Ph.D.'s, 3) promoting diversity of both the mathematical research community and the students, 4) low-cost publication of high quality mathematics, 5) the future of the mathematical libraries.

Joseph H. Silverman

Professor of Mathematics, Brown University.
Born: March 27, 1955, New York, New York, USA.
Ph.D.: Harvard University, 1982.
AMS Committees: Conant Prize Selection Committee, 2000–2003; University Lecture Series Editorial Committee, 2006–2008.
Selected Addresses: MAA Invited Address, Joint Mathematics Meeting, Baltimore, 2003; Frontier Lecture Series, Texas A&M, 2005; Summer School on Computational Number Theory and Cryptography, Wyoming, 2006; Invited Lecture Series, NCTS National Tsing Hua University, Taiwan, 2006; Distinguished Lecturer, Oberlin, 2007.

Additional Information: NSF Post-Doctoral Fellow, MIT, 1983–1986; Sloan Foundation Fellow, 1987–1991; Compositio Mathematica Editorial Board, 1993–2005; MAA Lester Ford Award, 1994; AMS Steele Prize for Mathematical Exposition, 1998; Guggenheim Foundation Fellowship, 1998–1999; NSF Institute for Pure and Applied Mathematics (IPAM) Board of Trustees, 2003–2005; Co-organizer of AMS Special Sessions (Providence, 1999, New Jersey, 2004), IPAM workshops on cryptography (2002, 2006), AIM Workshop on Arithmetic Dynamics (2008).

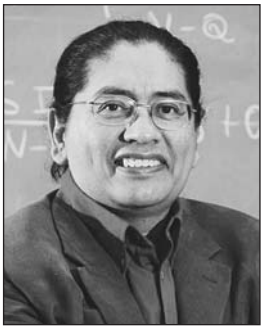
Selected Publications: 1. *The Arithmetic of Elliptic Curves*, Graduate Texts in Mathematics **106**, Springer-Verlag, N.Y., 1986. MR**0817210 (87g:11070)**; 2. with M. Hindry, The canonical height and integral points on elliptic curves, *Invent. Math.* **93** (1988), 419–450. MR**0948108 (89k:11044)**; 3. with M. Rosen, On the rank of an elliptic surface, *Invent. Math.*, **133** (1998), 43–67. MR**1626465 (99f:11081)**; 4. with M. Hindry, *Diophantine Geometry: An Introduction*, Graduate Texts in Mathematics **201**, Springer-Verlag, New York, 2000. MR**1745599 (2001e:11058)**; 5. *The Arithmetic of Dynamical Systems*, Graduate Texts in Mathematics, Springer-Verlag, N.Y., 2007.
Statement: I have been actively involved for more than 25 years in mathematics research and mathematics education at the undergraduate and graduate levels, including the supervision of 18 Ph.D. students. My six textbooks and two edited conference proceedings, whose target audiences range from first-year students to advanced math majors to graduate students to research mathematicians, have given me a wide-ranging perspective on the varied requirements of and mathematical activities at colleges and universities around the country. There are many challenges currently facing the mathematical community that I hope to address as a member of the AMS Council. Among these I mention two in particular. First, we need to increase and regularize funding opportunities for young mathematicians as they progress on the long road from graduate student to tenured faculty member. Second, the mathematical publishing field faces many challenges including issues of electronic versus print, the spiraling cost of journals, and the importance of copyright protection versus the desirability of making resources widely and easily available via the Internet. I feel that the AMS, through its journal and book publication activities, can play an active role in helping to resolve these issues.

Sarah J. Witherspoon

Associate Professor of Mathematics, Texas A&M University.
Born: October 5, 1966, Maryland, USA.
Ph.D.: University of Chicago, 1994.
AMS Committees: AMS-MAA-SIAM Joint Committee on Employment Opportunities, 2007–2009.
Selected Addresses: Colloque de Luminy, Methodes Homologiques et Representations de Groupes, France, 1997; MSRI Hopf Algebras Workshop, Berkeley, 1999; Lie Groups, Lie Algebras, and their Representations Workshop, University of California, Santa Cruz, 2004; Coloquio Latinoamericano de Algebra, Colonia, Uruguay, 2005; Bristol-Leicester-Oxford Algebra Colloquium, Oxford, U. K., 2006.
Additional Information: Co-organizer, AMS-IMS-SIAM Joint Summer Research Conference on Groups, Representations, and Cohomology, Mount Holyoke College, 2002; Alexander von Humboldt Foundation Research Fellow, 2005–2006; Co-organizer, Banff International Research Station Workshop on Hochschild Cohomology of Algebras, Canada, 2007.
Selected Publications: 1. with M. S. Montgomery, Irreducible representations of crossed products, *J. Pure Appl. Algebra,* **129** (1998), No. 3, 315–326. MR**1631261 (99d:16030);** 2. with S. F. Siegel, The Hochschild cohomology ring of a group algebra, *Proc. London Math. Soc. (3)*, **79** (1999), No. 1, 131–157. MR**1687539 (2000b:16016);** 3. with G. Benkart, A Hopf structure for down-up algebras, *Math. Z.,* **238** (2001), No. 3, 523–553. MR**1869697 (2002k:16059);** 4. Products in Hochschild cohomology and Grothendieck rings of group crossed products, *Adv. Math.,* **185** (2004), No. 1, 136–158. MR**2058782 (2005j:16010);** 5. with J. Pakianathan, Quillen stratification for Hochschild cohomology of blocks, *Trans. Amer. Math. Soc.*, **358** (2006), No. 7, 2897–2916. MR**2216251 (2007b:20110).**
Statement: The future of our profession depends on its youngest members and on its potential future members. It is crucial that we be engaged in efforts to improve mathematics education and awareness at all levels, and that we support young mathematicians in every way possible as they begin their careers. In particular, it is important to continue removing any obstacles, other than merit, in the paths of underrepresented groups on their way to becoming mathematicians. As a member of the AMS Council, I would work on these and the many other issues of importance to the society, including employment and funding opportunities, teacher training and outreach, journals and libraries.

Nominating Committee

Carlos Castillo-Chavez



University Regents and Joaquin Bustoz Jr. Professor, Arizona State University.

Born: March 29, 1952, Mexico.

Ph.D.: University of Wisconsin-Madison, 1984.

AMS Committees: Committee on Committees, 2005–2007.

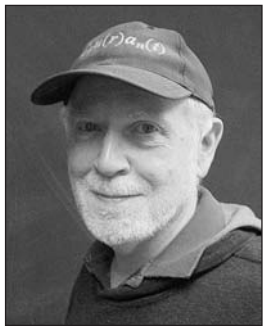
Selected Addresses: Hispanic Heritage Month Key Note Speaker, The National Institutes of Health Hispanic Employee Organization (NIH-HEO), September, 2004; Dr. Marjorie Lee Brown Colloquium Speaker, January, 2005; Key Note Speaker, 2005 World Conference on Natural Resource Modeling, Humboldt State University, Arcata, CA, June, 2005; Invited Speaker, National Academy of Sciences, Vienna, Austria, April, 2006; Distinguished Invited Speaker, Dean's Summit, Rice University, Houston, TX, April, 2007; Key Note Speaker, 2007 Xiangshan Science Conference on Social Computing, Chinese National Academy of Sciences, Beijing, China, April, 2007; Joint Invited Address, Mathematical Association of America and the Society for Mathematical Biology, MathFest, San Jose, California, August, 2007.

Additional Information: Presidential Faculty Fellowship Award, National Science Foundation and the Office of the President of the United States, 1992–1997; Board of Directors, Society for Mathematical Biology, 1994–1997; Board of Directors, Society for the Advancement of Chicanos and Native Americans in Science (SACNAS), 1995–1996; Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring, National Science Foundation and the Office of the President of the United States, 1997; Distinguished Alumni, University of Wisconsin-Stevens Point; SACNAS Distinguished Scientist Award, Phoenix, AZ, 2001; Ulam Scholar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos, NM, 2003; Richard Tapia Achievement Award for Scientific Scholarship, Civic Science and Diversity in Computing, Coalition to Diversity in Computing, 2003; External Faculty Member, Santa Fe Institute, 2003–2006; SIAM's Council (2003–2005 and 2006–2008, elected position); Adjunct Professor, Cornell University, 2004–2009; Co-Chair, National Advisory Committee, SAMSI (Statistical and Applied Mathematical Sciences Institute), 2004–2007; Honorary Professor, Xi'an Jiaotong University, China, May 2004; AMS Recognition: Programs that Make a Difference (MTBI/SUMS), American Mathematical Society, 2007; Member Alignment Committee, The Governor's P-20 Council (Governor of Arizona Council on Mathematics Education), 2007.

Selected Publications: 1. with Gumel, A., Clemence, D. P. and R. E. Mickens, eds., *Modeling the Dynamics of Human Diseases: Emerging Paradigms and Challenges*, Contemporary Mathematics, vol. 410, American Mathematical Society, 2006; 2. with Nuno, M., Chowell, G., and Wang, X., On the role of cross-immunity, vaccines and 'flu' survival, *Theoretical Population Biology,* **71** (2007), 20–29; 3. with Shim, E., Feng, Z., and Martcheva, M., An age-structured epidemic model of rotavirus with vaccination, *J. Math. Biol.,* (in press); 4. with Fabio Sánchez, Xiahong Wang, Paul Gruenewald and Dennis Gorman, Drinking as an epidemic—A simple mathematical model with recovery and relapse, *Evidence Based Relapse Prevention*, edited by Katie Witkiewitz and G. Alan Marlatt, (in press); 5. with C. W. Castillo-Garsow, Increasing minority representation in the mathematical sciences: Good models but no will to scale up their impact, *Graduate Education–Creating the Faculty of the Future*, edited by Ronald G. Ehrenberg, Cornell University Press (in press).

Statement: The work of the Nominating Committee is critical to the function of AMS because of its role in identifying a pool of diverse and talented candidates for elected leadership positions. If elected to this committee, I would increase its diversity not only because of my own background but more importantly because of my past experiences with three national organizations, SIAM, SMB and SACNAS.

Percy Deift



Professor, Courant Institute, New York University.

Born: September 10, 1945, Durban, South Africa.

Ph.D.: Princeton University, 1977.

AMS Committees: Chair, Advisory Panel for AMS-IMS-SIAM Summer Research Conferences, 2000–2004;Chair, Committee to Select the Gibbs Lecture for 2001 and 2002; Chair, Selection Committee for the George Polya Prize for 2002; Chair, AMS-SIAM Committee to Select the Winner of the Norbert Wiener Prize for 2007.

Selected Addresses: Invited address, ICM, 1998; Plenary speaker, ICM, 2006; Plenary speaker, International Congress on Mathematical Physics, 2006.

Additional Information: Co-winner of George Polya Prize for 1998; Guggenheim Fellow, 1999–2000; Member of AAAS.

Selected Publications: 1. with X. Zhou, A steepest descent method for oscillatory Riemann-Hilbert problems. Asymptotics for the MKDV equation, *Ann. of Math. (2)*, **137** (1993), No. 2, 295–368. MR**1207209 (94d:35143);** 2. with A. Its and X. Zhou, A Riemann-Hilbert approach to asymptotic problems arising in the theory of random matrix models, and also in the theory of integrable statistical mechanics, *Ann. of Math. (2)*, **146** (1997), No. 1, 149–235. MR**1469319 (98k:47097);** 3. with T. Kriecherbauer, K. McLaughlin, S. Venakides and X. Zhou, Uniform asymptotics for polynomials orthogonal with respect to varying exponential weights and applications to universality questions in random matrix theory, *Comm. Pure Appl. Math.*, **52** (1999), No. 11, 1335–1425. MR**1702716 (2001g:42050);** 4. with J. Baik and K. Johansson, On the distribution of the length of the longest increasing subsequence of random permutations, *J. Amer. Math. Soc.*, **12** (1999), 1119–1178. MR**1682248 (2000e:05006);** 5. with X. Zhou, Perturbation theory for infinite dimensional integrable systems on the

line. A case study, *Acta Math.*, **188** (2002), No. 2, 163–262. MR**1947893 (2005m:37172).**

Statement: In finding mathematicians to serve on committees, the Nominating Committee plays an essential role in the workings of the AMS. If elected, I will do my best to ensure that there is a broad slate of highly competent and enthusiastic candidates to fill the various offices of the Society.

Steffen Lempp

Professor, Department of Mathematics, University of Wisconsin.

Born: 1959 in Germany.

Ph.D.: University of Chicago, 1986.

AMS Committees: Chair, ASL Committee on Translations and ASL Subcommittee of the AMS Committee on Translations from Russian and Other Slavic Languages, 1995–2001; Logic editor, TAMS, since 2003.

Selected Addresses: Sixth Asian Logic Meeting, Beijing, May, 1996; International Conference on Mathematical Logic (1999 Malcev Meeting), Novosibirsk, Russia, August, 1999; ASL European Summer Meeting (Logic Colloquium '02), Münster, Germany, August, 2002; Winter Meeting of the Association for Symbolic Logic (in conjunction with the annual AMS Meeting), Phoenix, January, 2004; Dagstuhl Seminar on the Algorithmic-Logical Theory of Infinite Structures, Dagstuhl, Germany, October/November, 2007.

Additional Information: Research Fellowship at the University of Heidelberg, Germany, 1989; Postdoctoral Fellowship at the MSRI, Berkeley, 1989–1990; Sabbatical at the University of Leeds, England, 1996; Two-month research visit in Siena, Italy, 1998; Mercator Guest Professorship, University of Heidelberg, 2002–2003; Member, Institute for Mathematical Sciences, National University of Singapore, 2005. *Other memberships:* Association for Symbolic Logic; Deutsche Mathematiker-Vereinigung.

Selected publications: 1. with Manuel Lerman, The decidability of the existential theory of the poset of recursively enumerable degrees with jump relations, *Adv. Math.*, **120** (1996), No. 1, 1–142. MR**1392275 (97i:03026); 2.** with André Nies and Theodore A. Slaman, The Π_3-theory of the enumerable Turing degrees is undecidable, *Trans. Amer. Math. Soc.*, **350** (1998), No. 7, 2719–2736. MR**1389784 (98j:03056); 3.** with Sergey S. Goncharov, Valentina S. Harizanov, Michael C. Laskowski, and Charles F. D. McCoy, Trivial, strongly minimal theories are model complete after naming constants, *Proc. Amer. Math. Soc.*, **131** (2003), No. 12, 3901–3912. MR**1999939 (2004g:03054);**

4. with Sergey S. Goncharov and D. Reed Solomon, The computable dimension of ordered abelian groups, *Adv. Math.*, **175** (2003), No. 1, 102–143. MR**1970243 (2004h:03093); 5.** with Bakhadyr M. Khoussainov, Michael C. Laskowski, and D. Reed Solomon, On the computability-theoretic complexity of trivial, strongly minimal models, *Proc. Amer. Math. Soc.*, to appear.

Statement: The American Mathematical Society depends on many colleagues volunteering their time and effort to achieve its goal of supporting excellence in mathematical research and the education of the next generation of mathematicians. Its role is particularly critical in high-quality/low-cost publishing, the organization of professional meetings, and in lobbying for more financial support for mathematics. If elected I will do my best to help with the nomination of a broad and diverse spectrum of mathematicians to support the Society's mission.

Louise Arakelian Raphael

Professor of Mathematics, Howard University.

Born: October 24, 1937, New York, New York.

Ph.D.: Catholic University, 1967.

AMS Offices: Member at Large of the Council, 2001–2003.

AMS Committees: AMS representative, CBMS Congressional Science Fellowship Committee, 1983–1986; AMS-MAA-SIAM Congressional Science Fellowship Selection Panel, 1985–1987; Liaison Committee on Education in Mathematics, 1989–1994; Liaison Committee with AAAS, 1992–1994; Committee on Professional Ethics, 1995–1997; AMS-MAA Committee on Research in Undergraduate Mathematics Education (CRUME), 2000–2004; Committee on Education, 2000–2004.

Selected Addresses: AMS Special Session on Hopf Algebras, San Francisco, CA, January, 1991; International Conference on Analysis and Its Applications, Cairo, January, 1994; Neaman Workshop on Signal and Image Representation in Combined Spaces, Technion-Israel Institute of Technology, May, 1994; Splines and Wavelets, Athens, Georgia, 2005; Wavelets and Applications Conference, EPFL, Lausanne, Switzerland, July 2006.

Additional Information: *Administrative Posts*: Acting Administrative Officer, CBMS, Washington, DC, October 1985–May 1986; NSF Associate Program Director, Science and Engineering Education Directorate, Teacher Enhancement Program, September 1986–August 1987; NSF Program Director, Division of Mathematical Sciences and Education Directorates, 1987–1988. *National MAA Office:* First Vice-President, MAA, 1996–1998. *Select MAA Committees*: Chair, Task Force on Minorities in Mathematics, 1987–1989; Department Editor, Status of the Profession, *Undergraduate Mathematics Education TRENDS*, published by AMS, MAA and SIAM, 1989–1995; Organizing Committee for 1992 annual meeting, 1991; Chair, Strategic Initiatives Committee, 1996–1998; Chair, Externally Funded Projects, 1996–1998; Chair, Committee on Graduate Students, 2003–2004. *Visiting Positions*: Massachusetts Institute of Technology, 1977–1978 and 1989–1990; New York University, Courant Institute of Mathematical Sciences, 1997–1998; Cornell University, Spring 2004. *REU: Using Support Vector Machines to Classify Microarray Data,* PI, D. Williams, co-PI, Howard University, Summer 2005. *Community Service:* Howard University Grass Roots Math-

ematical Partnership, Director of informal partnership between parents, elementary school teachers/principals, community workers, and Howard University mathematicians, 2001–present.

Selected Publications: 1. with P. S. Hirschhorn, Coalgebraic foundations of the method of divided differences, *Adv. Math.,* **91** (1992), No. 1, 75–135. MR**1144346 (92m:05012);** 2. with S. E. Kelly and M. Kon, Pointwise convergence of wavelet expansions, *Bull. Amer. Math. Soc.*, **30** (1994), No. 1, 87–94. MR**1248218 (95a:42048);** 3. with S. E. Kelly and M. Kon, Local convergence for wavelet expansions, *J. Funct. Anal.*, **126** (1994), No. 1, 102–138. MR**1305065 (95k:42048);** 4. with M. Kon, Characterizing convergence rates for multiresolution approximations, *Signal and Image Representation in Combined Spaces* (J. Zeevi and R. Coifman, eds.), Wavelet Anal. Appl., vol. 7, Academic Press, San Diego, 1998, pp. 415–437. MR**1614983 (99f:42067)**; 5. with M. Kon, Approximating functions in reproducing kernel Hilbert spaces via statistical learning theory, *Mod. Methods Math.,* Nashboro Press (2005), 271–286. MR**2233457 (2007b:41029).**

Statement: The AMS assists the profession face a wide range of challenges: maintaining excellence in research and our advanced degree programs; expanding support for new and established research areas; implementing educational changes required by mathematical—scientific work forces.

My years of experience as a research mathematician at Historically Black Colleges and Universities has included sabbaticals at major research universities and terms as an elected AMS council member, an MAA first vice president, and other national administrative posts. Over this span of time, I have come to know and work with a broad and diverse group of mathematicians, many of whom have the talent, experience and energy to implement programs that help their colleagues pursue research and their graduate-undergraduate students adapt to the challenges of entering the profession.

If elected, I will work with the committee members to nominate a diverse slate of qualified, experienced mathematicians including underrepresented groups.

John R. Stembridge

Professor of Mathematics, University of Michigan.

Born: July 8, 1959, Glendale, California, USA.

Ph.D.: Massachusetts Institute of Technology, 1985.

AMS Committees: AMS-IMS-SIAM Committee on Joint Summer Research Conferences in the Mathematical Sciences, 1993–1996.

Selected Addresses: Commutative Algebra and Combinatorics, Nagoya, 1990; Interactions of Combinatorics and Representation Theory, RIMS, Kyoto, 1998; Renaissance of Combinatorics, Tianjin, 2001; Computational Lie Theory, CRM, Montreal, 2002; Combinatorics & Optimization 40th Anniversary, Waterloo, 2007.

Additional Information: Sloan Fellow, 1990–1992; Presidential Young Investigator, 1990–1995; Editorial Board Member, *Proceedings of the AMS,* 1998–2005; Guggenheim Fellow, 2001; Editorial Board Member, *Transactions of the AMS*, 2006– .

Selected Publications: 1. Shifted tableaux and the projective representations of symmetric groups, *Adv. Math.,* **74** (1989), No. 1, 87–134. MR**0991411 (90k:20026);** 2. Hall-Littlewood functions, plane partitions and the Rogers-Ramanujan identities, *Trans. Amer. Math. Soc.,* **319** (1990), No. 2, 469–498. MR**0986702 (90j:05021);** 3. Canonical bases and self-evacuating tableaux, *Duke Math. J.,* **82** (1996), No. 3, 585–606. MR**1387685 (97f:05193);** 4. Combinatorial models for Weyl characters, *Adv. Math.,* **168** (2002), No. 1, 96–131. MR**1907320 (2003j:17007);** 5. A local characterization of simply-laced crystals, *Trans. Amer. Math. Soc.*, **355** (2003), No. 12, 4807–4823. MR**1997585 (2005h:17024).**

Statement: The continued success of the Society is dependent on the efforts of its many capable and energetic members. The Nominating Committee is charged with finding candidates for election to various offices of the Society. If elected, I pledge to seek out nominees with a broad range of experience and perspective who will best serve our collective interest by maintaining a strong program of publications, conferences, and public outreach.

Richard A. Wentworth

Professor and Chair, Johns Hopkins University.

Born: October 5, 1963, Iowa City, Iowa, USA.

Ph.D.: Columbia University, 1990.

AMS Committees: AMS-NSF Postdoctoral Fellowship Selection Committee, 2001–2003 (Chair, 2003); Editorial Board, *Proceedings of the AMS*, 2002–2010; AMS Centennial Fellowship Selection Committee, 2003–2004.

Selected Addresses: Special Session, Eastern Sectional Meeting, Brooklyn, 1994; Invited hour address, Western Sectional Meeting, Salt Lake City, 1999; Special Session, Central Sectional Meeting, Ann Arbor, 2002.

Additional Information: Editorial Boards for the *American Journal of Mathematics* and *Geometriae Dedicata*; NSF Postdoctoral Fellow, 1990–1993; Sloan Research Fellow, 1995–1997.

Selected Publications: 1. The asymptotics of the Arakelov-Green's function and Faltings' delta invariant, *Commun. Math. Phys.,* **137** (1991), No. 3, 427–459. MR**1105425 (92g:14019);** 2. with G. Daskalopoulos, Local degeneration of the moduli space of vector bundles and factorization of rank two theta functions I, *Math. Ann.*, **297** (1993), No. 3, 417–466. MR**1245399 (94m:32028);** 3. with A. Bertram and G. Daskalopoulos, Gromov invariants for holomorphic maps from Riemann surfaces to Grassmannians, *J. Amer. Math. Soc.*, **9** (1996), No. 2, 529–571. MR**1320154 (96f:14066);** 4. with G. Daskalopoulos, Classification of Weil-Petersson isometries, *Amer. J. Math.*, **125** (2003),

No. 4, 941–975. MR**1993745 (2004d:32011);** 5. with G. Daskalopoulos, Convergence properties of the Yang-Mills flow on Kähler surfaces, *J. Reine Angew. Math.*, **575** (2004), 69–99. MR**2097548 (2005m:53116)**.

Statement: The scope of activities of the AMS is vast. From promoting mathematics research, outreach and publicity programs, to fostering educational initiatives and establishing guidelines for professional ethics, to leading the discussion on the direction of the mathematical community. With such a diverse charge, it is crucial that the Nominating Committee identify capable and energetic candidates from a broad spectrum. If elected I will work with the Committee to fulfill this responsibility through extensive consultation with mathematicians around the country and a careful evaluation of the needs of the individual committees and their members.

Editorial Boards Committee

David Brydges

Professor, University of British Columbia.

Born: July 1, 1949, Chester, Cheshire, United Kingdom.

Ph.D.: University of Michigan, 1976.

AMS Committees: Joint Summer Research Conference Committee, 1998–2002.

Selected Addresses: Plenary lecture, Annual Meeting of the American Mathematical Society, 1982.

Additional Information: Treasurer, then President, International Association of Mathematical Physics, 2000–2006.

Selected Publications: 1. with T. Spencer, Self-avoiding walk in 5 or more dimensions, *Comm. Math. Phys.*, **97** (1985), No. 1-2, 125–148. MR**0782962 (86h:82056); 2.** with John Z. Imbrie, Branched polymers and dimensional reduction, *Ann. Math., (2)* **158** (2003), No. 3, 1019–1039. MR**2031859 (2005c:82051).**

Gui-Qiang Chen

Professor of Mathematics, Northwestern University.

Born: May 25, 1963, Ningbo, Zhejiang Province, PRC. Nationality: USA.

Ph.D.: Academia Sinica (Beijing), 1987.

AMS Committees: AMS Program Committee for the Joint International Meeting between the AMS and the Shanghai Mathematical Society (Dec. 17–21, 2008), 2006–2008; AMS-MAA Program Committee for the Joint Mathematics Meetings in San Diego (January 6–9, 2008), 2007–2008; AMS Program Committee for National Meetings, 2007–2010.

Selected Addresses: Plenary Speaker, International Conference on Problems and Perspectives on the Calculus of Variations: Physics, Economics, and Geometry, Fields Institute, Toronto, Canada, 2001; Plenary Speaker, International Conference in Celebration of 50th Anniversary of the Instituto de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, Brazil, 2002; Series of Four Lectures on Nonlinear Partial Differential Equations, Newton Institute, University of Cambridge, England, 2003; The 21st William J. Spencer Lecture in Mathematics, Kansas, 2004; Plenary Speaker, International Conference on Analysis, Modeling and Computation of PDE and Multiphase Flow, Stony Brook, 2004.

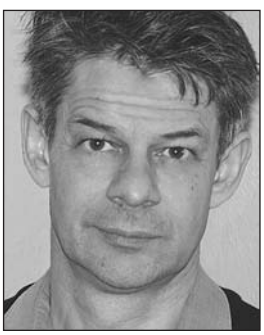
Additional Information: *Honors, Awards, and Other Recognitions:* Best Paper Award, Beijing Mathematical Society, PRC, 1988; Argonne-University of Chicago Fellow in Mathematics, USA, 1989–1991; Chinese National Medal of Natural Sciences, PRC, 1990; Alfred P. Sloan Foundation Fellow, USA, 1991–1997; Alexander von Humboldt Foundation Fellow, Germany, 2003–2007. *Editor for AMS Volumes*: Nonlinear Partial Differential Equations, *Contemporary Mathematics*, **238**, AMS: Providence, 1999, ISBN-10: 0-8218-1196-7, ISBN-13: 978-0-8218-1196-2 (Edited with E. DiBenedetto); Nonlinear Partial Differential Equations: Electronic Edition, *Contemporary Mathematics*, **238**, AMS: Providence, 1999, ISBN-10: 0-8218-2034-6, ISBN-13: 978-0-8218-2034-6 (Edited with E. DiBenedetto); Nonlinear Partial Differential Equations and Related Analysis, *Contemporary Mathematics*, **371**, AMS: Providence, 2005, ISBN-10: 0-8218-3533-5, ISBN-13: 978-0-8218-3533-3 (Edited with G. Gasper and J. Jerome); Stochastic Analysis and Partial Differential Equations, *Contemporary Mathematics*, **429**, AMS: Providence, 2007, ISBN-10: 0-8218-4059-2, ISBN-13: 978-0-8218-4059-7 (Edited with E. Hsu and M. Pinsky); *Editorial Boards: Zeitschrift für angewandte Mathematik und Physik* (ZAMP), 1991–; *Acta Mathematica Scientia*, 1996–; *Chinese Annals of Mathematics, 1998–; SIAM Journal of Mathematical Analysis*, 2000–; *Communications on Pure and Applied Analysis*, 2001–; *Acta Mathematicae Applicatae Sinica,* 2001–; *Journal of Partial Differential Equations*, 2001–; *Journal of Hyperbolic Differential Equations*, 2003–; *Visiting Memberships and Professorships:* Visiting Member, Courant Institute of Mathematical Sciences, New York University, 1987–1989; Visiting Member, Institute for Mathematics and Its Applications, Minneapolis, 1989; Visiting Member, Mathematical Sciences Research Institute, Berkeley, California, 1990–1991; Visiting Member, Institute for Advanced Study, Princeton, 1994; Visiting Professor, Department of Mathematics, University of Nice, France, 1996; Visiting Professor, École Normale Supérieure (Ulm-Paris), France, 1996, 2000; Senior Fellow, Institute for Pure and Applied Mathematics (IPAM), University of California at Los Angeles, 2001; Visiting Professor, Newton Institute, University of Cambridge, U. K., 2003; Visiting Professor, University of Heidelberg, Germany, 2004–2007; Visiting Member, Mittag-Leffler Institute of Mathematics, Royal Swedish Academy of Sciences, Sweden, 2005.

Selected Publications: 1. with D. Levermore and T.-P. Liu, Hyperbolic conservation laws with stiff relaxation terms and entropy, *Comm. Pure Appl. Math.,* **47** (1994), No. 6, 787–830. MR**1280989 (95h:35133);** 2. with M. Feldman, Multidimensional transonic shocks and free

boundary problems for nonlinear equations of mixed type, *J. Amer. Math. Soc.,* **16** (2003), No. 3, 461–494. MR**1969202 (2004d:35182)**; 3. with H. Frid, Extended divergence-measure fields and the Euler equations of gas dynamics, *Comm. Math. Phys.*, **236** (2003), No. 2, 251–280. MR**1981992 (2004f:35113);** 4. with B. Perthame, Well-posedness for anisotropic degenerate parabolic-hyperbolic equations, *Ann. Inst. H. Poincaré Anal. Non Linéaire*, **20** (2003), No. 4, 645–668. MR**1981403 (2004c:35235)**; 5. with M. Feldman, Global solutions to shock reflection by a large-angle wedge for potential flow, *Ann. Math.*, 108 pages, 2007 (in press).

Statement: The AMS has a longstanding tradition of excellence in disseminating mathematical progress through the AMS publications for the benefit of the mathematical community. The primary responsibility for maintaining and developing fully this tradition in the modern rapidly changing world of publishing lies with the AMS editorial boards. I think that the nominations by the Committee should reflect the high standard of the AMS publications, the demanding efficiency with which the AMS editorial boards serve, as well as the broad interests and diversity of the mathematical community. If elected, I will do my best to seek out well-qualified candidates by actively soliciting and evenhandedly considering suggestions from the community at large for each AMS editorial board.

Alan W. Reid



Pennzoil Company Regents Professor of Mathematics, The University of Texas.

Born: June 14, 1962, Aberdeen, U.K.

Ph.D: University of Aberdeen, 1988.

AMS Committees: Centennial Fellowship Selection Committee, 2001–2003 (Chair, 2002–2003).

Selected Addresses: British Mathematical Colloquium, Heriot-Watt University, 1995; Workshop on Groups and 3-Manifolds, C.R.M., Université de Montréal, 2001; AMS Invited Address, University of Michigan, 2002; XXth Nevanlinna Colloquium, Lausanne Switzerland, 2005; Geometry and Topology of 3-Manifolds, ICTP Trieste Italy, 2005.

Additional Information: Royal Society University Research Fellow, 1992–1996; Edinburgh Mathematical Society Sir Edmund Whittaker Prize, 1993; Alfred P. Sloan Foundation Research Fellow, 1997–2000; Editorial Boards: *Geometriae Dedicata, Bulletin, Journal* and *Proceedings of the London Mathematical Society*.

Selected Publications: 1. with D. Cooper and D. D. Long, Bundles and finite foliations, *Invent. Math.*, **118** (1994), No. 2, 255–283. MR**1292113 (96h:57013);** 2. with D. Cooper and D. D. Long, Essential closed surfaces in bounded 3-manifolds, *J. Amer. Math. Soc.,* **10** (1997), No. 3, 553–563. MR**1431827 (97m:57021);** 3. with I. Agol and D. D. Long, The Bianchi groups are separable on geometrically finite subgroups, *Ann. of Math. (2),* **153** (2001), No.3, 599–621. MR**1836283 (2002e:20099);** 4. with D. D. Long, Pseudo-modular surfaces, *J. Reine Angew. Math.*, **552** (2002), 77–100. MR**1940433 (2003i:20091);** 5. with C. Leininger, A combination theorem for Veech subgroups of the mapping class group, *Geom. Funct. Anal.*, **16** (2006), No.2, 403–436. MR**2231468 (2007d:57002).**

Statement: The enduring excellence and diversity of the book series and journals published by the AMS ensure that they continue to play an important role in the mathematical community. The success of the journals and book series relies on the editorial boards that run them. In my opinion, it is the job of the EBC to identify and recommend mathematicians that will advance the mission of these book series and journals, and continue their tradition of success.

Catherine Sulem

Professor of Mathematics, University of Toronto.

Born: June 19, 1955, Algiers, Algeria.

Ph.D.: Thèse d'État, Université Paris-Nord, 1983.

Selected Addresses: Invited address, AMS meeting, Austin, 1999; Invited address, SIAM-INRIA meeting on wave propagation, Santiago del Compostello, Spain, 2000; Plenary speaker, NSF-CBMS Regional Research Conference on New perspectives for boundary value problems and their asymptotics, University of Texas-Pan American, 2005; Principal lecturer, short course on nonlinear waves, Reading, London Math. Society, 2005; Invited lecturer, CIMPA School on wave propagation, Cuernavaca, Mexico, 2006.

Additional Information: Krieger-Nelson Prize of the Canadian Mathematical Society, 1998; Associate Editor of the *Canadian Journal of Mathematics*, 1999–2004; Associate Editor of the *SIAM Journal of Mathematical Analysis since* 2001.

Selected Publications: 1. with P. L. Sulem, *The Nonlinear Schrödinger Equation: Self-Focusing and Wave Collapse*, Applied Mathematical Sciences, 139, Springer-Verlag, 1999. MR**1696311 (2000f:35139)**; 2. with V. Buslaev, On asymptotic stability of solitary waves for nonlinear Schrödinger equations, *Ann. Inst. H. Poincaré Anal. Non Linéaire*, **20** (2003), No. 3, 419–475. MR**1972870 (2004d:35229)**; 3. with J. Colliander, S. Raynor, and J. D. Wright, Ground state mass concentration in the L^2-critical nonlinear Schrödinger equation below H^1, *Math. Res. Lett.* **12** (2005), No. 2–3, 357–375. MR**2150890 (2006:35300);** 4. with T. Passot and P. L. Sulem, Linear versus nonlinear dissipation for critical nonlinear Schrödinger equation, *Phys. D,* **203** (2005), No. 3–4, 167–184. MR**2138383 (2005k:35382);** 5. with W. Craig, P. Guyenne, J. Hammack, and D. Henderson, Solitary water wave interactions, *Phys. Fluids,* **18** (2006), No. 5, 057106, 1–25. MR**2259317.**

Statement: AMS journals and books play a very important role for the diffusion of mathematical research and pedagogical material. I will do my best to contribute to the tradition of excellence of AMS publications and their accessibility to mathematics departments around the world.

CALL FOR Suggestions

Your suggestions are wanted by:

The Nominating Committee, for the following contested seats in the 2008 AMS elections:
vice president, trustee,
and five members at large of the Council

Deadline for suggestions: November 5, 2007

The President, for the following contested seats in the 2008 AMS elections:
three members of the Nominating Committee
two members of the Editorial Boards Committee

Deadline for suggestions: February 26, 2008

The Editorial Boards Committee, for appointments to various editorial boards of AMS publications

Deadline for suggestions: Can be submitted any time

Send your suggestions for any of the above to:

Robert J. Daverman, Secretary
American Mathematical Society
312D Ayres Hall
University of Tennessee
Knoxville, TN 37996-1330 USA
email: secretary@ams.org

AMS
American Mathematical Society
www.ams.org

2008 AMS Election

Nominations by Petition

Vice President or Member at Large

One position of vice president and member of the Council *ex officio* for a term of three years is to be filled in the election of 2008. The Council intends to nominate at least two candidates, among whom may be candidates nominated by petition as described in the rules and procedures.

Five positions of member at large of the Council for a term of three years are to be filled in the same election. The Council intends to nominate at least ten candidates, among whom may be candidates nominated by petition in the manner described in the rules and procedures.

Petitions are presented to the Council, which, according to Section 2 of Article VII of the bylaws, makes the nominations. The Council of 23 January 1979 stated the intent of the Council of nominating all persons on whose behalf there were valid petitions.

Prior to presentation to the Council, petitions in support of a candidate for the position of vice president or of member at large of the Council must have at least fifty valid signatures and must conform to several rules and operational considerations, which are described below.

Editorial Boards Committee

Two places on the Editorial Boards Committee will be filled by election. There will be four continuing members of the Editorial Boards Committee.

The President will name at least four candidates for these two places, among whom may be candidates nominated by petition in the manner described in the rules and procedures.

The candidate's assent and petitions bearing at least 100 valid signatures are required for a name to be placed on the ballot. In addition, several other rules and operational considerations, described below, should be followed.

Nominating Committee

Three places on the Nominating Committee will be filled by election. There will be six continuing members of the Nominating Committee.

The President will name at least six candidates for these three places, among whom may be candidates nominated by petition in the manner described in the rules and procedures.

The candidate's assent and petitions bearing at least 100 valid signatures are required for a name to be placed on the ballot. In addition, several other rules and operational considerations, described below, should be followed.

Rules and Procedures

Use separate copies of the form for each candidate for vice president, member at large, or member of the Nominating and Editorial Boards Committees.

1. To be considered, petitions must be addressed to Robert J. Daverman, Secretary, American Mathematical Society, 312 D Ayres Hall, University of Tennessee, Knoxville, TN 37996-1330 USA, and must arrive by 25 February 2008.
2. The name of the candidate must be given as it appears in the *Combined Membership List* (`www.ams.org/cml`). If the name does not appear in the list, as in the case of a new member or by error, it must be as it appears in the mailing lists, for example on the mailing label of the *Notices*. If the name does not identify the candidate uniquely, append the member code, which may be obtained from the candidate's mailing label or by the candidate contacting the AMS headquarters in Providence (amsmem@ams.org).
3. The petition for a single candidate may consist of several sheets each bearing the statement of the petition, including the name of the position, and signatures. The name of the candidate must be exactly the same on all sheets.
4. On the next page is a sample form for petitions. Petitioners may make and use photocopies or reasonable facsimiles.
5. A signature is valid when it is clearly that of the member whose name and address is given in the left-hand column.
6. The signature may be in the style chosen by the signer. However, the printed name and address will be checked against the *Combined Membership List* and the mailing lists. No attempt will be made to match variants of names with the form of name in the *CML*. A name neither in the *CML* nor on the mailing lists is not that of a member. (Example: The name Robert J. Daverman is that of a member. The name R. Daverman appears not to be.)
7. When a petition meeting these various requirements appears, the secretary will ask the candidate to indicate willingness to be included on the ballot. Petitioners can facilitate the procedure by accompanying the petitions with a signed statement from the candidate giving consent.

Nomination Petition

for 2008 Election

The undersigned members of the American Mathematical Society propose the name of

_____

as a candidate for the position of (check one):

- ☐ **Vice President**
- ☐ **Member at Large of the Council**
- ☐ **Member of the Nominating Committee**
- ☐ **Member of the Editorial Boards Committee**

of the American Mathematical Society for a term beginning 1 February, 2009

Return petitions by 26 February 2008 to:
Secretary, AMS, 312 D Ayres Hall, University of Tennessee, Knoxville, TN 37996-1330 USA

Name and address (printed or typed)	Signature
	Signature
	Signature
	Signature
	Signature
	Signature

Mathematics Calendar

The most comprehensive and up-to-date Mathematics Calendar information is available on the AMS website at http://www.ams.org/mathcal/.

September 2007

3–6 **38th Annual Iranian Mathematics Conference**, Zanjan University, Zanjan, Iran. (Jun/Jul 2007, p. 778)
Scientific Committee: F. Mirzapour (The head of conference), f.mirza@mail.znu.ac.ir; M. T. Dastjerdi (The head of scientific committee of conference), tdast@yahoo.com; E. S. Mahmoodian, emahmood@sharif.edu; M. Adib, madib@mail.znu.ac.ir; M. Ariannejad, m_ariannejad@yahoo.com; M. Emami, emami@mail.znu.ac.ir; J. Malaki, j.malaki@mail.znu.ac.ir; H. Mohebi, hmohbei@mail.uk.ac.ir; A. Rasooli, rasooli@yahoo.com; Sh.Rezapour, sh.rezapour@azaruni.ac.ir; S. Salehipourmehr, saeed@iasbs.ac.ir; S. Varsaie, varsaie@iasbs.ac.ir; R. Zarenahandi, rashidzn@iasbs.ir.
Information: Contact: 6-Kilometer of Tabriz Road, Zanjan, IRAN, Zanjan University Po Box: 313; Tel: (+98) 0241 5152681; Fax: (+98) 0241 5152514; aimc38@znu.ac.ir; http://aimc38.znu.ac.

3–7 **Algebraic and Arithmetic Structures of Moduli Spaces**, Hokkaido University, Sapporo, Japan. (Jun/Jul 2007, p. 778)
Organizers: Iku Nakamura (Hokkaido University) and Lin Weng (Kyushu University).
Fee: No registration fee is required.
Information and Contact: http://coe.math.sci.hokudai.ac.jp/sympo/moduli2007/; cri@math.sci.hokudai.ac.jp.

3–7 **Conference in Numerical Analysis 2007 (NumAn 2007): Recent Approaches To Numerical Analysis: Theory, Methods and Applications**, Kalamata, Greece. (May 2007, p. 665)
Overview: NumAn provides an opportunity to learn of new developments and to present original research results in all areas of Numerical Analysis such as Theory, Methods and Applications.
Call for Papers: Further information is available at: http://www.elsevier.com/wps/find/journaldescription.cws_home/505613/authorinstructions/.To submit a paper, send an email to: numan2007@math.upatras.gr.
Important Dates: Submission of abstracts: March 31, 2007. Notification of acceptance: April 30, 2007. Full versions of the accepted presentations to be included in the Proceedings of the Conference: May 31, 2007.
Financial Support: Some financial support will be available from the conference, to cover expenses of graduate students and postdoctoral fellows. Applications should be sent electronically to the conference e-mail address: numan2007@math.upatras.gr.
Information: Contact: email: numan2007@math.upatras.gr; http://www.math.upatras.gr/numan2007/.

3–7 **Some Trends in Algebra '07**, Czech University of Agriculture, Prague, Czech Republic. (Aug. 2007, p. 917)
Program: The topics include various aspects of module theory. The main focus is on category theoretic, homological, set theoretic and model theoretic methods.
Organizers: Department of Algebra, Charles University in Prague, Department of Mathematics, Czech Agricultural University.
Information: http://www.karlin.mff.cuni.cz/katedry/ka/sta07.htm.

3–7 **The Riemann-Hilbert Problem and Toeplitz Operators**, Heriot Watt University, Edinburgh, Scotland. (May 2007, p. 665)
Organizer: International Centre for Mathematical Sciences.
Information: http://www.icms.org.uk/workshops/toepop/.

3–14 **Epidemiology & Control of Infectious Diseases: Introduc-**

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/.

tion to mathematical models of global and emerging infections, Imperial College, London, England. (Apr. 2007, p. 559)
Description: Our understanding of infectious-disease epidemiology and control has been greatly increased through mathematical modelling. Insights from this increasingly-important and exciting field are now informing policymaking at the highest levels, for pandemic influenza, SARS, HIV/AIDS, TB, malaria, foot-and-mouth disease and other infections. Participants need only a basic mathematical ability (high school level is more than sufficient): most course participants do not use maths regularly, and calculation is done using Excel and the user- friendly modelling package, Berkeley Madonna; hence manipulation of equations is not required. We offer an optional 'maths refresher' day on Sunday 2 September, free of charge.
Information: For further details visit the course website: http://www.imperial.ac.uk/cpd/epidemiology/ which includes full information on how to apply for the course or contact Ulrika Wernmark, Centre for Professional Development, Imperial College London, South Kensington Campus, London SW7 2AZ, Tel: +44 (0)20 7594 6886.

3–December 21 **Phylogenetics**, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK. (Nov. 2006, p. 1264)
Organizers: D. Huson (Tubingen), V. Moulton (East Anglia) and M. Steel (Canterbury, NZ).
Information: http://www.newton.cam.ac.uk/programmes/PLG/.

4–6 **International Conference on Mathematical Biology 2007 (ICMB07)**, Universiti Putra Malaysia, Serdang, Malaysia. (Nov. 2006, p. 1253)
Call for Paper: (http://www.inform.upm.edu.my/icbm07/).
Talks: Prospective authors are invited to submit extended summaries of no more than four (4) pages including results, figures and references. Paper will be accepted only by electronic submission via email to icmb07@inform.upm.edu.my . Prospective authors are expected to present their paper at the conference. Authors without Internet access should contact us well before the submission deadline.
Submission Deadlines: Submission of extended summaries: January 15, 2007. Notification of acceptance: April 16, 2007. Submission of full paper: May 14, 2007.
Topics of Interest: Topics of interest for submission include, but are not limited to: Biofluids, cell biology, physiology, neurobiology and behaviour, development, ecology, population biology, genetics and evolution, epidemiology, immunology, molecular biology, DNA and protein structure and function, bio-informatics and biometrics.
Registration Fees: The conference fees are as follows: Participant : USD $200.00. Accompanying person : USD $50.00. Student : USD $50.00.
Information: http://www.inform.upm.edu.my/icbm07/.

* 4–7 **Numerical Analysis: Multiscale methods, adaptivity and complexity**, University of Bath, United Kingdom.
Themes: Numerical analysis for multiscale problems, Stochastic and high-dimensional problems, Adaptive methods, Inverse problems and applications, Numerical methods for wave propogation problems.
Speakers: H. Ammari (Ecole Polytechnique, Paris), D. Bird (Bath), M. Burger (Muenster), S. N. Chandler-Wilde (Reading), M. Cullen (UK Met. Office), W. Dahmen (Aachen), C. M. Elliott (Sussex), T.-Y. Hou (Caltech), W. Huang (Kansas), P. K. Jimack (Leeds), I. G. Kevrekidis (Princeton), M. Kirkilionis (Warwick), C. N. Mitchell (Bath), R. Potthast (Reading), C. Reisinger (Oxford), C. Schwab (ETH, Zurich), V. P. Smyshlyaev (Bath), I. H. Sloan (New South Wales), E. Suli (Oxford), R. Tempone (Florida).
Information: Scientific enquiries: I. G. Graham; email: I.G.Graham@bath.ac.uk or R. Scheichl; email: R.Scheichl@bath.ac.uk. Administrative enquiries: A. D. Linfield; email: bics@maths.bath.ac.uk; http://www.bath.ac.uk/math-sci/BICS/nammac/.

4–8 **Potential Theory and Stochastics**, Albac, Romania. (May 2007, p. 665)
Dedicated: To the memory of Aurel Cornea.
Organizers: Simion Stoilow, Institute of Mathematics of the Romanian Academy, University of Alba Iulia and University of Pitesti.
Main speakers: H. Aikawa (Hokkaido) [to be confirmed], D. Bakry (Toulouse), A. Bendikov (Wroclav), H.-P. Blatt (Eichstaett), J. Bliedtner (Frankfurt), K. El Mabrouk (Monastir), S.-L. Eriksson (Tampere), D. Feyel (Evry), B. Fuglede (Copenhagen), M. Fukushima (Osaka), S. Gardiner (Dublin), J. Glover (Gainesville), K. GowriSankaran (Montreal), W. Hansen (Bielefeld), N. Jacob (Swensa), K. Janssen (Duesseldorf), K. Kuwae (Kumamoto), A. de La Pradelle (Paris), J. Lukes (Prague), T. Lyons (Oxford)[to be confirmed], Z.-M. Ma (Beijing), H. Maagli (Tunis), I. Netuka (Prague), M. Rao (Gainesville), M. Roeckner (Bielefeld), W. Stannat (Darmstadt), J. Vesely (Prague) [to be confirmed].
Information: http://www.imar.ro/~purice/conferences/afis-albac.pdf/; email: lucian.beznea@imar.ro.

* 5–8 **XVI International Fall Workshop on Geometry and Physics**, IST, Lisbon, Portugal.
Program: Minicourses, Ana Cannas da Silva on "4-Manifolds (Symplectic or Not)", and Fernando Barbero on "Quantum Geometry and Quantum Gravity", plus invited speakers, contributed talks and posters.
Deadlines: Deadline for abstracts of contributed talks and posters: June 27, 2007. Deadline for registration: July 25, 2007.
Information: http://www.math.ist.utl.pt/IFWGP/.

* 6–9 **Advances in Scientific Computing**, The University of Chicago, Chicago, Illinois.
Description: In honor of Todd Dupont's 65th birthday.
Themes: The conference is organized around four themes: Interface computation, reduced dimension models, inverse problems and optimization, and reliable computation.
Information: For more information (including confirmed speakers, registration, travel and housing details), please see: http://www.ci.uchicago.edu/events/ASC2007/.

7–9 **Geometry, Rigidity, and Group Actions: A Conference in Honor of Robert J. Zimmer's 60th Birthday**, University of Chicago, Illinois. (Jun/Jul 2007, p. 778)
Speakers: David Fisher (Indiana University), Alex Furman (University of Illinois, Chicago), Anatole Katok (Pennsylvania State University), Alexander Lubotzky (Hebrew University, Israel), Gregory Margulis (Yale University), Amos Nevo (Technion, Israel), Leonid Polterovich (Tel Aviv University, Israel), Sorin Popa (University of California, Los Angeles), Yehuda Shalom (Tel Aviv University, Israel), and Shmuel Weinberger (University of Chicago).
Schedule: The conference will begin Friday morning, and end before noon on Sunday. Talks will be 45 minutes in length, and limited in number, to allow time for informal discussions. On Sunday afternoon, after the conference, there will be a workshop for young researchers to give a short talk on their work.
Organizers: Benson Farb (University of Chicago), David Fisher (Indiana University), Dave Witte Morris (University of Lethbridge), and Ralf Spatzier (University of Michigan).
Information: http://www.math.uchicago.edu/zimmer60/.

7–11 **KIAS Conference on Geometric Analysis**, KIAS, Seoul, Korea. (Apr. 2007, p. 559)
Topics: Minimal surfaces, Constant mean curvature surfaces, Lagrangian submanifolds, Isoperimetric problems, Geometric measure theory, Geometric analysis and PDE's.
Organizers: Jaigyoung Choe (KIAS) and Richard Schoen (Stanford).
Invited Speakers: Richard Schoen (Stanford), Robert Hardt (Rice), Motoko Kotani (Tohoku), Conan Leung (CUHK), Rafe Mazzeo (Stanford), Michael Wolf (Rice), Jon Wolfson (Michigan State), and more to be invited.
Information: http://newton.kias.re.kr/~choe/cga.html.

7–13 **9th International Conference of The Mathematics Education into the 21st Century Project**, Charlotte, North Carolina. (Apr. 2007, p. 498)
Preliminary Announcement and Call for Papers: The Mathematics Education into the 21st Century Project has just completed its eighth successful international conference in Malaysia, following conferences in Egypt, Jordan, Poland, Australia, Sicily, Czech Republic and Poland. Our project was founded in 1986 and is dedicated to the planning, writing and disseminating of innovative ideas and materials in Mathematics and Statistics Education.
Organizer: David K. Pugalee (chairman), of the University of North Carolina Charlotte.
Information: email: arogerson@inetia.pl.

* 8–16 **Variational Analysis and Aerospace Engineering**, Erice (Sicily), Italy.
Information: For further details about the meeting see the web page: http://www2.ing.unipi.it/~o24401/Workshop%20Erice/Home.html.

9–10 **SHARCS'07: Special-purpose Hardware for Attacking Cryptographic Systems**, Vienna Marriott Hotel, Vienna, Austria. (Mar. 2007, p. 439)
Deadline: Submission deadline: June 15.
Information: Please consult the workshop's webpage http://www.sharcs.org for details.

10–11 **Journées Jean-Yves Girard, Conference in Honour of his 60th Birthday**, Institut Henri Poincaré, Paris, France. (May 2007, p. 665)
Program: Through our choice of invited speakers, we hope to illustrate the wide range of scientific interests of Jean-Yves Girard over thirty-five years, from the complexity of proofs to quantum mechanics, from system F to the geometry of computation, from denotational semantics to Von Neumann algebras.
Organizers: Michele Abrusci (Roma III), Pierre-Louis Curien (CNRS - Paris 7, chair), Martin Hyland (Cambridge), Giuseppe Longo (ENS, Paris), Mitsu Okada (Keio Univ., Tokyo), Phil Scott (Univ. of Ottawa), Jacqueline Vauzeilles (Paris 13, co-chair).
Speakers: Patrick Dehornoy, Gerard Huet, Herman Jervell Yves Lafont, Olivier Laurent, Thierry Paul Peter Selinger, Glynn Winskel.
Information: http://www-lipn.univ-paris13.fr/jyg60/.

10–14 **1st IMACS International Conference on Computational Biomechanics and Biology ICCBB 2007**, University of West Bohemia, Pilsen, Czech Republic. (Jun/Jul 2007, p. 778)
Scientific topics: The conference, under the auspices of IMACS, will be devoted to certain problems in biomechanical, biological, medical modelling, and mathematical methods for their solutions. The conference features a number of invited scientific sessions in the following areas: Soft tissue and muscular mechanics, Bone and dental mechanics, Cardiovascular mechanics, Micro-circular and respiratory systems, Cellular and molecular mechanics, Tissue engineering, biomaterials, Biotransport and multi-field problems, Organ biomechanics and fluid-structure interaction, Impact and injury biomechanics, sport biomechanics, Orthopedics and implant modelling, Muscle-skeletal systems and performance, Computational biomechanics and large simulations, Imaging and computer assisted surgery, Biological, biomechanical and medical modelling.
Information: http://www.iccbb.zcu.cz.

10–14 **5th Symposium on Nonlinear Analysis**, Nicolaus Copernicus University, Torun, Poland. (Apr. 2007, p. 559)
Scientific Committee: Lech Górniewicz (chair), Jan Andres, Jurgen Appell, Thomas Bartsch, Kazimierz Goebel, Russel Johnson Wojciech Kryszewski, Wacaw Marzantowicz, Jean Mawhin Paolo Nistri, Zbigniew Peradzyński, Krzysztof Rybakowski Roman Srzednicki, Andrzej Szulkin, Andrzej Wieczorek.
Topics: Topics in the topological and metric fixed point theory, Topological and variational methods in nonlinear analysis, Qualitative theory of ordinary and partial differential equations and inclusions, Nonsmooth and convex analysis, Critical point theory, Optimal control theory, Applications.
Information: http://www-users.mat.uni.torun.pl/~sna2007/; email: sna2007@mat.uni.torun.pl.

10–14 **11th Workshop on Well-Posedness of Optimization Problems and Related Topics**, University of Alicante, Alicante, Spain. (Jun/Jul 2007, p. 778)
Description: The Workshop started in 1987 in Milan, Italy, as a small meeting between Bulgarian and Italian groups working on the subject: Well-Posedness of Optimization Problems and Related Topics. A Summer School on "Stability and Well-Posedness in Convex Optimization" will be held parallel to the workshop.
Topics: Well-posedness and stability of optimization models and problems in calculus of variations, optimal control and mathematical programming; Hadamard, Tykhonov and similar type of concepts of well-posedness; topological aspects of well-posedness, with applications to special classes of optimization problems; game theory and equilibrium; variational principles; well-posedness concepts for vector optimization problems; regularization techniques for ill-posed problems; stability in stochastic optimization; applications to the performance analysis of numerical optimization methods and their stable behavior under perturbations; critical point theory.
Deadline: For abstracts: April 16, 2007.
Information: http://www.eio.ua.es/congreso/index.html.

10–14 **High-order methods for computational wave propagation and scattering**, AIM Research Conference Center, Palo Alto, California. (Aug. 2006, p. 824)
Description: This workshop, sponsored by AIM and the NSF, will address numerical methods for wave propagation with a focus on high-order convergence for general scattering configurations. The workshop will have an emphasis on spectral methods concerning the following topics: High frequency approximations, Geometric singularities, and Generalized impedance boundary conditions.
Organizers: Oscar P. Bruno and Rainer Kress.
Deadline: June 1, 2007.
Information: Visit http://aimath.org/ARCC/workshops/wavescattering.html.

10–15 **10th Quantum Mathematics International Conference: QMath10**, Moeciu, Romania. (Apr. 2007, p. 560)
Workshop Topics: Scroedinger Operators & Inverse Scattering, Random Schroedinger Operators & Random Matrices, Quantum Field Theory & Relativistic Quantum Mechanics, Condensed Matter & Open Systems, Pseudodifferential Operators & Semiclassical Analysis, Quantum Information.
Scientific Committee: Yosi Avron (Haifa), Pavel Exner (Prague), Bernard Helffer (Paris), Ari Laptev (Stockholm), Gheorghe Nenciu (Bucharest), Heinz Siedentop (Muenchen).
Organizers: The SPECT Program of ESF: The Institute of Mathematics "Simion Stoilow" of the Romanian Academy.
Plenary Speakers: M. Esteban, F. Germinet, G.M. Graf, Ch. Hainzl, A. Joye, R. Killip, M. Loss, Ch. Maes, S. Popescu, R. Purice, P. Seba, R. Seiringer, S. Serfaty, R. Wedder, M. Zworski.
Information: Contact: Radu.Purice@imar.ro; tel: +40-21-319.65.09; Institute of Mathematics "Simion Stoilow" of the Romanian Academy; P. O. Box 1-764, RO-014700 Bucharest; http://www.imar.ro/~purice/QM10/QM10.html.

10–15 **International Conference on Nonlinear Partial Differential Equations dedicated to the memory of Igor V. Skrypnik**, NPDE2007, Yalta, Crimea, Ukraine. (Feb. 2007, p. 307)
Preliminary List of Main Speakers: V. Barbu, M. Bidaut-Veron, M. Biroli, L. Boccardo, M. Chipot, E. Feireisl, M. Fila, A. G. Kartsatos, R. Kersner, V. A. Kondratiev, A. Kufner, V. Liskevich, H. Matano, N. Mizoguchi, M. Marcus, F. Murat, S. I. Pokhozhaev, V. V. Pukhnachev,

E. V. Radkevich, J. Rehberg, V. A. Solonnikov, P. Souganidis, L. Veron, E. Yanagida, V. V. Zhikov.
Information: email: NPDE2007@iamm.ac.donetsk.ua; http://iamm.ac.donetsk.ua/conferences/npde2007.html.

10–15 **School (and Workshop) on the Geometry of Special Varieties**, Fondazione Bruno Kessler-IRST, Povo, Trento, Italy. (Jun/Jul 2007, p. 779)
Information: The School is mainly aimed at Ph.D. students and young researchers in Algebraic Geometry, introducing the participants to research, beginning from a basic level with a view towards the applications and to the most recent results. A tentative program is as follows: Secant and defective varieties; Classification of varieties with extremal tangential properties; Degeneration of varieties (expecially of toric varieties); Degeneration of maps (expecially of projections); Applications to the study of secant varieties; Toric degeneration; Tropical geometry. The Workshop is intended to discuss the state of the art.
Lecturers: C. Ciliberto (University of Roma II) and F. Russo (Universidade Federal de Pernambuco). Speakers in the workshop: M. Andreatta (University Trento), L. Badescu (University Genova), L. Chiantini (University Siena), K. Ranestad (University Oslo).
Registration Deadline: June 30, 2007 (for researchers asking a financial grant) and July 20, 2007 (for other participants).
Information: http://www.science.unitn.it/cirm/; A. Micheletti, Secretary of CIRM, Fondazione Bruno Kessler, Via Sommarive 14, I-38050 Povo (Trento), Italy. email: michelet@science.unitn.it, Tel. +39-0461-881628, Fax +39-0461-810629.

10–December 14 **Mathematics of Knowledge and Search Engines (Long Program)**, UCLA, Los Angeles, California. (May 2007, p. 665)
Scientific Overview: This long program at IPAM will be devoted to new mathematics and methodologies of knowledge engines: the mathematical procedures used to extract knowledge from large databases. While this includes topics related to search engines it is mainly devoted to the more general problem of finding features in a database or using defined features to search within a database.
Activities: There will be an active program of research activities, seminars and workshops throughout the period and core participants will be in residence at IPAM continuously for these fourteen weeks. The program will open with tutorials, and will be punctuated by four major workshops and a culminating workshop at UCLA's Lake Arrowhead Conference Center. Several distinguished senior researchers will be in residence for the entire period. Between the workshops there will be a program of activities involving the long-term and short-term participants, as well as visitors.
Application: Please apply online to request financial support to attend and participate for extended periods up to the entire length of the program. Applications for individual workshops are separate and will be posted on individual workshop home pages. For the fullest consideration we urge you to apply as early as possible but no later than August 1, 2007. Successful applicants will be notified as soon as funding decisions are made. We have funding to support the attendance of recent Ph.D.'s, graduate students, and researchers in the early stages of their career. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.
Information: The application and more information is available at http://www.ipam.ucla.edu/programs/se2007/.

11–14 **Fall 2007 Workshop for Young Researchers in Mathematical Biology (WYRMB)**, Columbus, Ohio. (May 2007, p. 665)
Information: http://www.mbi.ohio-state.edu/postdocworkshop/fwyrmb2007.html

11–15 **CSL07: 16th EACSL Annual Conference on Computer Science and Logic**, Lausanne, Switzerland. (Feb. 2007, p. 308)
Important Dates: Paper Registration Deadline (with short abstracts): April 2, 2007. Paper Submission Deadline: April 9, 2007. Author Notification: May 21, 2007. Final Versions for the Proceedings: June 18, 2007. Conference: September 11–15, 2007.
Information: http://www2.unil.ch/csl07/.

13–14 **IMA Tutorial: Mathematics of Nucleic Acids**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1380)
Organizers: Wilma Olson (Rutgers University), David Swigon (University of Pittsburgh).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/T9.13-14.07/.

*14–17 **BALCOR 2007 8th Balkan Conference on Operational Research**, University of Belgrade, Belgrade-Zlatibor, Serbia.
Topics: Continuous Optimisation & Control; DEA and Performance Measurement; Data Mining & Knowledge Discovery; Decision Analysis & Decision Support Systems; Discrete Optimisation, Graphs & Networks, Scheduling; Financial Modelling & Risk Managemen; Fuzzy Sets & Expert Systems; Game Theory & Mathematical Economics; Logistics & Transportation & Traffic; Metaheuristics, Multiple Criteria Decision Making and Optimisation; Operational Research Applications: Agriculture- Forestry, Education, History, Ethics Health & Life Sciences, Industries, Environmental Management, Revenue Management; Simulation & Stochastic Programming and Modelling; Software for OR/Modelling Languages.
Information: email: andreea_madalina_s@yahoo.com.

*15–16 **Great Lakes Geometry Conference**, University of Minnesota, Minneapolis, Minnesota.
Confirmed speakers (partial list): Jun Li, Stanford University; Ciprian Manolescu, Columbia University; Davesh Maulik, Princeton University; Yong-Geun Oh, University of Wisconsin; Aleksey Zinger, SUNY Stony Brook.
Organizers: Bob Gulliver, Tian-Jun Li and Yongbin Ruan.
Financial Assistance: Preference for younger scientists. Send email to glgc07@umn.edu. Women and minorities are especially encouraged to apply.
Information: http://math.umn.edu/glgc/.

16–19 **Mathematical Neuroscience**, Centre de recherches mathématiques, Université de Montréal, Montréal, Canada. (Jun/Jul 2007, p. 779)
Goal: The goal of this workshop is to provide an overview of the current state of research in mathematical approaches to neuroscience. This workshop will not be preceded by a minicourse. Graduate students and early career scientists seeking further preparation before attending this workshop might consider the computational Neuroscience Summer School in Ottawa in June 2007.
Organizers: S. Coombes (Nottingham), A. Longtin (Ottawa), J. Rubin (Pittsburgh).
Information: http://www.crm.math.ca/Dynamics2007/.

16–20 **International Conference of Numerical Analysis and Applied Mathematics 2007 (ICNAAM 2007)**, Corfu, Greece. (Mar. 2007, p. 440)
Invited Speakers: Carl R. de Boor, Department of Computer Sciences and Department of Mathematics, University of Wisconsin-Madison, USA; C. W. Gear (Bill), Senior Scientists, Chemical Engineering, Princeton University (zero-time appointment), Emeritus President, NEC Research Institute, Emeritus Professor, Department of Computer Science, University of Illinois at Urbana-Champaign, USA; Mariano Gasca, Depto. Matematica Aplicada, Fac. Ciencias, Universidad de Zaragoza, 50009 Zaragoza, Spain; G. Alistair Watson, University of Dundee, Division of Mathematics, Dundee DD1 4HN, Scotland.
Leaflets and Posters: If you want leaflets and posters for ICNAAM 2007, please send your request to: tsimos@mail.ariadne-t.gr (with a carbon copy to: tsimos.conf@gmail.com).

Information: http://www.icnaam.org/.

*16–21 **Profinite and Asymptotic Group Theory**, Grand Hotel Bellavista, Levico Terme, Trento, Italy.
Description: A CIRM-Clay Conference on the occasion of the 60th birthday of Professor Dan Segal.
Scientific Organizers: Andrea Caranti (Trento), David A. Ellwood (Clay), Willem de Graaf (Trento), Fritz Grunewald (Duesseldorf), Marcus du Sautoy (Oxford).
Registration deadline: August 10, 2007.
Information:http://science.unitn.it/~caranti/Conferences/PAGT2007/.
Information: A. Micheletti, Secretary of CIRM, Fondazione Bruno Kessler, Via Sommarive 14, I-38050 POVO (Trento), Italy; email: michelet@science.unitn.it; tel.: +39-0461-881628; fax: +39-0461-810629.

17–20 **Fourth International Workshop on Meshfree Methods for Partial Differential Equations**, Universitaet Bonn, Bonn, Germany. (Mar. 2007, p. 440)
Aim: To promote collaboration among engineers, mathematicians, and computer scientists and industrial researchers to address the development, mathematical analysis, and application of meshfree and particle methods especially to multiscale phenomena.
Topics: While contributions in all aspects of meshfree methods are invited, some of the key topics to be featured are Coupling of meshfree methods, finite element methods, particle methods, and finite difference methods; Coupling of multiple scales, e.g. continuum models to discrete models; Application of meshfree, generalized finite element methods; Parallel computation in meshfree methods; Mathematical theory of meshfree, generalized finite element, and particle methods; Fast and stable domain integration methods; Enhanced treatment of boundary conditions; Identification and characterization of problems where meshfree methods have clear advantage over classical approaches.
Deadlines: If you are interested in contributing to this workshop, please submit an abstract of about 300 words (preferably in LaTeX format) by e-mail to the contact address meshfree@ins.uni-bonn.de by May 1, 2007. Confirmation and Program: August 1, 2007.
Information: http://wissrech.ins.uni-bonn.de/meshfree.

17–21 **13th Czech-French-German Conference on Optimization**, University of Heidelberg, Heidelberg, Germany. (Feb. 2007, p. 308)
Topics: Continuous optimization (smooth and nonsmooth), numerical methods for mathematical programming, optimal control and calculus of variations, robust optimization, mixed integer optimization, optimization with PDE, differential inclusions and set-valued analysis, stochastic optimization, multicriteria optimization, optimization techniques for industrial applications.
Plenary Speakers: Guillaume Carlier (Paris Dauphine), Roger Fletcher (University of Dundee), Roland Griesse (Austrian Academy of Sciences), Pierre Maréchal (UPS Toulouse), Alexander Martin (TU Darmstadt), David Preiss (University College London), Carsten Scherer (TU Delft), Zdenek Strakos (Czech Academy of Sciences), Emmanuel Trélat (Université d'Orléans), Michael Valáúek (Czech Technical University), Luís Nunes Vicente (Universidade de Coimbra), Andreas Wächter (IBM, Yorktown Heights), Andrea Walther (TU Dresden).
Deadlines: Conference: September 17-21, 2007. Talk abstract submission: March 31, 2007.
Information: http://cfg07.uni-hd.de; http://www.iwr.uni-heidelberg.de/groups/agbock/CONFERENCES/2007/CFG/index.php?l=en.

17–21 **IMA Workshop: Mathematics and Biology of Nucleic Acids**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1380)
Organizers: Stephen Harvey (Georgia Institute of Technology), Wilma Olson (Rutgers University), De Witt Sumners (Florida State University), David Swigon (University of Pittsburgh).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W9.17-21.07/.

17–21 **Manifolds with nonnegative sectional curvature**, American Institute of Mathematics, Palo Alto, California. (May 2007, p. 665)
Description: This workshop, sponsored by AIM and the NSF, will be devoted to manifolds with nonnegative and positive curvature. Significant progress has been made recently following a program suggested by K. Grove that one should study this condition under the presence of a large isometry group. The workshop will consider various special cases, with significant time spent working on problems.
Organizers: Kristopher Tapp and Wolfgang Ziller.
Deadline: May 15, 2007.
Information: http://aimath.org/ARCC/workshops/nnsectcurvature.html.

17–21 **SECURECOMM 2007: Third International Conference on Security and Privacy for Communication Networks**, Nice, France. (May 2007, p. 665)
Information: For information regarding the conference, please visit: http://www.securecomm.org/.

17–21 **Summer School on "New Trends and Directions in Harmonic Analysis, Approximation Theory, and Image Analysis"**, Inzell, Germany. (Jun/Jul 2007, p. 779)
Aims and Scope: The workshop is intended to bring together leading international scientists and young researchers from different facets of harmonic analysis, approximation theory and signal and image analysis to present their latest cutting-edge research and to establish new and exciting directions for future investigations.
Organizers: Brigitte Forster-Heinlein, Peter Massopust, and Rupert Lasser Centre of Mathematical Sciences, Technische Universität München, Garching, Germany, and Institute for Biomathematics and Biometry, GSF National Research Centre for Environment and Health, Neuherberg, Germany. The Summer School partially financed by means of the Marie Curie Excellence Team MAMEBIA funded by the European Commission.
Invited Plenary Speakers: John Benedetto (University of Maryland), Ole Christensen (Technical University of Denmark), Karlheinz Gröchenig (University of Vienna), Michael Unser (École Polytechnique Fédérale de Lausanne), Guido Weiss (Washington University, St. Louis).
Information: http://www.mamebia.de/inzell.

20–22 **Finsler Geometry (Mathematics and Physics)**, Institut de Recherche Mathématique Avancée, Strasbourg, France. (May 2007, p. 666)
Organizers: Athanase Papadopoulos and Vladimir Turaev.
Invited speakers: Yves Benoist (ENS Paris), Christian Duval (Marseille), Patrick Foulon (Strasbourg), Hubert Goenner (Goettingen), Vladimir Matveev (Jena), Gabriel Paternain (Cambridge), Jean-Baptiste Pomet (Sophia-Antipolis), Hans Bert Rademacher (Leipzig), Marc Troyanov (Lausanne), Constantin Vernicos (Neuchatel), Abdelghani Zeghib (ENS Lyon).
Information: email: papadopoulos@math.u-strasbg.fr.

22–23 **Minicourse on Quantitative Biology**, Centre de recherches mathématiques, Université de Montréal, Montréal, Canada. (Jun/Jul 2007, p. 779)
Description: Biology is becoming a quantitative science. For example, new technologies allow the motion of individual proteins to be visualized in single cells and the expression levels of all genes in a genome to be measured simultaneously. Nevertheless, a traditional biology training does not give the mathematical tools required to analyse such data. Across the life sciences, there is a need for researchers who are familiar with both mathematics and biology.

This minicourse will introduce the fundamentals of quantitative biology. Its goal will be to give sufficient background to enable mathematics students to start reading the scientific literature and to enable biology students to critique the assumptions behind some mathematical techniques. Students will be taught by experts in quantitative biology, all of whom have themselves moved their research from the physical to the biological sciences.

Organizers: P. S. Swain (McGill), B. P. Ingalls (Waterloo), M. C. Mackey (McGill).

Information: http://www.crm.math.ca/Dynamics2007/.

22–24 **Geometrization of Probability: A Fields Institute/ University of Ottawa workshop**, University of Ottawa, Ottawa, Ontario, Canada. (Jun/Jul 2007, p. 779)

Program: The workshop, mostly aimed at graduate students and recent Ph.D. recepients, will feature minicourses, one-hour invited lectures, and possibly time for short communications and a discussion of open problems.

Topics: Recent decades have seen a remarkable degree of interaction between probability theory and high-dimensional convexity theory. The framework of the subject involves very high dimensional spaces (normed spaces, convex bodies) and accompanying asymptotic phenomena as the dimension goes to infinity. Concepts, results and approaches of a new theory developed in the framework of geometrization of probability will benefit many mathematicians using in one form or another probabilistic and functional-analytic methods in their work. The lecturers at the workshop are today's foremost experts in the area.

Minicourse lecturers: Shiri Artstein-Avidan (Tel-Aviv University), Robert McCann (University of Toronto), Boaz Klartag (IAS and Clay Institute).

Invited Speakers: Alexander Litvak (University of Alberta), Sasha Sodin (Tel-Aviv University), Stanislaw Szarek (Case Western Reserve University), Nicole Tomczak-Jaegermann (University of Alberta), Elisabeth Werner (Case Western Reserve University).

Financial support: Limited financial support will be available for Ph.D. students and postdoctoral fellows, cf. the web page for details.

Information: http://www.fields.utoronto.ca/programs/scientific/07-08/geometrization/index.html.

23–26 **Applied Statistics 2007**, Ribno (Bled), Slovenia. (Jun/Jul 2007, p. 780)

Program: The conference will provide an opportunity for researchers in statistics, data analysts, and other professionals from various statistical and related fields to come together, present their research, and learn from each other. A three day program consists of invited paper presentations, contributed paper sections from diverse topics, and finishes with a workshop. Cross-discipline and applied paper submissions are especially welcome.

Plenary speakers: Alan Agresti, University of Florida, USA; Ingram Olkin, Stanford University, USA; Rolf Steyer, Friedrich-Schiller-University Jena, Germany.

Organizers: Statistical Society of Slovenia.

Deadlines: Abstract Submission: July 1, 2007. Registration: August 15, 2007.

Information: info.AS@nib.si; http://ablejec.nib.si/AS2007/.

23–26 **The 15th International Symposium on Graph Drawing**, Syndey, Australia. (Aug. 2007, p. 917)

Scope: The range of topics that are within the scope of the International Symposium on Graph Drawing includes (but is not limited to): • Visualization of networks, • Web maps, • software engineering diagrams, • database schemas, • chemical structures and molecules, • Graph Algorithms, • Geometric graph theory, • Geometric computing, • Software systems for graph visualization, • Topology and planarity, • Graph theory and optimization on graphs, • Interfaces for interacting with graphs, • Task analysis to guide graph drawing.

Invited Speakers: Brendan McKay (ANU, Australia), Norishige Chiba (Iwate University, Japan).

Contact Information: The organizing committee can be contacted at gd2007@cs.usyd.edu.au.

23–28 **14th Workshop on Stochastic Geometry, Stereology and Image Analysis**, Friedrich-Schiller-University Jena, Department of Stochastics, Jena, Germany. (Feb. 2007, p. 308)

Information: http://www.minet.uni-jena.de/stoch_geom_07/.

24–25 **DIMACS/DyDAn Workshop on Computational Methods for Dynamic Interaction Networks**, DIMACS Center, CoRE Building, Rutgers University, Piscataway, New Jersey. (Aug. 2007, p. 917)

Short Description: A substantial body of research in various sciences aims at understanding the dynamics and patterns of interactions within populations, in particular how social groups arise and evolve. As a result of the advances in communications and computing technology, extreme amounts of data are being accumulated representing the evolution of large scale communication networks, such as the WWW, chatrooms, Blogs, and networks of bluetooth enabled handheld devices. Moreover, as small sensors become largely available and affordable, new research areas are exploiting the social networks resulting from those sensor networks data. Finding patterns of social interaction within a population has been addressed in a wide range applications including: disease modeling cultural and information transmission, intelligence and surveillance, business management, conservation biology and behavioral ecology.

Organizers: Tanya Berger-Wolf, University of Illinois at Chicago, tanyabw@uic.edu; Mark Goldberg, RPI, goldberg@cs.rpi.edu; Malik Magdon-Ismail, RPI, magdon@cs.rpi.edu; Fred Roberts, DIMACS, froberts@dimacs.rutgers.edu; William "Al" Wallace, RPI, wallaw@rpi.edu.

Information: http://dimacs.rutgers.edu/Workshops/Dynamic.

24–27 **International Conference on Applications in Nonlinear Dynamics**, Poipu Beach, Koloa, Kauai, Hawaii.

Information: All information about conference can be found at http://www.icand2007.org.

24–28 **Towards Relative Symplectic Field Theory**, CUNY Graduate Center, New York, New York. (Jun/Jul 2007, p. 780)

Description: The goal of this workshop, sponsored by AIM, NSF, CUNY Graduate Center and Stanford Mathematical Research Center (MRC), is to understand the structure of relative Symplectic Field Theory (SFT), discuss and reconcile different versions of its algebraic formalism, and to work towards building rigorous foundations of the theory. There will also be explored applications of relative SFT to symplectic and contact topology, as well as low-dimensional topology.

Organizers: Kai Cieliebak, Tobias Ekholm, Yakov Eliashberg, Kenji Fukaya, Dennis Sullivan, and Michael Sullivan.

Deadline: May 21, 2007.

Information: http://aimath.org/ARCC/workshops/relsymplectic.html.

24–28 **Workshop on Deconstructing Biochemical Networks**, Centre de recherches mathématiques, Université de Montréal, Montréal, Canada. (Jun/Jul 2007, p. 780)

Organizers: P. S. Swain (McGill), B. P. Ingalls (Waterloo), M. C. Mackey (McGill).

Description: New technologies have led to a huge increase in molecular level data in biological systems. As well as fueling the transition of molecular biology to a quantitative science, this data is also revealing new complexity in biochemical networks. This workshop will bring together both modellers and experimentalists, and will focus on network "design".

Information: http://www.crm.math.ca/Dynamics2007/.

24–29 **18th Congress of Unione Matematica Italiana**, Bari, Italy. (May 2007, p. 666)
Information: email: segreteria@congressoumi2007.it; http://www.congressoumi2007.it.

24–29 **International Algebraic Conference dedicated to the 100th anniversary of D. K. Faddeev**, Euler International Mathematical Institute, St. Petersburg, Russia. (Apr. 2007, p. 560)
Organizers: St. Petersburg State University, St. Petersburg Dept. of the V. A. Steklov Inst. of Math. of the Russian Acad. of Sci., Euler International Math. Inst., Euler Foundation, St. Petersburg Math. Soc.
Program Committee: A. V. Yakovlev, S. V. Vostokov, N. A. Vavilov, A. I. Generalov, N. L. Gordeev.
Information: email: novikova@pdmi.ras.ru; http://www.pdmi.ras.ru/EIMI/2007/DKF.

25–28 **The 2nd International Conference on Nonlinear Dynamics: KhPI 2007 in honor of Alexander Lyapunov 150th Anniversary**, National Technical University, Kharkov Polytechnical Institute, Kharkov, Ukraine. (Feb. 2007, p. 308)
Topics: Analytical and numerical methods in nonlinear dynamics; Resonances, stability analysis and bifurcations in nonlinear systems; Nonlinear normal modes; Transient processes and localization of energy; Chaotic dynamics; Nonlinear dynamics of continuous systems, in particular, plates and shells; Vibro-impact systems and other non-smooth systems; Vibro-creep problems and other problems of nonlinear dynamics
Call for papers: A one-page abstract for presentation at the conference is invited.
Deadlines: The deadline for the pre-registration and abstract submission is February 17th, 2007. Only electronic submission is accepted. Notification of acceptance: April 15, 2007.
Language: English.
Information: Dept. of Applied Mathematics (Prof. Yu.V. Mikhlin, Prof. L.V. Kurpa, Dr. G.V. Rudnyeva), National Technical University "Kharkov Polytechnical University", 21 Frunze str., Kharkov, 61002, Ukraine; Phone: +38-057-7076032; Fax: +38-057-7076601; email: muv@kpi.kharkov.ua, yuri_mikhlin@mail.ru, gayane@kpi.kharkov.ua;http://users.kpi.kharkov.ua/infiz/conf/index.html.

October 2007

1–5 **Dynamic Searches and Knowledge Building**, UCLA, Los Angeles, California. (Jun/Jul 2007, p. 780)
Topics: User-tailored search, Textual entailment, Knowledge Discovery and Data Mining, Analysis and organization of search results, Measures of document or semantic similarity, Multi-media data mining and semantic annotation, including images, video and audio, Applications integrating search and knowledge (e.g. biomedicine, customer relationship management).
Speakers: Will be announced soon on: http://www.ipam.ucla.edu/programs/sews1/.
Organizing Committee: Karin Verspoor, Chair (Los Alamos National Laboratory, CCS-3), Jennifer Chu-Carroll (IBM Watson Research Center), Ronald Coifman (Yale University), Carey Priebe (Johns Hopkins University, Center for Imaging Science).
Application/Registration: An application/registration form is available at: http://www.ipam.ucla.edu/programs/sews1/. 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. We urge you to apply as early as possible. Applications received by August 20, 2007 will receive fullest consideration. Successful applicants will be notified as soon as funding decisions are made.
Funding: To support the attendance of recent Ph.D.'s, graduate students, and researchers in the early stages of their career; however, mathematicians and scientists at all levels who are interested in this area are encouraged to apply for funding. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.

5–6 **AMS Central Section Meeting**, DePaul University, Chicago, Illinois. (Dec. 2006, p. 1380)
Information: http://www.ams.org/amsmtgs/sectional.html.

6–7 **AMS Eastern Section Meeting**, Rutger University-New Brunswick, Busch Campus, New Brunswick, New Jersey. (Dec. 2006, p. 1380)
Information: http://www.ams.org/amsmtgs/sectional.html.

8–12 **Dichotomy Amenable/Nonamenable in Combinatorial Group Theory**, AIM Research Conference Center, Palo Alto, California. (Jun/Jul. 2006, p. 714)
Organizers: Mark Sapir and Tatiana Nagnibeda.
Description: This workshop, sponsored by AIM and the NSF, will be devoted to various incarnations of the notion of amenability for a finitely generated group. The main goal of the workshop is to gain better understanding of the meaning of being amenable or nonamenable for a discrete, finitely generated group. Our attention will be concentrated on a certain number of concrete open problems about (non)amenability of groups with origins in very different areas of mathematics, as described on the workshop announcement page.
Deadline: June 20, 2007.
Details:http://aimath.org/ARCC/workshops/nonamenable.html.

9–11 **SIAM Conference on Mathematics for Industry: Challenges and Frontiers (MI07)**, Hyatt Regency Philadelphia, Philadelphia, Pennsylvania. (Mar. 2007, p. 440)
Description: SIAM's conference on Mathematics for Industry focuses attention on the many and varied opportunities to promote applications of mathematics to industrial problems.
Deadlines: Minisymposium proposals: March 9, 2007. Abstracts for contributed and minisymposium speakers: April 9, 2007.
Information: http://www.siam.org/meetings/mi07/.

11–12 **Tenth New Mexico Analysis Seminar**, University of New Mexico, Albuquerque, New Mexico. (Jun/Jul 2007, p. 780)
Keynote Speakers: Andrea Nahmod, University of Massachussets, Amherst. Minicourse on "Bilinear Operators in Analysis and PDEs", and Rodrigo Banuelos, Purdue University Minicourse on "Martingales and Fourier multipliers. What's new in this old marriage?".
Conference Information and Registration: This seminar is organized by analysis aficionados at New Mexico State University and The University of New Mexico. This year the conference is scheduled in the Fall prior to an AMS meeting that will be held in Albuquerque on Oct 13–14, 2007. The goal is to provide an opportunity for scientific exchange and cooperation among broadly defined analysts. This year the centerpieces of the seminar will be two minicourses given by the keynote speakers.
There is time allocated for shorter contributed talks, most of them will be presented in special sessions during the AMS meeting. If you would like to attend and give a talk, please contact one of the organizers by June 26, 2007. Doctoral students and recent Ph.D.s are specially encouraged to apply.
The registration form can be found at http://www.math.unm.edu/conferences/10thAnalysis/registration.html.
The seminar is being sponsored by NSF. We will provide travel stipends for qualified graduate students. We intend to pay, at least partially, shared accommodations for all participants, and if there are funds left, we will reimburse some travel expenses to those participants who have no other sources of funding (priority given to speakers and junior participants).
Information about the conference will be posted at: http://www.math.unm.edu/conferences/10thAnalysis/.
Organizers: Cristina Pereyra (crisp@math.unm.edu), Tiziana Giorgi (tgiorgi@nmsu.edu), Joseph Lakey (jlakey@nmsu.edu), Adam Sikora (asikora@nmsu.edu), Robert Smits (rsmits@nmsu.edu).

*11–13 **Algebra, Geometry, and Mathematical Physics**, Chalmers, Göteborg, Sweden.
Information: http://www.agmf.astralgo.eu/gb07/.

13–14 **AMS Western Section Meeting**, University of New Mexico, Albuquerque, New Mexico. (Jun/Jul. 2006, p. 714)
Information: http://www.ams.org/amsmtgs/sectional.html

*15–19 **Diagonally symmetric polynomials and applications**, CIEM, Castro-Urdiales, Spain.
Topics: The diagonally symmetric polynomials are the polynomials in the entries of a matrix of indeterminates that are invariant under the permutations of its columns. They are also known as multisymmetric polynomials, vector symmetric polynomials, MacMahon symmetric polynomials, ... The goal of this conference is to share this knowledge, to present the state-of-the art on these objects, and also to present the problems that need to be solved.
Speakers: François Bergeron, Riccardo Biagioli, Ira Gessel, Francesco Vaccarino.
Organizers: Emmanuel Briand, Mercedes Rosas.
Information: http://www.congreso.us.es/dsym/.

*17–23 **Algebraic Aspects in Geometry**, Mathematical Research and Conference Center, Bedlewo, Poland.
Topics: The following topics will be addressed: 1. Infinite-dimensional Lie algebras: cohomology and geometry, applications in conformal field theory: The Virasoro algebra and the affine Kac-Moody algebras play an important role in conformal field theory. For a quantization of the theory, fields and field operators on higher genus Riemann surfaces have to be considered. The corresponding global algebras are the algebras of Krichever-Novikov type. There exists an elegant formulation of Wess-Zumino-Novikov-Witten models using them. Further topics to be considered are higher algebraic structures, deformations of Lie algebras, central extensions, cohomology, families of infinite-dimensional Lie algebras over the moduli spaces of curves with marked points... 2. Algebraic characterization of (super) space, Weyl algebra and related conjectures: Recent Lie-algebraic characterizations of spaces are tightly connected with the description of automorphisms and derivations of quantum and classical Poisson algebras. These works are close to the study of the automorphism groups of the Weyl algebra and its classical counterpart, hence to the Kanel-Kontsevich, Dixmier, and Jacobi conjectures, which are statements challenging the mathematical community for several decades. 3. Courant algebroids and symplectic Supergeometry, L-infinity algebras, Sigma models and supersymmetry: Supermathematics is inspired by supersymmetry. Potential new supersymmetric sigma models should turn out to be a rich source of elegant and physically motivated theorems in Geometry. Interest in Q-manifolds is related with the Alexandrov, Kontsevich, Schwarz, and Zaboronsky interpretation of Batalin-Vilkovisky formalism in topological field theory. A Q-field on a supermanifold is dual to an L-infinity algebraic structure. Moreover, by the use of derived brackets in Q-geometry, one can reproduce a wide class of algebraic constructions, including Poisson manifolds and Courant algebroids, such that Dirac structures and, in particular, generalized complex structures are recognized to be certain super Lagrange submanifolds.
Invited Speakers: will include G. Barnich, V. Bavula, A. Fialowski, A. Kanel-Belov, C. Klimcik, A. Kotov, G. Landi, M. Markl, K.-H. Neeb, P. Severa, O. Sheinman, S. Skryabin, M. Stienon, T. Strobl, A. van den Essen, T. Voronov, A. Wade.
Information: Application Form & Programme available from http://www.esf.org/conferences/07249. Contact at ESF: Ms. Chiara Orefice (corefice@esf.org).

19–20 **27th Southeast Atlantic Regional Conference on Differential Equations (SEARCDE)**, Murray State University, Murray, Kentucky. (Jun/Jul 2007, p. 781)
Organizers: Maeve L. McCarthy (maeve.mccarthy@murraystate.edu) and K. Renee Fister.
Speakers: Jeff Borggaard, Virginia Tech; Gerda deVries, University of Alberta; Barbara L. Keyfitz, Fields Institute and University of Houston.
Deadlines: October 1, 2007.
Information: http://campus.murraystate.edu/searcde/.

21–27 **The ADONET-CIRM School on Graphs and Algorithms**, Grand Hotel Bellavista, Levico Terme, Trento, Italy. (Jun/Jul 2007, p. 781)
Minicourses: The school offers six minicourses (four lectures each) on state-of-the art topics on graphs and algorithms and related subjects. The minicourses are given by: Maria Chudnowsky (Columbia University): "Forbidding induced subgraphs", Jim Geelen (University of Waterloo): "Graph minors: Structure and algorithms", Michel Goemans (Massuchusetts Institute of Technology): "Uncrossing techniques", Bertrand Guenin (University of Waterloo): "Flows in graphs and matroids", Satoru Iwata (University of Tokyo): "Submodular function", Bill Jackson (University of London): "Rigidity of graphs". Institutional lectures will be given by Carsten Thomassen (Technical University of Denmark) and Wolfgang Mader (University of Hannover).
Scientific Organizers: Michele Conforti (University of Padova) and Bert Gerards (CWI, Amsterdam and Technische Universiteit Eindhoven).
Information:http://www.science.unitn.it/cirm/ADONETCIRM07.html; registration deadline is July 31, 2007. A. Micheletti, CIRM, Fondazione Bruno Kessler, 38050 Povo (Trento), Italy. email: michelet science.unitn.it, Tel. +39-0461-881628, Fax +39-0461-810629.

22–26 **Numerical Tools and Fast Algorithms for Massive Data Mining, Search Engines and Applications**, UCLA, Los Angeles, California. (Aug. 2007, p. 918)
Topics: Deterministic and randomized algorithms for matrix approximation, Analysis of dense matrices, Fast algorithms for SVD solvers, Algorithms for l0 and l1 approximation, High precision randomized algorithms of linear algebra, Interior point methods, Relation of fast solvers to the Fast Multipole Method, Manifold approximation, Band-limited functions on data sets.
Organizing Committee: Yann LeCun, Chair (New York University), Ming Gu (University of California, Berkeley), Piotr Indyk (Massachusetts Institute of Technology), Vladimir Rokhlin (Yale University), Sam Roweis (University of Toronto), Andrew Zisserman (University of Oxford).
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/sews2/. 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 3, 2007, will receive fullest consideration.

23–25 **Petra International Conference on Mathematics**, Al-Hussein Bin Talla Unversity, Ma'an, Jordan. (Jun/Jul 2007, p. 781)
Information: http://www.ahu.edu.jo/picom2007/.

24–26 **2007 International Conference in Modeling Health Advances**, Clark Kerr Campus, UC Berkeley, California. (Mar. 2007, p. 440)
Deadlines: Last Date for submission of Manuscripts: July 6, 2007. Last Date for Submission of Final/Camera Ready Paper: July 30, 2007. Pre-registration Due: July 30, 2007.
Information: For further information, please contact: Prof. B. D. Aggarwala, Department of Mathematics and Statistics, University of Calgary, Calgary, Alberta, Canada aggarwal@math.ucalgary.ca.

24–27 **Integers Conference 2007**, University of West Georgia, Carrollton, Georgia. (Apr. 2007, p. 560)
Purpose: The Integers Conference 2007 is an international conference in combinatorial number theory, held for the purpose of bringing together mathematicians, students, and others interested in combinatorics and number theory.

Organizers: B. Landman, M. Nathanson, J. Nesetril, R. Nowakowski, C. Pomerance.
Plenary Speakers: George Andrews, Vitaly Bergelson, Bryna Kra, Florian Luca, Ken Ono, Van Vu.
Information: See http://www.westga.edu/~math/IntegersConference2007/.

29–November 2 **IMA Workshop: RNA in Biology, Bioengineering and Nanotechnology**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1381)
Organizers: Tamar Schlick (New York University), Eric Westhof (CNRS, Strasbourg).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W10.29-11.2.07/.

November 2007

* 1–3 **International Conference "Theory of functions, algebra and mathematical logics", devoted to 90 anniversary of academician A. D. Taimanov**, Center of physical and mathematical researches, Institute of Mathematics, Kazakh National University, Kazakh National Pedagogical University, Institute for Problems of Informatics and Control, Almaty, Kazakhstan.
Topics: Program of the conference consists of 3 sections: 1. Algebra, Geometry and Topology. 2. Mathematical Logic and its application to Computer Science. 3. Theory of functions and Differential Equations.
Submissions: Submission of abstracts for presentation at the conference is now invited. The registration is available at http://mmf.kazsu.kz/konf/TFAL-2007. We will appreciate if you write down your abstracts in LaTeX with length no longer than 3 pages.
Deadline: For submission of abstract for presentation: September 10, 2007. Deadline for abstract submitting: September 15, 2007.
Registration Fee: 2000 Kazakhtenge ($15.00-$20.00 USA).
Information: You can obtain any additional information at: vvv@ipic.kz; baizhanov@ipic.kz, dzenali@math.kz, baizhanov2007@rambler.ru. Telephones: 8-327-291-18-34, 8-701-481-67-12, 8-777-260-03-06.

* 1–3 **Seventh Mississippi State - UAB Conference on: Differential Equations & Computational Simulations**, Doubletree Hotel, Birmingham, Alabama.
Description: This Interdisciplinary Conference will provide a joint forum where mathematicians, scientists, and engineers from academia and industry can exchange research ideas involving theoretical and applied developments in differential equations and computational simulations. In addition to the thirteen principal lectures, there will be sessions of contributed talks. Reviewed manuscripts will be published as a special issue of the Electronic Journal of Differential Equations.
Principal Speakers: Oscar Bruno, California Institute of Technology; Chris Cosner, University of Miami; Jeff Crandall, University of Virginia; Norman Dancer, University of Sydney, Australia; Joshua Epstein, The Brookings Institution; Lisa Fauci, Tulane University; Yanyan Li, Rutgers University; Jean Mawhin, University of Catholique de Louvain, Belgium; Charles Nietubicz, Army research Laboratory; Stanley Osher, University of California, Los Angeles; Jaime Peraire, Massachusetts Institute of Technology; John Rice, IBM TJ Watson Research Center; Peter Takac, University of Rostock, Germany.
Organizers: Ratnasingham Shivaji & Bharat Soni.
Deadlines: Pre-registration deadline is October 1, 2007. Abstracts for contributed papers should be submitted electronically no later than September 1, 2007.
Information: For further information, kindly visit: http://www.msstate.edu/dept/math/events/de.conf/de2007/.

1–4 **Knotting Mathematics and Art: a Conference on Low Dimensional Topology and Mathematical Art**, University of South Florida, Tampa, Florida. (Aug. 2007, p. 918)
Organizers: J. Scott Carter, University of South Alabama; Mohamed Elhamdadi, University of South Florida; Natasa Jonoska, University of South Florida; Seiichi Kamada, Hiroshima University; Akio Kawauchi, Osaka City University; Masahico Saito, University of South Florida; John Sims, JohnSimsProjects.
Program: Lectures on knot theory, low dimensional topology and mathemtical art. Exhibition of mathematical art.
Information: Contact: saito@math.usf.edu (Masahico Saito), jonoska@math.usf.edu (Natasha Jonoska); http://knotart.cas.usf.edu.

1–5 **Joint AARMS-CRM Workshop on Recent Advances in Functional and Delay Differential Equations**, Dalhousie University, Halifax, Canada. (Jun/Jul 2007, p. 781)
Organizers: J. Appleby (Dublin City), H. Brunner (Memorial), A. R. Humphries (McGill), D.E. Pelinovsky (McMaster).
Local Organizers: P. Keast (Dalhousie), P. Muir (St Mary's).
Description: Delay differential equations arise in many applications, and in the case of constant delays solutions give rise to semi-flows on function spaces. This workshop will provide a wide perspective on current research and open problems, covering theory, applications and numerical analysis of these equations.
Concentrated Topics: Dissipative Advanced Retarded Equations, Hamiltonian Advanced Retarded Equations Numerical DDEs (Chinese & Italian schools, numerics also in other concentrations), Applications in Mathematical Biology (Mathematical Physiology and Pop Dynamics), Volterra and Integral Equations, State Dependent Delays.
Information: http://www.crm.math.ca/Dynamics2007/.

1–December 31 **Program on Bose-Einstein Condensation and Quantized Vortices in Superfluidity and Superconductivity**, Institute for Mathematical Sciences, Singapore, Singapore. (May 2007, p. 666)
Topics: Review the most recent and advanced development in the research on Bose-Einstein condensation and quantized vortices in superfluidity and superconductivity, from experiment to theory, simulation and application; present the recently developed mathematical theories, including modeling, analysis and computational techniques, that are relevant to BEC and quantized vortices; discuss and compare different recently proposed scientific models for BEC, especially for BEC at finite temperatures, and fermion condensation; identify critical scientific issues in the understanding of BEC and quantized vortices and the difficulties that are common to both disciplines; accelerate the interaction of applied and computational mathematics with physics and materials science, and promote this highly interdisciplinary research that has emerging applications; develop and foster international collaborations in a new era of scientific research.
Organizing Committee: Weizhu Bao (National University of Singapore), Fanghua Lin (Courant Institute, New York University).
Information: For enquiries on scientific aspects of the program, please email Weizhu Bao at bao_weizhu@nus.edu.sg.

2–3 (REVISED) **Seventh Annual Prairie Analysis Seminar**, Kansas State University, Manhattan, Kansas.
Speakers: Luis Caffarelli, University of Texas, Antoine Mellet, University of British Columbia, and Daniel Phillips, Purdue University. There will be sufficient time for contributed talks; mathematicians early in their careers are especially encouraged to contribute a 20-minute talk.
Organizers: Marianne Korten, Diego Maldonado, Charles Moore, Virginia Naibo, Kansas State University and Estela Gavosto, Rodolfo Torres, University of Kansas.
Information: For information and registration see http://www.math.ksu.edu/pas/2007/. The conference will be supported by the National Science Foundation. Support for travel is available, with priority given to support graduate students, younger researchers,

minorities, those from underrepresented groups, and others who do not currently have other NSF awards to attend the seminar.

3–4 **AMS Southeastern Section Meeting**, Middle Tennessee State University, Murfreesboro, Tennessee. (Jun/Jul. 2006, p. 714)
Information: http://www.ams.org/amsmtgs/sectional.html

5–9 **Algorithmic Convex Geometry**, AIM Research Conference Center, Palo Alto, California. (Mar. 2007, p. 440)
Description: This workshop, sponsored by AIM and the NSF, is motivated by algorithms and draws heavily on probability (especially the theory of stochastic processes), convex geometry and functional analysis. The workshop will bring together leading researchers in these areas.
Organizers: Assaf Naor and Santosh Vempala.
Deadline: July 1, 2007.
Information: http://aimath.org/ARCC/workshops/convexgeometry.html.

11–16 **21st Large Installation System Administration Conference (LISA '07)**, Hyatt Regency Dallas, 300 Reunion Boulevard, Dallas, Texas 75207. (Jun/Jul 2007, p. 781)
Description: The most in-depth, real-world system administration training available. For twenty years, the annual LISA conference has been the foremost worldwide gathering for everyone interested in the technical and administrative issues of running a large computing facility. Administrators of all specialties and levels of expertise meet at LISA to exchange ideas, sharpen old skills, learn new techniques, debate current issues, and meet colleagues and friends.
Information: http://www.usenix.org/events/lisa07/.

*13–17 **Sixth Workshop on Lie Theory and Geometry**, Cruz Chica, La Cumbre, Argentina.
Preceded by: Meeting on Lie Theory and Geometry, celebrating the 60th birthday of Professors Roberto Miatello and Isabel Dotti, November 12th, 2007, Cordoba, Argentina.
Aims and Scope: The topics of the workshop will include several aspects of Lie Groups and Geometry, with special emphasis in four main areas: (i) representation theory (ii) inverse spectral geometry (iii) geometric structures on homogeneous spaces (iv) applications to number theory.
Support: For a limited number of advanced graduate students and recent Ph.D.'s is being provided by the National Science Foundation. To apply for funding, please send a request by e-mail to both Carolyn Gordon; csgordon@dartmouth.edu and Joseph Wolf; jawolf@math.berkeley.edu. Graduate students must request a letter of recommendation from their thesis advisors. Recent Ph.D.'s should include a description of up to a page of their research interests and plans, indicating how they fit with the workshop. The target date for applications is August 12, 2007. Applications received after that date will be considered if funding remains. Those awarded travel support can also expect local support through Argentine funds. The workshop is being supported by CONICET (Argentina), FONCYT (Argentina) (pending), ICTP (Trieste, Italy) (pending), and the NSF. Support for local expenses is available for a limited number of participants at all career stages.
Information and Registration: http://www.famaf.unc.edu.ar/~liegeo07/index.html.

14–16 **Workshop on Dynamical Systems and Continuum Physics**, Centre de recherches mathématiques, Université de Montréal, Montréal, Québec, Canada. (Jun/Jul 2007, p. 781)
Organizer: L. Tuckerman (PMMH-ESPCI, France).
Description: Dynamical systems theory provides astonishingly faithful representations of systems from continuum physics. This workshop will focus on recent research in laminar and turbulent hydrodynamics and in some more discrete systems, notably granular media and foams.
Information: http://www.crm.math.ca/Dynamics2007/.

*19–23 **Workshop on Bioimaging II/PDEs**, Johann Radon Institute for Computational and Applied Mathematics (RICAM), Linz, Austria.
Description: The workshop is part of the Special Semester on Quantitative Biology analyzed by Mathematical Methods held at the Johann Radon Institute for Computational and Applied Mathematics (RICAM), Linz, October 1, 2007–January 27, 2008.
Overview: Problems in the fields of Bioimaging, Biomechanics and Chemotaxis, Ion Channels, Pattern Formation and Functional Morphology, Systems Biology. will be studied by exploring mathematical methods from the areas of Inverse Problems, PDEs, Stochastics, Dynamical Systems.
Information: http://www.ricam.oeaw.ac.at/specsem/ssqbm/.

28–29 **International Conference on Mathematical Sciences (ICMS'07)**, Equatorial Hotel, Bangi-Putrajaya, Malaysia. (Jun/Jul 2007, p. 781)
Description: "Integrating Mathematical Sciences within Society".
Focus: Theory and applications of mathematical sciences in engineering, medical, biotechnology, insurance, finance and other related areas.
Important Dates: Abstract deadline: July 1, 2007. Conference Registration: August 1, 2007 (early birds). Full paper deadline: Sept. 30, 2007.
Organizers: Universiti Kebangsaan Malaysia & Malaysian Mathematical Sciences Society.
Information: email: seminarppsm@lycos.com; http://pkukmweb.ukm.my/~ppsmfst/icoms/.

December 2007

*1 **National Conference on Technology and Innovation in Mathematics Education**, IIT Bombay, Mumbai, India.
Description: TIME 2007 Second National conference on technology and mathematics education for school teachers and college teachers.
Information: http://www.math.iitb.ac.in/~time2007/.

3–7 **Rigidity and polyhedral combinatorics**, American Institute of Mathematics, Palo Alto, California. (Jun/Jul 2007, p. 782)
Organizers: Robert Connelly, Ezra Miller, and Igor Pak.
Description: This workshop, sponsored by AIM and the NSF, will be devoted to polyhedral objects in Euclidean spaces. Specifically, which metric or combinatorial properties must change or remain constant under certain classes of deformations, such as bending, folding, stretching, or flexing?
Deadline: July 15, 2007.
Information: http://aimath.org/ARCC/workshops/polyhedralcomb.html.

7–11 **Fourth Pacific Rim Conference on Mathematics: Celebrating the Tenth Anniversary of the Liu Bie Ju Centre for Mathematical Sciences**, City University of Hong Kong, Hong Kong. (Jan. 2007, p. 64)
Description: The Conference, which is open to all areas of mathematics, will have eight Focus Sessions. Each Focus Session will include a Plenary Speaker and several Invited Speakers. In addition, seven Plenary Speakers will give talks to celebrate the Tenth Anniversary of the Liu Bie Ju Centre for Mathematical Sciences, City University of Hong Kong.
Focus Sessions: Algebraic Geometry, Conformal Geometry, Heisenberg Geometry - Curve and Surface Theories, Homogenization and its Impact on Physics, Inverse Problems, Kinetic Equations and Fluid Dynamical Systems, Partial Differential Equations, Representation Theory and Group Theory.
Plenary Speakers: Jean-Pierre Bourguignon (Institut des Hautes Études Scientifiques), Philippe G. Ciarlet (City Univ. of Hong Kong), Hyeonbae Kang (Seoul National Univ.), Ta-Tsien Li (Fudan Univ.), Tai-Ping Liu (Stanford Univ.), Gaven Martin (Univ. of Auckland), Amnon Neeman (Australian National Univ.), Michael J.D. Powell (Univ. of Cambridge), Steve Smale (Toyota Technological Institute, Chicago), Seiji Ukai (City Univ. of Hong Kong), Muthusamy Vanninathan (Tata

Institute of Fundamental Research), Roderick S.C. Wong (City Univ. of Hong Kong), Paul Yang (Princeton Univ.), Xiping Zhu (Zhongshan Univ.), Jiping Zhang (Peking Univ.).
Deadline: For submission of abstract of contributed papers: October 1, 2007.
Information: http://www6.cityu.edu.hk/rcms/PRCM4/. For enquiries, please e-mail to Ms Sophie Xie at MCLBJ@cityu.edu.hk. Note: Registration is compulsory.

10–12 **SIAM Conference on Analysis of Partial Differential Equations (PD07)**, Hilton Phoenix East/Mesa, Mesa, Arizona. (Apr. 2007, p. 560)
Information: The Call for Presentations for this conference is available at: http://www.siam.org/meetings/pd07/.
Deadlines: Minisymposium proposals: May 11, 2007. Abstracts for all contributed and minisymposium presentations: June 11, 2007.
Information: For additional information, contact SIAM Conference Department at email: meetings@siam.org.

10–14 **Triangulations, Heegaard splittings and hyperbolic geometry**, American Institute of Mathematics, Palo Alto, California. (Apr. 2007, p. 560)
Description: This workshop, sponsored by AIM and the NSF, will be devoted to the study of 3-manifolds via two new methods of decomposing them: efficient triangulations and Mom technology. These are reminiscent of the classical tools of triangulations and Heegaard splittings and one goal of the workshop is to draw connections amongst these four structures. Furthermore, we aim to make connections between these decompositions and the geometry of the manifold.
Organizers: Jennifer Schultens and Maggy Tomova.
Deadline: August 1, 2007.
Information: http://aimath.org/ARCC/workshops/triangulations.html.

11–14 **Workshop on Chaos and Ergodicity of Realistic Hamiltonian Systems**, Centre de recherches mathématiques, Université de Montréal, Montréal, Québec, Canada. (Jun/Jul 2007, p. 782)
Organizers: H. Broer (Groningen), P. Tupper (McGill).
Topics: Is mathematical ergodicity too strong a property for realistic systems? What is the relation between chaos and ergodicity for Hamiltonian systems? What about stronger properties, such as mixing, and CLT? What are the limits imposed by KAM? What is the relevance to molecular dynamics and fluid mechanics? What are the prospects for the Arnold-Avez Conjecture: For rather general Hamiltonian systems show that areas of positive measure exist with positive Lyapunov exponent.
Information: email: paradis@crm.umontreal.ca; http://www.crm.math.ca/Dynamics2007/.

12–15 **First Joint International Meeting between the AMS and the New Zealand Mathematical Society (NZMS)**, Wellington, New Zealand. (Jun/Jul. 2006, p. 714)
Information: http://www.ams.org/amsmtgs/internmtgs.html

15–17 **First Announcement and Call for Papers: The Eighth Asian Symposium on Computer Mathematics (ASCM 2007)**, National University of Singapore, Singapore. (Jun/Jul 2007, p. 782)
Description: The Asian Symposia on Computer Mathematics (ASCM) are a series of conferences which offer a forum for participants to present original research, to learn of research progress and new developments, and to exchange ideas and views on doing mathematics using computers. ASCM 2007 will consist of invited talks, regular sessions of contributed papers, and software demonstrations.
Call for Papers: Research papers on all aspects of the interaction between computers and mathematics are solicited for the symposium. Papers should be written in English, in single column, not exceeding 15 pages, and the main text font not smaller than 10 pt. Authors are expected to submit their papers electronically (in postscript, or pdf format).
Information: http://www.comp.nus.edu.sg/~ascm2007/. See submission instructions from the conference http://www.comp.nus.edu.sg/~ascm2007/A_Instructions.htm.

15–17 **International Symposium on Recent Advances in Mathematics & Its Applications (ISRAMA 2007)**, Calcutta, India. (Jun/Jul 2007, p. 782)
Topics: Algebra, Discrete Mathematics & Theoretical Computer Science, Analysis & Topology and their Applications, Geometry and its Applications, Dynamical Systems, Chaos and Fractals, Continuum Mechanics, Plasma Physics, Control Theory and Optimization Theory, Bio-mechanics and Bioinformatics, Applications of Mathematics to Environmental Problems, History and Philosophy of Physical Science, Quantum Information Theory, Relativity and its Applications.
Information: Professor M. R. Adhikari, Secretary, Calcutta Mathematical Society, AE-374, Sector-1, Salt Lake City, India; email: cms@cal2.vsnl.net.in or cms_mra@yahoo.co.in.

16–20 **The Twelfth Asian Technology Conference in Mathematics (ATCM2007)**, Taipei, Taiwan. (Mar. 2007, p. 441)
Description: The ATCM 2007 is an international conference that will continue addressing technology-based issues in all Mathematical Sciences. Thanks to advanced technological tools such as computer algebra systems (CAS), interactive and dynamic geometry, and handheld devices, the effectiveness of our teaching and learning, and the horizon of our research in mathematics and its applications continue to grow rapidly. The aim of this conference is to provide a forum for educators, researchers, teachers and experts in exchanging information regarding enhancing technology to enrich mathematics learning, teaching and research at all levels.
Theme: Making mathematics fun, accessible and challenging through technology.
Language: English.
Deadlines: Submission of Abstracts: June 15, 2007. Submission of Full Papers: July 15, 2007.
Information: http://www.atcm.mathandtech.org.

17–19 **The 3rd Indian International Conference on Artificial Intelligence (IICAI-07)**, Pune, India. (Jun/Jul 2007, p. 782)
Description: IICAI-07 is one of the major AI events in the world. This conference focuses on all areas of AI and related fields. We invite paper submissions. Please visit on the conference website for more details.
Information: Bhanu Prasad, IICAI-07 Chair, Department of Computer and Information Sciences, Florida A & M University, Tallahassee, FL 32307; email: bhanupvsr@gmail.com; tel: 850-412-7350; http://www.iiconference.org.

17–22 **Transformation Groups 2007**, Independent University of Moscow, Moscow, Russia. (Apr. 2007, p. 560)
Description: The conference is aimed to review the development of Transformation Group Theory during last decades, to present the most bright recent achievements in this area, and to discuss the perspectives of further research. The motivations for the conference are to gather researchers working on transformation groups in various areas of mathematics, in order to extend their ideas and methods to a broader context and to provide an opportunity for a broad discussion and exchange of ideas and experience between mathematicians from various countries and of different generations. The conference will be dedicated to the anniversary of Ernest Vinberg, who will become seventy in the summer of 2007.
Invited speakers: Dmitri N. Akhiezer, Dmitri V. Alexeevsky, Leonid A. Bokut, Michel Brion, Victor M. Buchstaber, Corrado De Concini, Michel Duflo, Alexander G. Elashvili, Victor M. Gichev, Simon G. Gindikin, Victor A. Ginzburg, Victor G. Kac, Alexandre A. Kirillov, Friedrich Knop, Bertram Kostant, Hanspeter Kraft, Shrawan Kumar, Peter Littelmann, Alex Lubotzky, Dominique Luna, Alexander D. Mednykh, Vladimir F. Molchanov, Grigori I. Olshanski, Arkadiy L. Onishchik, Alexander N. Panov, Dmitri I. Panyushev, Alexey N.

Parshin, Vladimir L. Popov, M. S. Raghunathan, Osip V. Shvartsman, Tonny A. Springer, Irina D. Suprunenko, Jacques L. Tits, Nikolai A. Vavilov, Anatoly M. Vershik, Andrei Yu. Vesnin, Valentin E. Voskresensky.
Organizers: Ivan V. Arzhantsev, David A. Ellwood, Yulij S. Ilyashenko, Victor G. Kac, Alexandre A. Kirillov, Arkadiy L. Onishchik, Alexey N. Parshin, Dmitri A. Timashev, Michael A. Tsfasman.
Deadlines: For registration: September 15, 2007. For abstracts submission: October 15, 2007.
Information: Visit http://www.mccme.ru/tg2007/; email: tg2007@mccme.ru.

30–January 4 **Conference on Representations of Algebras, Groups and Semigroups**, Bar-Ilan University, Ramat-Gan, Israel and the Netanya Academic College, Netanya, Israel. (Jun/Jul 2007, p. 782)
Information: email: margolis@math.biu.ac.il; http://www.math.biu.ac.il/~margolis.

January 2008

6–9 **Joint Mathematics Meetings**, San Diego, California. (Jun/Jul 2007, p. 782)
Information: http://www.ams.org/amsmtgs/national.html.

7–June 27 **Statistical Theory and Methods for Complex, High-Dimensional Data**, Isaac Newton Institute for Mathematical Sciences, Cambridge, United Kingdom. (Jun/Jul. 2006, p. 714)
Programme Theme: Most of twentieth-century statistical theory was restricted to problems in which the number p of 'unknowns', such as parameters, is much less than n, the number of experimental units. However, the practical environment has changed dramatically over the last twenty years or so, with the spectacular evolution of computing facilities and the emergence of applications in which the number of experimental units is comparatively small but the underlying dimension is massive, leading to the desire to fit complex models for which the effective p is very large. The existence of key applications strongly motivates the programme, but the fundamental aim is to promote core theoretical and methodological research. Both frequentist and Bayesian paradigms will be featured.
Organizers: D. Banks (Duke), P. Bickel (UC Berkeley), P. Hall (Australian National), I. M. Johnstone (Stanford), D. M. Titterington (Glasgow), S. van de Geer (Zurich).
Information: http://www.newton.cam.ac.uk/programmes/SCH/. Isaac Newton Institute for Mathematical Sciences, 20 Clarkson Road, Cambridge, CB3 0EH, U.K. Tel.: +44-1223-335999, Fax.: +44-1223-330508, email: info@newton.cam.ac.uk.

10–11 **IMA Tutorial: Mathematics of Proteins**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1381)
Organizers: Michael Levitt (Stanford University Medical School), Patrice Koehl (University of CaliforniaWashington).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2006-2007/T1.12-13.07/.

10–13 **First Announcement for Thirteenth Annual Conference and First International Conference of Gwalior Academy of Mathematical Sciences (GAMS) with Symposium on Mathematical Modeling in Engineering and Biosciences**, Anand Engineering College, Agra, U.P. India. (Aug. 2007, p. 918)
Workshop Topic: Mathematical Modeling in Engineering and Biosciences.
Organizers: Jointly organized by Gwalior Academy of Mathematical Sciences (GAMS): http://www.gamsinfo.com & Anand Engineering College, Keetham, AGRA-282007 (India).
Deadlines: Last date for Pre- Registration & Submission of Abstract: August 6, 2007. Communication of Acceptance: September 10, 2007. Last date for submission of full-length papers for publication in the Proceedings: October 1, 2007. Second Announcement: October, 2007.
Information: General Correspondence: Prof. V. P. Saxena, Anand Engineering College Keetham, Agra- Delhi Road (N.H. #2) Agra-282007, India; Mob. +91-94251-09044; email: saxena_vp@rediffmail.com. Submission of Abstracts and Papers: Prof. K. R. Pardasani, Department of Mathematics, Maulana Azad National Institute of Technology, Bhopal- 462007, India; Bhopal- 462007, India; Mob. +91-94253-58308; email: 13plus1gams@gmail.com; http://kamrajp@hotmail.com.

14–18 **IMA Workshop: Protein Folding**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1381)
Organizers: Ken Dill (University of California), Sorin Instrail (Brown University), Michael Levitt (Stanford University School of Medicine).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W1.14-18.08/.

14–18 **The uniform boundedness conjecture in arithmetic dynamics**, American Institute of Mathematics, Palo Alto, California. (May 2007, p. 666)
Description: This workshop, sponsored by AIM and the NSF, will be devoted to arithmetic properties of preperiodic points for morphisms on projective space. The hope is to create new approaches to the study of arithmetic properties of periodic and preperiodic points for (quadratic) polynomials, for one-dimensional rational maps, and for projective morphisms of higher dimension. A specific goal of the workshop is to develop tools and a strategy for proving the first (highly) nontrivial case of the uniform boundedness conjecture in dynamics, namely for quadratic polynomials in one variable over Q.
Organizers: Matthew Baker, Robert Benedetto, Liang-Chung Hsia, and Joseph H. Silverman.
Deadline: September 1, 2007.
Information: See http://aimath.org/ARCC/workshops/arithdynamics.html.

14–July 4 **Combinatorics and Statistical Mechanics**, Isaac Newton Institute for Mathematical Sciences, Cambridge, United Kingdom. (Dec. 2006, p. 1381)
Description: The past half-decade has seen an increasing interaction between combinatorialists, probabilists, computer scientists and theoretical physicists concerned broadly with the study of "probability theory on graphs" or "statistical mechanics on graphs". The programme will build on this cross-fertilisation.
Topics: Zeros of combinatorial polynomials, including the chromatic, flow, reliability and Tutte polynomials; Markov-chain Monte Carlo methods; combinatorial identities and their applications in statistical mechanics; use of methods from statistical mechanics and quantum field theory in combinatorial enumeration; correlation inequalities; and phase transitions in combinatorial structures.
Organizers: P. J. Cameron (Queen Mary, University of London), B. Jackson (Queen Mary, University of London), Dr. A. Scott (University of Oxford), A. Sokal (New York University) and D. G. Wagner (University of Waterloo)
Information: http://www.newton.cam.ac.uk/programmes/CSM/; email: info@newton.cam.ac.uk.

20–22 **ACM-SIAM Symposium on Discrete Algorithms (SODA08)**, Holiday Inn Golden Gateway, San Francisco, California. (Jun/Jul 2007, p. 782)
Information: This symposium focuses on research topics related to efficient algorithms and data structures for discrete problems. In addition to the design of such methods and structures, the scope also includes their use, performance analysis, and the mathematical problems related to their development or limitations. Performance analyses may be analytical or experimental and may address worst-case or expected-case performance. Studies can be theoretical or

based on data sets that have arisen in practice and may address methodological issues involved in performance analysis.
Submission Deadline: July 6, 2007.

28–February 1 **Image Analysis Challenges in Molecular Microscopy**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Aug. 2007, p. 918)
Description: Scientific Background: Understanding the hierarchical organization of molecules, multi-protein assemblies, organelles and networks within the interior of a eukaryotic cell is a challenge of fundamental interest in cell biology. A wide variety of microscopic and spectroscopic methods already exist for imaging intact cells and their components: modern fluorescence microscopic methods provide powerful tools for imaging at spatial resolutions in the micron range, while emerging methods in electron microscopy can be used to image the arrangement of protein assemblies at resolutions of 1 nm or better. To take advantage of these rapid advances in imaging technology, it is critical to develop and apply advanced computational strategies for image processing that can cope both with the volume and complexity of the data. This conference seeks to bring together leaders at this interdisciplinary interface of image processing and stimulate new partnerships to address computational problems at this exciting frontier of cell biology. The one-week meeting will bring together biologists, physicists, mathematicians and specialists in microscopy and image analysis.
Organizing Committee: Guillermo Sapiro, Chair (University of Minnesota, Twin Cities), Alberto Bartesaghi (National Institutes of Health (NIH)), Jacqueline Milne (National Institutes of Health (NIH)), Sriram Subramaniam (National Institutes of Health (NIH)).
Application/Registration: An application/registration form is available on http://www.ipam.ucla.edu/programs/imm2008/. 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. We urge you to apply as early as possible. Applications received by December 17, 2007, will receive fullest consideration. Successful applicants will be notified as soon as funding decisions are made. We have funding to support the attendance of recent Ph.D.s, graduate students, and researchers in the early stages of their career; however, mathematicians and scientists at all levels who are interested in this area are encouraged to apply for funding. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.

March 2008

2–7 **IX International Conference "Approximation and Optimization in the Caribbean"**, Sunrise Beach Hotel, San Andres Island, Colombia. (Jun/Jul 2007, p. 782)
Information: For more information about this event please visit the website http://matematicas.univalle.edu.co/~appopt2008/.

3–7 **IMA Workshop: Organization of Biological Networks**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1381)
Organizer: Steven Altschuler (University of Texas Southwestern Medical Center), Alexander Hoffmann (University of California at San Diego), Lani Wu (University of Texas Southwestern Medical Center).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W3.3-7.08/.

* 9–12 **LUMS 2nd International Conference on Mathematics and its Applications in Information Technology 2008**, Lahore University of Management Sciences (LUMS), Lahore, Pakistan.
Call for Papers: The Second LUMS International Conference on Mathematics and is Applications in Information Technology will be held on the beautiful campus of LUMS in March 2008 over four days.
Topics: The conference will cover a broad range of topics in Mathematical research. The topics include, but are not limited to: Applied Mathematics, Pure Mathematics, Industrial Mathematics, Financial Mathematics, Auctorial Mathematics, Information Technology for Mathematics, Discrete Mathematics.
Deadlines: Submission of 100-150 words Abstract: November 10, 2007. Notification of Acceptance of Abstract: November 26, 2007. Last date of submission of full papers: December 15, 2007. Feedback to authors and selection of papers: December 31, 2007. Final paper drafting due (one of the authors must register and attend the conference): January 19, 2008. Registration: February 10, 2008.
Information: fmbhatti@lums.edu.pk.

10–June 13 **Optimal Transport (Long Program)**, UCLA, Los Angeles, California. (Jun/Jul 2007, p. 983)
Aim: The aim of the workshop is to put together physicists, biologists, mathematicians working on the optimization of transportation networks.
Organizing Committee: Andrea Bertozzi (UCLA, Mathematics), Yann Brenier (Université de Nice Sophia Antipolis), Wilfrid Gangbo (Georgia Institute of Technology), Peter Markowich (Universität Wien, Institute of Mathematics), Jean-Michel Morel (École Normale Supérieure de Cachan, CMLA).
Funding: We have funding especially to support the attendance of recent Ph.D.'s, graduate students, and researchers in the early stages of their career; however, mathematicians and scientists at all levels who are interested in this area are encouraged to apply for funding. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.
Information: Please apply online to request financial support to attend and participate for extended periods up to the entire length of the program. The application and more information is available at http://www.ipam.ucla.edu/programs/ot2008/.

15–16 **AMS Eastern Section Meeting**, Courant Institute of New York University, New York, New York. (Jun/Jul 2007, p. 983)
Information: http://www.ams.org/amsmtgs/sectional.html.

17–21 **Nonlinear PDEs of mixed type arising in mechanics and geometry**, American Institute of Mathematics, Palo Alto, California. (Jun/Jul 2007, p. 983)
Organizers: Gui-Qiang Chen, Tai-Ping Liu, Richard Schoen, and Marshall Slemrod.
Description: This workshop, sponsored by AIM and the NSF, will be devoted to the study of nonlinear partial differential equations of mixed hyperbolic and elliptic type arising in conservation laws, continuum mechanics, differential geometry, relativity, and string theory.
Deadline: November 1, 2007.
Information: See http://aimath.org/ARCC/workshops/pdesofmixedtype.html.

19–21 **The IAENG International Conference on Operations Research 2008**, Regal Kowloon Hotel, Kowloon, Hong Kong. (Jun/Jul 2007, p. 983)
Topics: Management Science, Managerial economics, Systems thinking and analysis, Optimization, Integer programming, Linear programming, Nonlinear programming, Assignment problem, Transportation network design, Simulation, Statistical Analysis, Stochastics Modelling, Reliability and maintenance, Queueing theory, Game theory, Graph theory, OR algorithms and software developments, OR applications and case studies.
Information:http://www.iaeng.org/IMECS2008/ICOR2008.html.

28–30 **AMS Southeastern Section Meeting**, Louisiana State University, Baton Rouge, Louisiana. (Jun/Jul 2007, p. 983)
Information: http://www.ams.org/amsmtgs/sectional.html.

*31–April 2 **SIAM International Conference on Numerical Combustion (NC08)**, Portola Plaza at Monterey Bay, Monterey, California.
Information: For additional information visit http://www.siam.org/meetings/nc08/.

31–April 4 **Applications of universal algebra and logic to the constraint satisfaction problem**, American Institute of Mathematics, Palo Alto, California. (Jun/Jul 2007, p. 783)
Description: This workshop, sponsored by AIM and the NSF, will be devoted to advancing the understanding of the computational complexity of the constraint satisfaction problem using methods and techniques from universal algebra and logic. The intended participants are researchers in computational complexity, universal algebra, and logic. By bringing together researchers from these three areas, progress could be made towards resolving long-standing open problems about the complexity of constraint satisfaction.
Organizers: Anuj Dawar, Phokion Kolaitis, Benoit Larose, and Matt Valeriote.
Deadline: November 15, 2007.
Information: See http://aimath.org/ARCC/workshops/constraintsatis.html.

April 2008

4–6 **AMS Central Section Meeting**, Indiana University, Bloomington, Indiana. (Jun/Jul 2007, p. 783)
Information: http://www.ams.org/amsmtgs/sectional.html.

17–18 **IMA Workshop: Network Dynamics and Cell Physiology**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1381)
Organizers: Bela Novak (Budapest University of Technology and Economics), John Tyson (Virginia Polytechnic Institute & State University).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/T4.17-18.08/.

21–25 **IMA Workshop: Design Principles in Biological Systems**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1381)
Organizers: Bud Mishra (New York University), Partha Mitra (Cold Spring Harbor Laboratory).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W4.21-25.08/.

*28–May 9 **NATO Advanced Study Institute, New Challenges in Digital Communications**, Vlora, Albania.
Program: A summer school for 2 weeks focused on coding theory and cryptography.
Director: T. Shaska.
Application Deadline: January 15, 2008.
Information: http://www.albmath.org/nato/index.html.

May 2008

3–4 **AMS Western Section Meeting**, Claremont McKenna College, Claremont, California. (Jun/Jul 2007, p. 783)
Information: http://www.ams.org/amsmtgs/sectional.html.

*11–14 **SIAM Conference on Mathematical Aspects of Materials Science (MS08)**, Doubletree Hotel Philadelphia, Philadelphia, Pennsylvania.
Description: The conference gathers an interdisciplinary group working on the development and application of sound mathematical and computational methods in the scientific study and practical exploitation of materials. The conference provides a forum to highlight the progress in a broad range of areas of current technological interest. In keeping with the interdisciplinary nature of materials science, the conference welcomes scientists and mathematicians from diverse backgrounds, including for example, mechanics, physics, engineering, mathematical analysis, computational science and biology.
Information: http://www.siam.org/meetings/ms08/.

11–16 **CHT-08: Advances in Computational Heat Transfer**, Kenzi Farah Hotel, Marrakech, Morocco. (Jun/Jul 2007, p. 783)
Goal: Of the symposium is to provide a forum for the exposure and exchange of ideas, methods and results in computational heat transfer. Papers on all aspects of computational heat transfer - both fundamental and applied - will be welcome.
Organizers: International Centre for Heat and Mass Transfer, the CFD Research Laboratory of the University of NSW, Australia and the LEEVAM Research Laboratory of the University of Cergy-Pontoise, France with the participation of the Heat Transfer Division of ASME International and the assistance of the University of Cadi Ayyad, Marrakech and the University of Limoges, France .
Co-chairs: Graham de Vahl Davis and Eddie Leonardi, CFD Research Laboratory, School of Mech. & Manuf. Engineering, The University of NSW, Sydney, NSW, Australia 2052.
Deadlines: One page abstract: October 1, 2007. Full text of paper: December 15, 2007.
Information: email: cht08@cfd.mech.unsw.edu.au; http://cht08.mech.unsw.edu.au/.

12–16 **Ferroelectric Phenomena in Soft Matter Systems**, American Institute of Mathematics, Palo Alto, California. (Jun/Jul 2007, p. 783)
Organizers: Maria-Carme Calderer and Jie Shen.
Description: This workshop, sponsored by AIM and the NSF, will be devoted to the modeling, simulation and analysis of the ferroelectric phenomena in soft matter systems such as liquid crystals, elastomers and gels. The ferroelectric phenomena of these materials, such as its interaction with electric fields in switching processes, introduce new challenging problems that can only be properly addressed with a combined effort of theoretical and experimental physicists, and analytical and computational mathematicians.
Deadline: January 10, 2008.
Details: http://aimath.org/ARCC/workshops/ferroelectric.html. .

15–17 **Twelfth International Conference Devoted to the Memory of Academician Mykhailo Kravchuk (Krawtchouk) (1892–1942)**, Kyiv, Ukraine. (Jun/Jul 2007, p. 783)
Topics: (1) Differential and integral equations, its applications; (2) Algebra, geometry, mathematical and numerical analysis; (3) Theory of probability and mathematical statistics; (4) History, methods of teaching of mathematics.
Organizers: National Tech. Univ. of Ukraine (KPI), Inst. of Math. of NASU, National Shevchenko Univ., National Drahomanov Pedagogical Univ.
Deadlines: Abstracts of one page by March 1, 2008.
Languages: English, Ukraine, Russian.
Information: Ukraine, 03056, Kyiv-56, Peremohy Ave. 37, National Technical University of Ukraine (KPI), Phys.-Math. Departments, Corpus 7, Room 437, M. Kravchuk Conference, N. Virchenko; tel. (380) 44 454-97-40; email: kravchukconf.@yandex.ru.

18–21 **The 7th AIMS International Conference on Dynamical Systems, Differential Equations and Applications**, University of Texas at Arlington, Arlington, Texas. (May 2007, p. 666)
Aims and Topics: Keeping the tradition of the AIMS conference series, the conference covers all major areas of analysis and dynamics, with emphases on theory, methods, application, modeling and computations.
Format: There will be plenary talks; 30-minute special session talks; 20-minute contributed talks; and poster sessions. If you are

interested in proposing a special session, please contact Shouchuan Hu at General@aimSciences.org.
Organizing Committee: Jianzhong Su (Chair; AIMS2008@uta.edu), Jianping Zhu (Co-chair), Tuncay Aktosun, Gaik Ambartsoumian, Alain Bensoussan, Hristo V. Kojouharov, Cecelia Levings, Yue Liu, Peter Moore, Hua Shan.
Scientific Committee: Shouchuan Hu (Chair) Jerry Bona, Alberto Bressan, Adrian Constantin, Amadeu Delshams, Hiroshi Matano, Alain Miranville, Wei-Ming Ni, N.S. Papageorgiou, Jianzhong Su, Jianping Zhu. Coordinator: Xin Lu; lux@uncw.edu.
Deadline: February 29, 2008: For both submission of abstracts and early registration.
Information: http://aimsciences.org/AIMS-Conference/2008/index.htm.

26–30 **IMA Workshop: Quantitative Approaches to Cell Motility and Chemotaxis**, University of Minnesota, Minneapolis, Minnesota. (Dec. 2006, p. 1381)
Organizers: Robert Bourret (University of North Carolina), Alex Mogilner (University of California, Davis), Julie Theriot (Stanford University).
Information: Institute for Mathematics and its Applications, University of Minnesota, 400 Lind Hall, 207 Church St. SE, Minneapolis, MN 55455. Phone: 612-624-6066; email: visit@ima.umn.edu; http://www.ima.umn.edu/2007-2008/W5.26-30.08/.

* 26–30 **Spring school in nonlinear partial differential equations**, Université catholique de louvain, Louvain-La-Neuve, Belgium.
Description: The thematic of the Spring school on nonlinear partial differential equations is centered around nonlinear elliptic partial differential equations. The four 6 hours lectures will deal with various modern and active research fields of the theory of partial differential equations that interplay one with the others. Participants will have the opportunity to present a short communication.
Information: email: denis.bonheure@uclouvain.be.

June 2008

4–7 **First Joint International Meeting with the Sociedade Brasileira de Matematica**, Instituto Nacional de Matematica Pura e Aplicada (IMPA), Rio de Janeiro, Brazil. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/internmtgs.html.

9–13 **12th International Conference on Hyperbolic Problems: Theory, Numerics, Applications**, University of Maryland, College Park, Maryland. (Jun/Jul 2007, p. 784)
Important dates: Full consideration will be given to abstracts which are submitted before February 29, 2008. Notification of acceptance of papers: March 28, 2008. Registration fee at a reduced rate: April 11, 2008.
Information: http://hyp2008.umd.edu.

9–19 **Advances in Set-Theoretic Topology: Conference in Honour of Tsugunori Nogura on his 60th Birthday**, Centre for Scientific Culture "Ettore Majorana", Erice, Sicily, Italy. (Jun/Jul 2007, p. 784)
Organizers: Szymon Dolecki, Yasunao Hattori, Dmitri Shakhmatov, Gino Tironi.
Topics: Convergence properties and convergence structures; Dimension theory and related fields; General topology and its applications in other areas of mathematics; Hyperspaces, set-valued mapping and their selections; Set theoretic methods in mathematics; Set theory; Topological algebra (topological groups, functions spaces, etc.).
Information: http://www.math.sci.ehime-u.ac.jp/erice/; email: erice@dmitri.math.sci.ehime-u.ac.jp.

17–20 **4th Croatian Mathematical Congress**, Department of Mathematics, University of Osijek, Osijek, Croatia. (Jun/Jul 2007, p. 784)
Description: The Congress will have an international component, and it is open to all areas of mathematics.
Program: Includes Plenary Lectures, Croatian Mathematical Society award lecture, parallel sessions and posters. The parallel sessions include invited lectures and contributed talks selected by the Scientific Committee.
Organizers: Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, HR-31 000 Osijek, Croatia . Croatian Mathematical Society, Bijenicka 30, HR-10 000 Zagreb, Croatia . Osijek Mathematical Society, Trg Ljudevita Gaja 6, HR-31 000 Osijek, Croatia .
Deadlines: March 15, 2008: For individual abstract submission. May 1, 2008: For notification of acceptance. May 15, 2008: For registration fee payment.
Information: Up-to-date information about the Congress will be available at the website http://www.mathos.hr/congress2008.

* 22–28 **Combinatorics 2008**, Costermano, Verona, Italy.
Theme: The main theme of this conference is combinatorics, its links with geometry, algebra and graph theory and its applications to coding theory, cryptography and statistics.
Speakers: Rosemary A. Bailey, London University (UK); Marco Buratti, Università di Perugia (Italy); Frank De Clerck, Ghent University (Belgium); András Gács Eötvös University (Hungary); Hans Havlicek, Technische Universität, Wien (Austria); William M. Kantor, University of Oregon (USA); Jennifer D. Key Clemson University (USA); László Lovász, Eötvös University (Hungary); Spyros Magliveras, Florida Atlantic University (USA); Udo Ott, Braunschweig University (Germany); Olga Polverino, Seconda Università di Napoli (Italy); Cheryl Praeger, University of Western Australia (Australia); Chris Rodger, Auburn University (USA); Alexander Rosa, McMaster University (Canada); Neil J.A. Sloane, AT&T Shannon Laboratory (USA); Leo Storme, Ghent University (Belgium); Anne Street, University of Queensland (Australia); Vitaly Voloshin Troy University (USA).
Information: http://combinatorics.ing.unibs.it.

23–27 **Hermitian Symmetric Spaces, Jordan Algebras and Related Problems**, CIRM Luminy, Marseille, France. (Jun/Jul 2007, p. 784)
Information: This international conference is in honor of Prof. Jean-Louis Clerc; see http://www.cirm.univ-mrs.fr/liste_rencontre/Rencontres2008/Koufany08/Koufany08.html or http://hssja08.iecn.u-nancy.fr/.

25–27 **ICNPAA 2008: Mathematical Problems in Engineering, Aerospace and Sciences [Theory, Methods (includes Experimental, Computational) and Applications]**, University of Genoa, Italy. (Jun/Jul 2007, p. 784)
Sponsors: IFNA, IFIP, AIAA University of Genoa, Italy
Deadlines: Organizing Special Session (To send the title of the session, name of the organizers): November 30, 2007. Final deadline for abstracts of the talks: February 15, 2008.
Scope: Includes mathematical problems in all areas of Engineering, Aerospace and sciences.
Organizers: Seenith Sivasundaram, USA; Marcello Sanguineti, Italy.
Information: Contact: ICNPAA 2008, 104 Snow Goose Court, Daytona Beach, Florida 32119; email: Seenithi@aol.com, seenithi@gmail.com; http://www.icnpaa.com.

29–July 4 **IWASAWA 2008**, Kloster Irsee, Germany. (Jun/Jul 2007, p. 784)
Information: Conference website: http://www.irsee2008.de.

30–July 4 **ICMI/IASE Study: Statistics Education in School Mathematics: Challenges for Teaching and Teacher Education**, ITESM, Monterrey, Mexico. (Dec. 2006, p. 1381)
Description: This study brings the mathematics and statistics education communities to work in collaboration with the aim of analysing the situation of teaching statistics at school level and making recommendations about how to train mathematics teachers to better succeed in educating statistical literate students.

Deadline: October, 1, 2007.
Information: http://www.ugr.es/~icmi/iase_study/.

July 2008

* 7–11 **VIII International Colloquium on Differential Geometry (E. Vidal Abascal Centennial Congress)**, Santiago de Compostela, Spain.
Topics: Foliation Theory. Riemannian Geometry.
Information: http://xtsunxet.usc.es/icdg2008.

14–18 **5th European Congress of Mathematics**, Amsterdam, the Netherlands. (Feb. 2007, p. 308)
Information: http://www.5ecm.nl.

14–December 19 **Mathematics and Physics of Anderson Localization: 50 Years After**, Isaac Newton Institute for Mathematical Sciences, Cambridge, United Kingdom. (Jun/Jul. 2006, p. 714)
Programme Theme: In his seminal paper "Absence of diffusion in certain random lattices" (1958) Philip W. Anderson discovered one of the most striking quantum interference phenomena: particle localization due to disorder. In the last 25 years the phenomenon of localization proved to be crucial for the understanding of the Quantum Hall Effect, mesoscopic fluctuations in small conductors as well as some aspects of quantum chaotic behavior. The goal of the program is to bring together the world leaders in spectral theory of random Schrödinger operators and theoretical physicists successfully working on the problem of Anderson localization.
Organizers: Y. V. Fyodorov (Nottingham), I. Goldshied (Queen Mary, London), T. Spencer (Princeton), M. R. Zirnbauer (Cologne).
Information: http://www.newton.cam.ac.uk/programmes/MPA/. Isaac Newton Institute for Mathematical Sciences, 20 Clarkson Road, Cambridge, CB3 0EH, U.K. Tel.: +44-1223-335999, Fax.: +44-1223-330508; email: info@newton.cam.ac.uk.

22–26 **International Workshop on Operator Theory and its Applications (IWOTA)**, College of William and Mary, Williamsburg, Virginia. (Feb. 2007, p. 308)
Information: The up-to-date information about the conference is at http://www.math.wm.edu/~vladi/IWOTA/IWOTA2008.htm.

August 2008

26–December 19 **The Nature of High Reynolds Number Turbulence**, Isaac Newton Institute for Mathematical Sciences, Cambridge, United Kingdom. (Jun/Jul. 2006, p. 714)
Programme Theme: Turbulence is a notoriously difficult subject. The goal of this programme is to bring together leading experts from across the world to debate the fundamental questions. The discussion will be wide ranging, from the initiation of turbulence through to its asymptotic state at high Reynolds number, including the effects of rotation and stratification, and the addition of different phases, such as bubbles, particles and polymers.
Organisers: P. Bartello (McGill), P. A. Davidson (Cambridge), D. Dritschel (St. Andrews), Y. Kaneda (Nagoya), R. Kerswell (Bristol).
Information: http://www.newton.cam.ac.uk/programmes/HRT/. Isaac Newton Institute for Mathematical Sciences, 20 Clarkson Road, Cambridge, CB3 0EH, U.K. Tel.: +44-1223-335999, Fax.: +44-1223-330508, email: info@newton.cam.ac.uk .

September 2008

12–18 **Models in Developing Mathematics Education**, Dresden University of Applied Sciences, Dresden, Germany. (Apr. 2007, p. 498)
Description: 10th International Conference of The Mathematics Education into the 21st Century Project Our project was founded in 1986 and is dedicated to the planning, writing and disseminating of innovative ideas and materials in Mathematics and Statistics Education.
Program: Papers are invited on all innovative aspects of mathematics education. There will be an additional social programme for accompanying persons. Our conferences are renowned for their friendly and productive working atmosphere. They are attended by innovative teachers and mathematics educators from all over the world, 25 countries were represented at our last conference for example!
Information: email: arogerson@inetia.pl.

24–27 (REVISED INFORMATION) **Vector Measures, Integration and Applications**, Katholische Universitaet Eichstaett-Ingolstadt, Eichstaett, Germany. (Feb. 2007, p. 308)
Organizers: W. J. Ricker & G. Mockenhaupt.
Information: http://www-math-analysis.ku-eichstaett.de/vmia-2008/.

October 2008

4–5 **AMS Western Section Meeting**, University of British Columbia and the Pacific Institute of Mathematical Sciences, Vancouver, Canada. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/sectional.html.

11–12 **AMS Eastern Section Meeting**, Wesleyan University, Middletown, Connecticut. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/sectional.html.

17–19 **AMS Central Section Meeting**, Western Michigan University, Kalamazoo, Michigan. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/sectional.html.

24–26 **AMS Southeastern Section Meeting**, University of Alabama, Huntsville, Alambama. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/sectional.html.

December 2008

17–21 **First Joint International Meeting with the Shanghai Mathematical Society**, Shanghai, China. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/internmtgs.html.

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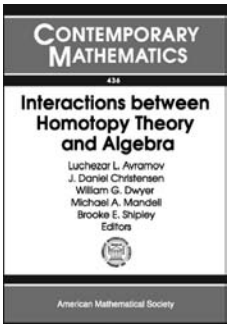
To subscribe to email notification of new AMS publications, please go to http://www.ams.org/bookstore-email.

Algebra and Algebraic Geometry



Interactions between Homotopy Theory and Algebra

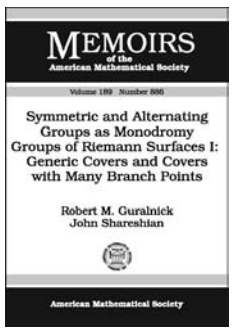
Luchezar L. Avramov, *University of Nebraska-Lincoln, NE*, **J. Daniel Christensen**, *University of Western Ontario, London, Ontario, Canada*, **William G. Dwyer**, *University of Notre Dame, IN*, **Michael A. Mandell**, *Indiana University, Bloomington, IN*, and **Brooke E. Shipley**, *University of Illinois, Chicago, IL*, Editors

This book is based on talks presented at the Summer School on Interactions between Homotopy theory and Algebra held at the University of Chicago in the summer of 2004. The goal of this book is to create a resource for background and for current directions of research related to deep connections between homotopy theory and algebra, including algebraic geometry, commutative algebra, and representation theory. The articles in this book are aimed at the audience of beginning researchers with varied mathematical backgrounds and have been written with both the quality of exposition and the accessibility to novices in mind.

Contents: *Introductory lecture series:* **P. Goerss** and **K. Schemmerhorn**, Model categories and simplicial methods; **C. Huneke** and **A. Taylor**, Lectures on local cohomology; **H. Krause**, Derived categories, resolutions, and Brown representability; **H. Krause**, Exercises on derived categories, resolutions, and Brown representability; *Topics lecture series:* **J. P. C. Greenlees**, Spectra for commutative algebraists; **K. Hess**, Rational homotopy theory: A brief introduction; **S. Iyengar**, André-Quillen homology of commutative algebras; **W. G. Dwyer**, Local cohomology in commutative algebra, homotopy theory, and group cohomology; **J. P. C. Greenlees**, First steps in brave new commutative algebra; **M. Hovey**, Cotorsion pairs and model categories; **K. Brüning** and **I. Burban**, Coherent sheaves on an elliptic curve; **A. Adem**, Lectures on the cohomology of finite groups.

Contemporary Mathematics, Volume 436

September 2007, 334 pages, Softcover, ISBN: 978-0-8218-3814-3, LC 2007060682, 2000 *Mathematics Subject Classification:* 13Dxx, 18Exx, 18Gxx, 55-XX; 13H10, 20J06, 14H52, **AMS members US$79**, List US$99, Order code CONM/436



Symmetric and Alternating Groups as Monodromy Groups of Riemann Surfaces I: Generic Covers and Covers with Many Branch Points

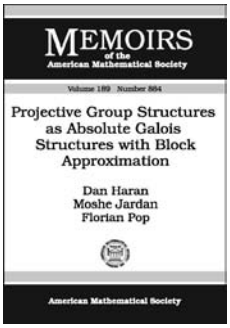
with an Appendix by R. Guralnick and R. Stafford

Robert M. Guralnick, *University of Southern California, Los Angeles, CA*, and **John Shareshian**, *Washington University, St. Louis, MO*

Contents: Introduction and statement of main results; Notation and basic lemmas; Examples; Proving the main results on five or more branch points—Theorems 1.1.1 and 1.1.2; Actions on 2-sets—the proof of Theorem 4.0.30; Actions on 3-sets—the proof of Theorem 4.0.31; Nine or more branch points—the proof of Theorem 4.0.34; Actions on cosets of some 2-homogeneous and 3-homogeneous groups; Actions on 3-sets compared to actions on larger sets; A transposition and an n-cycle; Asymptotic behavior of $g_k(E)$; An n-cycle—the proof of Theorem 1.2.1; Galois groups of trinomials—the proofs of Propositions 1.4.1 and 1.4.2 and Theorem 1.4.3; Appendix A. Finding small genus examples by computer search—by R. Guralnick and R. Stafford; Appendix. Bibliography.

Memoirs of the American Mathematical Society, Volume 189, Number 886

August 2007, 128 pages, Softcover, ISBN: 978-0-8218-3992-8, LC 2007060802, 2000 *Mathematics Subject Classification:* 14H30, 20B15, **Individual member US$37**, List US$62, Institutional member US$50, Order code MEMO/189/886



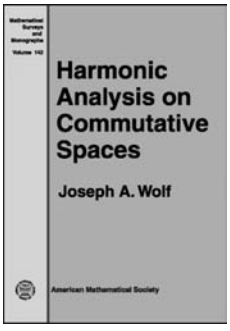
Projective Group Structures as Absolute Galois Structures with Block Approximation

Dan Haran and **Moshe Jarden**, *Tel Aviv University, Israel*, and **Florian Pop**, *University of Pennsylvania, Philadelphia, PA*

Contents: Introduction; Étale topology; Group structures; Completion of a cover to a cartesian square; Projective group structures; Special covers; Unirationally closed fields; Valued fields; The space of valuation of a field; Locally uniform v-adic topologies; Locally uniform Hensel's lemma; Field valuation structures; Block approximation; Rigid Henselian extensions; Projective group structures as absolute Galois structures; From field structures to field valuation structures; References.

Memoirs of the American Mathematical Society, Volume 189, Number 884

August 2007, 56 pages, Softcover, ISBN: 978-0-8218-3995-9, LC 2007060804, 2000 *Mathematics Subject Classification:* 12E30, **Individual member US$31**, List US$52, Institutional member US$42, Order code MEMO/189/884



Harmonic Analysis on Commutative Spaces

Joseph A. Wolf, *University of California, Berkeley, CA*

This book starts with the basic theory of topological groups, harmonic analysis, and unitary representations. It then concentrates on geometric structure, harmonic analysis, and unitary representation theory in commutative spaces. Those spaces form a simultaneous generalization of compact groups, locally compact abelian groups, and riemannian symmetric spaces. Their geometry and function theory is an increasingly active topic in mathematical research, and this book brings the reader up to the frontiers of that research area with the recent classifications of weakly symmetric spaces and of Gelfand pairs.

Part 1, "General Theory of Topological Groups", is an introduction with many examples, including all of the standard semisimple linear Lie groups and the Heisenberg groups. It presents the construction of Haar measure, the invariant integral, the convolution product, and the Lebesgue spaces.

Part 2, "Representation Theory and Compact Groups", provides background at a slightly higher level. Besides the basics, it contains the Mackey Little-Group method and its application to Heisenberg groups, the Peter–Weyl Theorem, Cartan's highest weight theory, the Borel–Weil Theorem, and invariant function algebras.

Part 3, "Introduction to Commutative Spaces", describes that area up to its recent resurgence. Spherical functions and associated unitary representations are developed and applied to harmonic analysis on G/K and to uncertainty principles.

Part 4, "Structure and Analysis for Commutative Spaces", summarizes riemannian symmetric space theory as a rôle model, and with that orientation delves into recent research on commutative spaces. The results are explicit for spaces G/K of nilpotent or reductive type, and the recent structure and classification theory depends on those cases.

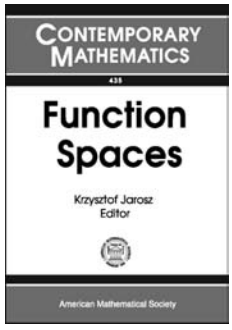
Parts 1 and 2 are accessible to first-year graduate students. Part 3 takes a bit of analytic sophistication but generally is accessible to graduate students. Part 4 is intended for mathematicians beginning their research careers as well as mathematicians interested in seeing just how far one can go with this unified view of algebra, geometry, and analysis.

Contents: *General theory of topological groups:* Basic topological group theory; Some examples; Integration and convolution; *Representation theory and compact groups:* Basic representation theory; Representations of compact groups; Compact Lie groups and homogeneous spaces; Discrete co-compact subgroups; *Introduction to commutative spaces:* Basic theory of commutative spaces; Spherical transforms and Plancherel formulae; Special case: Commutative groups; *Structure and analysis for commutative spaces:* Riemannian symmetric spaces; Weakly symmetric and reductive commutative spaces; Structure of commutative nilmanifolds; Analysis on commutative nilmanifolds; Classification of commutative spaces; Bibliography; Subject index; Symbol index; Table index.

Mathematical Surveys and Monographs, Volume 142

September 2007, 387 pages, Hardcover, ISBN: 978-0-8218-4289-8, LC 2007060807, 2000 *Mathematics Subject Classification:* 20G20, 22D10, 22Exx, 53C30, 53C35, **AMS members US$79**, List US$99, Order code SURV/142

Analysis



Function Spaces

Krzysztof Jarosz, *Southern Illinois University at Edwardsville, IL*, Editor

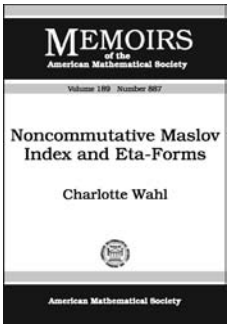
This book consists of contributions by the participants of the Fifth Conference on Function Spaces, held at Southern Illinois University in May of 2006. The papers cover a broad range of topics, including spaces and algebras of analytic functions of one and of many variables (and operators on such spaces), L^p-spaces, spaces of Banach-valued functions, isometries of function spaces, geometry of Banach spaces, and other related subjects. The goal of the conference was to bring together mathematicians interested in various problems related to function spaces and to facilitate the exchange of ideas between people working on similar problems. Hence, the majority of papers in this book are accessible to non-experts. Some articles contain expositions of known results and discuss open problems; others contain new results.

Contents: Y. I. Alber, Young-Fenchel transformation and some new characteristics of Banach spaces; **N. Arcozzi**, **R. Rochberg**, and **E. Sawyer**, The diameter space, a restriction of the Drury-Arveson-Hardy space; **H. Arizmendi**, **A. Carrillo**, and **L. Palacios**, An example concerning the boundary of topologically invertible elements; **R. M. Aron**, **J. A. Conejero**, **A. Peris**, and **J. B. Seoane-Sepúlveda**, Sums and products of bad functions;

D. Atanasiu, The disc algebra and a moment problem; **A. Blanco** and **N. Grønbæk**, Cohomology of Banach algebras of operators and geometry of Banach spaces; **O. Blasco**, Operators from H^p to ℓ^q for $0 < p < 1 \leq q < \infty$; **D. P. Blecher** and **L. E. Labuschagne**, von Neumann algebraic H^p theory; **G. Bulancea**, On the stability of logmodularity for uniform algebras; **P. G. Casazza** and **D. Edidin**, Equivalents of the Kadison-Singer problem; **S. Dutta** and **D. Narayana**, Strongly proximinal subspaces in Banach spaces; **J. F. Feinstein**, Countable linear combinations of characters on commutative Banach algebras; **J. F. Feinstein** and **M. J. Heath**, Regularity and amenability conditions for uniform algebras; **M. González**, **B. Sari**, and **M. Wójtowicz**, Semi-homogeneous bases in Orlicz sequence spaces; **J. J. Grobler**, Closed sums of marginal subspaces of Banach function spaces; **M. Haralampidou**, Strong semisimplicity and finite-dimensionality in Ambrose algebras; **D. Honma**, Surjections on the algebras of continuous functions which preserve peripheral spectrum; **A. Kamińska** and **Y. Raynaud**, Copies of ℓ_p and c_0 in general quasi-normed Orlicz-Lorentz sequence spaces; **A. Y. Karlovich**, Asymptotics of Toeplitz determinants generated by functions with Fourier coefficients in weighted Orlicz sequence classes; **J. Kauppi**, Approximation properties for subalgebras of $C_0(X)$; **L. A. Khan**, The general strict topology on topological modules; **S. Lambert**, **A. Luttman**, and **T. Tonev**, Weakly peripherally-multiplicative mappings between uniform algebras; **J. S. Manhas**, Topological structures of the spaces of composition operators on spaces of analytic functions; **M. Mathieu** and **C. Ruddy**, Spectral isometries, II; **T. L. Miller**, **V. G. Miller**, and **M. M. Neumann**, When do quasi-similar operators have the same essential spectrum?; **T. Miura** and **D. Honma**, A survey of certain algebraic equations in commutative C^*-algebras; **R. Mullen**, Examples of Banach spaces that are not Banach algebras; **I. Patyi**, On complex Banach submanifolds of a Banach space; **A. Sołtysiak**, Topological joint spectrum of generators and continuous characters; **F. H. Szafraniec**, Moments from their very truncations; **K. Watanabe**, A variation of Takesaki duality for ordered abelian groups and Arveson's spectral subspaces; **N.-C. Wong**, Zero product preserves of C*-algebras; **A. Zagorodnyuk**, Spectra of algebras of analytic functions and polynomials on Banach spaces.

Contemporary Mathematics, Volume 435

August 2007, 394 pages, Softcover, ISBN: 978-0-8218-4061-0, LC 2007060681, 2000 *Mathematics Subject Classification:* 30H05, 46B04, 46E05, 46E15, 46E30, 46E40, 46H05, 46J10, 47L10, **AMS members US$87**, List US$109, Order code CONM/435



Noncommutative Maslov Index and Eta-Forms

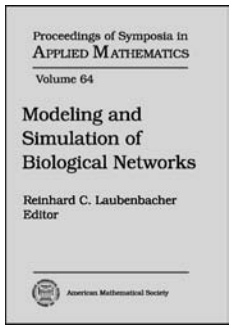
Charlotte Wahl, *Virginia Polytechnic Institute and State University, Blacksburg, VA*

Contents: Introduction; Preliminaries; The Fredholm operator and its index; Heat semigroups and kernels; Superconnections and the index theorem; Definitions and techniques; Bibliography.

Memoirs of the American Mathematical Society, Volume 189, Number 887

August 2007, 118 pages, Softcover, ISBN: 978-0-8218-3997-3, LC 2007060803, 2000 *Mathematics Subject Classification:* 19K56; 53D12, 58J28, 46L87, **Individual member US$37**, List US$61, Institutional member US$49, Order code MEMO/189/887

Applications



Modeling and Simulation of Biological Networks

Reinhard C. Laubenbacher, *Virginia Bioinformatics Institute at Virginia Tech, Blacksburg, VA*, Editor

It is the task of computational biology to help elucidate the unique characteristics of biological systems. This process has barely begun, and many researchers are testing computational tools that have been used successfully in other fields. Mathematical and statistical network modeling is an important step toward uncovering the organizational principles and dynamic behavior of biological networks. Undoubtedly, new mathematical tools will be needed, however, to meet this challenge. The workhorse of this effort at present comprises the standard tools from applied mathematics, which have proven to be successful for many problems. But new areas of mathematics not traditionally considered applicable are contributing other powerful tools.

This volume is intended to introduce this topic to a broad mathematical audience. The aim is to explain some of the biology and the computational and mathematical challenges we are facing. The different chapters provide examples of how these challenges are met, with particular emphasis on nontraditional mathematical approaches. The volume features a broad spectrum of networks across scales, ranging from biochemical networks within a single cell to epidemiological networks encompassing whole cities.

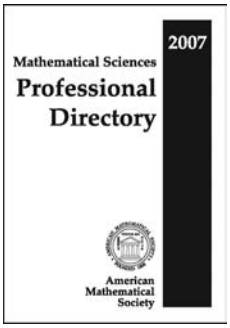
Chapter topics include phylogenetics and gene finding using tools from statistics and algebraic geometry, biochemical network inference using tools from computational algebra, control-theoretic approaches to drug delivery using differential equations, and interaction-based modeling and discrete mathematics applied to problems in population dynamics and epidemiology.

Contents: **L. Pachter**, An introduction to reconstructing ancestral genomes; **E. S. Allman** and **J. A. Rhodes**, Phylogenetics; **B. Stigler**, Polynomial dynamical systems in systems biology; **S. Lenhart** and **J. T. Workman**, An introduction to optimal control applied to immunology problems; **C. L. Barrett**, **K. Bisset**, **S. Eubank**, **M. V. Marathe**, **V. S. A. Kumar**, and **H. S. Mortveit**, Modeling and simulation of large biological, information and socio-technical systems: An interaction-based approach.

Proceedings of Symposia in Applied Mathematics, Volume 64

September 2007, 151 pages, Hardcover, ISBN: 978-0-8218-3964-5, LC 2007060770, 2000 *Mathematics Subject Classification:* 92B05, **AMS members US$31**, List US$39, Order code PSAPM/64

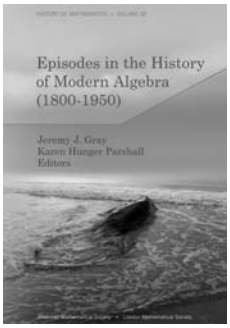
General and Interdisciplinary



Mathematical Sciences Professional Directory, 2007

This annual directory provides a handy reference to various organizations in the mathematical sciences community. Listed in the directory are the following: officers of over thirty professional mathematical organizations; addresses of selected government agencies; academic departments in the mathematical sciences; and alphabetic listings of colleges and universities.

June 2007, 159 pages, Softcover, ISBN: 978-0-8218-4283-6, List US$55, Institutional member US$44, Order code PRODIR/2007



Episodes in the History of Modern Algebra (1800–1950)

Jeremy J. Gray, *The Open University, Milton Keynes, England*, and **Karen Hunger Parshall**, *University of Virginia, Charlottesville, VA*, Editors

Algebra, as a subdiscipline of mathematics, arguably has a history going back some 4000 years to ancient Mesopotamia. The history, however, of what is recognized today as high school algebra is much shorter, extending back to the sixteenth century, while the history of what practicing mathematicians call "modern algebra" is even shorter still.

The present volume provides a glimpse into the complicated and often convoluted history of this latter conception of algebra by juxtaposing twelve episodes in the evolution of modern algebra from the early nineteenth-century work of Charles Babbage on functional equations to Alexandre Grothendieck's mid-twentieth-century metaphor of a "rising sea" in his categorical approach to algebraic geometry. In addition to considering the technical development of various aspects of algebraic thought, the historians of modern algebra whose work is united in this volume explore such themes as the changing aims and organization of the subject as well as the often complex lines of mathematical communication within and across national boundaries. Among the specific algebraic ideas considered are the concept of divisibility and the introduction of non-commutative algebras into the study of number theory and the emergence of algebraic geometry in the twentieth century.

The resulting volume is essential reading for anyone interested in the history of modern mathematics in general and modern algebra in particular. It will be of particular interest to mathematicians and historians of mathematics.

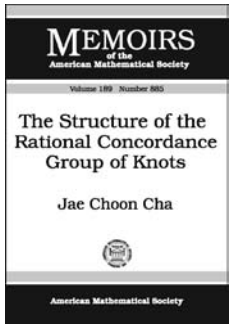
Co-published with the London Mathematical Society beginning with Volume 4. Members of the LMS may order directly from the AMS at the AMS member price. The LMS is registered with the Charity Commissioners.

Contents: J. J. Gray and **K. H. Parshall**, Acknowledgments; **J. J. Gray** and **K. H. Parshall**, Introduction; **E. L. Ortiz**, Babbage and French *Idéologie*: Functional equations, language, and the analytical method; **S. E. Despeaux**, "Very full of symbols": Duncan F. Gregory, the calculus of operations, and the *Cambridge Mathematical Journal*; **O. Neumann**, Divisibility theories in the early history of commutative algebra and the foundations of algebraic geometry; **H. M. Edwards**, Kronecker's fundamental theorem of general arithmetic; **G. Frei**, Developments in the theory of algebras over number fields: A new foundation for the Hasse norm residue symbol and new approaches to both the Artin reciprocity law and class field theory; **J. Schwermer**, Minkowski, Hensel, and Hasse: On the beginnings of the local-global principle; **D. D. Fenster**, Research in algebra at the University of Chicago: Leonard Eugene Dickson and A. Adrian Albert; **C. W. Curtis**, Emmy Noether's 1932 ICM lecture on noncommutative methods in algebraic number theory; **L. Corry**, From *Algebra* (1895) to *Moderne Algebra* (1930): Changing conceptions of a discipline—A guided tour using the *Jahrbuch über die Fortschritte der Mathematik*; **N. Schappacher**, A historical sketch of B. L. van der Waerden's work in algebraic geometry: 1926–1946; **S. Slembek**, On the arithmetization of algebraic geometry; **C. McLarty**, The rising sea: Grothendieck on simplicity and generality.

History of Mathematics, Volume 32

August 2007, 336 pages, Hardcover, ISBN: 978-0-8218-4343-7, LC 2007060683, 2000 *Mathematics Subject Classification:* 01A55, 01A60, 01A70, 01A72, 01A73, 01A74, 01A80, **AMS members US$55**, List US$69, Order code HMATH/32

Geometry and Topology



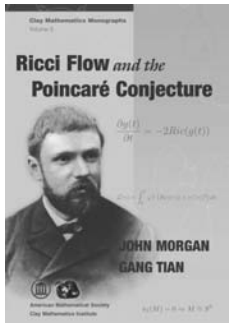
The Structure of the Rational Concordance Group of Knots

Jae Choon Cha, *Information and Communications University, Daejeon, Korea*

Contents: Introduction; Rational knots and Seifert matrices; Algebraic structure of $\mathcal{G}_n$; Geometric structure of $\mathcal{C}_n$; Rational knots in dimension three; Bibliography.

Memoirs of the American Mathematical Society, Volume 189, Number 885

August 2007, 95 pages, Softcover, ISBN: 978-0-8218-3993-5, LC 2007060801, 2000 *Mathematics Subject Classification:* 57M25, 57Q45, 57Q60, **Individual member US$36**, List US$60, Institutional member US$48, Order code MEMO/189/885



Ricci Flow and the Poincaré Conjecture

John Morgan, *Columbia University, New York, NY*, and **Gang Tian**, *Princeton University, NJ, and Peking University, Beijing, China*

For over 100 years the Poincaré Conjecture, which proposes a topological characterization of the 3-sphere, has been the central question in

topology. Since its formulation, it has been repeatedly attacked, without success, using various topological methods. Its importance and difficulty were highlighted when it was chosen as one of the Clay Mathematics Institute's seven Millennium Prize Problems. In 2002 and 2003 Grigory Perelman posted three preprints showing how to use geometric arguments, in particular the Ricci flow as introduced and studied by Hamilton, to establish the Poincaré Conjecture in the affirmative.

This book provides full details of a complete proof of the Poincaré Conjecture following Perelman's three preprints. After a lengthy introduction that outlines the entire argument, the book is divided into four parts. The first part reviews necessary results from Riemannian geometry and Ricci flow, including much of Hamilton's work. The second part starts with Perelman's length function, which is used to establish crucial non-collapsing theorems. Then it discusses the classification of non-collapsed, ancient solutions to the Ricci flow equation. The third part concerns the existence of Ricci flow with surgery for all positive time and an analysis of the topological and geometric changes introduced by surgery. The last part follows Perelman's third preprint to prove that when the initial Riemannian 3-manifold has finite fundamental group, Ricci flow with surgery becomes extinct after finite time. The proofs of the Poincaré Conjecture and the closely related 3-dimensional spherical space-form conjecture are then immediate.

The existence of Ricci flow with surgery has application to 3-manifolds far beyond the Poincaré Conjecture. It forms the heart of the proof via Ricci flow of Thurston's Geometrization Conjecture. Thurston's Geometrization Conjecture, which classifies all compact 3-manifolds, will be the subject of a follow-up article.

The organization of the material in this book differs from that given by Perelman. From the beginning the authors present all analytic and geometric arguments in the context of Ricci flow with surgery. In addition, the fourth part is a much-expanded version of Perelman's third preprint; it gives the first complete and detailed proof of the finite-time extinction theorem.

With the large amount of background material that is presented and the detailed versions of the central arguments, this book is suitable for all mathematicians from advanced graduate students to specialists in geometry and topology.

Clay Mathematics Institute Monograph Series

The Clay Mathematics Institute Monograph Series publishes selected expositions of recent developments, both in emerging areas and in older subjects transformed by new insights or unifying ideas.

Titles in this series are co-published with the Clay Mathematics Institute (Cambridge, MA).

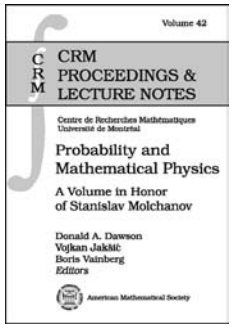
Contents: *Background from Riemannian geometry and Ricci flow:* Preliminaries from Riemannian geometry; Manifolds of non-negative curvature; Basics of Ricci flow; The maximum principle; Convergence results for Ricci flow; *Perelman's length function and its applications:* A comparison geometry approach to the Ricci flow; Complete Ricci flows of bounded curvature; Non-collapsed results; κ-non-collapsed ancient solutions; Bounded curvature at bounded distance; Geometric limits of generalized Ricci flows; The standard solution; *Ricci flow with surgery:* Surgery on a δ-neck; Ricci flow with surgery: The definition; Controlled Ricci flows with surgery; Proof of non-collapsing; Completion of the proof of Theorem 15.9; *Completion of the proof of the Poincaré conjecture:* Finite-time extinction; Completion of the proof of Proposition 18.24; 3-manifolds covered by canonical neighborhoods; Bibliography; Index.

Clay Mathematics Monographs, Volume 3

September 2007, 521 pages, Hardcover, ISBN: 978-0-8218-4328-4, LC 2007062016, 2000 *Mathematics Subject Classification:* 53C44, 57M40, **AMS members US$55**, List US$69, **Special Introductory Price US$48***, Order code CMIM/3

***Offer good until December 7, 2007.**

Probability



Probability and Mathematical Physics

A Volume in Honor of Stanislav Molchanov

Donald A. Dawson, *Carleton University, Ottawa, ON, Canada*, **Vojkan Jakšić**, *McGill University, Montréal, QC, Canada*, and **Boris Vainberg**, *University of North Carolina, Charlotte, NC*, Editors

This volume is based on talks given at a conference celebrating Stanislav Molchanov's 65th birthday held in June of 2005 at the Centre de Recherches Mathématiques (Montreal, QC, Canada). The meeting brought together researchers working in an exceptionally wide range of topics reflecting the quality and breadth of Molchanov's past and present research accomplishments. This collection of survey and research papers gives a glance of the profound consequences of Molchanov's contributions in stochastic differential equations, spectral theory for deterministic and random operators, localization and intermittency, mathematical physics and optics, and other topics.

This item will also be of interest to those working in differential equations and mathematical physics.

Titles in this series are co-published with the Centre de Recherches Mathématiques.

Contents: G. B. Arous, **S. Molchanov**, and **A. Ramírez**, Transition asymptotics for reaction-diffusion in random media; **L. V. Bogachev**, Extreme value theory for random exponentials; **J. Breuer**, Singular continuous and dense point spectrum for sparse trees with finite dimensions; **J.-M. Combes**, **P. D. Hislop**, and **F. Klopp**, Some new estimates on the spectral shift function associated with random Schrödinger operators; **M. Cranston** and **S. Molchanov**, On phase transitions and limit theorems for homopolymers; **G. Derfel**, **P. J. Grabner**, and **F. Vogl**, Asymptotics of the Poincaré functions; **A. Figotin** and **J. Schenker**, Hamiltonian extension and eigenfunctions for a time dispersive dissipative string; **F. Germinet**, **P. D. Hislop**, and **A. Klein**, Localization at low energies for attractive Poisson random Schrödinger operators; **Y. A. Godin**, **S. Molchanov**, and **B. Vainberg**, On the influence of random perturbations on the propagation of waves described by a periodic Schrödinger operator; **A. Gordon**, **J. L. Holt**, and **S. Molchanov**, Spectral theory of 1-D Schrödinger operators with unbounded potentials; **A. Gordon**, **S. Molchanov**, and **J. Quinn**, Fermi-Dirac generators and tests for randomness; **R. Grigorchuk**, **D. Savchuk**, and **Z. Šunić**, The spectral problem, substitutions and iterated monodromy; **V. Imaykin**, **A. Komech**, and **B. Vainberg**, On scattering of solitons for wave equation coupled to a particle; **U. Kaluzhny** and **Y. Last**, Purely absolutely continuous spectrum

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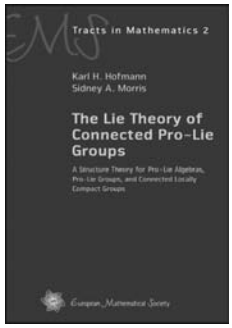
CRM Proceedings & Lecture Notes, Volume 42

August 2007, 475 pages, Softcover, ISBN: 978-0-8218-4089-4, LC 2007060768, 2000 *Mathematics Subject Classification:* 60-06, 35-06, **AMS members US$103**, List US$129, Order code CRMP/42

New AMS-Distributed Publications

Algebra and Algebraic Geometry



The Lie Theory of Connected Pro-Lie Groups

A Structure Theory for Pro-Lie Algebras, Pro-Lie Groups, and Connected Locally Compact Groups

Karl H. Hofmann, *Technische University Darmstadt, Germany*, and **Sidney A. Morris**, *University of Ballarat, Australia*

Lie groups were introduced in 1870 by the Norwegian mathematician Sophus Lie. A century later Jean Dieudonné quipped that Lie groups had moved to the center of mathematics and that one cannot undertake anything without them.

If a complete topological group G can be approximated by Lie groups in the sense that every identity neighborhood U of G contains a normal subgroup N such that G/N is a Lie group, then it is called a *pro-Lie group*. Every locally compact connected topological group and every compact group is a pro-Lie group. While the class of locally compact groups is not closed under the formation of arbitrary products, the class of pro-Lie groups is.

For half a century, locally compact pro-Lie groups have drifted through the literature, yet this is the first book which systematically treats the Lie and structure theory of pro-Lie groups irrespective of local compactness. This study fits very well into the current trend which addresses infinite-dimensional Lie groups. The results of this text are based on a theory of pro-Lie algebras which parallels the structure theory of finite-dimensional real Lie algebras to an astonishing degree, even though it has had to overcome greater technical obstacles.

This book exposes a Lie theory of connected pro-Lie groups (and hence of connected locally compact groups) and illuminates the manifold ways in which their structure theory reduces to that of compact groups on the one hand and of finite-dimensional Lie groups on the other. It is a continuation of the authors' fundamental monograph on the structure of compact groups (1998, 2006) and is an invaluable tool for researchers in topological groups, Lie theory, harmonic analysis, and representation theory. It is written to be accessible to advanced graduate students wishing to study this fascinating and important area of current research, which has so many fruitful interactions with other fields of mathematics.

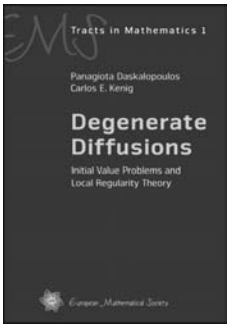
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Panoramic overview; Limits of topological groups; Lie Groups and the Lie theory of topological groups; Pro-Lie groups; Quotients of pro-Lie groups; Abelian pro-Lie groups; Lie's third fundamental theorem; Profinite-dimensional modules and Lie algebras; The structure of simply connected pro-Lie groups; Analytic subgroups and the Lie theory of pro-Lie groups; The global structure of connected pro-Lie groups; Splitting theorems for pro-Lie groups; Compact subgroups of pro-Lie groups; Iwasawa's local splitting theorem; Catalog of examples; Appendix 1. The Campbell–Hausdorff formalism; Appendix 2. Weakly complete topological vector spaces; Appendix 3. Various pieces of information on semisimple Lie algebras; Bibliography; List of symbols; Index.

EMS Tracts in Mathematics

May 2007, 693 pages, Hardcover, ISBN: 978-3-03719-032-6, 2000 *Mathematics Subject Classification:* 22-02; 17B65, 22D05, 22E20, 22E65, 58B25, **AMS members US$94**, List US$118, Order code EMSTM/2

Differential Equations



Degenerate Diffusions

Initial Value Problems and Local Regularity Theory

Panagiota Daskalopoulos, *Columbia University, New York, NY*, and **Carlos E. Kenig**, *University of Chicago, IL*

The book deals with the existence, uniqueness, regularity, and asymptotic behavior of solutions to the initial value problem (Cauchy problem) and the initial-Dirichlet problem for a class of degenerate diffusions modeled on the porous medium type equation $u_t = \Delta u^m$, $m \geq 0$, $u \geq 0$. Such models arise in plasma physics, diffusion through porous media, thin liquid film dynamics, as well as in geometric flows such as the Ricci flow on surfaces and the Yamabe flow. The approach presented to these problems uses local regularity estimates and Harnack type inequalities, which yield compactness for families of solutions. The theory is quite complete in the slow diffusion case ($m > 1$) and in the supercritical fast diffusion case ($m_c < m < 1, m_c = (n-2)_+/n$) while many problems remain in the range $m \leq m_c$. All of these aspects of the theory are discussed in the book.

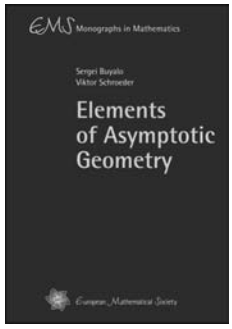
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Local regularity and approximation theory; The Cauchy problem for slow diffusion; The Cauchy problem for fast diffusion; The initial Dirichlet problem in an infinite cylinder; Weak solutions; Bibliography; Index.

EMS Tracts in Mathematics

May 2007, 207 pages, Hardcover, ISBN: 978-3-03719-033-3, 2000 *Mathematics Subject Classification:* 35-02, 35K55, 35K65, **AMS members US$50**, List US$62, Order code EMSTM/1

Geometry and Topology



Elements of Asymptotic Geometry

Sergei Buyalo, *Russian Academy of Sciences, St. Petersburg, Russia*, and **Viktor Schroeder**, *University of Zurich, Switzerland*

Asymptotic geometry is the study of metric spaces from a large scale point of view, where the local geometry does not come into play. An important class of model spaces are the hyperbolic spaces (in the sense of Gromov), for which the asymptotic geometry is nicely encoded in the boundary at infinity.

In the first part of this book, in analogy with the concepts of classical hyperbolic geometry, the authors provide a systematic account of the basic theory of Gromov hyperbolic spaces. These spaces have been studied extensively in the last twenty years and have found applications in group theory, geometric topology, Kleinian groups, as well as dynamics and rigidity theory. In the second part of the book, various aspects of the asymptotic geometry of arbitrary metric spaces are considered. It turns out that the boundary at infinity approach is not appropriate in the general case, but dimension theory proves useful for finding interesting results and applications.

The text leads concisely to some central aspects of the theory. Each chapter concludes with a separate section containing supplementary results and bibliographical notes. Here the theory is also illustrated with numerous examples as well as relations to the neighboring fields of comparison geometry and geometric group theory.

The book is based on lectures the authors presented at the Steklov Institute in St. Petersburg and the University of Zürich.

A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Hyperbolic geodesic spaces; The boundary at infinity; Busemann functions on hyperbolic spaces; Morphisms of hyperbolic spaces; Quasi-Möbius and quasi-symmetric maps; Hyperbolic approximation of metric spaces; Extension theorems; Embedding theorems; Basics of dimension theory; Asymptotic dimension; Linearly controlled metric dimension: Basic properties; Linearly controlled metric dimension: Applications; Hyperbolic dimension; Hyperbolic rank and subexponential corank; Appendix. Models of the hyperbolic space H^n; Bibliography; Index.

EMS Monographs in Mathematics

May 2007, 209 pages, Hardcover, ISBN: 978-3-03719-036-4, 2000 *Mathematic s Subject Classification:* 51F99, 53C23, 55M10; 53C23, 54C20, 20F67, 20F69, **AMS members US$62**, List US$78, Order code EMSMONO/3

AMS SHORT COURSE

Aspects of Statistical Learning

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.

Th is 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)

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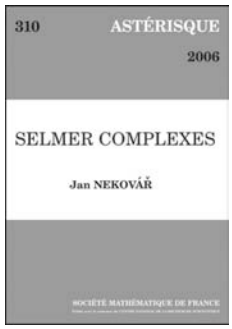
Number Theory



Selmer Complexes

Jan Nekovář, *Université Pierre et Marie Curie, Paris, France*

This book builds new foundations of Iwasawa theory, based on a systematic study of cohomological invariants of big Galois representations in the framework of derived categories. A new duality formalism is developed, which leads to generalized Cassels–Tate pairings and generalized p-adic height pairings. One of the applications is a parity result for Selmer groups associated to Hilbert modular forms.

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; Homological algebra: Products and signs; Local duality; Continuous cohomology; Continuous cohomology of pro-finite groups; Duality theorems for Galois cohomology revisited; Selmer complexes; Unramified cohomology; Iwasawa theory; Classical Iwasawa theory; Generalized Cassels–Tate pairings; R-valued height pairings; Parity of ranks of Selmer groups; Errata; List of symbols; Bibliography.

Astérisque, Number 310

May 2007, 559 pages, Softcover, ISBN: 978-2-85629-227-3, 2000 *Mathematics Subject Classification:* 11R23, 11G40, 11F41, **Individual member US$112**, List US$124, Order code AST/310

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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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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

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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: October 2007 issue–July 26, 2007; November 2007 issue–August 28, 2007; December 2007 issue–October 1, 2007; January 2008 issue–October 26, 2007; February 2008 issue–November 28, 2007; March 2008–December 28, 2007.

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.

available positions are filled. The University of Chicago is an Equal Opportunity/ Affirmative Action Employer.

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SOUTHERN ILLINOIS UNIVERSITY CARBONDALE
Department of Mathematics
Mathematics Education Position

Applications are invited for a tenure-track position at the rank of assistant professor to begin on August 16, 2008, to support the department's programs in mathematics education as part of an on-going Teaching Excellence in Mathematics and Science initiative. Applicants must demonstrate evidence of, or potential for, excellence in research and teaching and have an interest in and aptitude for educating prospective teachers of mathematics. Ph.D. in pure or applied mathematics required by August 15, 2008. The applicant hired into this position will be expected to teach effectively, to maintain a vigorous research program, to seek external research funding in the area of mathematics education, and to develop a satisfactory record of service. Teaching and service duties of the position will involve the training of teachers at the elementary and secondary levels. To apply, please send letter of application, curriculum vitae and statements of research and teaching interests, and have three letters of recommendation sent, to: Mathematics Education Position, Department of Mathematics, Mail Code 4408, Southern Illinois University Carbondale, 1245 Lincoln Drive, Carbondale, Illinois 62901. Review of applications will begin September 30, 2007, and continue until position is filled. SIUC is an Affirmative Action/Equal Opportunity Employer that strives to enhance its ability to develop a diverse faculty and staff and to increase its potential to serve a diverse student population. All applications are welcomed and encouraged and will receive consideration.

000048

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

UNIVERSITY OF MASSACHUSETTS
Department of Mathematics

The Department of Mathematics and Statistics (`http://www.math.umass.edu`) invites applications for an Assistant Professor position in Statistics pending budgetary approval. Candidates should have outstanding potential for methodological and applied research in statistics as well as for interdisciplinary collaborations. A commitment to excellent teaching at all levels of the curriculum is also expected. The University of Massachusetts Amherst is developing excellence initiatives in the areas of Biomedicine, Energy Science and Technology, Environment, Nanotechnology, and Science Education. Candidates interested in interdisciplinary work in these and other areas are encouraged to apply. Outstanding candidates at the Associate or Full Professor levels may also be considered should funding become available. In addition, Visiting Assistant Professor/Lecturer positions are expected to be available subject to availability of funds. Applications should be submitted electronically through the AMS website `mathjobs.org`. Alternatively, applicants may send a curriculum vitae, research and teaching statements, and arrange to have three letters of recommendation sent to: Search Committee, Department of Mathematics and Statistics, Lederle Graduate Research Center, 710 North Pleasant St., Amherst, MA 01003-9305. Review of applications will begin November 1, 2007. Applications will continue to be accepted until all positions are filled. Please, refer to Search 28094 for the tenure-track positions and Search 28096 for the Visiting Assistant Professor/Lecturer positions. The department is committed to the development of a diverse faculty, student body, and workplace; women and members of minority groups are encouraged to apply. The University of Massachusetts is an Affirmative Action/ Equal Opportunity Employer.

000056

MICHIGAN

UNIVERSITY OF MICHIGAN
Department of Mathematics

Pending authorization, the Department invites applications for a Lecturer III in Mathematics to begin September 2008. This is not a tenure-track position but may be renewed, annually for up to the first four years, and thereafter for intervals of three to five years. Criteria for renewal are excellence in classroom teaching and participation in administration of the Department's Introductory Program and instructor development. Interest and activity in pedagogical research is encouraged but not essential for reappointment. The successful candidate is likely to have both a doctorate and substantial experience in teaching mathematics. Please submit a curriculum vitae, evidence of teaching excellence, and the names of at least three references. Application materials should preferably be submitted electronically through the AMS website `MathJobs.Org`. Alternatively, applications may be sent to: Personnel Committee, University of Michigan, Department of Mathematics, 2074 East Hall, 530 Church Street, Ann

Arbor MI 48109-1043. Applications are considered on a continuing basis but candidates are urged to apply by November 1, 2007. Inquiries may be made by email to math-fac-search@umich.edu. More detailed information regarding the department may be found on our website: www.math.lsa.umich.edu. Women and minority candidates are encouraged to apply. The University of Michigan is an Equal Opportunity /Affirmative Action Employer.

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UNIVERSITY OF MICHIGAN
Department of Mathematics

Pending authorization, the Department of Mathematics anticipates having one or more openings at the tenure-track or tenured level. Candidates should hold a Ph.D. in mathematics or a related field and should show outstanding promise and/or accomplishments in both research and teaching. Applications are encouraged from any area of pure, applied, computational, or interdisciplinary mathematics. Salaries are competitive and are based on credentials. Junior candidates should furnish a placement dossier consisting of a letter of application, curriculum vitae, and three letters of recommendation; senior candidates should send a letter of application, curriculum vitae, and names of three suggested references. In all cases please provide a statement of teaching philosophy and experience, evidence of teaching excellence, and a statement of current and future research plans. Application materials should preferably be submitted electronically through the AMS website MathJobs.Org. Alternatively, applications may be sent to: Personnel Committee, University of Michigan, Department of Mathematics, 2074 East Hall, 530 Church Street, Ann Arbor MI 48109-1043. Applications are considered on a continuing basis but candidates are urged to apply by November 1, 2007. Inquiries may be made by email to math-fac-search@umich.edu. More detailed information regarding the Department may be found on our website: www.math.lsa.umich.edu. Women and minority candidates are encouraged to apply. The University of Michigan is supportive of the needs of dual career couples and is an Equal Opportunity /Affirmative Action Employer.

000060

OHIO

THE OHIO STATE UNIVERSITY
Mathematical Biosciences Institute
Seeks a New Director

The Mathematical Biosciences Institute (MBI) located at The Ohio State University seeks candidates for the position of Director, to be appointed effective August 2008. The mission of this National Science Foundation (NSF) funded Institute is to develop mathematical theories, statistical methods, and computational algorithms for the solution of fundamental problems in the biosciences; to involve mathematical scientists and bioscientists in the solutions of these problems; and to nurture and grow a community of scholars through education and support of students and researchers in mathematical biosciences. The structure under which these goals are achieved includes emphasis year programs, current topics workshops, educational programs, and sponsored research projects. The role of the director is to provide scientific and administrative leadership to the Institute.

The successful candidate will have a substantial international scientific reputation and a distinguished record of research, teaching, and service in the mathematical and/or biological sciences, so as to also be qualified for a tenured professor appointment at Ohio State.

Nominations or letters of application along with a curriculum vita and five letters of reference should be sent to:

MBI Director Search Committee
c/o Dr. Richard R. Freeman
Dean and Distinguished Professor
of Mathematical and Physical Sciences
1947 College Road, Room 425
Columbus, Ohio 43210

Email inquiries can be sent to Teresa Hagerman, Hagerman.1@osu.edu. The review of applications will begin immediately and continue until the position is filled. For more information about the MBI, please see our website: http://mbi.osu.edu/. The search committee includes: Professor Lisa Fauci (committee chair), Professor Peter Curtis, Professor David Goss, Dr. Kirk Jordan, Dr. Hans Kaper, Professor James Keener, Professor John Rinzel, Professor John Tyson, Professor Doug Wolfe.

To build a diverse workforce Ohio State encourages applications from individuals with disabilities, minorities, veterans, and women. Flexible work options available. EEO/AA employer.

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TEXAS

RICE UNIVERSITY
Mathematics Department

The Department of Mathematics invites applications for an anticipated position at the rank of tenure-track Assistant Professor; candidates who could make an extraordinary contribution to the department may be considered at other levels. All applicants should have extremely strong research potential and demonstrated success in the classroom. Send a curriculum vitae to:

Appointments Committee,
Department of Mathematics,
Rice University, P. O. Box 1892,
Houston, TX 77251-1892.

In addition, please provide evidence of teaching skills and solicit at least 3 letters of reference, asking that they be sent directly to the address above. Submission of the AMS Application Cover Sheet would be greatly appreciated. Applications which are complete by November 1, 2007, will be assured consideration.

Rice University is an Equal Opportunity/Affirmative Action Employer and strongly encourages applications from women and members of underrepresented minority groups.

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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

WISCONSIN

UNIVERSITY OF WISCONSIN-MADISON
Department of Mathematics

The Department of Mathematics invites applications for one or more positions to begin August 25, 2008, at the tenure-track (assistant professor) level. Applications are invited in all areas of mathematics. Candidates should exhibit evidence of outstanding research potential, normally including significant contributions beyond the doctoral dissertation. A strong commitment to excellence in instruction is also expected. Additional departmental information is available on our website: http://www.math.wisc.edu. Applicants should send a completed AMS Standard Cover Sheet, a curriculum vitae which includes a publication list, and brief descriptions of research and teaching to:

Hiring Committee
Dept. of Mathematics, Van Vleck Hall
University of Wisconsin-Madison
480 Lincoln Drive
Madison, WI 53706-1388

Applicants should also arrange to have sent to the above address, three to four letters of recommendation, at least one of which must discuss the applicant's teaching experiences and capabilities.

Review of applications will begin on November 12, 2007. Applications will be accepted until the position is filled.

The Department of Mathematics is committed to increasing the number of women and minority faculty. The University of Wisconsin is an Affirmative Action, Equal Opportunity Employer and encourages applications from women and minorities. Unless confidentiality is requested in writing, information regarding the applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

000057

CANADA

UNIVERSITY OF BRITISH COLUMBIA
Department of Mathematics

The Mathematics Department at the University of British Columbia is seeking candidates for at least one Tier I Canada Research Chair in any area of mathematics, with a starting date of July 1, 2008. The successful candidate will have a record of world-class research accomplishments and high quality teaching. This is a senior level position, and salary will be commensurate with experience and research record. Details about the federal government's CRC programme can be found at: http://www.chairs.gc.ca.

Applicants are strongly encouraged to apply online as described at: http://www.math.ubc.ca/Dept/jobs.htm#Apply. Alternatively, applicants may send a current CV including a list of publications, statement of research and teaching interests, a teaching dossier or similar record of teaching experience, and should arrange for three letters of recommendation to be sent directly to:

Chair, Departmental Committee on Appointments
Department of Mathematics, #121-1984 Mathematics Road
University of British Columbia
Vancouver, B.C., Canada, V6T 1Z2

Review of applications will begin on October 15, 2007.

All positions are subject to review and final approval by the CRC Secretariat. Canada Research Chairs are open to individuals of any nationality; offers will be made in accordance with Canadian immigration requirements associated with the Canada Research Chairs program. UBC hires on the basis of merit and is committed to employment equity. We encourage all qualified persons to apply.

The department 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), Banff International Research Station (BIRS), and the UBC Institute of Applied Mathematics (IAM). For more information see http://www.math.ubc.ca.

000058

HUNGARY

CENTRAL EUROPEAN UNIVERSITY (CEU)
Department of Mathematics
Study in the country of John von Neumann and Peter Erdos!

The Department of Mathematics and Its Applications of Central European University (CEU), Budapest, Hungary, offers innovative programs at both Ph.D. and MS levels. The language of instruction at CEU is English. The Ph.D. program in mathematics and its applications is registered by the board of regents of the University of the State of New York for, and on behalf of, the New York State Education Department. The program covers major branches in both mathematics and its applications. It is carried out jointly with the Renyi Institute of Mathematics of the Hungarian Academy. We further have partnership agreements with other prominent institutions from abroad. Outstanding foreign scholars are regularly invited to deliver lectures and teach our students, among whom were Haim Brezis (France), Carsten Carstensen (Germany), Constantin Corduneanu (USA), Eduard Feireisl (Czech Republic), Peter D. Lax (USA).

The department will launch an international, two-year Master of Science (MS) in applied mathematics program starting academic year 2008/2009. Our MS program will be focused on modern topics, including analytical, statistical, numerical and computational methods, which are essential in the employment market building strongly on cross-disciplinary practical skills.

For details see http://www.ceu.hu/math or write to: G. Morosanu; email: morosanug@ceu.hu.

000054

PUERTO RICO

University of Puerto Rico at Humacao
Department of Mathematics

Applications are invited for a tenure-track position at the assistant or associate professor level beginning in the Spring of 2008. Responsibilities include teaching Actuarial Mathematics to our Computational Mathematics students, design courses, conducting research, mentor undergraduate research and committee service.

A Ph.D. in Statistics or a Ph.D. in Finance or Economy with a Master in Statistics is required. Selection criteria include teaching, undergraduate research, scholarly activities, and curricular innovation. Application deadline: October 5, 2007.

See http://math.uprh.edu/recruitment for details.

The University of Puerto Rico is an Equal Opportunity/Affirmative Action employer.

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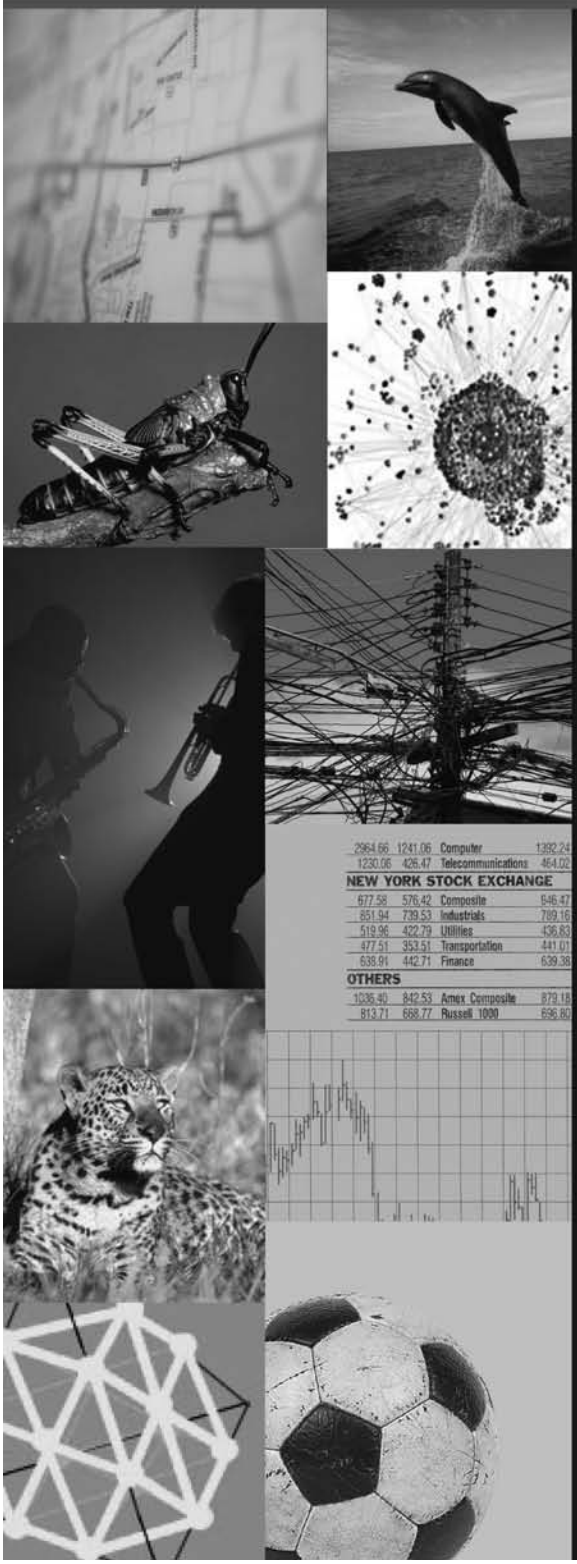
MATH in the MEDIA

Math in the news from the American Mathematical Society



www.ams.org/mathmedia/

- Mathematicians on television
- Prizewinners
- High school math prodigies
- Encryption
- Data-mining at the NSA
- The shape of soccer balls
- Sabermetrics
- Mathematics of cake-cutting
- The Poincaré conjecture
- Women in math
- Quantum computing
- Mathematical art exhibits
- Climate modeling
- The statistics of war crimes
- Mathematics of finance

AMS members: Sign up for the Headlines & Deadlines service at www.ams.org/enews to receive email notifications when each new issue is posted.

Mathematical Sciences Employment Center

San Diego Convention Center, San Diego, California
January 6, 7, 8, and 9, 2008

2008 Employment Center Schedule

October 24, 2007 Registration deadline for inclusion in *Winter List* books.

December 14, 2007 Advance registration deadline. After this date, all registration activities will happen on site in San Diego.

Sunday, January 6

7:30 a.m.–4:00 p.m. Registration and materials pick-up.

9:00 a.m.–9:30 a.m. Short (optional) orientation session.
9:30 a.m.–4:00 p.m. Submission of Scheduled Employment Register interview request forms for both Monday and Tuesday interviews. No request forms can be accepted after 4:00 p.m. Sunday.

9:30 a.m.–6:00 p.m. Interview Center open.
No Scheduled Employment Register interviews are held on Sunday.

Monday, January 7

7:00 a.m.–8:15 a.m. Distribution of interview schedules for both Monday and Tuesday for those participating in the Scheduled Employment Register. Employers who have elected the combination package will receive schedules for Monday only.
8:15 a.m.–4:40 p.m. Scheduled Employment Register interviews in 4 sessions: *Session 1:* 8:15 a.m.–9:50 a.m., *Session 2:* 10:00 a.m.–11:35 a.m., *Session 3:* 1:00 p.m.–2:35 p.m., *Session 4:* 3:00 p.m.–4:35 p.m.
8:00 a.m.–7:30 p.m. Interview Center open (doors open at 7:30 a.m.; do not schedule before 8:00 a.m.).

Tuesday, January 8

8:15 a.m.–4:40 p.m. Scheduled Employment Register interviews in 4 sessions: *Session 5:* 8:15 a.m.–9:50 a.m., *Session 6:* 10:00 a.m.–11:35 a.m., *Session 7:* 1:00 p.m.–2:35 p.m., *Session 8:* 3:00 p.m.–4:35 p.m.
8:00 a.m.–7:30 p.m. Interview Center open (doors open at 7:30 a.m.; do not schedule before 8:00 a.m.). Employers who have elected the combination package will now be moved into this section for interviews.

Wednesday, January 9

9:00 a.m.–12 noon Interview Center open.
Note: Any participant who plans to use the Scheduled Employment Register must appear at the Employment Center on Sunday by 4:00 p.m. to turn in the Interview Request/Availability Form. Before traveling, please refer to the Employment Center Webpage for important phone numbers to contact in case of unexpected delays.

Overview of the Employment Center

The Employment Center (formerly the Employment Register) serves as a meeting place and information center for employers and Ph.D.-level job seekers attending the Joint Mathematics Meetings. Most applicants and employers began the search process in the fall and are looking for an opportunity to meet in person with those with whom they've already had communication. Some, however, use the Employment Center as a way to make some initial contacts, gather information, and distribute their own information. This is a less effective, but common, use of the program. The Employment Center allows everyone to choose a comfortable level of participation by seeking interviews for any of the open hours or by limiting schedules to certain days or hours.

The Employment Center is a four-day program which takes place on the Sunday, Monday, Tuesday, and Wednesday (morning only) of the Joint Meetings. Most participants register in advance (by the October 24 deadline), and their brief résumé or job description is printed in a booklet that is mailed to participants in advance.

The Employment Center houses two services: the computer-scheduled interview tables (the Scheduled Employment Register) and the employer-scheduled interview tables (the Interview Center). Following two years of a job market favorable to employers, the Employment Center applicant/employer ratio seems to be remaining stable. At the 2007 Employment Center, 638 candidates and 142 employers participated, giving an overall applicant-to-employer ratio of 4.4:1 (compared with 554 applicants and 138 employers in 2006, a ratio of 3.9:1). Those with the most interviews are those requested most by employers, usually as a result of a careful application process during the months before the Employment Center takes place. The total number of interviews arranged is dependent on the number of participating employers. Fewer employers will mean fewer interviews overall.

At the January 2008 Employment Center, job candidates will be able to choose how to participate. Two forms of participation will be available:

All Employment Center services (computer-scheduling system, form posted in *Winter List of Applicants*, *Winter List of Employers* received by mail, use of Employment Message Center, availability for employer-scheduled Interview Center).

Message Center and *Winter Lists* only (form posted in *Winter List of Applicants*, *Winter List of Employers* received by mail, use of Employment Message Center, availability for employer-scheduled Interview Center, BUT NOT use of the computer-scheduling system).

No matter which option is chosen, advance registration works best so that the Applicant Form (received by October 24, 2007) can be printed in the *Winter List* distributed to employers.

Employer forms submitted by registered employers have no connection with the AMS online job ads (EIMS). Submitted forms are not available for browsing on the Web. They are reproduced in the *Winter List* booklet for use by Employment Center participants.

The Mathematical Sciences Employment Center is sponsored by the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics; it is managed by members of the AMS staff, with the general guidance of the AMS-MAA-SIAM Committee on Employment Opportunities.

Employers: Choose one of these tables:

Computer-scheduled Employment Register table

Employer-scheduled Interview Center table

Combination Interview Table (split Computer-scheduled/Interview center)

The Employment Register Computer-Scheduling System

Employers register in advance by the October 24 deadline, and their job listings ("Employer Forms") are printed and distributed in mid-December to applicants. Employers receive the book of brief, numbered applicant résumés in mid-December. Participants decide on Sunday, January 6, which of the eight sessions (of five interviews each) they will participate in and submit their Availability/Interview Request Forms between 9:30 a.m. and 4:00 p.m. Sunday. Employers can reserve time for other Joint Meetings events by marking "unavailable" for one or more of the eight sessions. Employers can request ten specific applicants per day, assuming they are available for all four sessions that day. Usually those requests will be filled by the scheduling algorithm, provided the applicants are present, except in the case of the few most-requested applicants. The rest of their interviews will be with applicants who ask to see them. Employers should be specific about their requirements on the Employer Form to avoid interviews with inappropriate candidates.

Schedules are distributed for all Monday and Tuesday interviews on Monday morning. Employers who have elected the combination package will receive schedules for Monday only. The schedule allows 15-minute interviews, with 5 minutes between for note taking. One or more interviewers for the same position(s) may interview at the table separately, together, or in shifts (however, **no more than two** may sit at the table at one time). For follow-up interviews, the scheduled tables will also be available for use until 7:30 p.m. on Monday and Tuesday, and on Wednesday morning from 9:00 a.m. to noon.

Participation in the scheduling program has become optional for applicants, so employers will notice some applicant résumés in the *Winter List of Applicants* with no applicant number. An employer can arrange to interview such an applicant outside of the scheduled interview sessions—for instance, between 4:40 p.m. and 7:30 p.m. Monday or Tuesday, or on Wednesday morning—or during sessions which they left unscheduled.

Employers who are interviewing for two distinct positions may wish to pay for two tables. See the instructions under "How to Register". Employers should bring school catalogs, corporate reports, or more lengthy job descriptions to the Employment Center early on Sunday for perusal by applicants prior to interviews.

The Employer-Scheduled Interview Center

The Interview Center allows any employer to reserve a table in an area adjacent to the Employment Center. Employers will arrange their own schedule of interviews, either in advance or on site, by using the Employment Message Center. Employers who have never used the Employment Center before might want to try conducting interviews at this convenient location. Since they will be setting their own schedules, employers will have complete control over whom they'll see, for how long, and when they'll be interviewing. This allows employers to pursue other activities at the Joint Meetings. Please note: Employers who have elected the combination package will be moved into this area on Tuesday.

The center will be open only during the following hours:

Sunday, January 6, 2008, 9:30 a.m.–6:00 p.m.
Monday, January 7, 2008, 8:00 a.m.–7:30 p.m.
Tuesday, January 8, 2008, 8:00 a.m.–7:30 p.m.
Wednesday, January 9, 2008, 9:00 a.m.–noon

The fee for use of this area is the same as the normal employer fee, $245. It is requested that all employers fill out an Employer Form for inclusion in the *Winter List*. This should clarify to Employment Center applicants what type of position is being filled. If an employer is unable to accept new applicants because the deadline has passed, that should be stated on the form.

The *Winter List of Applicants*, containing information about the candidates present at the Employment Center, will be mailed to all employers in advance of the meeting.

Employers scheduling interviews in advance should tell applicants to find the table with the institution's name

in the Interview Center (not the numbered-table area). Employers can schedule any time during the open hours listed above. To schedule interviews after arriving in San Diego, leave messages for Employment Center applicants in the Employment Message Center. Paper forms will be provided to help speed the invitation process. Each employer will be provided with a box in the Message Center where applicants can leave items.

Employers should have at most two interviewers per table at any time due to space limitations. There will be no outlets or electricity available at the interviewing tables. Only banners that can be draped over the four-foot table can be accommodated.

Combination Interview Table

This year, employers may opt to pay one table fee and experience both settings. The combination table will be located in the computer-scheduled area for one full day of interviews, and then in the Interview Center for the last day and a half.

About the *Winter List of Applicants*

This booklet contains hundreds of résumés of applicants who registered by October 24 for the Employment Center. It will be mailed in December to all employers who register by October 24 and indicate on their Joint Meetings registration form that they would like their materials mailed. Employers should be aware that there will be hundreds of brief résumés to look through and should be sure to obtain the *Winter List of Applicants* as early as possible.

Employers Not Planning to Interview

Employers who do not plan to participate in the Employment Center at all may place a job description in the book of employers. This description must be submitted on the Employer Form, which is located on the Web at www.ams.org/emp-reg, with the appropriate box checked, indicating that no interviews will take place. A fee of $50 is charged for this service (paid through the Joint Meetings registration form). The form must be received in the Providence office (with payment or purchase order sent separately) by the October 24 deadline to appear in the *Winter List of Employers*. Forms received in the Providence office after that deadline will be displayed at the meeting. Those wishing to bring a one-page job description to the Employment Center desk for display during the meetings may do so at no charge.

Employers: How to Register

The interviewer should register and pay for the Joint Mathematics Meetings. They should register for the Employment Center by completing the following steps:

Indicate on the Joint Meetings registration form (available electronically in early September 2007 at www.ams.org/amsmtgs/2109_intro.html that you are also paying the Employment Center employer fee. Indicate your choice of tables. Mark all that apply.

Submit an Employer (job listing) Form electronically at www.ams.org/emp-reg. Be sure the form indicates which type or types of tables will be used. This form will be printed in the *Winter List of Employers*.

It is important to register by the October 24 deadline in order for your form to be included in the *Winter List of Employers*. However, registration will be accepted up to December 14 for the normal fees or on site in San Diego at the on-site rates. Call 800-321-4267, ext. 4113, with any questions or deadline problems.

Any representatives of the institution can sit at the table together or working in shifts (however, the limit is two at one time). If possible, their names should be listed on the Employer Form as a reference point for the applicants. Employment Center fees should be paid only for each table required, not for each person.

In a few unusual cases, an institution will be conducting interviews in the Employment Center for two or more distinct positions and will not want to conduct these interviews at one table. In that case, two or more Employer Forms should be submitted, and separate tables and employer numbers will be provided. Applicants will then be able to request interviews for the appropriate job by employer number. First and second table fees should be paid.

The fee for all employers to register in advance is $245 for the first table and $95 for each additional table. On-site registration fees (any registrations after December 14, 2007) are $325 for the first table and $125 for each additional table. Employers must also register for the Joint Meetings and pay the appropriate Joint Meetings fee.

Employers: Registration on Site

Employers who do not register for the Joint Mathematics Meetings and the Employment Center by December 14 may register on site in San Diego at the Joint Meetings registration desk. They must bring their receipt to the Employment Center desk between 7:30 a.m. and 4:00 p.m. on Sunday, January 6, to receive their materials. If registering for the employer-scheduled Interview Center only, registration on Monday is possible.

Applicants: Use of the computer-scheduled program is now optional.

In 2008 applicants will be given flexibility in deciding how to participate in the Employment Center. There are two options:

All Employment Center services (computer-scheduling system, form posted in *Winter List of Applicants*, *Winter List of Employers* received by mail, use of Employment Message Center, availability for employer-scheduled Interview Center).

Message Center and *Winter Lists* only (form posted in *Winter List of Applicants*, *Winter List*

of Employers received by mail, use of Employment Message Center, availability for employer-scheduled Interview Center, BUT NOT use of the computer-scheduling system). This option is available at a slightly lower price.

Applicants who participate in the 2008 Employment Center will find themselves talking with employers in two different settings:

1. A computer-scheduling program sets 15-minute interviews at the Employment Register numbered tables. This is the choice that has now become optional for applicants. Applicants do not have to hand in a computer-scheduling form at all.

2. There is also an Interview Center, where employers set their own schedules. These employers do not participate in the scheduling program, so applicants have no automatic access to interviews with them. They determine their own schedules and make their own appointments privately, either in advance or on site using the Employment Message Center. These interviews have always been "optional" for applicants, since they may turn down any written invitation they receive. Applicants are reminded to respond to all invitations promptly. Many applicants prefer the interviews they are invited for in this setting, since it is more relaxed and interviews tend to last longer.

Overall, many applicants report being disappointed that there are not more research-oriented jobs being interviewed for at the Employment Center. The best way to predict what type of employers will interview at the Employment Center is to peruse a list of institutions from the previous year, available at www.ams.org/emp-reg. Applicants should expect that many of the jobs are best suited to enthusiastic and well-qualified candidates who can contribute on many levels in an academic setting.

The Schedule

For applicants using all services there is a certain scheduling burden placed on them to juggle these simultaneous services. However, computer-scheduled sessions are in small blocks, for a total of eight sessions over the two days of interviews (Monday and Tuesday). This allows applicants, once they receive invitations to interview in the Interview Center, to accept, knowing that when they submit the computer schedule request on Sunday, they can mark that they are unavailable for one or more of these sessions without seriously jeopardizing their chances of obtaining scheduled interviews. Likewise, applicants who are scheduled to give a talk can avoid interviews for that time. Applicants are encouraged to schedule their time in advance in this manner and not wait for the computer schedule to be distributed Monday morning.

Applicants are advised to place as many selections as possible on their scannable request sheets; however, be advised that this may result in interviews with less-preferred employers. Applicants should be aware that each year approximately 10 percent of applicants signing up for all services fail to submit a schedule request sheet. This is often due to having too many schedule conflicts.

Interviews

Applicants should understand that the Employment Center provides no guarantees of interviews or jobs. It is simply a convenient meeting place for candidates and employers who are attending the Joint Meetings. Those who have not yet begun their job search efforts may go unnoticed at the Employment Center (although applicants will likely receive between one and three interviews in the scheduled program). Attention generally goes to candidates who already have applied for open positions or to those who are well suited for teaching positions at bachelor's-granting colleges.

Data from recent Employment Centers show that women represent about half of the most sought-after applicants, although they make up less than half of the total Employment Center applicant pool. Those without permanent authorization to work in the United States will find themselves far less requested than U.S. citizens or permanent residents. Newer Ph.D.'s tend to be invited for more interviews than those who have been working longer. Most jobs listed require a doctorate. Approximately 32 percent of applicants responding to a recent survey report having between zero and two interviews in the Interview Center. The rest reported higher numbers. Most of the applicants reported that at least some of the Interview Center appointments had been arranged in advance of the meetings.

Preparations

Candidates just beginning a job search should realize that employers have no method to judge their credentials other than the brief résumé form, and they should make an effort to make it distinct and interesting.

Applicants who register in advance will receive the *Winter List of Employers* in mid-December. If time permits, they should apply for suitable open positions they notice in the *Winter List of Employers* after they receive it. Applicants are advised to bring a number of copies of their brief vita or résumé so that they may leave them with prospective employers. It is a good idea in the fall for applicants to alert any employer to whom applications are made that they plan to be present at the Joint Meetings. Also, they should bring enough materials with them to accompany requests for interviews they may want to leave in the Message Center boxes of the Interview Center employers.

Applicants are also encouraged to leave some extra copies of their résumés in their own message folders so that interested employers may find them there. Photocopying costs at a convention/hotel are high, so applicants should come prepared with a reasonably large number of copies. A brightly colored form in each folder gives applicants an opportunity to present for public perusal some information about their availability during the meetings.

The *Winter List of Applicants* is mailed to all employers in advance, so it is vital that the Joint Meetings registration form, applicant résumé form, and payments be received by the October 24 deadline so the Applicant Form can be printed in the book. This greatly increases an applicant's chances of being invited to the Interview Center.

Applicants should keep in mind that interviews arranged by the Employment Center represent only an initial contact with the employers and that hiring decisions are not ordinarily made during or immediately following such interviews.

Results

In a recent survey, 63 percent of applicants responding reported being invited for at least one on-campus visit to an employer they had interviewed with during the Employment Center; 44 percent reported receiving at least one job offer in the months following the interview. Overall, 30 percent reported accepting a position with an employer they spoke with during the Employment Center. Another 56 percent reported (in May) having no new job offers. The rest accepted positions with employers they met through other means.

Applicants: Register Early

Applicants need to complete the following steps by the advance deadline of October 24, 2007.

1. Pay fees

Register for the Joint Mathematics Meetings (the electronic information available in early September 2007 at www.ams.org/amsmtgs/2109_intro.html). You cannot participate in the Employment Center unless you are a Meetings participant. Mark one of the two "Employment Center Applicant Fee" boxes on the Joint Meetings registration form and make payments. The fee in advance for applicants is $44; "Message Center and *Winter List* ONLY" registration is $22.

2. Send form

Submit the Applicant Form (a brief résumé form) electronically at www.ams.org/emp-reg/.

After Registration

Submission of the Applicant Form electronically will result in an email acknowledgement almost immediately. For registration and payments, the Meetings Service Bureau acknowledges all payments. When payments AND the Applicant Form have been received, another acknowledgement will go out by email, if possible, or by mail. Please allow a week or so for processing, but after that contact staff (AMS 800-321-4267, ext. 4113) if you do not receive acknowledgement from the Employment Center.

Around December 15 the *Winter List of Employers* will be mailed to all registered applicants unless they request otherwise.

Registering after the Deadline

After October 24 applicants can still register for the Employment Center at the same prices until the final deadline of December 14. However, the Applicant Form will NOT be included in the *Winter List of Applicants,* but will be posted on site at the Employment Center (a serious disadvantage). Those who do not register by December 14 must register on site at the Joint Meetings registration desk and pay higher fees ($82 Employment Center fee; however, the "Message Center and *Winter List* ONLY" fee is always just $22).

It is worthwhile to submit the applicant form even if you miss the October 24 deadline. An unexpected delay in publishing may allow your late form to get into the book. At the very least, your printed-out form will be brought to the meetings by staff and displayed there (after all the fees have been paid).

When to Arrive

All participants in the scheduled section of the Employment Center must submit their Interview Request/Availability Forms in person between 9:30 a.m. and 4:00 p.m. on Sunday, January 6, 2008, or they will not be included when the interview-scheduling program runs Sunday night. Before traveing, please refer to the Employment Center webpage for important phone numbers to contact in case of unexpected delays. Be sure to keep Employment Center materials with you, because in an emergency you can report your interview requests over the phone.

Applicants: Registering on Site

Feel free to enter the Employment Center area first to consult staff about the decision to register on site and to check on which employers are participating. Full registration on site early Sunday is allowed for a higher fee but is severely discouraged. Most employers will not notice an Applicant Form that arrives on Sunday. Therefore, these individuals will receive only a couple of computer-scheduled interviews. Registration on site is advisable only for those who know they will be interviewed in the Interview Center and would like a Message Center folder for employers to leave messages in. Registering on site for a mailbox only is possible, at the $22 rate, on Sunday and Monday. Pay the fees at the Joint Meetings registration area and then bring your receipt to the Employment Center desk to register yourself.

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.

Chicago, Illinois

DePaul University (Loop Campus)

October 5–6, 2007

Friday – Saturday

Meeting #1030

Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: August 2007
Program first available on AMS website: August 16, 2007
Program issue of electronic *Notices*: October 2007
Issue of *Abstracts*: Volume 28, Issue 3

Deadlines

For organizers: 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

Martin Golubitsky, University of Houston, *Symmetry breaking and synchrony breaking*.

Matthew J. Gursky, University of Notre Dame, *Origins and applications of some nonlinear equations in conformal geometry*.

Alex Iosevich, University of Missouri, *Incidence theory, Fourier analysis and applications to geometric combinatorics and additive number theory*.

David E. Radford, University of Illinois at Chicago, *Title to be announced*.

Special Sessions

Algebraic Coding Theory (in honor of Harold N. Ward's retirement), **Jay A. Wood**, Western Michigan University.

Algebraic Combinatorics: Association Schemes and Related Topics, **Sung Y. Song**, Iowa State University, and **Paul Terwilliger**, University of Wisconsin.

Algebraic Geometry, **Lawrence Man Hou Ein** and **Anatoly S. Libgober**, University of Illinois at Chicago.

Algorithmic Probability and Combinatorics, **Manuel Lladser**, University of Colorado, and **Robert S. Maier**, University of Arizona.

Analysis and CR Geometry, **Song-Ying Li**, University of California Irvine, and **Stephen S-T Yau**, University of Illinois at Chicago.

Applied Harmonic Analysis, **Jonathan Cohen** and **Ahmed I. Zayed**, DePaul University.

Automorphic Forms: Representation Theory of p-adic and Adelic Groups, **Mahdi Asgari** and **Anantharam Raghuram**, Oklahoma State University.

Differential Geometry and Its Applications, **Jianguo Cao**, University of Notre Dame.

Ergodic Theory and Symbolic Dynamical Systems, **Ayse A. Sahin** and **Ilie D. Ugarcovici**, DePaul University.

Extremal and Probabilistic Combinatorics, **Jozsef Balogh**, University of Illinois at Urbana-Champaign, and **Dhruv Mubayi**, University of Illinois at Chicago.

Free Resolutions, **Noam Horwitz** and **Irena Peeva**, Cornell University.

Geometric Combinatorics, **Caroline J. Klivans**, University of Chicago, and **Kathryn Nyman**, Loyola University Chicago.

Graph Theory, **Hemanshu Kaul** and **Michael J. Pelsmajer**, Illinois Institute of Technology.

Hopf Algebras and Related Areas, **Yevgenia Kashina** and **Leonid Krop**, DePaul University, **M. Susan Montgomery**, University of Southern California, and **David E. Radford**, University of Illinois at Chicago.

Mathematical Modeling and Numerical Methods, **Atife Caglar**, University of Wisconsin-Green Bay.

Model Theory of Non-elementary Classes, **John T. Baldwin**, University of Illinois at Chicago, **David W. Kueker**, University of Maryland, and **Rami Grossberg**, Carnegie Mellon University.

Networks, **Martin Golubitsky***,* University of Houston, *and* **Mary Silber***,* Northwestern University.

Nonlinear Conservation Laws and Related Problems, **Cleopatra Christoforou** and **Gui-Qiang Chen**, Northwestern University.

Numerical and Symbolic Techniques in Algebraic Geometry and Its Applications, **GianMario Besana**, DePaul University, **Jan Verschelde**, University of Illinois at Chicago, and **Zhonggang Zeng**, Northeastern Illinois University.

Sequence Spaces and Transformations, **Constantine Georgakis**, DePaul University, and **Martin Buntinas**, Loyola University of Chicago.

Singular Integrals and Related Problems, **Laura De Carli**, Florida International University, and **A. M. Stokolos**, DePaul University.

Smooth Dynamical Systems, **Marian Gidea**, Northeastern Illinois University, and **Ilie D. Ugarcovici**, DePaul University.

The Euler and Navier-Stokes Equations, **Alexey Cheskidov**, University of Michigan, and **Susan J. Friedlander** and **Roman Shvydkoy**, University of Illinois at Chicago.

Wave Propagation from Mathematical and Numerical Viewpoints, **Gabriel Koch**, University of Chicago, **Catalin Constantin Turc**, Caltech and University of North Carolina at Charlotte, and **Nicolae Tarfulea**, Purdue University Calumet.

New Brunswick, New Jersey

Rutgers University-New Brunswick, College Avenue Campus

October 6–7, 2007

Saturday – Sunday

Meeting #1031

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: August 2007
Program first available on AMS website: August 16, 2007
Program issue of electronic *Notices*: October 2007
Issue of *Abstracts*: Volume 28, Issue 3

Deadlines

For organizers: 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

Satyan L. Devadoss, Williams College, *The topology of particle collisions.*

Tara S. Holm, University of Connecticut, *Act globally, compute locally: Localization in symplectic geometry.*

Sir Roger Penrose, University of Oxford, *Spacetime conformal geometry, and a new extended cosmology* (Einstein Public Lecture in Mathematics).

Scott Sheffield, Courant Institute and Institute for Advanced Study, *Random metrics and geometries in two dimensions.*

Mu-Tao Wang, Columbia University, *Isometric embeddings and quasi-local mass.*

Special Sessions

Commutative Algebra, **Jooyoun Hong**, University of California Riverside, and **Wolmer V. Vasconcelos**, Rutgers University.

Geometric Analysis of Complex Laplacians, **Siqi Fu**, Rutgers University, Camden, **Xiaojun Huang**, Rutgers University, New Brunswick, and **Howard J. Jacobowitz**, Rutgers University, Camden.

Invariants of Lie Group Actions and Their Quotients, **Tara S. Holm**, Cornell University, and **Rebecca F. Goldin**, George Mason University.

Mathematical and Physical Problems in the Foundations of Quantum Mechanics (in honor of Shelly Goldstein's 60th birthday), **Roderich Tumulka** and **Detlef Dürr**, München University, and **Nino Zanghi**, University of Genova.

Noncommutative Geometry and Arithmetic Geometry, **Caterina Consani**, Johns Hopkins University, and **Li Guo**, Rutgers University.

Partial Differential Equations in Mathematical Physics (in honor of Shelly Goldstein's 60th birthday), **Sagun Chanillo**, **Michael K.-H. Kiessling**, and **Avy Soffer**, Rutgers University.

Partial Differential Equations of Mathematical Physics, I (dedicated to the memory of Tom Branson), **Sagun Chanillo**, **Michael K.-H. Kiessling**, and **Avy Soffer**, Rutgers University.

Probability and Combinatorics, **Jeffry N. Kahn** and **Van Ha Vu**, Rutgers University.

Set Theory of the Continuum, **Simon R. Thomas**, Rutgers University.

Toric Varieties, **Milena S. Hering**, Institute for Mathematics and Its Applications, and **Diane Maclagan**, Rutgers University.

Albuquerque, New Mexico

University of New Mexico

October 13–14, 2007

Saturday – Sunday

Meeting #1032

Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of *Notices*: August 2007
Program first available on AMS website: August 30, 2007
Program issue of electronic *Notices*: October 2007
Issue of *Abstracts*: Volume 28, Issue 4

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: August 21, 2007

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/sectional.html`.

Invited Addresses

Emmanuel Candes, California Institute of Technology, *The role of probability in compressed sensing*.

Alexander Polischuk, University of Oregon, *Title to be announced*.

Eric Rains, University of California Davis, *Elliptic hypergeometric integrals*.

William E. Stein, University of California San Diego, *SAGE: Open source mathematics software*.

Special Sessions

Affine Algebraic Geometry (Code: SS 2A), **David Robert Finston**, New Mexico State University.

Arithmetic and Algebraic Geometry (Code: SS 10A), **Alexandru Buium** and **Michael J. Nakamaye**, University of New Mexico.

Computational Applications of Algebraic Topology (Code: SS 6A), **Ross Staffeldt**, New Mexico State University.

Computational Methods in Harmonic Analysis and Signal Processing (Code: SS 1A), **Emmanuel Candes**, California Institute of Technology, and **Joseph D. Lakey**, New Mexico State University.

Financial Mathematics: The Mathematics of Financial Markets and Structures (Code: SS 12A), **Cristina Mariani** and **Kenneth Martin**, New Mexico State University.

Geometric Structures on Manifolds (Code: SS 11A), **Charles Boyer** and **Krzysztof Galicki**, University of New Mexico.

Harmonic Analysis Applied to Partial Differential Equations (Code: SS 7A), **Justin Holmer**, University of California Berkeley, **Changxing Miao**, Institute of Applied Physics and Computational Mathematics, and **Jiaong Wu**, Oklahoma State University.

Harmonic Analysis and Operator Theory (Code: SS 9A), **Maria C. Pereyra** and **Wilfredo O. Urbina**, University of New Mexico.

Mathematical and Computational Aspects of Compressible Flow Problems (Code: SS 8A), **Jens Lorenz** and **Thomas M. Hagstrom**, University of New Mexico.

Methods of Heterogeneous Data Analysis (Code: SS 14A), **Hanna Ewa Makaruk**, Los Alamos National Laboratory, and **Nikita A. Sakhanenko**, University of New Mexico.

Nonlinear Waves in Optics, Hydrodynamics, and Plasmas (Code: SS 13A), **Alejandro Aceves** and **Pavel Lushnikov**, University of New Mexico.

Recent Developments in 2-D Turbulence (Code: SS 3A), **Michael S. Jolly**, Indiana University, and **Greg Eyink**, Johns Hopkins University.

Topics in Mathematical Physics (Code: SS 4A), **Rafal Komendarczyk**, University of Pennsylvania, and **Robert Michal Owczarek**, Los Alamos National Laboratory.

Variational Problems in Condensed Matter (Code: SS 5A), **Lia Bronsard**, McMaster University, and **Tiziana Giorgi**, New Mexico State University.

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: September 11, 2007

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 (Code: SS 3A), **James B. Hart**, Middle Tennessee State University.

Applied Partial Differential Equations (Code: SS 4A), **Yuri A. Melnikov**, Middle Tennessee State University, and **Alain J. Kassab**, University of Central Florida.

Billiards and Related Topics (Code: SS 6A), **Sergei Tabachnikov**, Pennsylvania State University, and **Richard Schwartz**, Brown University.

Combinatorial Enumeration, Optimization, Geometry, and Statistics (Code: SS 13A), **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) (Code: SS 8A), **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 (Code: SS 1A), **Wenzhang Huang** and **Jia Li**, University of Alabama, Huntsville, and **Zachariah Sinkala**, Middle Tennessee State University.

Financial Mathematics (Code: SS 16A), **Abdul Khaliq**, Middle Tennessee State University.

Graph Theory (Code: SS 2A), **Rong Luo**, **Don Nelson**, **Chris Stephens**, and **Xiaoya Zha**, Middle Tennessee State University.

Lie and Representation Theory (Code: SS 11A), **Terrell L. Hodge**, University of Virginia and Western Michigan University, **Daniel K. Nakano**, University of Georgia, and **Brian J. Parshall**, University of Virginia.

Mathematical Modeling in Biological Systems (Code: SS 9A), **Terrence J. Quinn**, Middle Tennessee State University.

Mathematical Tools for Survival Analysis and Medical Data Analysis (Code: SS 7A), **Curtis Church**, Middle Tennessee State University, **Chang Yu**, Vanderbilt University, and **Ping Zhang**, Middle Tennessee State University.

Nonlinear Partial Differential Equations and Applications (Code: SS 14A), **Emmanuele DiBenedetto**, **Mikhail Perepelitsa**, and **Gieri Simonett**, Vanderbilt University.

Physical Knots and Links (Code: SS 10A), **Yuanan Diao**, University of North Carolina at Charlotte, and **Claus Ernst**, Western Kentucky University.

Recent Advances in Algebraic Topology (Code: SS 12A), **Mark W. Johnson**, Pennsylvania State University, Altoona, and **Donald Yau**, The Ohio State University at Newark.

Splines and Wavelets with Applications (Code: SS 5A), **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 (Code: SS 15A), **Michaele F. Chappell**, Middle Tennessee State University, and **Judith H. Hector**, Walters State Community College.

Accommodations

Participants should make their own arrangements directly with a hotel of their choice as early as possible. Special rates have been negotiated with the hotels listed below. Rates quoted do not include sales tax of 14.75%. The AMS is not responsible for rate changes or for the quality of the accommodations. When making a reservation, participants should state that they are with the **American Mathematical Society (AMS) Meeting at MTSU group**. Cancellation and early checkout policies vary; be sure to check when you make your reservation.

Blocks of rooms at each hotel are limited, so be sure to call early to obtain your first choice. These three hotels are all off Interstate 24 in the vicinity of Exit 78B and are about four miles from campus. The university will run a limited shuttle service in the morning and late afternoon between these hotels and the meeting site on campus. Participants are also encouraged to use personal/rental cars to facilitate transportation to and from hotels, campus, and restaurants.

Doubletree Hotel, 1850 Old Fort Parkway, Murfreesboro, TN 37129; 615-895-5555 (phone) or 615-895-3557 (fax), US$86/single or double, full service hotel with restaurant and lounge, outdoor heated pool; sleeping rooms are equipped with a refrigerator, coffee maker, and free high speed Internet. **Deadline for reservations is October 3, 2007**. Be sure to check cancellation and early checkout policies.

Wingate Inn, 165 Chaffin Place, Murfreesboro, TN; 615-849-9000 (phone), 615-849-9066 (fax); US$75/single or double in a large room that includes a coffee maker and microfridge, free wireless access; fitness center; complimentary hot breakfast; several restaurants within walking distance. **Deadline for reservations is October 3, 2007**. Be sure to check cancellation and early checkout policies.

Red Roof Inn, 2282 Armory Drive, Murfreesboro, TN 37129; 615-893-0104 (phone), 615-848-5356 (fax); US$59.99/single or double with microwave/refrigerator in room; complimentary continental breakfast, pool, and fitness room. **Deadline for reservations is October 3, 2007**. Be sure to check cancellation and early checkout penalties.

Food Service

In the Student Center on campus there are some fast food services (open Saturday only), as well as the student all-you-can-eat service (open both Saturday and Sunday). More extensive lists of restaurants near campus, restaurants in

town, and restaurants near the hotels listed above will be available at the meeting.

Local Information

The university's website is http://www.mtsu.edu; the Department of Mathematical Sciences is at http://math.web.mtsu.edu.

Other Activities

Book Sales: Stop by the onsite AMS Bookstore—review the newest titles from the AMS, enter the free book drawing, enjoy up to 25% off all titles or even take home the new AMS t-shirt! Complimentary coffee will be served courtesy of AMS Membership Services.

AMS Editorial Activity: An acquisitions editor from the AMS book program will be present to speak with prospective authors. If you have a book project that you would like to discuss with the AMS, please stop by the book exhibit.

Parking

Parking will be available near the meeting site. Watch the AMS website at http://www.ams.org/amsmtgs/sectional.html for more information.

Registration and Meeting Information

The meeting is on the campus of Middle Tennessee State University, Murfreesboro, TN; this is in the Central Time Zone of the U.S. Sessions and Invited Addresses will take place in the Business and Aerospace Building and the John Bragg Mass Communication Building.

The registration desk will be in the lobby of the Business and Aerospace Building and will be open Saturday, March 3, 7:30 a.m. to 4:00 p.m., and Sunday, April 4, 8:00 a.m. to noon. Fees are US$40 for AMS or CMS members, US$60 for nonmembers; and US$5 for students, unemployed mathematicians, and emeritus members. Fees are payable on site by cash, check, or credit card.

Travel, Campus Map, and Directions

The nearest airport is in Nashville, TN (BNA), 1 Terminal Dr. # 501, Nashville, TN 37214 (615-275-1675) and is about 30 miles north of campus. Shuttle service must be reserved in advance with Anytime Transport (http://www.anytimetransport.com), 615-254-7433 (Nashville), 615-217-7433 (Murfreesboro) or 877-479-5483 (toll free). The fare for a one-way shuttle trip is about US$35, or $65 round trip. Taxi fare from the airport to Murfreesboro is about US$62. See http://www.flynashville.com for extensive airport information. Directions and links to campus maps are at http://www.mtsu.edu/maps.shtml.

Driving directions to campus: From Nashville take I-24E to Murfreesboro exit 78B, merge onto Old Fort Parkway (Hwy 96E), and drive 2.1 miles. Turn right onto Broad Street (US-41S/70S), drive 0.4 miles, and turn left onto West Main Street. Proceed 1.5 miles and turn left onto Old Main Circle (MTSU entrance). Or, take I-24E to Murfreesboro exit 76, turn left onto Medical Center Parkway, and proceed for 4 miles to Memorial Blvd. Turn left on Memorial and go .5 miles to Clark Blvd. Turn right on E. Clark and drive for 1.1 miles (street name changes to Middle Tennessee Blvd). Proceed 1.1 miles to East Main Street and turn left. Make an immediate left onto Old Main Circle (MTSU entrance).

From Knoxville take I-40W to Nashville/Lebanon and exit onto 840W. Take Murfreesboro/Smyrna (US-41S/70S) exit 55A. Merge onto US-41S/70S (Broad Street). Drive 4.5 miles and turn left onto W. Main Street, proceeding through the town square to E. Main Street. Proceed 1.5 miles on E. Main Street, cross Middle Tennessee Blvd., and take the first left onto Old Main Circle (MTSU entrance).

From Chattanooga take I-24W toward Nashville; take Murfreesboro exit 81. At the red light, turn right onto Church Street (US-231N) and drive 0.9 miles; turn right onto Middle Tennessee Blvd. Drive 1.9 miles and turn right onto Main Street. Take an immediate left onto Old Main Circle (MTSU entrance).

From Columbia take I-65N to TN 840E exit 59. Take exit 53A onto I-24E towards Chattanooga. Take either exit 76 or exit 78B and follow the directions from Nashville above.

From Memphis take I-40E to Nashville and then I-440 to I-24E, then follow the directions from Nashville above.

Car Rental

Avis is the official car rental company for the sectional meeting in Murfreesboro, Tennessee.

All rates include unlimited free mileage. Weekend daily rates are available from noon Thursday–Monday at 11:59 P.M. Rates for this meeting are effective October 27, 2007–November 11, 2007 and begin at US$24/day (weekend rate). Should a lower qualifying rate become available at the time of booking, Avis is pleased to offer a 5% discount off the lower qualifying rate or the meeting rate, whichever is lowest. Rates do not include any state or local surcharges, tax, optional coverages, or gas refueling charges. Renters must meet Avis' age, driver, and credit requirements. Reservations can be made by calling 800-331-1600 or online at http://www.avis.com. Meeting Avis Discount Number **B159266**.

Weather

March temperatures in Murfreesboro range from 40 degrees F. to 60 degrees F. An umbrella may be desirable.

Information for International Participants

Visa regulations are continually changing for travel to the United States. Visa applications may take from three to four months to process and require a personal interview, as well as specific personal information. International participants should view the important information about traveling to the U.S. found at http://www7.nationalacademies.org/visas/Traveling_to_US.html and http://travel.state.gov/visa/index.html. If you need a preliminary conference invitation in order to secure a visa, please send your request to dls@ams.org.

If you discover you do need a visa, the National Academies website (see above) provides these tips for successful visa applications:

* Visa applicants are expected to provide evidence that they are intending to return to their country of residence. Therefore, applicants should provide proof of "binding" or sufficient ties to their home country or permanent residence abroad. This may include documentation of the following:

– family ties in home country or country of legal permanent residence

– property ownership

– bank accounts

– employment contract or statement from employer stating that the position will continue when the employee returns;

* Visa applications are more likely to be successful if done in a visitor's home country than in a third country;

* Applicants should present their entire trip itinerary, including travel to any countries other than the United States, at the time of their visa application;

* Include a letter of invitation from the meeting organizer or the U.S. host, specifying the subject, location and dates of the activity, and how travel and local expenses will be covered;

* If travel plans will depend on early approval of the visa application, specify this at the time of the application;

* Provide proof of professional scientific and/or educational status (students should provide a university transcript).

This list is not to be considered complete. Please visit the web sites above for the most up-to-date information.

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: September 28, 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, *Title to be announced*.

Gaven J. Martin, Massey University, *Curvature and dynamics*.

Assaf Naor, Microsoft Research/Courant Institute, *Title to be announced*.

Theodore A. Slaman, University of California Berkeley, *Title to be announced*.

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.

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.

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: September 20, 2007

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/national.html`.

Joint Invited Addresses

Fan Chung, University of California San Diego, *The mathematics of PageRank* (AMS-MAA Invited Address).

Terence Tao, University of California Los Angeles, *Structure and randomness in the prime numbers* (AMS-MAA Invited Address).

AMS Invited Addresses

James G. Arthur, University of Toronto, *Semisimple groups as universal examples* (AMS Retiring Presidential Address).

Constantine M. Dafermos, Brown University, *Progress in hyperbolic conservation laws*.

Wen-Ching Winnie Li, National Tsing Hua University and Pennsylvania State University, *Combinatorics and number theory*.

Donald G. Saari, University of California Irvine, *A new mathematical frontier: The social and behavioral sciences*.

Peter Teichner, University of California Berkeley, *Quantum field theory and generalized cohomology*.

Wendelin Werner, University of Paris-Sud, *Random conformally invariant pictures* (AMS Colloquium Lectures).

Avi Wigderson, Hebrew University of Jerusalem, *Randomness—A computational complexity view* (AMS Josiah Willard Gibbs Lecture).

AMS Special Sessions

Some sessions are cosponsored with other organizations. These are noted within the parenthesis at the end of each listing, where applicable.

Algebraic Dynamics (Code: SS 37A), **Diana M. Thomas**, Montclair State University, **Lennard F. Bakker**, Brigham Young University, and **Donald Mills**, Rose-Hulman Institute of Technology.

Algebraic Topology (Code: SS 48A), **Nitu Kitchloo**, University of California San Diego, **Ralph L. Cohen**, Stanford University, **James P. Lin** and **Justin Robert**, University of California San Diego, and **Peter Teichner**, University of California Berkeley.

Algebraic and Geometric Aspects of Integrable Systems (Code: SS 43A), **Baofeng Feng**, University of Texas-Pan American, **Wenxiu Ma**, University of South Florida, **Kenichi Maruno** and **Zhijun Qiao**, University of Texas-Pan American, and **Taixi Xu**, Southern Polytechnic State University.

Applications of Computer Algebra in Enumerative and Algebraic Combinatorics (Code: SS 39A), **Akalu Tefera**, Massachusetts Institute of Technology and Grand Valley State University, and **Moa Apagodu**, Virginia Commonwealth University.

Asymptotic Methods in Analysis with Applications (Code: SS 18A), **Diego Dominici**, SUNY New Paltz, and **Peter A. McCoy**, U.S. Naval Academy (AMS-SIAM).

Automorphic Forms and Related Topics (Code: SS 1A), **Olav K. Richter**, University of North Texas, **Kathrin Bringmann**, University of Minnesota, and **Harold M. Stark**, University of California San Diego.

Biomathematical Modeling (Code: SS 3A), **Olcay Akman**, Illinois State University, and **Timothy D. Comar**, Benedictine University.

Conformally Flat Lorentzian Manifolds (Code: SS 40A), **Virginie Charette**, Université de Sherbrooke, **William M. Goldman**, University of Maryland, **Karin H. Melnick**, Yale University, and **Kevin Scannel**, Saint Louis University.

Dynamics and Stability of Coherent Structures (Code: SS 45A), **Ricardo Carretero**, San Diego State University, and **Jennifer M. Gorsky**, University of San Diego.

E-Theory, Extensions, and Elliptic Operators (Code: SS 38A), **Constantin D. Dumitrascu**, University of Arizona, and **John D. Trout**, Dartmouth College.

Environmental Mathematics: Some Mathematical Problems on Climate Change and Geophysical Fluid Dynamics (Code: SS 29A), **Samuel S. Shen**, San Diego State University, and **Gerald R. North**, Texas A&M University (AMS-SIAM).

Expanders and Ramanujan Graphs: Construction and Applications (Code: SS 44A), **Michael T. Krebs** and **Anthony M. Shaheen**, California State University, Los Angeles, and **Audrey A. Terras**, University of California San Diego.

Financial Mathematics (Code: SS 11A), **Jean-Pierre Fouque**, University of California Santa Barbara, **Kay Giesecke**, Stanford University, **Ronnie Sircar**, Princeton University, and **Knut Solna**, University of California, Irvine.

Global Optimization and Operations Research Applications (Code: SS 4A), **Ram U. Verma**, University of Central Florida.

Graph Theory (Code: SS 46A), **Andre Kundgen** and **K. Brooks Reid**, California State University, San Marcos.

Groups, Representations, and Character Theory (Code: SS 8A), **Manouchehr Misaghian**, Johnson C. Smith University, and **Mohammad Reza Darafsheh**, University of Tehran, Iran.

Heegaard Splittings, Bridge Positions, and Low Dimensional Topology (Code: SS 20A), **Jesse Johnson**, Yale University, **Abigail A. Thompson**, University of California Davis, and **Robin Wilson**, University of California Santa Barbara.

History of Mathematics (Code: SS 28A), **Joseph W. Dauben**, Lehman College, CUNY, **Patti Hunter**, Westmont College, **Victor J. Katz**, University of District of Columbia, and **Karen H. Parshall**, University of Virginia (AMS-MAA).

Hyperbolic Dynamical Systems (Code: SS 30A), **Todd L. Fisher**, University of Maryland, and **Boris Hasselblatt**, Tufts University.

Interactions Between Noncommutative Algebra and Algebraic Geometry (Code: SS 42A), **Daniel S. Rogalski** and **Lance W. Small**, University of California San Diego, and **James J. Zhang**, University of Washington.

Inverse Problems in Geometry (Code: SS 9A), **Peter A. Perry**, University of Kentucky, and **Carolyn S. Gordon**, Dartmouth College.

Learning and Math Graduate Students in K–12 Classroom (Code: SS 36A), **Richard S. Millman**, University of Kentucky, **Loyce M. Adams**, University of Washington, **Overtoun M. Jenda**, Auburn University, and **M. Helena Noronha**, California State University, Northridge.

Low Genus Curves and Applications (Code: SS 34A), **Kristin E. Lauter**, Microsoft Research, and **Peter Stevenhagen**, Leiden University.

Mathematical Problems in Biological Formations (Code: SS 5A), **Yuanwei Qi**, University of Central Florida.

Mathematics and Education Reform (Code: SS 14A), **Bonnie S. Saunders**, University of Illinois, Chicago, **William H. Barker**, Bowdoin College, **Dale R. Oliver**, Humboldt State University, and **Michael Starbird**, University of Texas, Austin (AMS-MAA-MER).

Mathematics for Teaching: Educating Elementary and Middle School Teachers for Success (Code: SS 33A), **Babette M. Benken**, California State University, Long Beach, and **Lynn C. McGrath** and **Perla L. Myers**, University of San Diego.

Modular Forms and Modularity (Code: SS 47A), **Ling Long**, Iowa State University, **Wen-Ching Winnie Li**, Pennsylvania State University, and **Tong Liu**, University of Pennsylvania.

Monotone Discrete Dynamical Systems with Applications (Code: SS 26A), **M. R. S. Kulenovic** and **Orlando Merino**, University of Rhode Island, and **Hal L. Smith**, Arizona State University.

Probability Theory and Statistical Mechanics (Code: SS 49A), **Itai Benjamini**, Weizmann Institute and Microsoft Research, and **Wendelin Werner**, University of Paris-Sud.

Progress in Commutative Algebra (Code: SS 24A), **Janet Striuli**, University of Nebraska, Lincoln, **Sean M. Sather-Wagstaff**, Kent State University, and **Lars Winther Christensen**, Texas Tech University.

Recent Advances in Mathematical Biology, Ecology, and Epidemiology (Code: SS 22A), **Linda J. S. Allen**, Texas Tech University, **Sophia R. Jang**, University of Louisiana at Lafayette, and **Lih-Ing W. Roeger**, Texas Tech University.

Representation Theory and Nonassociative Algebras (Code: SS 17A), **Murray R. Bremner**, University of Saskatchewan, **Irvin R. Hentzel**, Iowa State University, and **Luiz A. Peresi**, University of Sao Paulo.

Research in Mathematics by Undergraduates (Code: SS 12A), **Darren A. Narayan** and **Bernard Brooks**, Rochester Institute of Technology, **Jacqueline A. Jensen**, Sam Houston State University, **Vadim Ponomarenko**, San Diego State University, and **Tamas Wiandt**, Rochester Institute of Technology (AMS-MAA-SIAM).

Secant Varieties and Related Topics (Code: SS 19A), **Christopher S. Peterson**, Colorado State University, **Hirotachi Abo**, University of Idaho, and **Anthony V. Geramita**, Queen's University and University of Genoa.

Set Theory and Banach Spaces (Code: SS 35A), **Christian Rosendal**, University of Illinois at Urbana-Champaign, and **Stevo B. Todorcevic**, University of Toronto and CNRS, Université Paris 7 (AMS-ASL).

Stochastic, Large-Scale, and Hybrid Systems with Applications (Code: SS 16A), **Aghalaya S. Vatsala**, University of Louisiana at Lafayette, and **G. S. Ladde**, University of Texas at Arlington.

Structure, Geometry, and Symbolic Computation of Algebraic Groups and Symmetric Spaces (Code: SS 10A), **Jennifer R. Daniel**, Lamar University, and **Aloysius G. Helminck**, North Carolina State University.

Time-Frequency Analysis: Hilbert Huang Transform and Wavelet Analysis (Code: SS 21A), **Yuesheng Xu**, Syracuse University, **Sherman D. Riemenschneider**, West Virginia University, and **Samuel S. Shen**, San Diego State University.

Voting Theory (Code: SS 41A), **Michael A. Jones**, Montclair State University, **Eric I. Gottlieb**, Rhodes College, and **Brian P. Hopkins**, Saint Peter's College.

Wavelet Sets and Tilings of R^n (Code: SS 23A), **Kathy D. Merrill**, Colorado College, and **Lawrence W. Baggett** and **Judith A. Packer**, University of Colorado, Boulder.

Zeta Functions of Graphs, Ramanujan Graphs, and Related Topics (Code: SS 13A), **Audrey A. Terras**, University of California San Diego, and **Matthew Horton**, Wellesley College (AMS-AWM).

The Feynman Integral in Mathematics and Physics (Code: SS 15A), **Lance W. Nielsen**, Creighton University.

The Linear Diophantine Problem of Frobenius (Code: SS 2A), **Matthias Beck**, San Francisco State University, **Stanley Wagon**, Macalester College, and **Kevin M. Woods**, Oberlin College.

The Mathematics of Information and Knowledge (Code: SS 27A), **Peter W. Jones**, Yale University, **James G. Glimm**, SUNY at Stony Brook, and **Steve Smale**, Toyota Institute of Technology at Chicago.

The Scholarship of Teaching and Learning in Mathematics (Code: SS 25A), **Curtis D. Bennett** and **Jacqueline M. Dewar**, Loyola Marymount University (AMS-MAA).

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: August 15, 2007
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.*

Ravi Vakil, Stanford University, *Title to be announced.*

Special Sessions

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.

Nonlinear Elliptic Equations and Geometric Inequalities (Code: SS 2A), **Fengbo Hang**, Princeton University, and **Xiaodong Wang**, Michigan State 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: August 28, 2007
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.*

Special Sessions

Harmonic Analysis and PDEs in Real and Complex Domains (Code: SS 3A), **Loredana Lanzani**, University of Arkansas, and **Zhongwei Shen**, University of Kentucky.

Structural Graph Theory (Code: SS 2A), **Maria Chudnovsky**, Columbia 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 4–6, 2008

Friday – 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: September 4, 2007
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

Birational Algebraic Geometry (Code: SS 3A), **Mircea I. Mustata**, University of Michigan, and **Mihnea Popa**, University of Illinois at Chicago.

Combinatorial and Geometric Aspects of Commutative Algebra (Code: SS 1A), **Juan Migliore**, University of Notre Dame, and **Uwe Nagel**, University of Kentucky.

Hyperbolic and Kinetic Equations (Code: SS 2A), **Shi Jin**, University of Wisconsin, and **Marshall Slemrod**, Univesity of Wisconsin.

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: October 4, 2007
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.

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.

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: Not applicable
Program issue of electronic *Notices*: Not applicable
Issue of *Abstracts*: Not applicable

Deadlines

For organizers: To be announced
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/internmtgs.html.

AMS Invited Addresses

Velimir Jurdjevic, University of Toronto, *Title to be announced.*

Richard M. Schoen, Stanford University, *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.*

Mark Kisin, University of Chicago, *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 Interntional Meeting Between the AMS and the Shanghai Mathematical Society
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: To be announced
Program first available on AMS website: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: To be announced
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

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.*

Washington, District of Columbia

Marriott Wardman Park Hotel and Omni Shoreham Hotel

January 7–10, 2009

Wednesday – Saturday
Joint Mathematics Meetings, including the 115th Annual Meeting of the AMS, 92nd Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: October 2008
Program first available on AMS website: November 1, 2008
Program issue of electronic *Notices*: January 2009
Issue of *Abstracts*: Volume 30, Issue 1

Deadlines

For organizers: April 1, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

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: Expired
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
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

Boston, Massachusetts

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January 4–7, 2012

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Program issue of electronic *Notices*: January 2012
Issue of *Abstracts*: Volume 33, Issue 1

Deadlines

For organizers: April 1, 2011
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

San Diego, California

San Diego Convention Center and San Diego Marriott Hotel and Marina

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For abstracts: To be announced

Baltimore, Maryland

Baltimore Convention Center

January 15–18, 2014

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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

Journals from the European Mathematical Society

Groups, Geometry, and Dynamics

ISSN: 1661-7207
2008. Vol. 2, 4 issues
Approx. 600 pages. 17.0 cm x 24.0 cm

Edited by
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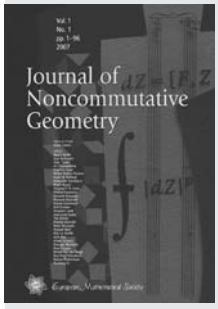
Tatiana Smirnova-Nagnibeda, Université de Genève, Switzerland
Zoran Šunić, Texas A&M University, USA



Journal of Noncommutative Geometry

ISSN: 1661-6952
2008. Vol. 2, 4 issues
Approx. 500 pages. 17.0 cm x 24.0 cm

Edited by
Alain Connes, Collège de France, Paris, France

Commentarii Mathematici Helvetici

A journal of the Swiss Mathematical Society

ISSN 0010-2571
2008. Vol. 83, 4 issues
Approx. 950 pages. 17.0 cm x 24.0 cm

Edited by
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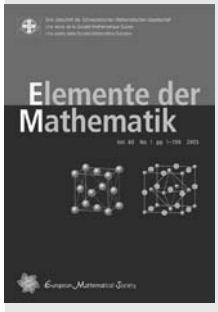

Elemente der Mathematik

A journal of the Swiss MaHerzlich - Thomastical Society

ISSN 0013-6018
2008. Vol. 63, 4 issues
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Edited by
Jürg Kramer, Humboldt-Universität zu Berlin, Germany

Journal of the European Mathematical Society

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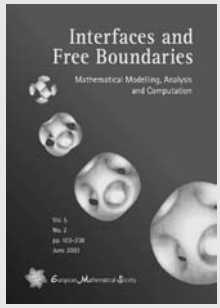
2008. Vol. 10, 4 issues
Approx. 900 pages. 17.0 cm x 24.0 cm

Edited by
Haïm Brezis, Université Pierre et Marie Curie, Paris, France and Institut Universitaire de France



Interfaces and Free Boundaries

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2008. Vol. 10, 4 issues
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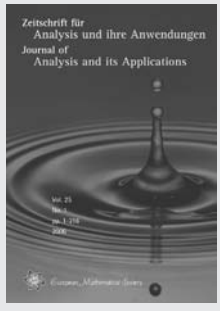
Edited by
José Francisco Rodrigues, Lisboa, Portugal
Charles M. Elliot, University of Sussex, UK
Robert V. Kohn, Courant Institute, USA

Atti della Accademia Nazionale dei Lincei

Rendiconti Lincei – Matematica e Applicazioni

ISSN: 1120-6330
2008. Series 9, Vol. 19, 4 issues
Approx. 400 pages. 17.0 cm x 24.0 cm

Edited by
A. Ambrosetti, SISSA, Trieste, Italy



Zeitschrift für Analysis und ihre Anwendungen / Journal for Analysis and its Applications

ISSN 0232-2064
2008. Vol. 27, 4 issues
Approx. 500 pages. 17.0 cm x 24.0 cm

Edited by
J. Appell (Universität Würzburg, Germany)
H. Freistühler, M. Günther, S. Luckhaus
(all Universität Leipzig, Germany)

Portugaliae Mathematica

A journal of the Portuguese Mathematical Society

ISSN 0032-5155
2008. Vol. 65, 4 issues
Approx. 500 pages. 17.0 cm x 24.0 cm

Edited by
Rui Loja Fernandes, Instituto Superior Técnico, Lisboa, Portugal

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2008. Vol. 5, 4 issues
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Edited by
Gert-Martin Greuel, Universität Kaiserslautern, Germany

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Meetings and Conferences of the AMS

Associate Secretaries of the AMS

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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.

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:

2007

October 5–6	Chicago, Illinois	p. 1095
October 6–7	New Brunswick, New Jersey	p. 1096
October 13–14	Albuquerque, New Mexico	p. 1097
November 3–4	Murfreesboro, Tennessee	p. 1097
December 12–15	Wellington, New Zealand	p. 1100

2008

January 6–9	San Diego, California Annual Meeting	p. 1101
March 22–23	New York, New York	p. 1103
March 28–30	Baton Rouge, Louisiana	p. 1103
April 4–6	Bloomington, Indiana	p. 1103
May 3–4	Claremont, California	p.1104
June 4–7	Rio de Janeiro, Brazil	p. 1104
October 4–5	Vancouver, Canada	p. 1105
October 11–12	Middletown, Connecticut	p. 1105
October 17–19	Kalamazoo, Michigan	p. 1105
October 24–26	Huntsville, Alabama	p. 1106
December 17–21	Shanghai, People's Republic of China	p. 1106

2009

January 7–10	Washington, DC Annual Meeting	p. 1106
March 27–29	Urbana, Illinois	p. 1107
April 4–5	Raleigh, North Carolina	p. 1107
April 25–26	San Francisco, California	p. 1107
Oct. 16–18	Waco, Texas	p. 1107
Oct. 30–Nov. 1	Boca Raton, Florida	p. 1107
Nov. 7–8	Riverside, California	p. 1108

2010

January 6–9	San Francisco, California Annual Meeting	p. 1108
March 27–29	Lexington, Kentucky	p. 1108

2011

January 5–8	New Orleans, Louisiana Annual Meeting	p. 1108

2012

January 4–7	Boston, Massachusetts Annual Meeting	p. 1109

2013

January 9–12	San Diego, California Annual Meeting	p. 1109

2014

January 15–18	Baltimore, Maryland Annual Meeting	p. 1109

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 similarily 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.

CAMBRIDGE

Essential New and Forthcoming MATH Titles!

Orbifolds and Stringy Topology
Alejandro Adem, Johann Leida, and Yongbin Ruan
Cambridge Tracts in Mathematics
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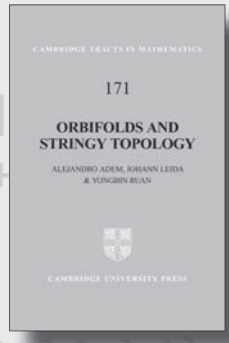
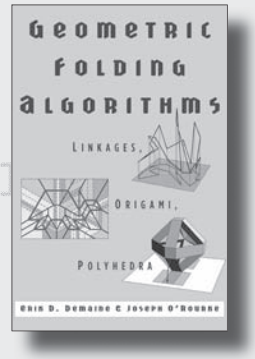


Geometric Folding Algorithms
Linkages, Origami, Polyhedra
Erik D. Demaine and Joseph O'Rourke
$95.00: Hardback: 978-0-521-85757-4: 496 pp.



Monopoles and Three-Manifolds
Peter Kronheimer and Tomasz Mrowka
New Mathematical Monographs
$145.00: Hardback: 978-0-521-88022-0: 770 pp.

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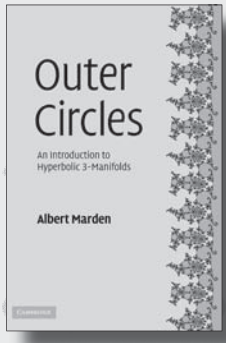
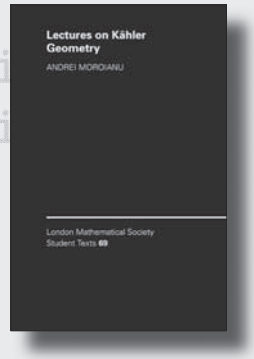
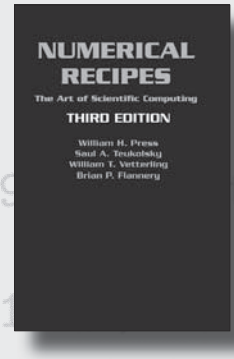
An Introduction to Hyperbolic 3-Manifolds
Albert Marden
$75.00: Hardback: 978-0-521-83974-7: 446 pp.



Lectures on Kähler Geometry
Andrei Moroianu
London Mathematical Society Student Texts
$99.00: Hardback: 978-0-521-86891-4: 182 pp.
$36.99: Paperback: 978-0-521-68897-0



Numerical Recipes, 3rd Edition
The Art of Scientific Computing
William H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery
$80.00: Hardback: 978-0-521-88068-8: 1256 pp.



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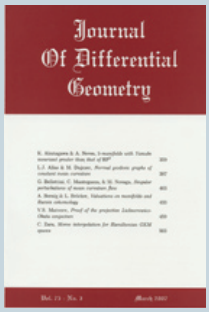

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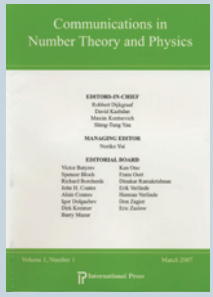

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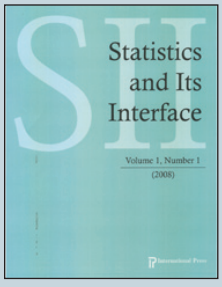

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H. Cohen, Université Bordeaux I, Talence, France

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Vol. I: 2007. XXIII, 650 p. (Graduate Texts in Mathematics, Volume 239) Hardcover
ISBN 978-0-387-49922-2 ► **$59.95**

Vol. II: 2007. XXIII, 596 p. (Graduate Texts in Mathematics, Volume 240) Hardcover
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B. P. Rynne, **M. A. Youngson**, Heriot-Watt University, Edinburgh, UK

This introduction to the ideas and methods of linear functional analysis shows how familiar and useful concepts from finite-dimensional linear algebra can be extended or generalized to infinite-dimensional spaces. Highlights of the second edition include - a new chapter on the Hahn-Banach theorem and its applications to the theory of duality. This chapter also introduces the basic properties of projection operators on Banach spaces, and weak convergence of sequences in Banach spaces; - topics that have applications to both linear and nonlinear functional analysis; - extended coverage of the uniform boundedness theorem; - plenty of exercises, with solutions provided at the back of the book.

2nd ed. 2007. Approx. 335 p. 6 illus. (Springer Undergraduate Mathematics Series) Softcover
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2nd ed. 2007. XXVI, 486 p. 212 illus. Hardcover
ISBN 978-0-387-73057-8 ► **approx. $79.95**

Numerical Linear Algebra

G. Allaire, École Polytechnique Palaiseau, France; **S. M. Kaber**, Université Pierre et Marie Curie, Lab. Jacques-Louis Lions, France

This book distinguishes itself from the many other textbooks on the topic of linear algebra by including mathematical and computational chapters along with examples and exercises with Matlab. Using both Matlab and SciLab software, the book covers core standard material and contains an excellent variety of exercises. Scilab exercises are also included online. In recent years, the use of computers in many areas of engineering and science has made it essential for students to get training in numerical methods and computer programming.

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J. H. Silverman, Brown University, Providence, RI, USA

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Ü. Lumiste, University of Tartu, Estonia

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Semiparallel Submanifolds in Space Forms will appeal to both researchers and graduate students.

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