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of the American Mathematical Society

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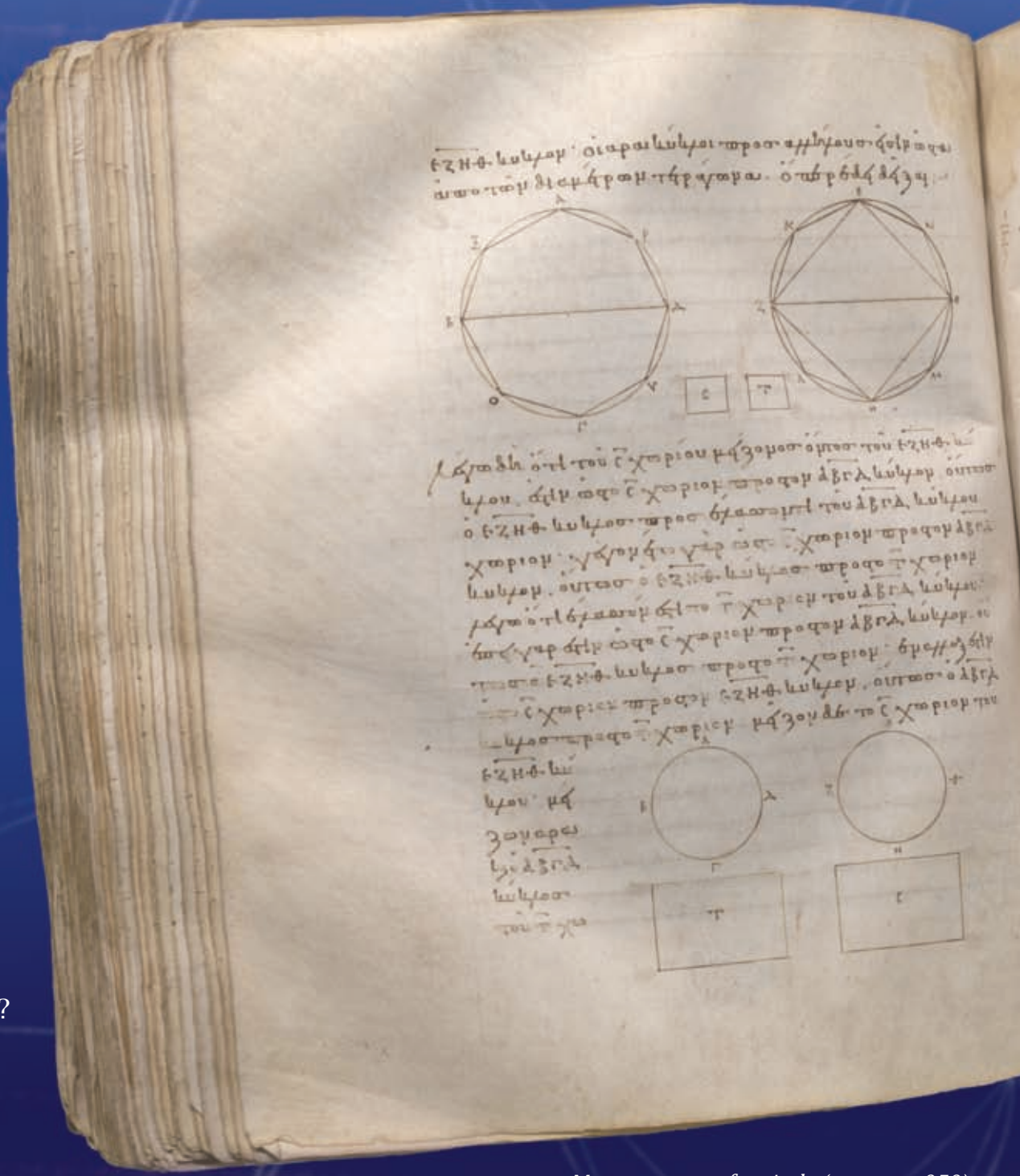

Measurement of a circle (see page 959)

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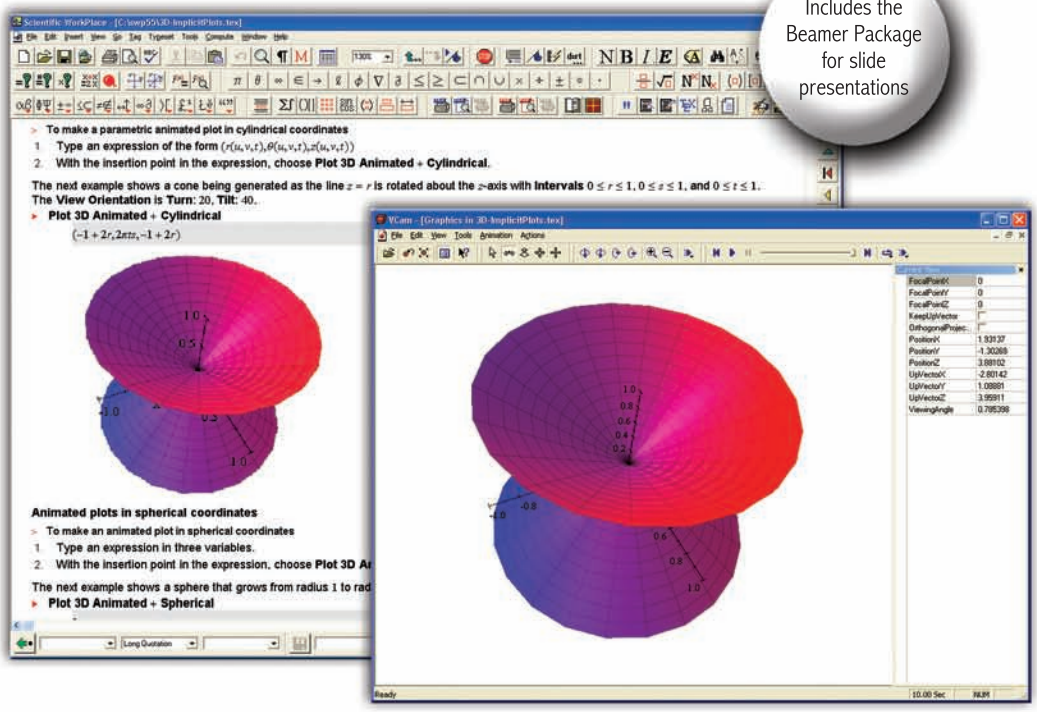

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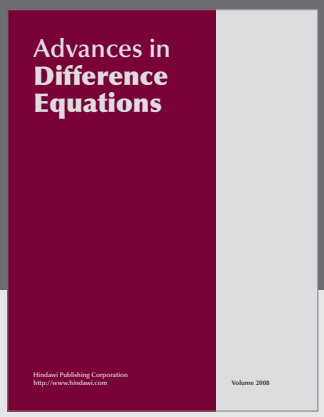

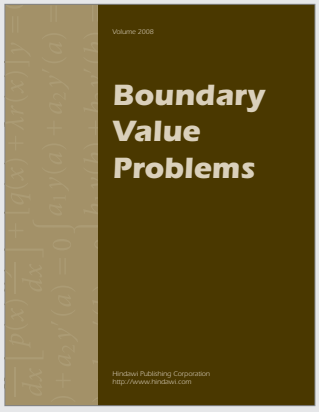

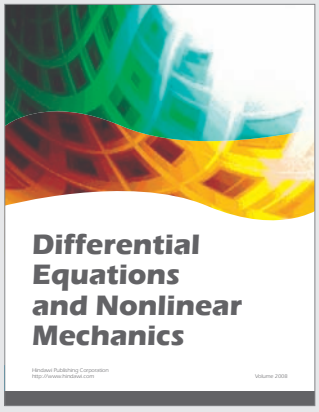

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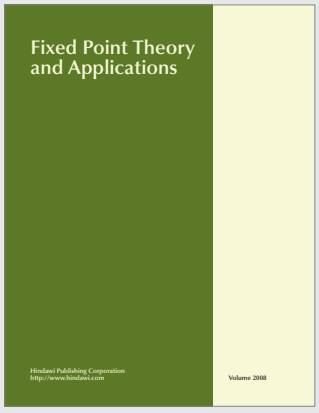

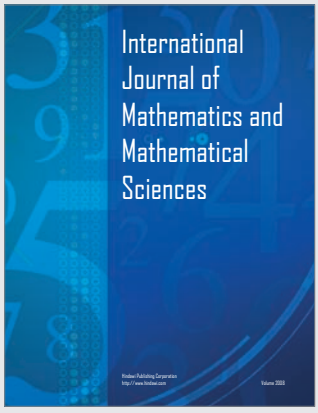

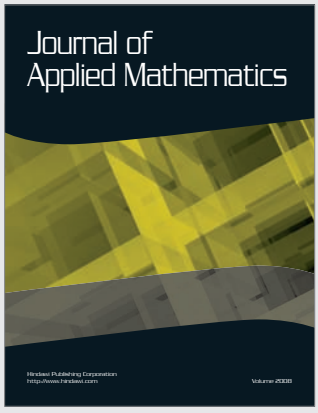

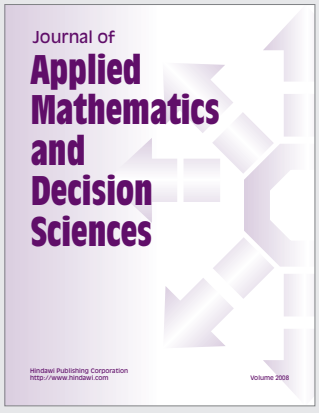

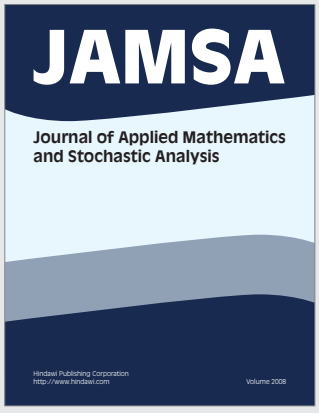

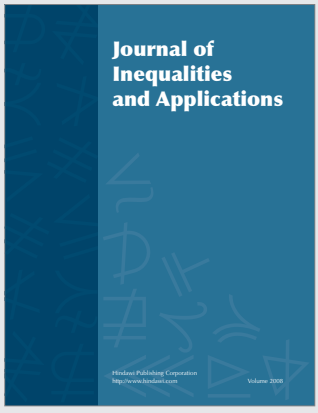

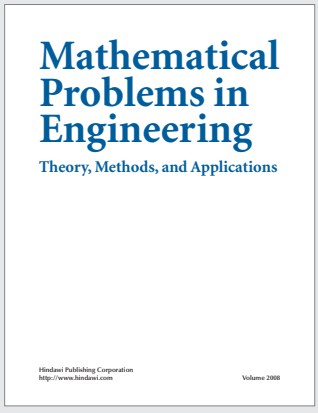

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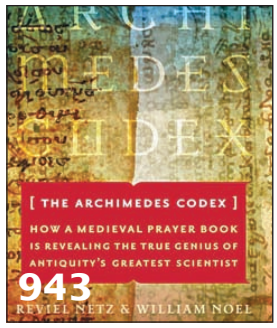
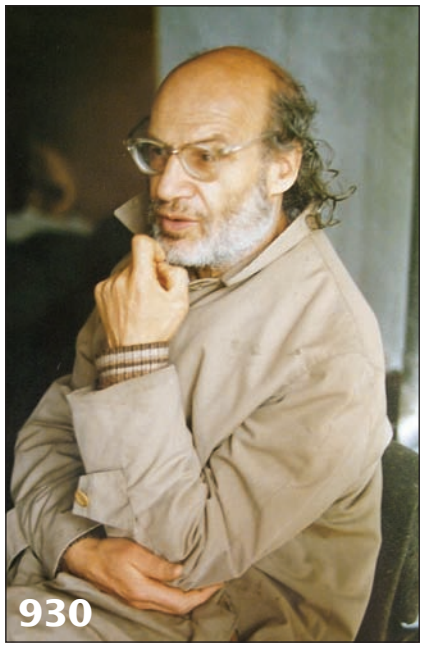
September 2008

Communications

Commentary





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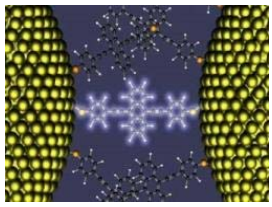

QUANTUM AND KINETIC TRANSPORT: ANALYSIS, COMPUTATIONS, AND NEW APPLICATIONS

March 9 - June 12, 2009

ORGANIZING COMMITTEE: **Eric Carlen** (Georgia Institute of Technology), **Pierre Degond** (Université de Toulouse III) **Irene Gamba** (University of Texas), **Frank Graziani** (Lawrence Livermore National Laboratory), **Shi Jin** (University of Wisconsin), **Karl Kempf** (Intel Corporation), **David Levermore** (University of Maryland), **Peter Markowich** (Universität Wien Institute of Mathematics), **Stanley Osher** (UCLA), **Christian Ringhofer** (Arizona State), **Marshall Slemrod** (University of Wisconsin)

Scientific Overview

We are at the dawn of the nanotechnology era, where scientific and technological advancements often demand the investigation of problems involving small or multiple scales. In such problems, the hydrodynamic theory is often invalid, and one has to apply the more fundamental laws of physics, such as kinetic theory (Boltzmann equation), molecular dynamics (Newton's second law or the Liouville equation), or even quantum mechanics (Schrodinger equation). This requires the development of new mathematical and computational methods for physical laws at these scales, or a mixture of them. Mathematical understanding of the scaling limit from one scale to another plays an important role, and interweaves with the development of new multiscale computational methods. This program will focus on the mathematical analysis, computational challenges and new applications of quantum and kinetic transport theory. Senior leading figures and young researchers working on these topics, including mathematicians and scientists in several disciplines and representing both academia and industry, will be invited.

Workshop Schedule

- Tutorials, March 10 – 13, 2009
- Workshop 1: Computational Kinetic Transport and Hybrid Methods, March 30 – April 3, 2009
- Workshop 2: The Boltzmann Equation: DiPerna-Lions Plus 20 Years, April 15 – 17, 2009
- Workshop 3: Flows and Networks in Complex Media, April 27 – May 1, 2009
- Workshop 4: Asymptotic Methods for Dissipative Particle Systems, May 18 – 22, 2009
- Culminating Workshop at Lake Arrowhead Conference Center, June 7 – 12, 2009

Participation

This long program will involve a community of senior and junior researchers. The intent is for participants to have an opportunity to learn about mathematical and computational aspects of quantum and kinetic transport, and to meet a diverse group of people and have an opportunity to form new collaborations.

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

www.ipam.ucla.edu/programs/kt2009

UCLA *IPAM is an NSF funded institute*

Institute for Pure & Applied Mathematics IPAM University of California, Los Angeles

The Wolf Prize and Supporting Palestinian Education

While in Israel to receive a Wolf Prize, I wrote the following to explain what the Wolf Prize meant to me:

"Mathematics is flourishing today as a vibrant international community, scholars free to travel, talk, and learn from each other anywhere in the world. Here is my own experience: the work for which I have received this prize owes more than I can say to sharing ideas when I was young with Jun-Ichi Igusa from Japan, C. S. Seshadri from India, Alexander Grothendieck, a stateless person—and many others. It was startling and moving when, as a young man, I received a letter from Seshadri, from halfway around the world, telling me that his and Narasimhan's work had led them to the same results as mine.

"Mathematics in Israel flourishes today on this high international plane. Its lifeblood is the free exchange of ideas with scholars visiting, teaching, learning from each other, traveling everywhere in the world. But sadly this is not the case in occupied Palestine where education struggles to continue and travel is greatly limited. Therefore I have decided to donate my part of the Wolf Prize in Mathematics to the cause of helping the university community in occupied Palestine survive and flourish. Its continued existence affects crucially the opportunities and dreams of the next generation and specifically whether potential mathematicians there have the opportunity to join this international community of scholars.

"For this reason, I am giving half of my prize to the Israeli foundation 'Gisha' (http://www.gisha.org) which works to further the right to education and freedom of movement of Palestinians and half to Birzeit University (http://www.birzeit.edu) directly."

This statement was made public as part of a press release by Gisha the day after the ceremony. This resulted in a wave of emails in my inbox, comments on blogs, and letters to *Ha'aretz*. In these comments, I have been called a racist, an anti-semite and even a dingbat by some, but also a true mensch and "*avec du panache*" by others. I reject vehemently the first two and don't feel the others are very accurate either. But clearly a small act like mine strikes a deep emotional chord—positive or negative—for many. I have received moving testimonies from Palestinians who are so grateful for this recognition of their situation; and I have also received expressions of fear by Israelis that any student body in the West Bank could be a hotbed for the intifada. There is no way to totally refute this fear—after all, even Harvard had its unabomber—but Birzeit is a remarkable educational institution, doing its best to teach the values and skills needed in a civilized society.

I was very pleased that my own belief in the importance of Palestinian education to the well being of Israel as well as of Palestine was echoed this June by both Israeli Supreme Court Justice Elyakim Rubinstein and by U.S. Secretary of State Condoleeza Rice. Justice Rubenstein told the State Attorney that the ban on allowing students from Gaza to study abroad seems "no less harmful to the Israeli interest, because we have to live with the Palestinians in the future, too." Rubinstein expressed the opinion that preventing students from accessing education "harms chances for some kind of co-existence." Secretary Rice said that "if you cannot engage young people and give them a complete horizon to their expectations and to their dreams, then I don't know that there would be any future for Palestine" (quoted from Gisha's website).

It's important to realize that Birzeit is an active vibrant modern university. After the 1967 war, when the West Bank was occupied, the Palestinians realized that they needed to create their own universities, and Birzeit was the first, starting in the early 1970s. Today it has about 7,500 students studying arts, science, engineering, law, commerce and economics, and information technology; it is starting new programs in nursing and pharmacology. Half its students are male, half female. Most of the students are studying for a bachelor's degree, but about 20% are studying for a master's degree. It occupies a striking modern campus built atop a hill with the help of support from many countries, especially the European Union. It has been closed intermittently in the past by Israel but now has been operating continuously for seven years. Although the intifada does break out in violence sometimes, life in the West Bank, as in Israel, is essentially peaceful and continues, working as best it can around the roadblocks and other obstacles of the occupation. It is just as feasible for visitors to stay in Ramallah as in West Jerusalem.

What is particularly exciting to the mathematical community is that a "Center of Excellence in Mathematics and Theoretical Physics" is starting up at Birzeit (see the proposal at http://www.peace-programme.org/content/view/20/30/). With the support of UNESCO, a chair has been created for the director of the proposed Center and it is now filled by Professor Henry Jaqaman. The Center held its first international meeting this July (http://www.peace-programme.org/content/view/74/5/). My report is that mathematics at Birzeit is on an upward trend and is flourishing.

—David Mumford
Brown University
david_mumford@brown.edu

Challenges for Math in Australia

Australia is facing a substantial under-supply of mathematical scientists. The Australian Government's *Audit of Science, Engineering and Technology Skills* [1]*, generally referred to as the Skills Audit and released in 2006, estimated that demand for mathematics skills grew by 52% in the eight-year period up to 2005, and forecast that it would grow by another 33% in the next eight years. These figures correspond to annual growth rates of 5.4% and 3.5%, respectively, and point to an expansion in demand for mathematicians and statisticians that is outpacing even that for engineers, where there are well-known and chronic skills shortages in Australia.

However, a review [2] of the mathematical sciences, partly funded by the Australian Government and reporting to the Australian Academy of Science in late 2006, noted that the number of mathematical sciences graduates, and the capacity of the nation to train mathematical scientists, were both falling. Recent data [3] confirm that the decline is continuing.

There is evidence that companies needing mathematics skills are not establishing offices in Australia. Back in 2003, when the problem of finding mathematics and statistics skills was less acute than it is today, the Hoffman La Roche group wrote to the Australian Government to explain that the company had chosen Australia for expansion because that country was "known to have many excellent statisticians, excellent educational institutions, and a stable political system… [However] the viability of this industry is now threatened because Australia is failing to produce sufficient statistics graduates." A major Australian employer of mathematicians is funding the education of foreign mathematics students in their home country, hoping to attract some of them to Australia on graduation.

Linking problems such as this to school mathematics education, the Skills Audit highlighted the "declining proportion of participation in the enabling sciences and advanced mathematics in schools and in post-school settings". Commenting on the "challenges in building Australia's science, research and innovation capacity for the future", the Audit noted that "an adequate supply of well qualified science and mathematics teachers is a key to success."

At present Australia is caught in a spiral, where the number of students studying university mathematics or statistics decreases every year, and the number of young men and women training to be mathematics teachers declines too. Therefore the number of school students capable of studying mathematics or statistics at university, at anything but the lowest level, goes down annually. However, outside Australian universities the demand for professional mathematicians and statisticians is increasing at a rate which outstrips that for just about every other field.

Therefore, when the University of Southern Queensland (USQ), acclaimed for its capacity to train future teachers, decided to shed more than 50% of its mathematics and statistics staff, a very substantial tide of opposition grew. The university argued that its mathematics and statistics programs were no longer financially viable, although data seemed to point strongly to the contrary.

Terry Tao weighed in to help, establishing Web pages [4, 5, 6, 7] addressing the problems. A central issue in the debate has been whether USQ management is passing on extra funding it received from the Australian Government in 2008, aimed specifically at supporting the mathematical sciences. The government, responding to the review, increased per-student funding for mathematics and statistics courses, but many universities are sending the new money to other areas where investment is likely to pay higher financial dividends in the future. Attempts at obtaining reliable financial data from USQ management have not proved successful. While the university has moderated its plans in the face of strong opposition, the planned reductions in the university's capacity to teach mathematics and statistics will still be very significant.

There are a number of lessons that can be learned from the problems being faced in Australia. First, the potential for maintaining mathematics student numbers in universities depends inexorably on the availability of well-trained and strongly motivated mathematics teachers in schools. Australia, with its school education system split among state governments which do not work well together, has failed to address this challenge. Over a long period the mathematical sciences community has striven to resolve the problem, but without much success. For example, letters to state authorities on the subject tend not to be answered.

Secondly, strong competition in higher education, both within and and between universities, can lead to short-term solutions and short-sighted policies. In Australian universities the teaching of mathematics and statistics is often in the hands of nonprofessionals in those areas, because they are better funded for the task than professionals. For example, engineering mathematics, and statistics courses for biologists, are typically taught by engineers and biologists, respectively, since those areas receive more money per student than mathematics or statistics. University managers have been known to applaud this situation as "government-encouraged competition".

An additional source of destructive rivalry has been strong competition for full-fee paying foreign students, many of whom have levels of university preparation lower than for Australian students. In the wake of government funding reductions, such students have become a mainstay of Australian university budgets.

—Peter Hall, President
Australian Mathematical Society
(halpstat@ms.unimelb.edu.au)

*See references on next page.

Letters to the Editor

Access to Electronic Resources

I think the AMS is making a mistake in accepting advertisements for expensive pieces of software such as *Mathematica* or *Scientific WorkPlace* or *Maple*. In the transition from having books and journals as our primary sources of knowledge to having knowledge incorporated in Internet sites and in software we have lost sight of the idea that knowledge should be available at no monetary cost—in public libraries—to all who are willing to make the effort to learn it.

Some libraries have computer terminals that anyone may use to access the Internet, but I don't know of any that make information-containing software freely available. And access to important stores of information such as *MathSciNet* is restricted, in university libraries, in ways that were never applied to *Mathematical Reviews*. I think this is a very negative development.

I am a retired mathematician, still actively interested in math. I can walk into a math library anywhere in the world and read books and journals—but special permission, which may not be readily available, is required for access to important online resources, and access to *Mathematica* (US$2,500 for a personal copy) is generally not available at all.

I believe this constitutes a decline in our mathematical culture; I hope it can be reversed.

—*Seymour Haber*
Jerusalem, Israel
s_haber@netvision.net.il

(Received May 23, 2008)

Visualizing Eratosthenes in 1949

Danilo Blanusa [Une interprétation géométrique du crible d'Eratosthènes, *Glasnik Mat. Fiz. Astronom. Drustvo Mat. Fiz. Hrvatske* (1949), 1–2] discovered the following beautiful two-dimensional visualization of the sieve of Eratosthenes almost sixty years ago. Let m and n be positive integers. The line $x + m(n+1)y - (n+1) = 0$ joins the points $(0, 1/m)$ and $(n+1, 0)$ and intersects the line $y + 1 = 0$ at the point $((m+1)(n+1), -1)$, where $(m+1)(n+1)$ is a composite number. Conversely, if x is a composite number, then x is of the form $(m+1)(n+1)$ for some positive integers m and n, and is the abscissa of the intersection of the line joining the points $(0, 1/m)$ and $(n+1, 0)$ with the line $y + 1 = 0$.

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Submitting Letters to the Editor

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Old and New on the Exceptional Group G_2

Ilka Agricola

In a talk delivered in Leipzig (Germany) on June 11, 1900, Friedrich Engel gave the first public account of his newly discovered description of the smallest exceptional Lie group G_2, and he wrote in the corresponding note to the Royal Saxonian Academy of Sciences:

> Moreover, we hereby obtain a direct definition of our 14-dimensional simple group [G_2] which is as elegant as one can wish for. [En00, p. 73][1]

Indeed, Engel's definition of G_2 as the isotropy group of a generic 3-form in 7 dimensions is at the basis of a rich geometry that exists only on 7-dimensional manifolds, whose full beauty has been unveiled in the last thirty years.

This article is devoted to a detailed historical and mathematical account of G_2's first years, in particular the contributions and the life of Engel's almost forgotten Ph.D. student Walter Reichel, who worked out the details of this description in 1907. We will also give an introduction to modern G_2 geometry and its relevance in theoretical physics (in particular, superstring theory).

The Classification of Simple Lie Groups

In 1887 Wilhelm Killing [Kil89] succeeded in classifying those transformation groups that are rightly called *simple*: by definition, these are the Lie groups that are not abelian and do not have any nontrivial normal subgroups.

Every Lie group G has a Lie algebra $\mathfrak{g}$ (the tangent space to the group manifold at the identity), which is a vector space endowed with a skew-symmetric product, the *Lie bracket* [,]; as a purely algebraic object it is more accessible than the original Lie group G. If G happens to be a group of matrices, its Lie algebra $\mathfrak{g}$ is easily realized by matrices too, and the Lie bracket coincides with the usual commutator of matrices. In Killing's and Lie's time, no clear distinction was made between the Lie group and its Lie algebra. For his classification, Killing chose a maximal set $\mathfrak{h}$ of linearly independent, pairwise commuting elements of $\mathfrak{g}$ and constructed base vectors X_α of $\mathfrak{g}$ (indexed over a finite subset R of elements $\alpha \in \mathfrak{h}^*$, the *roots*) on which all elements of $\mathfrak{h}$ act diagonally through [,]:

$$[H, X_\alpha] = \alpha(H)\, X_\alpha \text{ for all } H \in \mathfrak{h}.$$

In order to avoid problems when doing so he chose the complex numbers $\mathbb{C}$ as the ground field. The dimension of the maximal abelian subalgebra $\mathfrak{h}$ (also called, somehow wrongly, a *Cartan subalgebra*) is the *rank* of the Lie algebra. It is a general fact that all roots $\alpha \neq 0$ appear only once. If we write $\mathfrak{g}_\alpha := \mathbb{C} \cdot X_\alpha$ (these are the *root spaces*), we obtain a decomposition of $\mathfrak{g}$ as

$$\mathfrak{g} = \mathfrak{h} \bigoplus_{\alpha \in R} \mathfrak{g}_\alpha$$

and vectors in $\mathfrak{g}_\alpha, \mathfrak{g}_\beta$ for two roots α, β satisfy an extremely easy multiplication rule: $[\mathfrak{g}_\alpha, \mathfrak{g}_\beta] \subset \mathfrak{g}_{\alpha+\beta}$ if $\alpha + \beta$ is again a root, while otherwise it is zero.

Two families of complex simple Lie algebras were well-known at that time:

(1) the Lie algebras $\mathfrak{so}(n, \mathbb{C})$ consisting of skew-symmetric complex matrices, which are the Lie algebras of the orthogonal groups $\mathrm{SO}(n, \mathbb{C})$ ($n = 3$ or $n \geq 5$),
(2) the Lie algebras $\mathfrak{sl}(n, \mathbb{C})$ consisting of trace-free matrices, which are the Lie algebras of the groups $\mathrm{SL}(n, \mathbb{C})$ of matrices of determinant one ($n \geq 2$).

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[1] *In Engel's own words: "Zudem ist hiermit eine direkte Definition unserer vierzehngliedrigen einfachen Gruppe gegeben, die an Eleganz nichts zu wünschen übrig lässt."*

It was Killing's original intent to prove that these were the *only* simple complex Lie algebras.[2] In fact, there exists a third family of simple algebras, namely the Lie algebras $\mathfrak{sp}(2n,\mathbb{C})$ of the symplectic groups $\mathrm{Sp}(2n,\mathbb{C})$ for $n \geq 1$, defined as invariance groups of non-degenerate 2-forms ω on $\mathbb{C}^{2n}$:

$$\mathrm{Sp}(2n,\mathbb{C}) = \{g \in \mathrm{GL}(2n,\mathbb{C}) : \omega = g^*\omega\}.$$

Around 1886, Sophus Lie and Friedrich Engel were aware of their existence, but they had not yet appeared in print anywhere [Ha00, p. 152]. To his big surprise, in May 1887[3] Killing discovered a completely unknown complex simple Lie algebra of rank 2 and dimension 14, which is just the exceptional Lie algebra $\mathfrak{g}_2$. By October 1887, he had basically completed his classification. He discovered that besides $\mathfrak{g}_2$ and the three families mentioned above, there exist four additional exceptional simple Lie algebras. In modern notation, they are: $\mathfrak{f}_4$, $\mathfrak{e}_6$, $\mathfrak{e}_7$, $\mathfrak{e}_8$, and they have dimensions 52, 78, 133, and 248 respectively.

There exist many real orthogonal Lie groups with complexification $\mathrm{SO}(n,\mathbb{C})$—namely all orthogonal groups $\mathrm{SO}(p,q)$ associated with scalar products with indefinite signature (p,q) such that $p+q=n$; they are called *real forms* of $\mathrm{SO}(n,\mathbb{C})$ (similarly for the Lie algebras), and it is an easy fact that $\mathrm{SO}(p,q)$ is compact only for $q=0$. Just as well, the complex Lie algebra $\mathfrak{g}_2$ with complex Lie group G_2 has two real forms that we are going to denote by $\mathfrak{g}_2^c$ and $\mathfrak{g}_2^*$; of their (simply connected) Lie groups G_2^c and G_2^*, only the former is compact.

Without doubt, the classification of complex simple Lie algebras is one of the outstanding results of nineteenth century mathematics (this was not Killing's point of view, however: his original aim had been a classification of *all real Lie algebras*, he was unsatisfied with his own exposition and the incompleteness of results, so that he would not have published his results without strong encouragement from Friedrich Engel). Indeed, Killing's formidable work contains some gaps and mistakes:[4] in his thesis (1894), Élie Cartan gave a completely revised and polished presentation of the classification [Ca94], which has therefore become the standard reference for the result.

[2] *Letter from W. Killing to Fr. Engel, April 12, 1886; see [Ha00, p. 153].*

[3] *Letter from W. Killing to Fr. Engel, May 23, 1887; see [Ha00, p. 161].*

[4] *For example, he had found two exceptional Lie algebras of dimension* 52 *and overlooked that they are isomorphic, and his classification was based on three main theorems whose statements and proofs were partially wrong.*

Élie Cartan (1869–1951) in the year 1904.

Friedrich Engel (1861–1941) around 1922.

(Photo sources: Cartan, *Oeuvres Complètes, vol. II*; Engel, University Archive Greifswald.)

First Results on G_2

We can only conjecture how Killing and his contemporaries felt about the exceptional Lie algebras—as disturbances to the symmetry or as exotic and unique objects. But since Lie theory as a whole was developed in these times, they were investigated *too*, but not with high priority. G_2 was the first—and, for rather a long time, the only—Lie group for which further results were obtained. This is natural for dimensional considerations, but we will see later that it has also much deeper reasons.

From the weight lattice, which one obtains automatically during the classification, one can easily determine the lowest dimensional representation of any simple Lie algebra. This Cartan did in the last section of his thesis, and he rightly observed that $\mathfrak{g}_2$ admits a 7-dimensional complex representation, which furthermore possesses a symmetric nondegenerate $\mathfrak{g}_2$-invariant bilinear form [Ca94, p. 146]:

$$\beta := x_0^2 + x_1y_1 + x_2y_2 + x_3y_3.$$

This scalar product has real coefficients, hence can be interpreted over the reals as well; in that case it has signature $(4,3)$, and one can understand Cartan's result as giving a real representation of the noncompact form $\mathfrak{g}_2^*$ inside $\mathfrak{so}(4,3)$.

At this stage, the question about explicit constructions of the exceptional Lie algebras becomes pressing. Élie Cartan and Friedrich Engel obtained the first breakthrough, published in two simultaneous notes to the Académie des Sciences de Paris [Ca93], [En93]: For every point $a \in \mathbb{C}^5$, consider the 2-plane π_a in the tangent space $T_a\mathbb{C}^5$ that is the zero set of the Pfaffian system

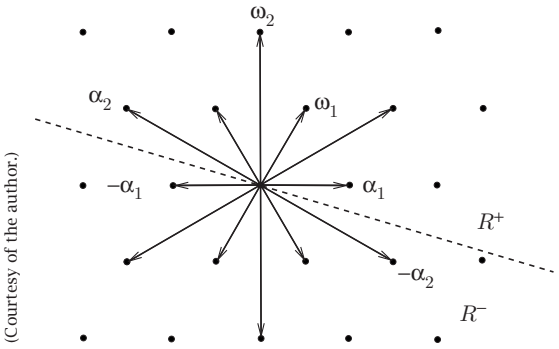
$$\begin{aligned} dx_3 &= x_1\,dx_2 - x_2\,dx_1, \\ dx_4 &= x_2\,dx_3 - x_3\,dx_2, \\ dx_5 &= x_3\,dx_1 - x_1\,dx_3. \end{aligned}$$

The 14 vector fields on $\mathbb{C}^5$ whose local flows map the planes π_a to each other satisfy the commutator relations of the Lie algebra $\mathfrak{g}_2$. Both authors then gave in the same papers a second geometric realization of $\mathfrak{g}_2$: Engel derived it from the first by a contact transformation, while Cartan identified $\mathfrak{g}_2$ as the symmetries of the solution space of the system of second order partial differential equations[5] ($f = f(x, y)$)

$$f_{xx} = \frac{4}{3}(f_{yy})^3,\ f_{xy} = (f_{yy})^2.$$

Both viewed their second realization as being different from the one through the Pfaffian system. Of course, this is correct: stated in modern terms, the complex Lie group G_2 has two non-conjugate 9-dimensional parabolic subgroups P_1 and P_2, and G_2 acts on the two compact homogeneous spaces $M_i^5 := G_2/P_i$, $i = 1, 2$. It is a detail that Engel and Cartan did not describe the $\mathfrak{g}_2$ action on the full spaces M_i^5, but rather on an open subset; this was the common way at that time.

Let us have a closer look at these two homogeneous spaces. For this, we need the lattice inside $\mathfrak{h}^*$ spanned by the 12 roots of $\mathfrak{g}_2$, the *root lattice*. It is the usual hexagonal planar lattice, in which the roots are denoted by arrows:



(Courtesy of the author.)

Figure 1. The $\mathfrak{g}_2$ root system and lattice.

The $\mathfrak{g}_2$ root system is the only one in which two roots include an angle of $\pi/6$, indicating its exceptional standing among all root systems. The roots above respectively below the dashed line are called *positive* respectively *negative roots*, and $R = R^+ \cup R^-$. The two positive roots marked α_1 and α_2 alone already generate the lattice; they are called *simple roots*. Keeping in mind the root system with the multiplication rule for root spaces $\mathfrak{g}_\alpha$ stated before, one sees that the direct sum of $\mathfrak{h}$ (corresponding, loosely speaking, to the origin), the six positive root spaces, and the root space of one negative of a simple root, span a subalgebra:

$$\mathfrak{p}_i := \mathfrak{h} \oplus \mathfrak{g}_{-\alpha_i} \bigoplus_{\alpha \in R^+} \mathfrak{g}_\alpha.$$

Subalgebras of this kind are called *parabolic subalgebras*. The 9-dimensional groups P_1 and P_2 above are now exactly the subgroups of G_2 with Lie algebras $\mathfrak{p}_1$ and $\mathfrak{p}_2$. By general results, the space G_2/P_i is a compact homogeneous variety, and it can be realized in the projectivization of the representation space V_i with highest weight ω_i (see figure) as the G_2 orbit of some distinguished vector v_i; but ω_1 generates the 7-dimensional representation (spanned by the six short roots and zero with multiplicity one), while ω_2 is the highest weight of the adjoint representation (spanned by all roots and zero with multiplicity two). Hence, we obtain

$$\begin{aligned} M_1^5 = G_2/P_1 &= \overline{G_2 \cdot [v_1]} \subset \mathbb{P}(\mathbb{C}^7) = \mathbb{CP}^6, \\ M_2^5 = G_2/P_2 &= \overline{G_2 \cdot [v_2]} \subset \mathbb{P}(\mathfrak{g}_2) = \mathbb{CP}^{13}. \end{aligned}$$

The first space M_1^5 is thus a quadric in $\mathbb{CP}^6$; we will come back to the second space later.

Let us look again at the real situation. There are two real 9-dimensional subgroups P_i^* inside the noncompact real form G_2^* corresponding to the complex parabolic groups $P_i \subset G_2$; but they have no counterparts in the compact Lie group G_2^c (roughly speaking, $\mathfrak{g}_2^c \subset \mathfrak{so}(7)$ consists of skew-symmetric matrices, while parabolics are always upper triangular): a maximal subgroup of G_2^c is isomorphic to $\mathrm{SU}(3)$ and thus 8-dimensional. Hence a geometric realization of the compact form G_2^c is still missing.

G_2 and 3-forms in Seven Variables

In his talk on June 11, 1900, in Leipzig, Friedrich Engel presented some results on the complex Lie group G_2 that finally led to the missing realization of its compact form G_2^c. Engel's geometric insight into the geometry of $M_1^5 \subset \mathbb{CP}^6$ was so good that he realized that it can be written as the zero set of an equation depending solely on the coefficients of a generic 3-form in seven variables [En00, p. 220].

By a *generic* p-form we mean an element $\omega \in \Lambda^p(\mathbb{C}^n)^*$ with open $\mathrm{GL}(n, \mathbb{C})$ orbit. For dimensional reasons, $n^2 \geq \binom{n}{p}$ is a necessary condition for the existence of generic p-forms; it holds for all n if $p = 2$, but only for $n \leq 8$ when $p = 3$, and, indeed, generic p-forms do exist for these values. The isotropy group of a differential form (or, for that matter, any tensor) consists of all group elements leaving the form invariant,

$$G_\omega := \{A \in \mathrm{GL}(n, \mathbb{C}) : \omega = A^*\omega\}.$$

[5] *In 1910, Élie Cartan returned to his description of G_2^* by Pfaffian systems and differential equations* [Ca10]*; a modern treatment and further investigation can be found in the worthwhile article by P. Nurowski* [Nu05]*. It is quite remarkable that the thesis of yet another of Engel's students plays a decisive role here (Karl Wünschmann, Greifswald, 1905).*

For a generic 3-form in dimension 7, its dimension is

$$\dim G_\omega = \dim \mathrm{GL}(7,\mathbb{C}) - \dim \Lambda^3(\mathbb{C}^7)^* = 14.$$

Friedrich Engel observed that all generic 3-forms are equivalent under $\mathrm{GL}(7,\mathbb{C})$ and proved the following theorem:

Theorem 1 (F. Engel, 1900)**.** *There exists exactly one* $\mathrm{GL}(7,\mathbb{C})$ *orbit of generic complex* 3*-forms* [En00, p. 74]*. One such generic form is given by*

$$\omega_0 := (e_1e_4 + e_2e_5 + e_3e_6)e_7 - 2e_1e_2e_3 + 2e_4e_5e_6.$$

For every generic complex 3*-form* $\omega \in \Lambda^3(\mathbb{C}^7)^*$*, the following holds:*

(1) *The isotropy group of* ω *is isomorphic to the simple Lie group* G_2 [En00, p. 73]*;*
(2) ω *defines a non-degenerate symmetric bilinearform* β_ω [En00, p. 222] *that is cubic in the coefficients of* ω*, and the quadric* M_1^5 *is its isotropic cone in* $\mathbb{CP}^6$*. In particular, every isotropy group* G_ω *is contained in some* $\mathrm{SO}(7,\mathbb{C})$*.*
(3) *There exists a* G_2*-invariant polynomial* $\lambda_\omega \neq 0$ *of degree* 7 *in the coefficients of* ω [En00, p. 231]*.*

In fact, Engel had already conjectured in a letter to Killing of April 1886 that the isotropy group of a 3-form might be a simple 14-dimensional group, but apparently neither he nor Killing had pursued this idea at that time.[6] In modern notation, we can define β_ω through [Br87]

$$\beta_\omega(X,Y) := (X \lrcorner \omega) \wedge (Y \lrcorner \omega) \wedge \omega,$$

which is a symmetric bilinear form with values in the one-dimensional vector space $\Lambda^7(\mathbb{C}^7)^*$. Over the reals, it can be turned into a true real-valued scalar product g_ω after taking an additional square root [Br87], [Hi00]. Geometrically, this means that every generic 3-form on a real 7-dimensional manifold induces a (pseudo)-Riemannian metric. An easy dimension count shows that the isotropy group of a generic 3-form can be a subset of $\mathrm{SO}(n,\mathbb{C})$ only for $n = 7, 8$.

Since β_ω is cubic in ω, its determinant is a polynomial of degree 21 in the ω coefficients; Engel understood that it is the third power of a degree 7 element λ_ω, and its non-vanishing is equivalent to the nondegeneracy of β_ω.

Engel's arguments still hold over the reals, as long as the isotropic cone does not degenerate completely. For the 3-form ω_0 cited above, g_{ω_0} is a real scalar product on $\mathbb{R}^7$ with signature $(4,3)$ [En00, p. 64]. In particular, there exists exactly one $\mathrm{GL}(7,\mathbb{R})$ orbit of real generic 3-forms $\omega \in \Lambda^3(\mathbb{R}^7)^*$ with non-degenerate isotropic cone for g_ω. Its isotropy group is again isomorphic to the real noncompact real form $G_2^* \subset \mathrm{SO}(4,3)$.

[6] *Letter from Fr. Engel to W. Killing, April 8, 1886; see [Ha00, p. 152].*

In the same article, Engel invested a lot of energy in a description of the second homogeneous space $M_2^5 \subset \mathbb{P}(\mathfrak{g}_2)$ through the coefficients of ω. For this, he used a symbolic method for invariants of alternating forms that was communicated to him by Eduard Study; however, Study's formalism is not in use anymore, hence his computations are rather hard to follow. Today, we know that $M_2^5 = G_2/P_2 \subset \mathbb{CP}^{13}$ is a rather complicated projective algebraic variety: it has degree 18 and its complete intersection with three hyperplanes is a K3 surface of genus 10 [Bor83]. For a geometric description of G_2/P_2 in terms of ω, observe that the 21-dimensional representation $\Lambda^2\mathbb{C}^7$ splits under G_2 into $\mathfrak{g}_2 \oplus \mathbb{C}^7$, hence G_2/P_2 is a subvariety of $\mathbb{P}(\Lambda^2\mathbb{C}^7)$ as well. By the Plücker embedding, the 14-dimensional Grassmann variety $G(2,7)$ of 2-planes in $\mathbb{C}^7$ lies in $\mathbb{P}(\Lambda^2\mathbb{C}^7)$. Now, G_2/P_2 is just the intersection of $G(2,7)$ with $\mathbb{P}(\mathfrak{g}_2)$ inside $\mathbb{P}(\Lambda^2\mathbb{C}^7)$. As a subvariety of $G(2,7)$, G_2/P_2 consists precisely of those 2-planes $\pi \subset \mathbb{C}^7$ on which β_ω and ω both degenerate (see [LM03] for a modern account), i. e., such that

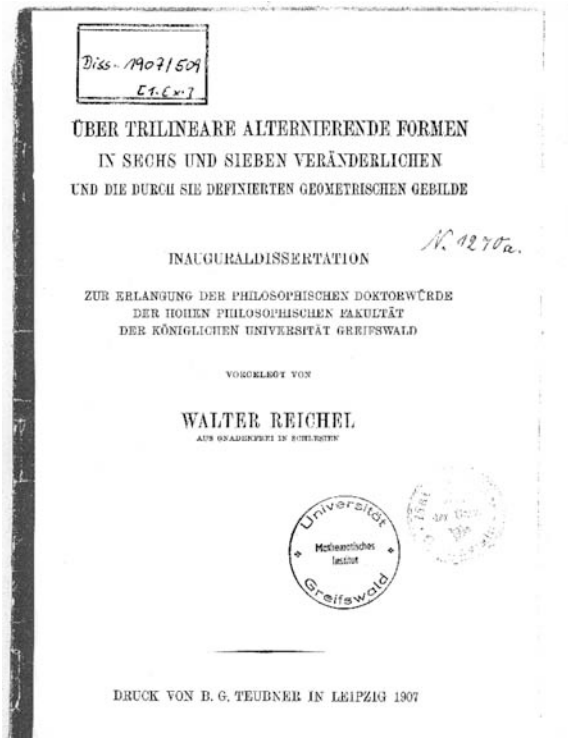
$$\pi \lrcorner \beta_\omega = 0, \quad \pi \lrcorner \omega = 0.$$

It was the realization of G_2 presented in Theorem 1 that led Friedrich Engel to the comment cited in the introduction. Besides its elegance, Theorem 1 has far-reaching consequences for modern differential geometry (see last section); furthermore, it will provide the missing realization of G_2^c, as is explained now.

Walter Reichel and the Invariants of G_2

While a professor at Greifswald University (1904-1913), Friedrich Engel turned again to this topic and assigned to his Ph. D. student Walter Reichel the task of computing a complete system of invariants for complex 3-forms in six and seven dimensions in Study's formalism. The thesis defended by Reichel in 1907 indeed contains the detailed description of the invariants and relations among them as well as normal forms of all 3-forms under the action of $\mathrm{GL}(7,\mathbb{C})$. The vanishing of λ_ω for non-generic forms and the drop of rank of the bilinear form β_ω play an essential role here.

Furthermore, Walter Reichel described the isotropy algebra $\mathfrak{g}_\omega$ of *any* generic 3-form ω directly through its coefficients [Rei07, p. 48], whereas Friedrich Engel had only computed it for one representative. Over the complex numbers, this makes no difference; but it turns out that when passing to real numbers, the *one* orbit of complex, $\mathrm{GL}(7,\mathbb{C})$ equivalent 3-forms splits into *two* orbits of real generic $\mathrm{GL}(7,\mathbb{R})$ equivalent 3-forms. If one interprets the scalar product β_ω as a real one, it turns out to have signature $(4,3)$ on one orbit and signature $(7,0)$ on the other orbit. It does not come as a surprise that the isotropy



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ÜBER TRILINEARE ALTERNIERENDE FORMEN
IN SECHS UND SIEBEN VERÄNDERLICHEN
UND DIE DURCH SIE DEFINIERTEN GEOMETRISCHEN GEBILDE

N. 1270a.

INAUGURALDISSERTATION

ZUR ERLANGUNG DER PHILOSOPHISCHEN DOKTORWÜRDE
DER HOHEN PHILOSOPHISCHEN FAKULTÄT
DER KÖNIGLICHEN UNIVERSITÄT GREIFSWALD

VORGELEGT VON

WALTER REICHEL

Universität Greifswald Mathematisches Institut

DRUCK VON B. G. TEUBNER IN LEIPZIG 1907

(Courtesy University Archive Greifswald.)

Figure 2. Title page of W. Reichel's thesis.

(Photos courtesy of Irmtraut (née Reichel) Schiller, Bremen.)

Walter Reichel (1883–1918) in November 1914.

W. Reichel (undated); one can recognize a portrait of Kant on the desk.

group $\mathfrak{g}_\omega$ is isomorphic to $\mathfrak{g}_2^* \subset \mathfrak{so}(4,3)$ in the first case and isomorphic to $\mathfrak{g}_2^c \subset \mathfrak{so}(7)$ in the second case.

Thus, Reichel obtained a uniform geometric description of both real forms of G_2. Unfortunately, the result was slowly forgotten afterwards; J. A. Schouten described the normal forms of 3-forms on $\mathbb{C}^7$ in 1931 by simpler methods (without invariants, mainly by reduction to smaller dimensions) and observed that Walter Reichel had missed two out of the nine normal forms [Sch31]. Based on these results, Gurevich solved the problem in dimension 8 [Gu35]. Up to our knowledge, the next authors to cite Reichel's thesis again are E. B. Vinberg and A. G. Elashvili in 1978, who worked out the details of the extremely involved case $n = 9$ [VE78].

It is well known that G_2^c is the automorphism group of the octonians $\mathbb{O}$. Élie Cartan included this as a comment in his long article on complex numbers and their generalizations from 1908 [Ca08, p. 467] (see also [Ca14, p. 298]), but apparently never returned to this topic. This approach to exceptional Lie groups became popular through the work of Hans Freudenthal, starting with the article [Fr51], and made the memory of the 3-form approach vanish. In fact, these descriptions are equivalent (a third equivalent description is through so-called "vector cross-products"), as is explained with great care in the article by J. Baez [Ba02, p. 37-39].

The Mathematician Walter Reichel

Whereas the life and work of all mathematicians mentioned up to here are well known, virtually nothing was known about Walter Reichel, despite the fact that his thesis has been cited widely in recent years. The 100th anniversary of his thesis last year was a further motivation to investigate his story.

Walter Reichel was born on November 3, 1883, in a little Silesian village then called Gnadenfrei (now Piława Górna, Poland). This village had been founded by members of the Moravian Unity, of which Reichel's father was deacon and, later, bishop. The Moravian Unity, or Unitas Fratrum (Unity of Brethren), emerged in the middle of the fifteenth century from the Bohemian Reformation Movement around Jan Hus (1369–1415) and was renewed in the early eighteenth century in Herrnhut (Saxony, not far from the Czech and Polish borders), where the management of its European branch and its archive are still hosted today. The history of the Reichel family is closely linked to the *Brüdergemeine*, as the Moravian Unity is called in German.

In his handwritten CV (which can be found in his Ph. D. files at Greifswald University), Walter Reichel describes how he went to school first in his home village, followed by four years at the "Pädagogium" in Niesky (another town founded by the Unitas Fratrum, close to Herrnhut) and three years at the Gymnasium in Schweidnitz (now Świdnica, Poland), from where he received his high school degree ("Reifezeugnis") at Easter 1902. He then studied mathematics, physics, and philosophy at the Universities of Greifswald, then Leipzig, Halle, and again, Greifswald.

Among others, he attended lectures by Friedrich Engel and Theodor Vahlen (in Greifswald); by Carl

The "Old Pädagogium" in Niesky, now a public library, built in 1741 as the first parish house of the newly founded community in Niesky. Between 1760 and 1945 it was used as an advanced boarding school.

(Photos this page courtesy of I. Agricola and T. Friedrich.)

Memorial stone on the "God's acre" in Niesky.

Detail of the inscription on the memorial stone. Walter Reichel's name and date of death ("30.3.18") are in the second to last line; the stone has been damaged and repaired above his name.

Neumann (in Leipzig), who formulated the Neumann boundary condition in analysis and founded the *Mathematische Annalen* together with Alfred Clebsch; by Georg Cantor and Felix Bernstein (in Halle), to whom we owe the foundations of set theory and the Cantor-Bernstein-Schröder Theorem in logic; by the theoretical physicist Gustav Mie (in Greifswald), who made important contributions to electromagnetism and general relativity; by the experimental physicist Friedrich Ernst Dorn (in Halle), who discovered the gas Radon in 1900. Moroever, he took courses in philosophy, chemistry, zoology, and art history.

In July 1907, Walter Reichel passed the examination for high school teachers in "pure and applied mathematics, physics and philosophical propaedeutics" with distinction. He spent one year as teacher-in-training in Görlitz, and was then appointed in Fall 1908 at the "Realprogymnasium" in Sprottau (now Szprotawa, Poland). In April 1914 he moved for an "Oberlehrer" position to Schweidnitz (now Świdnica, Poland). With the beginning of the First World War he was drafted, and he died in France on March 30, 1918. He has no grave, but an inscription on the WWI memorial on the "God's acre" of the Moravian community in Niesky commemorates his death.

Walter Reichel married Gertrud, née Müller (1889–1956) in 1909. They had three sons (born 1910, 1913, and 1916), who left no children, and a daughter (born March 11, 1918). After the first World War, Reichel's widow moved with her children to Niesky, where she was supported by the Moravian Unity. For many years, she accommodated pupils of the "Pädagogium" who did not live in the boarding school's dormitories. Walter Reichel's daughter Irmtraut Schiller now lives in Bremen and has three children; one of her granddaughters is a teacher of mathematics.

G_2 Geometry in Dimension 7

The classical symmetry approach to differential geometry is based on the notion of the *isometry group* of a Riemannian manifold, i. e., the group of all transformations acting on the manifold that preserve the metric. In the twentieth century, the concept of *(Riemannian) holonomy group* became fundamental to Riemannian geometry: it is the group generated by all parallel transports along closed null-homotopic loops on the manifold. Here, parallel transport is understood with respect to the Levi-Civita connection

∇^g, i.e., the straightforward—but not the only possible—generalization of the directional derivative of vectors. Marcel Berger's Holonomy Theorem from 1955 states that for an irreducible non-symmetric manifold, the holonomy group is either $\mathrm{SO}(n)$ or from a finite list—and G_2^c is the only exceptional Lie group on that list. In this case, the manifold is necessarily 7-dimensional, the holonomy group G_2^c acts on the tangent bundle by its 7-dimensional real representation, and the manifold would be called a *parallel* or *integrable* G_2^c*-manifold*. The argument of the proof is basically reduced to the question of which compact Lie groups admit transitive sphere actions, and this is the case for G_2^c on S^6, thought of not as a symmetric space but rather as the homogeneous space $G_2^c/\mathrm{SU}(3)$.

Since Berger's Holonomy Theorem lists only the *possible* holonomy groups without actually constructing manifolds admitting them, his classification result was not an end point, but rather a research program asking for a more detailed geometric investigation (and a long breath); in particular, no Riemannian manifolds with holonomy group G_2^c were known. In 1966, Edmond Bonan observed in a note preceding his thesis (supervised by André Lichnerowicz) that manifolds with G_2^c holonomy admit a global 3-form ω with $\nabla^g\omega = 0$, and, in consequence, have to be Ricci flat—a very restrictive geometric condition that intrigued some contemporaries [Bon66]. This 3-form ω is of course precisely the form whose stabilizer is G_2^c as described by Engel and Reichel, but had already been forgotten in this time. For his work, Edmond Bonan had started from Cartan's description of G_2^c as the automorphism group of the octonians, and saw how to derive an invariant 3-form from its multiplication law.

The credit for having made the most creative use of G_2^c and its defining 3-form in differential geometry goes without doubt to Alfred Gray. Since the 1960s he had investigated vector cross products and their geometric properties in a series of papers. In 1971 he had the radical idea of weakening the classical holonomy concept to cover interesting manifolds that do not appear in Berger's list. In particular, he defined *nearly parallel* G_2^c*-manifolds*: they have structure group G_2^c, but instead of being parallel, the 3-form ω satisfies the differential equation

$$d\omega = \lambda * \omega$$

for a real constant $\lambda \neq 0$, and they are Einstein with strictly positive scalar curvature. Later, he proved together with Marisa Fernández that there are in fact four basic classes of G_2^c-manifolds depending on the possible nature of the tensor $\nabla^g\omega$ [FG82]. Maybe even more importantly, they initiated the (still-ongoing) construction of many interesting examples—ranging from $S^7 = \mathrm{Spin}(7)/G_2^c$ to the Allow-Wallach spheres $\mathrm{SU}(3)/S^1$, from extensions of Heisenberg groups to clever non-homogeneous examples. Since then, these *non-integrable geometries* (not only for G_2^c, but also for contact structures, almost Hermitian structures, 8-dimensional Spin(7)-structures, etc.) have been studied intensively [Ag06]. Today, the main philosophy is that for many Riemannian geometries (M, g) defined by tensors that are not ∇^g-parallel, it is possible to replace the Levi-Civita connection by a more suitable metric connection ∇ with skew-symmetric torsion $T \in \Lambda^3(M)$ (the *characteristic connection*)

$$g(\nabla_X Y, Z) := g(\nabla^g_X Y, Z) + \frac{1}{2}\, T(X, Y, Z)$$

such that the object becomes parallel, and the holonomy group of this new connection plays the role of the classical Riemannian holonomy group. For example, a G_2^c-manifold (M, g, ω) admits a characteristic connection if and only if there is a vector field β such that $\delta(\omega) = -\beta \lrcorner \omega$ (this excludes one of the four basic types), and its torsion is then given by [FI02]

$$T = - * d\omega - \frac{1}{6}(d\omega, *\omega)\, \omega + *(\beta \wedge \omega).$$

For integrable G_2^c geometries, the first breakthrough was obtained a few years after Gray's work. In 1987 and 1989, Robert Bryant and Simon Salamon succeeded in constructing local complete metrics with Riemannian holonomy G_2^c ([Br87], [BrSa89]). It was only in 1996—more than forty years after Berger's original paper—that Dominic Joyce was able to show the existence of *compact* Riemannian 7-manifolds with Riemannian holonomy G_2^c [Joy00]: this comes down to proving the existence of solutions of nonlinear elliptic partial differential equations on compact manifolds by very difficult and involved analytical methods.

One distinguished property of G_2^c is still missing in our discussion—this is the one that makes it attractive for mathematical physics. The group G_2^c can be lifted to the universal covering Spin(7) of SO(7), and Spin(7) has an 8-dimensional irreducible real representation Δ_7, the *spin representation*, that decomposes under $G_2^c \subset \mathrm{Spin}(7)$ into the trivial and the 7-dimensional representation. Thus, a 7-dimensional spin manifold endowed with a connection ∇ has a ∇-parallel spinor field if and only if the holonomy of ∇ lies inside G_2^c, and G_2^c is the isotropy group of a generic spinor. In fact, any spinor field defines a global 3-form and vice versa, so this last characterization of G_2^c is, in itself, nothing new. But it explains the intricate relation between G_2^c and spin geometry. For example, the nearly parallel G_2^c-manifolds discovered by Gray in 1971 are precisely those 7-manifolds that admit a real Killing spinor field [FK90]. More recently, superstring theory has stimulated a deep interest in 7-manifolds with integrable or non-integrable G_2^c geometry [Du02]. In this approach, a ∇-parallel

spinor field is interpreted as a supersymmetry transformation: by tensoring with a spinor field, bosonic particles can be transformed into fermionic particles (and vice versa). The torsion of ∇ (if present) is related to the B-field, a higher order version of the classical field strength of Yang-Mills theory (which would be a 2-form and not a 3-form, of course).

The story of G_2 and its relatives is far from concluded. The algebraic foundations for the many lines of development sketched in this article were laid more than a hundred years ago by Friedrich Engel and his student Walter Reichel in a work of remarkable mathematical insight.

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Who Is Alexander Grothendieck?

Winfried Scharlau

This article is a translation of the article "Wer ist Alexander Grothendieck?", which originally appeared in German in the *Annual Report 2006* of the Mathematics Research Institute in Oberwolfach, Germany (copyright © Mathematisches Forschungsinstitut Oberwolfach 2007). The article is based on the Oberwolfach Lecture delivered by Winfried Scharlau in 2006. With the permission of the author and of the institute, the article was translated into English by D. Kotschick, Ludwig-Maximilians-Universität München, with the assistance of Allyn Jackson, *Notices* deputy editor (translation copyright © D. Kotschick 2008).

Scharlau is writing a three-volume biography, *Wer ist Alexander Grothendieck?: Anarchie, Mathematik, Spiritualität*. The first volume, which primarily treats the lives of Grothendieck's parents, has appeared as a self-published book and is available on the Web at `http://www.scharlau-online.de/ag_1.html`.

For a mathematician, it is not hard to give an answer to the question posed in the title of this lecture: Grothendieck is one of the most important mathematicians of the second half of the twentieth century, to whom we owe in particular a complete rebuilding of algebraic geometry. This systematic rebuilding permitted the solution of deep number-theoretic problems, among them the final step in the proof of the Weil Conjectures by Deligne, the proof of the Mordell Conjecture by Faltings, and the solution of Fermat's Last Problem by Wiles. However, this lecture is concerned not with Grothendieck's mathematics but with his very unusual life on the fringes of human society. In particular, there is, on the one hand, the question of why at the age of forty-two Grothendieck first of all resigned his professorship at the Institut des Hautes Etudes Scientifiques (IHES); then withdrew from mathematics completely; and finally broke off all connections to his colleagues, students, acquaintances, friends, as well as his own family, to live as a hermit in an unknown place. On the other hand, one would like to know what has occupied this restless and creative spirit since his withdrawal from mathematics. I will try to pursue both questions, even though an exhaustive and satisfactory answer is surely impossible.

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Grothendieck's Parents

One can only understand the life of Grothendieck—if one can understand it at all—if one knows about the life of his parents. I report briefly on the life of his father.

He was from a Jewish family, was (probably) called Alexander Schapiro, and was born in 1890 in Novozybkov in the border area of Russia, White Russia, and Ukraine. At the age of fifteen he was recruited by anarchist groups that were fighting against the tsarist regime; in 1905 Russia was in uproar. After two years of fierce battles, he and all of his comrades were taken as prisoners. All were sentenced to death, and all but Schapiro were executed; he was led to the execution plaza every day for three weeks before being pardoned because of his youth and sentenced to life in prison, where he spent the next ten years. In the confusion of the October Revolution and the First World War, he escaped and immediately joined the anarchist peasant army of the Ukrainian General Machno. He married a Jewish woman called Rachil and with her fathered a son named Dodek, but carried on a busy love life outside of marriage. Again, after fierce battles, he was taken prisoner by the Bolsheviks and sentenced to death. Probably during an attempt to escape (or in an assassination attempt?), he lost his left arm. With the help of various women and

comrades in arms, he managed to flee to western Europe. He went into hiding first in Berlin, then in Paris. From this time on he lived with forged documents under the name of Alexander Tanaroff. For many years he earned his living as a street photographer. Around the year 1924 he returned to Berlin, where he met Hanka Grothendieck. He introduced himself to her husband, Alf Raddatz, with the words, "I will steal your wife."

And so it happened. In March 1928 Alexander Grothendieck, the son of Alexander Tanaroff and Hanka Grothendieck, was born. For five years the "family", consisting of these three people, together with Hanka's daughter Maidi (Frode Raddatz) from her marriage, lived in the so-called "Scheunenviertel" in Berlin, where for some time they operated a photography studio. After the National Socialists came to power, the situation in Germany became too dangerous for the Jewish Tanaroff, and he moved back to Paris. Hanka Grothendieck decided to follow her companion as soon as possible. Around New Year's 1933–34 she placed her five-year-old son in a foster home with the family of the Hamburg pastor Wilhelm Heydorn. (Like all people close to Grothendieck, Heydorn was a very remarkable personality about whom a 450-page biography was published.[1]) Hanka then went to France as well. Both she and Tanaroff took part in the Spanish Civil War, not fighting actively but in supporting roles. After the defeat of the Republicans, both returned to France. Certainly with the start of the Second World War, Tanaroff was in danger in France as well—as an alumnus of the Spanish War, as a Jew, and as an illegal alien. He was interned in the infamous camp Le Vernet, extradited to the Germans in 1942, and transported to Auschwitz. Under the name Alexandre Tanaroff, he appears on the list of victims of the Shoah. Throughout his adventurous life he had known only one goal: the fight for freedom and self-determination of all people. For that he would put his whole existence on the line at any time.

The life of Hanka Grothendieck was similarly dramatic, although the drama is more internal than external. Her great goal was to be a writer. Although she had remarkable talent, she ultimately failed. She too lived a life on the fringe. For reasons of space and time, I will not go into any detail in this lecture.

I now come to Alexander Grothendieck himself. I first would like to report on the outline of his biography. For further information, I refer to the very informative article by Allyn Jackson.[2]

[1] Wilhelm Heydorn, Nur Mensch Sein!: Lebenserrinerungen, *I. Groschek and R. Hering, editors, Dölling und Galitz Verlag, Hamburg, 1999.*

[2] *Allyn Jackson, "Comme appelé du néant—As if summoned from the void: The life of Alexandre Grothendieck",* Notices, *October 2004 and November 2004.*

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Grothendieck around 1936 in the garden of the Heydorn's house in Hamburg-Blankenese.

Child to Mathematician to Hermit

As mentioned before, Alexander Grothendieck was born on March 28, 1928, as Alexander Raddatz in Berlin and lived there with his parents and his half-sister, Maidi, for the first six years of his life. From early 1934 to the end of April 1939 he lived together with other foster children in the home of Wilhelm and Dagmar Heydorn in Hamburg-Blankenese, where he initially attended elementary school and then the *Gymnasium*. Except for the years at the IHES, this may have been the only period in his life when he lived in "normal circumstances". In early 1939 his situation in Germany became too dangerous, particularly since his foster parents opposed the Nazi regime and had to contend with the possibility that their foster children would be taken away from them. In such a situation, his Jewish heritage would have come to light. So at the end of April 1939, Alexander was sent to his parents in France. It is unknown where he spent the next few months; he was probably with his mother in Nîmes. After the start of the war, Hanka, as a citizen of an enemy nation, was interned together with her son in the camp Rieucros near Mende. Alexander was able to attend school there and sometimes had private tutoring as well. Around 1942 Alexander somehow arrived in Le Chambon sur Lignon. This small town in the Massif Central was a center of resistance against the Nazis; thousands of refugees were hidden there, given false papers and food vouchers, and then smuggled across the Swiss border. Thousands were saved from deportation to German death camps. The crucial person in this collective resistance was the Protestant clergyman André Trocmé, who systematically traveled to French camps and tried in particular to get out as many children as possible. Perhaps this is how Grothendieck came to

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Grothendieck's house in Villecun, where he lived from 1973 to 1979.

Le Chambon. (The great story of Le Chambon has been the subject of many documentaries, novels, and movies.[3]) In Le Chambon, Grothendieck was able to attend the Collège Cévénol, an international private school founded by Trocmé, which from the beginning was dedicated to nonviolence and the solidarity of all people—not popular ideas in a time of war. In 1945 Alexander completed there his rather chaotic schooling with the *baccalauréat*.

It is probably by accident that Grothendieck ended up in Montpellier after the war. Perhaps his mother had found work there. He received a modest scholarship and started his studies of mathematics. It soon turned out that the university did not have much to offer him, and he had to rely largely on self-study. Since the time he was in school, he had planned to find out what concepts like length and volume really mean, and according to his own reports, he basically developed the theory of the Lebesgue integral. In the fall of 1948 he went to Paris for a year, where he met the most important French mathematicians of the day, both the active middle generation of Henri Cartan, André Weil, Jean Leray, Laurent Schwartz, and Claude Chevalley, as well as the younger generation, his contemporaries Jean-Pierre Serre, Pierre Cartier, François Bruhat, and Armand Borel. Originally, Grothendieck had hoped to be able to quickly get a Ph.D. for his work on the "Lebesgue integral". Of course, he now found out that to a large extent he had simply rediscovered known things. Nevertheless, he wanted to stick with this subject, so, following the advice of Cartan and Weil, on June 20, 1949, he wrote a letter to Jean Dieudonné, who like Schwartz was teaching in Nancy. From this time on, Grothendieck came into the mathematical mainstream, and it is generally known what he did and achieved during the next twenty years. So that I can keep my account short, I refer for details to Jackson and the literature quoted there.

To begin with, Schwartz gave Grothendieck a paper to read that he had just written with Dieudonné, which ended with a list of fourteen unsolved problems. After a few months, Grothendieck had solved all of them. Try to visualize the situation: On one side, Schwartz, who had just received a Fields Medal and was at the top of his scientific career, and on the other side the unknown student from the provinces, who had a rather inadequate and unorthodox education. Grothendieck was awarded a Ph.D. for his work on topological vector spaces and stuck with that field for a while. He went to Brazil for two years and then to Kansas. Largely under the influence of Serre, he turned to algebraic geometry beginning in 1954. The most spectacular new result in the field was the theorem of Riemann-Roch-Hirzebruch. Within two years of the awakening of his interest in algebraic geometry, Grothendieck found a far-reaching generalization and a completely new proof, which has remained possibly his most significant single achievement in mathematics.

The next fifteen years of Grothendieck's scientific work were dedicated to the rebuilding of algebraic geometry. In 1958 he was appointed to the IHES, which had just been founded by the businessman Léon Motchane. Together with Dieudonné, his former teacher and now colleague at the IHES, Grothendieck began working on the *Eléments de Géométrie Algébrique* (EGA) and held the legendary *Séminaire de Géométrie Algébrique* (SGA). Many mathematicians who were close to him in those days emphasize that his way of doing mathematics was completely singular: He was not interested in the solving of difficult or famous problems, especially if it had to be done "by force", but his goal was to achieve such a deep and complete understanding of the underlying structures that the solutions of such problems would fall out "on their own".

During his twelve years at the IHES, Grothendieck led an outwardly bourgeois life: He married Mireille Dufour and had three children with her, born in 1959, 1961, and 1965. Earlier he had had a son from a previous relationship. However, the education of his children was unconventional; at least temporarily, they did not attend public schools. Grothendieck thought that finding one's own way was more important than a formal education. His home was hospitable, and he sometimes took in people in need for weeks at a time.

In his IHES seminar, Grothendieck surrounded himself with a group of outstanding students to

[3] *See for example Philip P. Hallie,* Lest Innocent Blood Be Shed: The Story of the Village of Le Chambon and How Goodness Happened There. *This book has been published in several editions by Harper & Row, New York.*

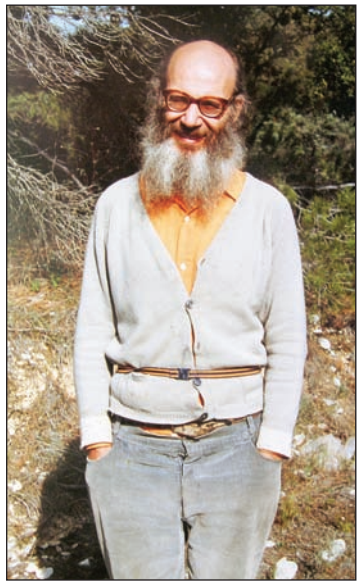
whom he generously gave his ideas for them to pursue. At the same time, more and more conflicts developed with Motchane, the founder and director of the institute. Grothendieck's relationship with his colleague René Thom was not without complications either. At the 1966 International Congress of Mathematicians, Grothendieck was awarded the Fields Medal. He was at the pinnacle of his fame. In May 1968 the student revolution erupted in Paris and made a deep impression on Grothendieck that would change his life decisively. I will return to this later on.

In the year 1970 an event occurred that Grothendieck later would often call "the great turning point" (*"le grand tournant"*). He gave up his job at the IHES and started turning away from mathematics, although he did for a few years more have positions at the Collège de France and at the University of Paris, Orsay. He turned to the problems of environmental protection and ecology, he supported the antinuclear power movement, and he fought against military buildup, especially of nuclear weapons, and the military-industrial complex. To pursue these goals actively, he and a number of comrades founded the group Survivre, which later was also known as Survivre et Vivre. For about three years he devoted all his energy to this movement.

At the same time, his family life dissolved. On a "propaganda trip" for Survivre through America, he met Justine Skalba, with whom he lived in France in a commune he founded and with whom he had a son. For a time, his children from his first marriage also lived in this commune. In 1973 there was another decisive change: he left Paris and moved to the tiny village of Villecun, on the southern edge of the Cévennes, about sixty kilometers northwest of Montpellier. Since that time Grothendieck has lived only in small villages or hamlets. More and more he broke off contact with former colleagues, students, acquaintances, friends, and his own family; his relationship with Justine Skalba also ended after two years.

Soon after his move to Villecun he took a job as a professor at the University of Montpellier, although he taught there only irregularly. For months or even years on end he stopped doing mathematics altogether before starting to write down obsessively his mathematical "meditations" of hundreds or even thousands of pages. In the last few years before his retirement in 1988, he again held a research position in the CNRS (Centre National de la Recherche Scientifique), though he did research only sporadically.

From 1974 Grothendieck turned to Buddhism; several times he was visited by Japanese monks from the order Nipponzan Myohoji (in English the name translates roughly as "Japanese community of the wonderful lotus sutra"), which preaches strict nonviolence and erects peace pagodas throughout the world. But his attachment to Buddhism did not last. From around 1980 Grothendieck gravitated toward Christian mystical and esoteric ideas. More and more often there were periods of serious psychological problems; presumably things were surfacing in Grothendieck that had always been there inside him. For a while he identified with the stigmatized Catholic nun Marthe Robin, who claimed to have lived for thirty years on the Eucharist alone. A kind of angel, whom he calls Flora or Lucifera depending on whether he wants to emphasize her divine or her devilish side, plays an important role in his thoughts. For nights on end Grothendieck played chorals on the piano and sang along. Finally in 1988 a period of excessive fasting almost cost him his life. Apparently he wanted to force God to reveal Himself. He wanted to consciously experience the moment of death and outdo Jesus's forty-day fast. In 1999 he predicted that the Final Judgment was imminent and that a golden age would start thereafter. Later on, these delusions extended to nonreligious areas, including, for example, questions of cosmology. There can be no doubt that, at least since the end of the 1980s, his life has been dominated for long periods by delusions and that he would have needed urgent medical and psychiatric help.



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Grothendieck in the 1980s.

In the summer of 1991 Grothendieck suddenly left his residence in Les Aumettes and withdrew to a place that remained unknown for a long time. He refuses almost all contact and seems to be occupied daily with writing down his meditations.

The Great Turning Point

Certainly there is a multitude of reasons that contributed to the "great turning point" of 1970. They are complementary and contradictory. Some seem obvious, while others are buried in the depths of Grothendieck's existence and his past and can hardly be brought to light. Much—in fact a great deal—remains a riddle. One does not have the impression that one understands or that one can understand his radical actions. Grothendieck's colleagues, pupils, and friends must all have asked themselves what the causes of this step could have been. I want to emphasize that the following attempt at an explanation is based on my personal views. Another person might well interpret the facts at hand in a different way.

It has often been said that the decisive reason for Grothendieck's break with the IHES was the fact that a part of the IHES budget (about 5 percent) came from the French defense ministry. This could not be reconciled with Grothendieck's pacifist, anarchist, and radical leftist political convictions. Grothendieck himself has often confirmed this version. But I think this explanation is not the whole truth and is not particularly plausible. It is no doubt correct that the financial support by the defense ministry was not acceptable to Grothendieck. But there had been many discussions of this topic between the leadership of the IHES and the faculty, in which the permanent professors had largely supported Grothendieck. With good will surely the problem could have been solved. In fact, the relationship between the founder and director, Motchane, and Grothendieck was already completely dysfunctional at this time. The reasons that led to the break with the IHES and in particular with Motchane have been analyzed by David Aubin in his Ph.D. thesis. We refer to his investigation for the details of this conflict.[4] In this conflict, it seems much more plausible that cause and effect were reversed: The dispute over the budget gave Motchane the possibility (finally) to get rid of Grothendieck, whom he regarded as a paranoid troublemaker. Perhaps Motchane had no choice, for if Grothendieck had stayed, probably two of the other permanent professors, Thom and Louis Michel, would have left.

That the conflict over the IHES budget is insufficient as grounds for Grothendieck's departure also follows from the fact that the conflict does not explain why he turned away from mathematics and from the mathematical community. Throughout the world he could have found places to work that were consonant with his moral and political convictions. He would have been welcome everywhere; he could have continued his research, and many of his students would have followed him.

In his commentary on the meditation *Récoltes et Semailles*, Jean-Pierre Serre talks about the decisive point. He says that Grothendieck never had the urge to do what perhaps the whole world expected of him, namely, to give a coherent explanation in the 1,600 pages of this treatise. Serre says:

> But you do not ask the most obvious question, the one every reader expects you to answer: why did you yourself abandon the work in question?

A few lines later Serre attempts to answer his own question:

> I have the impression that, despite your well known energy, you were quite simply tired of the enormous work you had undertaken.

By letter and in conversations, Serre later confirmed this view. Considering that, as a colleague put it, Grothendieck had done mathematics twelve hours a day, seven days a week, and twelve months a year for twenty years, one can only agree. But a question remains. Many scholars (or artists) give up a project they have started because their creativity and strength dissipate. But they do remain respected members of the community.

Serre speaks simply of "tiredness". Similar views have been expressed by others, who, however, see deeper reasons, including "disappointment". According to an oral communication from Helmut Koch, Igor Shafarevich thought that it was a disastrous decision on the part of Grothendieck to begin working on the *Eléments de Géométrie Algébrique*. He should have used his creativity on the "great problems" and not on a complete construction of a gigantic theory. Comments in this direction have also been made by the physicist David Ruelle, a colleague of Grothendieck's at the IHES: After a superhuman effort, Grothendieck had to admit that he would never be able to complete the oeuvre he had begun. It was as if he had set his mind on building a cathedral with his own hands. When the walls were two meters high, he had to stop.

It seems to me that all three—Serre, Shafarevich, and Ruelle—are making important points but missing the decisive one. They might explain why Grothendieck gave up mathematics, but not why he changed his whole life, why he withdrew from human society. No doubt this event, originating in the core of his personality, is much more deep-seated and more emotional than giving up one's job or withdrawing from scientific research. Again it seems natural to think that cause and effect might have been reversed: Because, for whatever reason, Grothendieck could no longer live in the society he had lived in from 1950 to 1970, he had to leave mathematics as well.

Grothendieck's old friend and colleague Cartier[5] has undertaken a less superficial attempt to explain Grothendieck's decision. He does not discount the importance of the financing of the IHES, and he sees the crises in Grothendieck's mathematical work, but he also sees that the rupture in Grothendieck's life had deeper reasons:

> I would like to try to analyze the reasons for this abrupt end to a career so astonishing and fertile at the age of 42. The reason given was that he had

[4] *David Aubin, "A cultural history of catastrophes and chaos: Around the Institut des Hautes Etudes Scientifiques, France, 1958–1980", Ph.D. thesis, Princeton University, 1998.*

[5] *Pierre Cartier, "A mad day's work: From Grothendieck to Connes and Kontsevich"*, Bulletin of the AMS (N.S.) **38** *(2001), 389–408.*

> discovered that the Ministry of Defense had been subsidizing the institute.…In order to understand the vehemence of Grothendieck's reaction, one must take account of his past and the political situation of the time. He is the son of a militant anarchist who had devoted his life to revolution. This was a father of whom he had very little direct knowledge; he knew him mostly through his mother's adulation. He lived as an outcast throughout his entire childhood and was a "displaced person" for many years.…He had always been uncomfortable frequenting the "better" places and felt more at ease among the poor, even the impoverished. The solidarity of outcasts had created in him a strong feeling of compassion. He lived his principles, and his home was always wide open to "stray cats". In the end he came to consider Bures a gilded cage that kept him away from real life. To this reason he added a failure of nerve, a doubt as to the value of scientific activity. Starting in 1957 at a Bourbaki Congress, he confided his doubts to me and told me that he was considering activities other than mathematics.[6] One should perhaps add the effect of a well-known "Nobel syndrome". [After being awarded the Fields Medal in 1966], when he was laboring over the last (decisive) stages of the proof of the Weil conjectures and perhaps beginning to perceive that Deligne would be needed to complete in 1974 the program he had set for himself, and perhaps yielding to the pernicious view that sets 40 as the age when mathematical creativity ceases, he may have believed that he had passed his peak and that thenceforth he would be able only to repeat himself with less effectiveness.
>
> The mood of the time also had a strong influence. The disaster that had been the second Vietnam War from 1963 to 1972 had awakened many consciences.

When it was said above that the dispute over the budget was not the really decisive point, this was not meant to imply that political, or more precisely socio-political, reasons played no role. On the contrary, they were of great importance to Grothendieck. To explain this, we must recall some of his political activities.

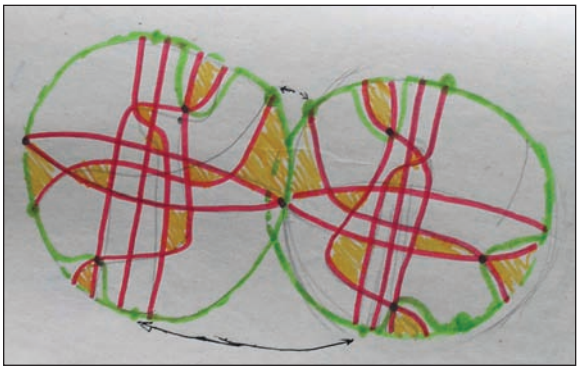
These activities have to be seen against the backdrop of his own life and the lives of his parents. Cartier is certainly right when he emphasizes that Grothendieck was always conscious of the example of his parents. His father had fought all his life for freedom and self-determination and against the powerful in this world. Grothendieck's sympathy was always with the poor, the persecuted, the oppressed, those in the shadows, and he always held leftist, liberal, and possibly even anarchist political convictions. But for many years these convictions were not expressed in political actions. In the late 1950s and early 1960s, he opposed the French war in Algeria as a matter of course, but in contrast with many of his closest colleagues such as Schwartz, Chevalley, Samuel, or Cartier, he did not participate in public protests. At least he took the matter seriously enough to consider emigrating to the United States.

Grothendieck's political commitment became publicly visible in the summer of 1966, when he refused to travel to Moscow to receive the Fields Medal at the International Congress of Mathematicians (ICM). This was his protest against the persecution and imprisonment of the Russian writers Yuri Daniel and Andrei Siniavsky. This action attracted a lot of attention. Some years later it was held very much against Grothendieck by orthodox communists and socialists who played a big role in the student movement.

His next political action was a trip, made at his own initiative, to Hanoi and North Vietnam during the last three weeks of November 1967 in the middle of the Vietnam War. He gave a series of lectures about this trip, in Paris on December 20, 1967, and later in other places. In addition to reporting on scientific and personal contacts and on the lectures he had given, he described the destruction the war had wrought, the bomb attacks, material deprivations, and the faith of the Vietnamese people in their own future. Though he cautiously criticized the indoctrination in dialectical materialism and the overwhelming regimentation of public life, every sentence of his report spoke of his deep sympathy for the struggles of the Vietnamese people to build a new society under difficult circumstances and to support public education and scholarship.

Grothendieck's spontaneous trip to Vietnam was probably typical of him in that it was an "individualistic" action. Many French intellectuals, including well-known figures such as Jean-Paul Sartre, had long taken an interest in Indochina. Many mathematicians were also committed to this cause, none more than Grothendieck's advisor, Laurent Schwartz. In his autobiography Schwartz talked at length about the fight for an independent Vietnam and about his love for that country and its

[6] *In a short note about the spiritual landmarks of his life, Grothendieck mentions for 1957 "calling and unfaithfulness" (footnote of W. S.).*



Archive of Winfried Scharlau.

An example of a handwritten mathematical diagram drawn by Grothendieck.

inhabitants.[7] He negotiated with many influential politicians, among them the Vietnamese prime minister Phan Van Dong and Ho Chi Minh himself.

Schwartz was also one of the initiators of the Russel tribunals, held in 1967 in Stockholm and Roskilde. He mentions as his comrades in arms many well-known French and other mathematicians, among them Jean-Pierre Kahane, Bernard Malgrange, Pierre Cartier, André Martineau, and Stephen Smale, but Grothendieck's name is mentioned only in passing. In those years Grothendieck had no interest in actions organized together with other people; he did not participate, perhaps he was even indifferent. All those who observed his political actions testified to his good will and his serious and honest intentions but at the same time ascribed to him an unbelievable naiveté and even ignorance. (I can barely believe the reports that Grothendieck at the time did not know what NATO really was.)

In May of 1968 the student revolution that was soon to envelop the whole Western world broke out in Paris. There were strikes and demonstrations that sometimes bordered on riots; there were demands for radical changes in university curricula, for abolishment of examinations, for self-determined learning, and for equal representation for faculty, staff, and students; in extreme cases, there were even demands for the destruction of computing centers and academic departments that were suspected of conducting military research. It was a true "cultural revolution" (which today seems like a distant past that has already faded). In several places in Grothendieck's meditations written in later times, he alludes to the deep impression these events made on him. He was convinced of the seriousness of the young people's revolution and certain that Western civilization and capitalism were headed for a deep crisis; he developed doubts about whether his own scholarly occupation was the right path and even wondered whether it was irresponsible to engage in such activity. This happened to many academics and intellectuals at the time, particularly in France; it was simply the "zeitgeist" (which is stronger than everything else). But Grothendieck reacted to this with his characteristic forcefulness, rigor, and recklessness against others and himself, and perhaps also with obstinacy and with a sense of mission (though maybe he was just more clairvoyant than those around him).

Considering this background, there can be no doubt that Grothendieck was incapable of compromising on the question of the IHES receiving a part of its budget from the French defense ministry. In his meditations (especially in *Récoltes et Semailles*), he has said repeatedly that this issue had to lead to a break with the IHES, and his closest colleagues, such as Serre and Deligne, have confirmed how decisive this issue was. Nevertheless, it must have happened as I explained above: Motchane had plenty of reasons to try to get rid of Grothendieck, and Grothendieck had already reached the great turning point internally, even if he was not yet conscious of this.

In trying to understand how the "great turning point" happened, one has to take into account Grothendieck's mental state, which already by then must have been unstable and perhaps sometimes out of control. This would not have been apparent in his interactions with his colleagues and students, even though Cartier hints at it. But in closer interaction, a deep personality disorder is clearly visible. This is not the place to go further into this subject.

We now come to the second aspect of the "great turning point", the departure from mathematics. It seems to me that this process has a "negative" and a "positive" aspect. The "negative" has already been mentioned: fatigue and disappointment, as seen and described by Serre, Shafarevich, Ruelle, and also Cartier. The "positive" aspect is that Grothendieck found an occupation that seemed to him to be more important than mathematics and to which he devoted himself for the next two or three years with the same energy and drive that he had previously lavished on mathematics. This occupation was environmental protection in the widest sense of the term, the rising ecological movement (the word "ecology" existed at that time only as the name of a subdiscipline of biology), resistance to atomic energy, the struggle against militarism and the arms race, support for a new society and a "cultural revolution"—all in all, a movement that followed many ideals of the generation of 1968. Apparently this movement, the new goals, and the new ideals impressed Grothendieck so much that he became a committed follower. At this time he did not yet consciously abandon mathematics; he

[7] *Laurent Schwartz,* Un Mathématicien aux Prises avec le Siècle*, Odile Jacob, Paris, 1997; English translation,* A Mathematician Grappling with His Century*, Birkhäuser, Basel, 2001.*

did not yet speak about it being for him like "a trip through the desert", as he would often say later on. But he had found something that, at least for the moment, was more important to him than mathematics.

Grothendieck's main activity with regard to these goals was the foundation of a group initially called Survivre and later on Survivre et Vivre:

> SURVIVRE
> *Mouvement international pour la survie de l'espèce humaine*
> An international and interprofessional movement for the survival of humanity

The goals of this movement are summarized in its first bulletin of August 1970 (this quotation is from the English edition of the bulletin, as is the slogan just above):

> To fight for the survival of the human species and of life in general, threatened as they are by the ecological disequilibrium created by contemporary industrial society (pollution, waste, devastation of natural resources), as well as by military conflicts and the threat of military conflicts.

On balance, it seems that Grothendieck's involvement in this movement, in complete contrast with his work in mathematics, has been without lasting effect and ended in defeat. That is how it would have seemed to him, but perhaps that point of view is too superficial: It is certain that during his Survivre et Vivre period, Grothendieck deeply impressed some young people and completely changed their lives. And maybe the group did make a contribution to the establishment of the "green" movement that has firmly taken root in society and politics in Europe.

Shortly after his official letter of resignation, on June 26, 1970, Grothendieck gave a lecture to hundreds of listeners at the University of Paris in Orsay in which he talked about all that had become important to him: the spread of nuclear weapons, the arms race, the threat to humanity posed by technological progress. He went so far as to call mathematical research dangerous because it is part of this technological progress. The content of this lecture was later circulated in various unofficial manuscripts under titles such as "Responsabilité du savant dans le monde d'aujourd'hui: Le savant et l'appareil militaire" ("The Responsibility of Scientists in Today's World: The Scientist and the Military Establishment").

The foundation of the group Survivre came about during a summer school on algebraic geometry in July and August 1970 in Montreal. Grothendieck had been invited to this meeting to deliver lectures on crystalline cohomology. He agreed to go under three conditions: In addition to his mathematical lecture, he wanted to give a lecture of equal duration about his ecological goals, and this additional lecture was to be advertised and published in the same way as the scientific lectures. The organizers of the meeting accepted these conditions, and so the participants found among the materials that they received at the beginning of the meeting a text based on the earlier lecture in Orsay. Apparently Grothendieck's charismatic personality impressed a whole group of mostly young mathematicians so much that Survivre was founded spontaneously by the group. One of the most active members was Gordon Edwards, who was then a Ph.D. student under Grothendieck's friend from student days, Paulo Ribenboim, and who later became a leader in the antinuclear movement in Canada.

The first bulletin of the group contains a list of members running to twenty-five people, eighteen of whom were mathematicians. One has to suspect that most of them were "recruited" by Grothendieck. His mother-in-law, Julienne Dufour, was among them, as was his son Serge, then seventeen years old. Grothendieck soon succeeded in winning over other prominent mathematicians, particularly those who had always been part of leftist movements. For the second issue of the bulletin, Claude Chevalley was the *directeur de publication* and a member of the editorial committee. About a year later, Pierre Samuel joined the French editorial committee.

As far as I know, a total of nineteen issues of the bulletin of the movement, totaling approximately seven hundred pages, were published between 1970 and 1975. There is no doubt that in the early years the main burden of the editorial work rested on Grothendieck, who surely wrote many of the unsigned articles. After his move to Villecun in 1973, he must have been less involved, if at all. As is usual with such groups, a tendency to disintegrate started after only a short time; for example, Samuel left the group in 1973.

It is important to note that at the beginning of his period of ecological and antimilitarist activities, Grothendieck consciously tried to profit from his reputation as a scholar. He was deeply imbued with the truth of the goals of Survivre et Vivre, and without doubt he thought that anyone would have to come to the same conclusions when presented with appropriate enlightenment and information. He took it for granted that any rational, sensible person would have to agree with the views of the group Survivre, so it was natural for him to first try to convince other mathematicians. And at the beginning, he believed that his efforts would be successful.

In Montreal he had convinced some participants just through the momentum of the early enthusiasm. Perhaps it was not difficult to win over in personal conversations some acquaintances

who had always been left-wing activists, such as Chevalley or Samuel. Others, like Serre or Deligne, must have been more cautious. But the moment of truth came when he tried to attract new converts through public activism, for example at the 1970 ICM in Nice. There he set up an information booth and attracted attention through spectacular actions in the expectation that mathematicians would join the group Survivre in droves. As he himself summarized, this attempt was an utter failure and surely contributed to his estrangement from the community of mathematicians. After a few years of toiling in vain, he must have reached the conclusion that mathematicians and scientists are blind to the dangers threatening human society and do not think and behave rationally. And so Grothendieck withdrew more and more, not just from mathematics but from the community of mathematicians.

At this point I want to conclude the discussion of the reasons that might have led to the "great turning point". But it seems to me that the decisive point has not been touched upon yet: Why has Grothendieck withdrawn from human society itself? Thinking about his whole personal life, one has the impression that, for whatever reason, it has been impossible for him to maintain a long-term personal relationship with anybody. Whenever such a relationship did not come to an end for purely external reasons, it inevitably led to deep conflicts and usually terrible reproaches, even imprecations, on the part of Grothendieck. He could not live long-term in human society as it exists, and therefore he also had to give up mathematics and activities connected to it.

No doubt this is a depressing tally for the life of a unique scientist and man.

The Meditations of Grothendieck

We now turn to the question of what Grothendieck did after his withdrawal from society. It goes without saying that such an active and creative mind could not remain idle. His main intellectual occupation clearly was, and still is, writing down his "Meditations", which, as far as is known, cover biographical, religious, esoteric, and philosophical themes. I use here Grothendieck's own word, "Meditations" (sometimes also "Reflections"), whereby he means, as he says on many occasions, "meditating" as well as writing. Since the 1960s, when he spent many hours daily at the typewriter, he has been used to putting down his thoughts in writing. (It is natural to conjecture that, from the 1980s onwards, this habit practically became a compulsion.)

To begin with, one has to observe that all his life Grothendieck felt a calling to be a writer and that he is without doubt a master of written expression. His linguistic and stylistic prowess, and above all his creativity in inventing words, would be to the credit of any writer. He does of course have a "genetic predisposition". His mother had the ambition to be a writer and left behind an important literary work, the autobiographical novel *Eine Frau*. His father too saw literature as his real calling, although his lifelong struggle for the anarchist movement prevented him from pursuing this vocation. Grothendieck himself first played with the idea of turning to poetry after the proof of the Riemann-Roch theorem. He wrote a good deal of occasional verse (in German, French, and English; most of it has been lost), and he has translated poetic texts from German into French. He undertook his first serious poetic attempt in 1979, when he wrote down the *Eloge*, about which more will be said later, and he had further plans at that time.

To create an overview, we now give a chronological survey of Grothendieck's known "Meditations", followed by a few comments about their content.

1979: *L'Eloge de l'Inceste (In Praise of Incest)* (January to July 1979, perhaps lost)

1981: *La Longue Marche à Travers la Théorie de Galois (The Long March through Galois Theory)* (January to June 1981, about 1,600 pages, plus about the same amount of commentary and supplementary material; unpublished, but since 2004 parts have been available on the Internet)

1983: *A la Poursuite des Champs* (*Pursuing Stacks*) (approximately 650 pages, started as a "letter" to D. Quillen, unpublished). Associated with this is an extensive correspondence with Ronnie Brown and Tim Porter.

1984: *Esquisse d'un Programme (Sketch of Program)* (January 1984)

1983–1985: *Récoltes et Semailles: Réflexions et Témoignage sur un Passé de Mathématicien (Reapings and Sowings: Reflections and Testimony on the Past of a Mathematician)* (1,252 pages plus approximately 200 pages of introduction, commentary, and summaries; produced as photocopies; available on the Internet)

1987: *La Clef des Songes (The Key to Dreams)* (315 pages, unpublished)

1987–88: *Notes pour la Clef des Songes (Notes on the Key to Dreams)* (691 pages, unpublished); includes a freestanding work, *Les Mutants*

1990: *Développements sur la Lettre de la Bonne Nouvelle (Developments on the Letter of Good News)* (82 + 2 pages, unpublished; written February 18–March 15, 1990)

1990: *Les Dérivateurs* (about 2,000 pages, unpublished, but parts available on the Internet)

Surely this considerable number of manuscripts is not all that Grothendieck wrote during those years. Various eyewitnesses have reported that one day (perhaps in 1990 or in early 1991) he burned many manuscripts and perhaps other documents, such as correspondence, in an old oil barrel. His only

work of fiction, *L'Eloge de l'Inceste*, possibly fell victim to this deed; it is also possible that a copy survives somewhere.

We now make a few comments on some of these "Meditations" only to show that a more extensive analysis and interpretation in a wider context would be desirable.

Without doubt the best known of his "Meditations" is *Récoltes et Semailles*, which contains above all his reckoning with mathematics and the mathematical community. Mostly because of his attacks on many colleagues and former pupils, which seem more or less unjustified, this text has achieved a certain notoriety. The widespread idea that he is "crazy" and "paranoid" is based mostly on this text. By now there is an extensive "unofficial" literature about this work (which is easy to research on the Internet), so we will not comment further on it here. It is hard to say what this text really is: not an autobiography, not a work of fiction, but not a scientific work either; in a letter to German friends, Grothendieck once called it a "mathematical phantasmagoria".

Grothendieck has said about *L'Eloge de L'Inceste* that it is on the one hand his first systematic *reflection* of a philosophical nature and on the other hand a work of fiction—he calls it a "song". He mentions it occasionally in his other meditations and apologizes for the somewhat flamboyant (*un peu tapageur*) title. In his correspondence with his German friends, Grothendieck mentions the *Eloge* on several occasions, for the first time on August 17, 1979:

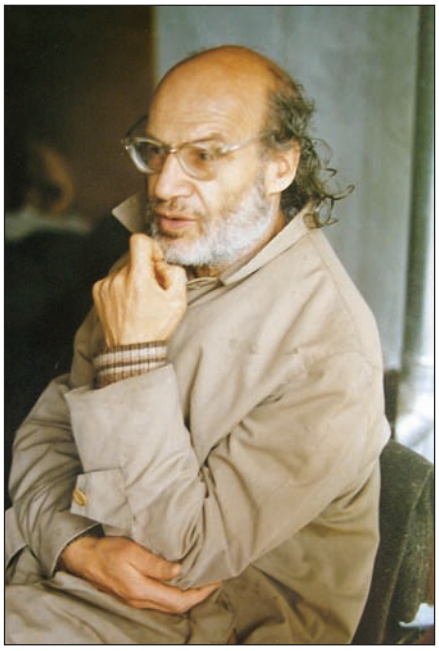
> Since the beginning of June, I have withdrawn to a solitary hermitage in the Vaucluse, where nobody knows me—maybe I will stay here for a whole year to "turn in" quietly. At the end of July, I finished the first version of the first song "In Praise of Incest". At the beginning of September, I want to go over it with a friend and then slowly type up a clean version—it will probably take two to three months, a few pages a day, after all I have other things to do as well.…And so in November or December, I will have it photocopied—but not at the university,…Two hundred copies to begin with—it's going to be about 170 pages all in all.… I have not yet decided 100 percent whether I will publish the song. Probably yes. It is surely the most meaningful thing I have ever done—but then there isn't much except mathematics. In any case, I will wait at least until the spring before I entrust a publisher with the first song. By then I assume that the substance of the next two songs will have ripened and clarified and that their form will have emerged, at least in outline.

It seems best to discuss *La Longue Marche à Travers la Théorie de Galois* (LM) and *Esquisse d'un Programme* (EP) together, because EP is in a certain sense a summary of LM. With the EP, Grothendieck applied for a position in the CNRS. The text contains a summary of his mathematical thoughts since the early 1970s. It has now been published together with an English translation.[8] The central objects of the investigations are the moduli spaces $M(g,n)$ of compact Riemann surfaces of genus g with n marked points that had been studied earlier by Pierre Deligne and David Mumford. Grothendieck makes a connection to arithmetic objects, in particular the absolute Galois group of the field of rational numbers $\mathbb{Q}$. To come to grips with the elementary geometric and combinatorial aspects of these questions, Grothendieck designs his theory of "children's drawings" (*dessins d'enfants*). He also speculates on an "anabelian geometry". Of all of Grothendieck's mathematical "meditations", these have certainly had the largest echo. There are many papers concerned with these questions, and in the 1990s several workshops were organized around these topics.

La Clef des Songes

I now come to the meditation *La Clef des Songes*, which is still largely unknown. As with the others, it is easier to say what it is not than to say what it is. It is not a scholarly work, because it has no clearly defined subject and the considerations follow no scholarly methodology. It is not an autobiography, although Grothendieck occasionally recounts episodes from his life. And it is certainly not a work of fiction in any form, for it has no narrative, no plot line, and no characters that could have carried a plot. However, at many points Grothendieck uses poetic language, and much of it can be understood only in the way in which one understands—or "absorbs"—poetry: not rationally but emotionally. (An example: *The only God is silent. And when He speaks, it is in such a low voice that nobody ever understands.*) And the text is not a systematic analysis of, say, the phenomenon of dreams, for it is not about concrete dreams. It is perhaps something like a confessional—but what would he be confessing? It is best to let Grothendieck speak for himself: "It is the record of a long *meditation*. A meditation that has no aim, in which the thoughts are left largely to themselves."

[8] *The following conference proceedings concern the circle of ideas around LM and EP, in particular the letter to Faltings and the text of EP:* The Grothendieck Theory of Dessins d'Enfants, *Leila Schneps, editor, London Mathematical Society Lecture Notes 200 (1994);* Geometric Galois Actions 1 and 2, *Leila Schneps and Pierre Lochak, editors, London Mathematical Society Lecture Notes 242 and 243 (1997).*



Archive of Winfried Scharlau.

Grothendieck in May 1988.

Many people who know Grothendieck report that he has "always" been very interested in dreams. But they became the central theme of his thinking only after the "great turning point" of 1970. It appears that he thoroughly worked through, for example, Freud's *Traumdeutung* (*The Interpretation of Dreams*) and also read other relevant literature.[9] On the other hand, he does not describe even a single one of his own dreams that had great importance for him, and he says nothing about how he analyzed them.

Instead of attempting a summary or a table of contents of *La Clef des Songes*, we will confine ourselves to mentioning a few key ideas. Grothendieck starts with the statement that there is an external being, the "dreamer", who knows the people and sends them dreams so that they will recognize themselves. Among these dreams there are some that carry particularly important messages. Because of torpor and fear of change, many people do not understand these messages. The dreams are not the result of mental processes of people; rather, they come from outside. Next Grothendieck analyzes the nature of the "dreamer" and comes to the conclusion that God exists and is the dreamer (*Le reveur n'est autre que Dieu*). He then discusses the question of how he himself arrived at his belief in God. There is a rather detailed description of the biography of his parents—both were convinced atheists and anarchists—and he talks a bit about his childhood and youth. Surely he is trying to express that, given his biography, it was by no means obvious that he would find the "path to God", but that this required an impulse from outside (namely, from God himself).

Grothendieck is convinced that each person has a "mission" and that an important part of this mission consists of finding one's self, of recognizing one's own self. Only through this search are a person's creative powers liberated, for they are ordinarily suppressed in many ways through the constraints of society and through inner torpor, which prevent their unfolding. He discusses the important role of "eros" as a decisive creative power. Furthermore, he discusses three levels at which a person develops both in general and with regard to creative powers: the physical, the mental-intellectual, and the spiritual level. Spirituality is a key concept in Grothendieck's thoughts, not only in *La Clef des Songes*. He measures all people according to how far they have come in attaining a spiritual life. He also discusses the spiritual aspect of his mathematical work. Finally, he speaks about the many deformations of humanity that go hand in hand with a loss of spirituality and manifest themselves, for example, in a loss of the feeling for beauty in all areas of life.

I personally consider the *Notes pour la Clef des Songes* to be the most interesting of Grothendieck's meditations known so far. Originally it was really meant to be remarks about *La Clef des Songes*. But soon an independent text called *Les Mutants* developed out of it. The somewhat strange title "The Mutants" (a word that in French too comes from the vocabulary of science fiction) refers to people who differ from "mere mortals" in a spiritual way; in particular, they are ahead of their times. At one place in the text Grothendieck gives the following explanation of this concept (slightly shortened in translation):

> There have been in this century (as doubtless in other centuries past) a certain number of isolated men who seem to my eyes to be "new men"—men who appear to be "mutants" and who already today, in one way or another, prefigure the "man of tomorrow" embodied in the present; the man in the full sense of the word, who undoubtedly will emerge in the generations to come, in the course of the "post-herd" age, of which the dawn is very close and which they tacitly herald.

For hundreds of pages Grothendieck describes and discusses the lives and works of a total of eighteen mutants. It becomes clear that he sees a personal connection between these mutants and himself; for example, he occasionally calls himself their heir, or he calls them his elders. We now give the list of these mutants, as he assembled it himself. No doubt their selection is rather arbitrary. A central (and not very original) theme in Grothendieck's thinking is the spiritual decline of humanity, necessarily followed by an apocalypse and soon thereafter by the "new age", the age of freedom and self-determination and of life in harmony with one's own "soul". The mutants are people who announce and anticipate this new age. This is the criterion by which he selected them. The list comprises the following people, all

[9] *This is apparent from, for example, marginal notes in Grothendieck's copy of* Freud, Die Traumdeutung, *Fischer Studienausgabe, Band II.*

men. The remarks on their works are taken from Grothendieck:

C. F. S. Hahnemann: German medical doctor and scholar, renewed the medicine of his time

C. Darwin: English natural scientist, scholar

W. Whitman: Journalist, American writer, poet and teacher

B. Riemann: German mathematician, scholar

Râmakrishna: Indian (Hindu) preacher, teacher

R. M. Bucke: American doctor and psychiatrist, scholar and *annonciateur* (herald)

P. A. Kropotkine: Russian geographer and scholar, anarchistic revolutionary

E. Carpenter: Priest, farmer, English thinker and writer, teacher

S. Freud: Austrian doctor and psychiatrist; scholar and creator of psychoanalysis, key to a new scientific humanism

R. Steiner: German scholar, philosopher, writer, orator, pedagogue...; visionary teacher, creator of anthroposophy

M. K. Gandhi: Indian lawyer and politician, teacher, worked for the spread of *ahimsa* (non-violence)

P. Teilhard de Chardin: French (Jesuit) priest and paleontologist, Christian religious ecumenical thinker, mystical visionary, worked toward the reconciliation of religion and science

A. S. Neill: English teacher and pedagogue who championed freedom in education

N. Fujii (called Fujii Guruji): Japanese Buddhist monk, teacher

J. Krishnamurti: Orator, Indian religious thinker and writer, teacher

M. Legaut: University professor, farmer, French Christian religious thinker and writer, disciple of Jesus of Nazareth, worked for a spiritual renewal of Christianity

F. Carrasquer: Spanish elementary school-teacher and pedagogue; militant anarchist for a "self-determined" school and society

Slovik: American worker and low-ranking employee apparently without any particular vocation

I cannot do much more here than give the names and list the aspects under which these people are discussed; they are sex (*sexe*), war (*guerre*), self-knowledge (*connaissance de soi*), religion (followed by an extensive explanation of what is meant—certainly not the church as an institution and not liturgy either), science (*science*), culture (*la civilisation actuelle et ses valeurs, "culture"*), eschatology (*la question des destinées de l'humanité dans son ensemble, "eschatologie"*), social justice (*justice sociale*), education *(education*), spirituality (*"science de demain" ou "science spirituelle"*).

Perhaps this small bit of information gives a vague impression of what this meditation is about. To complete the picture, I would like to mention that Felix Carrasquer and his wife, Matilde Escuder, were close friends of the Grothendieck family (the original acquaintance was through Grothendieck's wife, Mireille Dufour) and that the writing of the *Notes pour la Clef des Songes*, including *Les Mutants*, was substantially inspired by Grothendieck's reading of the books of M. Legaut. A more detailed discussion must be left for another occasion.

Among these texts, the philosophical ones (and in a certain way the mathematical ones as well) all follow a common presentation. Grothendieck recorded his thoughts section by section, as if in a diary, and later edited these sections very little if at all. When he had more to say on one of his sections, he usually did so through footnotes or addenda, which sometimes led to whole new sections. It also happened that he would meditate on parts of the written text; this generated remarks on remarks on…as well as numerous footnotes. Surely this presentation does not facilitate reading, but in my view the more important criticism is that many of these long manuscripts do not have a clear aim. Both in *Récoltes et Semailles* and in *La Clef des Songes* it is obvious that new points of view appeared after the writing had already begun. As the texts do not seem to have any clear aim, there is no clear structure either. They meander, unstreamlined and unchanneled, in loops that change direction through a wide swath of landscape, as if through the valley of a primordial stream. The author drifts without any will to focus. It is completely different from his earlier writings on mathematics: Both EGA and SGA go into the breadth and the details, but there is a very clear aim, the "correct" development of algebraic geometry or the "correct" cohomology theory in algebraic geometry.

Since his disappearance, Grothendieck has written down tens of thousands of pages of his meditations. Printed in their entirety, they would surely fill dozens of volumes. It seems almost impossible that all of this, or even a large part of it, could be of importance. One cannot imagine that truly important writings can come about in complete intellectual and human isolation.

But one has to remember that Grothendieck is a true master of language, that he certainly has unconventional ideas and thoughts, and that he sees the world in an unusual and even singular way. So one can imagine that in the countless pages of his manuscripts there might often be finished texts: poems, biographical episodes from his life and the lives of people who were close to him, commentaries on books he read, perhaps lyric texts that go beyond poetry, philosophical thoughts, apocalyptic visions. It seems necessary to begin before it is too late to preserve for future generations those parts of Grothendieck's life's work that may be important beyond his mathematics.

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The Archimedes Codex

Reviewed by J. L. Berggren

The Archimedes Codex: How a Medieval Prayer Book is Revealing the True Genius of Antiquity's Greatest Scientist
Reviel Netz and William Noel
Da Capo Press, 2007
US$27.50, 352 pages
ISBN-13: 978-0306815805

This book tells the story of one of the most famous codices in the world, a medieval prayer book that turned out to contain not only prayers but also text from lost treatises of Archimedes.

The authors of this book have been closely involved in the study of the codex since an anonymous buyer bought it for US$2.2 million dollars at Christie's auction house in New York in October of 1998, and both are uniquely qualified to write on the topic. Reviel Netz, professor of philosophy and classics at Stanford University, is a historian of mathematics who has been engaged in publishing an English translation of the works of Archimedes. He has also, almost since the purchase of the codex, been directing the scholarly study of its Archimedean text. The other author, William Noel, is curator of manuscripts at the Walters Art Museum in Baltimore, where the codex is currently housed, and director of the Archimedes Palimpsest Project. Together they have written a book that, although aimed at a "lay" audience, is one that any mathematician interested in a fascinating chapter in the history of mathematics will surely enjoy.

The reviewer first met Archimedes in 1972 in a small seminar run by Asger Aaboe at Yale University, where we read the Greek master in Greek and English. The Greek text was that of the edition of the Danish philologist J. L. Heiberg, who devoted much of his scholarly life to editing the extant texts of the great Greek mathematicians (with Latin translations for those who could not read the Greek!).

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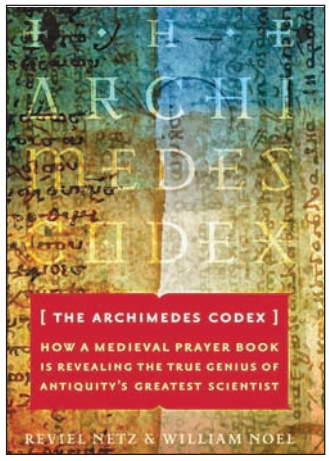

We learned, of course, something of the curious story of the oldest (by 400 years) surviving manuscript of some of Archimedes' works, collected in a Byzantine codex that contained the end of *Equilibrium of Planes*, great parts of *The Sphere and the Cylinder* and *Measurement of the Circle*, a sizable portion of *On Floating Bodies*, one folio of *The Stomachion*, and a large portion of *The Method*. This codex had not been easy for Heiberg to read because it was a palimpsest. It seems that at some point early in the year 1229, a Greek priest, Ioannes Myronas, needing parchment for a prayer book, took a collection of Archimedes' works that had been written on parchment about 250 years earlier and erased, as best he could, the Archimedean text from those of its pages that were still usable. He then used these pages to write the text of a collection of Greek prayers at right angles to the much fainter Archimedean text underneath. Myronas in fact needed more parchment than the old Archimedes codex could provide, so he also recycled other important, now lost, texts in the same way. (But that is another story.) Despite the obstacles to reading the text, Heiberg felt it was more than worth the effort, especially since the Greek texts of *Floating Bodies*, the *Stomachion,* and the *Method*, were unknown. *Floating Bodies* existed only in an incomplete Latin translation, only a short Arabic account of the *Stomachion* was known, and the *Method* was known only from its mention in a Byzantine lexicon and three brief citations, of results only, in Heron's *Metrika*. Moreover, since the one extant folio of the *Stomachion* was almost

impossible to read, while a large part of the *Method* was readable (at least to Heiberg's practiced eye), it was the *Method* that attracted the most attention.

When Heiberg published it in his revised edition of Archimedes' works during the years 1910–1915, it forced scholars to revise completely their understanding of Archimedes and Greek mathematics. For the first time we had a Greek mathematician—and the greatest one of all, at that!—explaining a powerful, heuristic method he had discovered for finding areas, volumes, and centers of gravity of such figures as segments of parabolas, spheres, and conoids.

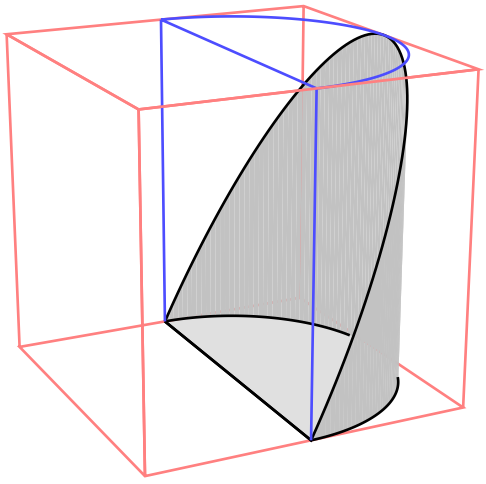

Figure 1.

This is what the reviewer, and most historians of Greek mathematics, knew in the early 1970s. But, after that, the manuscript of the *Method* dropped off the radar. There were rumors that it was with a private owner in France and, later, that an American scholar was trying to interest an American university in purchasing it. But we believed that Heiberg had read what could be read, Archimedes' method was well understood, and, although we might like to have some of the gaps filled in, they would, if we could read them, probably not tell us much that we didn't already know.

Thus, when the manuscript appeared in an auction at Christie's in New York and was purchased for US$2.2 million by a private collector in a spirited bidding war, many historians of ancient mathematics would have agreed with what Netz records as his opinion at the time (p. 188): "In terms of the traditional concerns of the history of mathematics I doubted that the Palimpsest could teach us much that was new. Perhaps we would be able to read something, perhaps not. But it would not be of much consequence to the history of mathematics."

Indeed, as Noel points out, the manuscript had been in private hands for a number of decades before its sale and was in significantly worse condition than when Heiberg first saw it in 1906. Amongst other problems, mold was rampant, some leaves were so fragile one dared not touch them, and parts of the text Heiberg saw in 1906 had been covered by forged Byzantine art (doubtless to increase the value of the codex).

This perceived lack of scholarly importance and abysmally poor condition may be one of the reasons why public institutions that were offered the book before the sale, at a price well below US$2.2 million, all declined. To those who will lament this fact, Noel has some advice: "If you think this is a shame then it is a shame that we all share. We live in a world where value translates into cash. If you care about what happens to world heritage, get political about it, and be prepared to pay for it." Yet, in this case, it is probably fortunate that the palimpsest ended up in private hands—at least in the particular private hands it did. For it is very hard to imagine that a university, responsible to its board of governors, or a government library, responsible to a legislative body, would even have dreamed of spending the kind of money the purchaser has spent on the purchase, preservation, and restoration of this ancient ruin.

But those of us who thought Heiberg had read what could be read reckoned without knowledge of the remarkable advances in imaging technology, which the authors explain at considerable length. And we reckoned without either the generosity of the purchaser or the determination of Noel and Netz to explore possibilities in the use of this technology. Thus, as a result of much money being spent and devoted labors by a large team of specialists, much that is new has been read, and many things have been learned about Archimedes since 1998. (The authors repeatedly credit by name the dedicated individuals whose specialties range from paleography to combinatorial mathematics and nuclear physics.) What has been read so far will influence how we look at the role of the visual in the history of mathematics, our view of Archimedes' techniques for dealing with infinity, and our view of the history of combinatorics.

As for the role of the visual, it was not the text that Netz initially thought would be the most instructive but (p. 22) the diagrams accompanying the text. These he hoped might be closer to the originals than the diagrams in our other two main sources for Archimedes' works. Netz makes a convincing case that Greek geometry was about diagrams, in the sense that they played the same role there that equations play in modern mathematics, and thus it would be important to try to get as near as possible to the diagrams Archimedes actually drew. And, as Netz demonstrates in Chapter 4 ("Visual Science"), the diagrams in the

codex probably are closer to the ones Archimedes drew than any we had earlier. Looking at the diagrams Netz found, one sees they are far from self-explanatory: as with equations, one has to learn to interpret them. Netz, naturally, focuses on the diagrams of the *Method*, where chords of circles are occasionally represented as concave arcs and arcs are sometimes represented as straight lines. The diagrams are not "realistic" but "schematic", as—for a further striking example—are those representing the geometry of a surface of a sphere in the ancient manuscripts of Euclid's treatise on spherical astronomy, his *Phænomena*.[1]

The chapters in the book alternate between those written by Netz on—broadly— Archimedes' mathematics and its historical significance and those written by Noel, on the history of the manuscript and what it takes to make a badly decayed palimpsest readable once again. This device works well, and the alternation of "voice" and focus keeps the reader's interest alive.

Netz begins in Chapter 2 with a discussion of Archimedes' family background and circle of friends, but he occasionally treats intriguing conjecture as fact. For example, of Netz's three claims that "The grandfather [of Archimedes] was an artist and the father was…an astronomer who turned to the new religion of beauty and order in the cosmos," only the father's profession is more than conjecture based on slender evidence. Readers will, however, enjoy Netz's account of Archimedes' mathematical style and a joke Archimedes played on his mathematical colleagues.

Netz's discussions of several pieces of Archimedes' mathematics convey both his style and the depth and beauty of his work very well. And anyone who has studied Archimedes' works and their historical influence will know that both topics invite superlatives. However, this reviewer must dissent from Netz's paraphrase of Whitehead's remark about the European philosophical tradition and Plato that "The safest general characterization of the European scientific tradition is that it consists of a series of footnotes to Archimedes."

In support of this astonishing claim Netz cites Galileo's approximation of curves (by rectilineal figures) and his use of the proportions of times and motions, both ideas that Netz credits to Archimedes. Of course, the importance of Archimedes' works for the scientific revolution is without doubt. However, not only Archimedes but also Aristotle in his *Physics* (equally well-known to the European Renaissance) wrote about the proportionality of motions and times. And Archimedes' idea of approximating curves by rectilineal figures was not too great a step from the use of regular polygons to approximate the areas of circles that we find in *Elements* XII, 2. Nor was it too far from the idea of Eudoxus, who, as Archimedes tells us in the preface to his *Method*, "first proved" that a cone is a third part of the circular cylinder containing it. (This is not to deny that Archimedes' idea was an important step, but only to point out that that it was an extension of ideas that proved to be equally important in the scientific revolution.)

Netz also claims that (p. 28) "The two principles that the authors of modern science learned from Archimedes are: 'The mathematics of infinity' and 'the application of mathematical models to the physical world'."

As to the former, it has long been accepted that Greek mathematicians, in the words of Aristotle, neither used infinity nor did they need to. When the "infinite" entered Greek mathematics it was as the potentially infinite, i.e., as the possibility of always bisecting a line one more time, extending a line by a fixed length once more, or always finding a whole number greater than any given one. For that reason, Netz is justifiably excited about what seems to be a use of an actual infinity in Archimedes' mathematics, one that he and a colleague, Ken Saito, found in the text of Proposition 14 of the *Method*.

Here Archimedes studies the volume of the solid shown in gray in Figure 1. The base of the solid is a semi-circle tangent to the sides of the outer square prism. The surface of this solid has become known as the "cylinder hoof". In Proposition 14 Archimedes shows that this solid is 1/6 of the whole prism.

The infinite sets involved are (1) two families of triangles formed by the set of all planes perpendicular to a given line and cutting two solid figures, and (2) the two families of parallel straight lines formed by the same set of planes cutting two plane figures. At a certain point in the argument Archimedes shows that to each pair of triangles, T_1 and T_2, formed by the plane sections of the two solids, corresponds a pair of lines, a_1 and a_2, such that $T_1 : T_2 = a_1 : a_2$. This much of the text Heiberg read, but there was a large gap he could not read, and here Netz and Saito feel they have read enough of the much-mutilated text to be confident that at this point something very surprising happens. Archimedes passes from this proportion, involving areas and lines, to another, involving solids and areas. And he does so by arguing that, since the sets of corresponding magnitudes (the T's and the a's) are "equal in multitude" and the members of corresponding pairs are equal magnitudes, it follows that solids formed by the parallel planes on one side of the proportion and the areas formed by the parallel lines on the other side of the proportion must also be in the same proportion.

[1] *See J. L. Berggren and R.S.D. Thomas,* Euclid's *Phaenomena*: A translation and study of a Hellenistic Treatise in Spherical Astronomy *(second printing: AMS-London Mathematical Society in the series History of Mathematics: Sources, Vol. 29, 2006).*

This, of course, does not follow, and if Archimedes did write this he was in error. For it was long ago pointed out that in triangles ABD and ACD (see Figure 2) pairs of lines x, x'; y, y'; etc., are parallel and equal, i.e., in the proportion of 1 to 1. However, although the triangles ABD and ABC are composed of an equal multitude of such equal lines, they are not themselves in the proportion of 1 to 1. So, perhaps it was fortunate that the Archimedean treatises that Galileo, Kepler, and Newton knew contained no notion of infinity that went beyond what they could equally well find in *Elements*, XII.

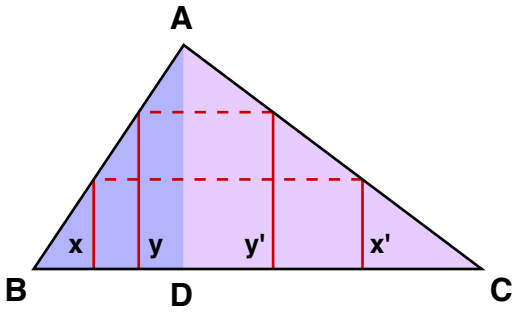

Figure 2.

As for Netz's claim concerning the application of mathematical models to the study of the physical world, one must point out that Euclid's application of geometrical models to the study of vision in his *Optics* was a very influential application of mathematics to the study of the physical world.[2] And, a good argument can be made that Archimedes neither invented the concept of center of gravity nor was he the first to prove the law of the lever. (Indeed, the proof Netz refers to, found in Propositions 6 and 7 of *Equilibrium of Planes, I*, has in Proposition 7 just the kind of tacit assumption that one can hardly believe Archimedes would make.[3])

A highly interesting chapter of Netz's work is Chapter 10, dealing with Archimedes' *Stomachion*. Only a fragment of this was known prior to Netz's study of the work, and no one understood what the treatise was about. Netz makes a convincing case that the treatise, in fact, sets the problem of counting the number of different ways a square can be assembled from a set of 14 polygonal pieces. Archimedes clearly liked problems involving counting, since he wrote both *The Sand-Reckoner*, in which he establishes an upper bound for the number of grains of sand that would fill the cosmos, and a problem known as The Cattle of the Sun God, which demands the calculation of a (very large) solution to a system of Diophantine equations. But, here again, Netz overstates his case by claiming that Archimedes was the first to tackle nontrivial counting problems with very large numbers as answers. For example, Xenocrates (396–314 BC) of Chalcedon, born about 120 years before Archimedes and head of the Platonic school, is said to have determined that a total of 1,002,000,000,000 syllables could be formed from the letters of the Greek alphabet.[4]

In Chapters 3, 5, and 7 Noel gives an engrossing account of the history of the manuscript. Particularly fascinating is his account of its fate after Heiberg studied it in the library of the Metochion of the Monastery of the Holy Sepulcher in Constantinople. Noel begins with the standard account, which is that at some unknown date, after Heiberg had studied the codex, portraits of the four evangelists were painted over portions of different pages of its text, and he shared the general assumption that some greedy Greek monk had forged the portraits to increase the value of this ancient prayer book. Then, at the end of the First World War, amidst the confusion of the collapsing Ottoman Empire, a French soldier, Marie Louis Sirieix, obtained the book and spirited it away to France. There, in Paris, it came into the care of his daughter, Anne Guersan, where it survived the Nazi occupation. It was eventually sold by Christie's in 1998.

However, this story of wars and human greed began to unravel as a result of the Canadian Conservation Institute's meticulous study, commissioned by the purchaser, of the condition of the book. Among its discoveries was that a green pigment used in the forged illustrations was one that became commercially available (in Germany) only in 1938! The Greek monks were thus exonerated and suspicion now fell on Europeans—presumably Sirieix or another member of his family. However, a letter was then discovered, written in 1934 by a Parisian antiquities dealer, who offered the book for US$6,000 to a specialist in palimpsests at the University of Chicago. Thus, Noel concludes, in 1934 the book had not yet come into Louis Sirieix's possession. But here—just as things are getting really interesting!—a curtain falls over the history of the work. Noel has, however, concocted a story to fill this gap, a story that he calls "The Casablanca Hypothesis". It is, he admits, "just as short on hard facts as the movie and should be

[2] *One assumes here that the key word in Netz's claim is "physical", in the sense of Aristotle's* Physics, *and in opposition to the celestial realm. Otherwise, not only Greek but also Babylonian astronomers were applying mathematical models of considerable sophistication well before Archimedes wrote.*

[3] *For a detailed consideration of these claims see J. L. Berggren, "Spurious Theorems in Archimedes'* Equilibrium of Planes, Book I*",* Archive for History of Exact Sciences ***16*** *(2), 1976, pp. 87–103.*

[4] *According to Plutarch, cited in T. L. Heath,* A History of Greek Mathematics, *Vol. I. Oxford: Clarendon Press, p. 319.*

similarly understood as fiction." It is a fascinating story, though, and I shall not spoil the mystery by revealing Noel's hypothesis here.

Throughout this book the authors are generous with their praise of the large, multidisciplinary team of experts who have devoted so much time and energy to the study of the codex. (Indeed, the "Acknowledgements" collects, under five areas of responsibility, a list of names reminiscent of the credits that one sees rolling by on the screen at the end of a movie!) Singled out for special praise are "The Patron" and "The Philologist". This first is a gracious acknowledgment of the generosity of the purchaser and contains some apt thoughts about public and private patronage of scholarship. The second, written by Netz, contains the following: "…we have been critical towards [Heiberg] throughout this book—the gaps he left, the false guesses he made, the diagrams with which he never bothered. Now is the time to admit the truth. Without Heiberg, we could have never made it. We would look at the text and see just a jumble of meaningless traces. We would interpret a few of them. We would conjecture a sense. Then we would check Heiberg and, low [sic] and behold, he had already made sense of it. He had even read further! Only then, looking back at the page, do we see those traces that provided Heiberg with his reading. And then, finally, based on Heiberg's foundations, we can go further and add to his readings." This passage is not only a gracious acknowledgment of pioneering work but describes perfectly the process of reading an ancient manuscript. And, indeed, the whole book could well be used as "required reading" in a course on the restoration and study of ancient manuscripts.

In the end, of course, it will be the words (and diagrams!) of Archimedes that matter. Puzzling these out of the mutilated text, publishing them in a critical edition, and accompanying them by a good translation will put "paid" to the authors' debt to "The Patron", "The Philologist", and the dedicated team that has given them such help. And it will, one hopes, bring back to life for a new generation of mathematicians the mathematical imagination of one of the greatest mathematicians who ever lived.

Search for an Executive Director for the American Mathematical Society

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The Trustees of the American Mathematical Society seek candidates for the position of Executive Director of the Society to replace Dr. John Ewing, who plans to retire in January 2009 after 13 years of exemplary service. This position offers the appropriate candidate the opportunity to have a strong positive influence on all activities of the Society, as well as the responsibility of overseeing a large, complex, and diverse spectrum of people, publications, and budgets. The desired starting date is as soon as possible in 2009.

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The Executive Director is the principal executive officer of the Society and is responsible for the execution and administration of the policies of the Society as approved by the Board of Trustees and by the Council. The Executive Director is a full-time employee of the Society appointed by the Trustees and is responsible for the operation of the Society's offices in Providence and Pawtucket, RI; Ann Arbor, MI; and Washington, DC. The Executive Director is an ex-officio member of the policy committees of the Society and is often called upon to represent the Society in its dealings with other scientific and scholarly bodies.

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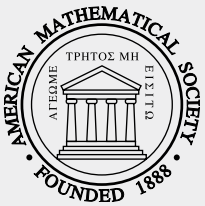

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WHAT IS . . .

an ∞-Category?

Jacob Lurie

One of the most celebrated invariants in algebraic topology is the *fundamental group*: given a topological space X with a base point x, the fundamental group $\pi_1(X,x)$ is defined to be the set of paths in X from x to itself, taken modulo homotopy. If we do not want to choose a base point $x \in X$, we can consider instead the *fundamental groupoid* $\pi_{\leq 1}X$: this is a category whose objects are the points of X, in which morphisms are given by paths between points (again taken modulo homotopy). The fundamental groupoid of X contains slightly more information than the fundamental group of X: it determines the set of path components $\pi_0 X$ (these are the isomorphism classes of objects in $\pi_{\leq 1}X$) and also the fundamental group of each component (the fundamental group $\pi_1(X,x)$ is the automorphism group of x in the category $\pi_{\leq 1}X$). The language of category theory allows us to package this information together in a very convenient form.

The fundamental groupoid $\pi_{\leq 1}X$ does not contain any information about the *higher* homotopy groups $\{\pi_n(X,x)\}_{n\geq 2}$. In order to recover information of this sort, it is useful to consider not only points and paths in X, but also the set of continuous maps $\mathrm{Sing}_n X = \mathrm{Hom}(\Delta^n, X)$ for every nonnegative integer n; here Δ^n denotes the topological n-simplex. This raises three questions:

- (A) What kind of a mathematical object is the collection of sets $\{\mathrm{Sing}_n X\}_{n\geq 0}$?
- (B) How much does this object know about X?
- (C) To what extent does this object behave like a category?

To address question (A), we note that $\mathrm{Sing} X = \{\mathrm{Sing}_n X\}_{n\geq 0}$ has the structure of a *simplicial set*. That is, for every nondecreasing function $f : \{0,1,\ldots,m\} \to \{0,1,\ldots,n\}$, there is an induced map $f^* : \mathrm{Sing}_n X \to \mathrm{Sing}_m X$, given by composition with a linear map of simplices $\Delta^m \to \Delta^n$. For example, if we take $f : \{0,1,\ldots,n-1\} \to \{0,1,\ldots,n\}$ to be the injective map that omits the value i, then we obtain a map $d_i : \mathrm{Sing}_n X \to \mathrm{Sing}_{n-1} X$, which carries an n-simplex of X to its ith face. The simplicial set $\mathrm{Sing} X$ is sometimes called the *singular complex* of the topological space X.

It turns out that the answer to question (B) is "essentially everything", at least to an algebraic topologist. More precisely, we can use the singular complex $\mathrm{Sing} X$ to construct a topological space that is (weakly) homotopy equivalent to the original space X. Consequently, no information is lost by discarding the original space X and working directly with the simplicial set $\mathrm{Sing} X$. In fact, it is possible to develop the theory of algebraic topology in entirely combinatorial terms, using simplicial sets as surrogates for topological spaces. However, not every simplicial set S behaves like the singular complex of a space; it is therefore necessary to single out a class of "good" simplicial sets to work with. For this, we need to introduce a bit of terminology.

Let $S = \{S_n\}_{n\geq 0}$ be a simplicial set. Here we imagine that S_n denotes the set of all continuous maps from an n-simplex Δ^n into a topological space X, although such a space need not exist. For $0 \leq i \leq n$, we define another set $\Lambda^n_i(S)$, which we think of as a set of partially defined maps from Δ^n into X: namely, maps whose domain consists of all faces of Δ^n that contain the ith vertex (this subset of Δ^n is sometimes called an *i-horn*). Formally, we define $\Lambda^n_i(S)$ to be the collection of all sequences $\{\sigma_j\}_{0\leq j\leq n, j\neq i}$ of elements of S_{n-1}, which "fit together" in the following sense: if $0 \leq j < k \leq n$ and $j \neq i \neq k$, then $d_j\sigma_k = d_{k-1}\sigma_j \in S_{n-2}$. There is a restriction map $S_n \to \Lambda^n_i(S)$, given by the formula $\tau \mapsto (d_0\tau, d_1\tau, \ldots, d_{i-1}\tau, d_{i+1}\tau, \ldots d_n\tau)$.

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Definition 1. A simplicial set $S = \{S_n\}_{n\geq 0}$ is a *Kan complex* if the map $S_n \to \Lambda^n_i(S)$ is surjective for all $0 \leq i \leq n$.

In other words, S is a Kan complex if every horn $\sigma \in \Lambda^n_i(S)$ can be "filled" to an n-simplex of S. Roughly speaking, a Kan complex is a simplicial set that resembles the singular complex of a topological space. In particular, the singular complex $\mathrm{Sing}\, X$ of a topological space X is always a Kan complex.

We now address question (C): in what sense does the singular complex $\mathrm{Sing}\, X$ behave like a category? To answer this, we observe that there is a close connection between categories and simplicial sets. For every category C and every integer $n \geq 0$, let C_n denote the set of all composable chains of morphisms

$$C_0 \to C_1 \to \ldots \to C_n$$

of length n. The collection of sets $\{C_n\}_{n\geq 0}$ has the structure of a simplicial set, which is called the *nerve* of the category C, and it determines C up to isomorphism. For example, the objects of C are simply the elements of C_0, and the morphisms in C are the elements of C_1.

We may therefore view the notion of a simplicial set as a *generalization* of the notion of a category. How drastic is this generalization? In other words, how can we tell if a simplicial set arises as the nerve of a category? The following result provides an answer:

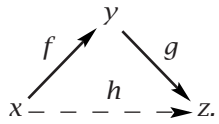
Proposition 2. *Let $S = \{S_n\}_{n\geq 0}$ be a simplicial set. Then S is isomorphic to the nerve of a category C if and only if, for each $0 < i < n$, the map $S_n \to \Lambda^n_i(S)$ bijective.*

The hypothesis of Proposition 2 resembles the definition of a Kan complex but is different in two important respects. Definition 1 requires that every horn $\sigma \in \Lambda^n_i(S)$ can be filled to an n-simplex of S. Proposition 2 requires this condition only in the case $0 < i < n$ but demands that the n-simplex be unique. Neither condition implies the other, but they admit a common generalization:

Definition 3. A simplicial set S is an *∞-category* if, for each $0 < i < n$, the map $S_n \to \Lambda^n_i(S)$ is surjective.

The notion of an ∞-category was originally introduced (under the name *weak Kan complex*) by Boardman and Vogt, in their work on homotopy invariant algebraic structures (see [1]). The theory has subsequently been developed more extensively by Joyal (who refers to ∞-categories as *quasicategories*); a good reference is [2].

Example 4. Let C be a category. Then the nerve $\{C_n\}_{n\geq 0}$ is an ∞-category, which determines C up to isomorphism. Consequently, we can think of an ∞-category $S = \{S_n\}_{n\geq 0}$ as a kind of generalized category. The *objects* of S are the elements of S_0, and the *morphisms* of S are the elements of S_1. Suppose we are given two morphisms $f, g \in S_1$ that are "composable" (that is, the source of g coincides with the target of f), as depicted in the following diagram



The morphisms f and g determine a horn $\sigma_0 \in \Lambda^2_1(S)$. If S is an ∞-category, then this horn can be filled to obtain a 2-simplex $\sigma \in S_2$. We can then define a new morphism $h : x \to z$ by passing to a face of σ; this morphism can be viewed as a composition of g and f. The 2-simplex σ is generally not unique, so that the composition $h = g \circ f$ is not unambigiously defined. However, one can use the horn-filling conditions of Definition 3 (for $n > 2$) to show that h is well-defined "up to homotopy". This turns out to be good enough: there is a robust theory of ∞-categories, which contains generalizations of most of the basic ideas of category theory (limits and colimits, adjoint functors, ...).

Definition 3 is really only a first step towards a much more ambitious generalization of classical category theory: the theory of *higher categories*. One can think of ∞-categories as higher categories in which every k-morphism is required to be invertible for $k > 1$.

Example 5. For every topological space X, the singular complex $\mathrm{Sing}\, X$ is an ∞-category. Since $\mathrm{Sing}\, X$ determines the space X up to (weak) homotopy equivalence, we can view the theory of ∞-categories as a generalization of classical homotopy theory.

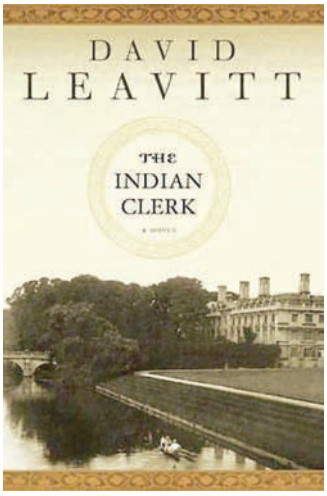
Examples 4 and 5 together convey the spirit of the subject: the theory of ∞-categories can be viewed as a combination of category theory and homotopy theory and has the flavor of both. Where classical category theory provides a language for the study of algebraic structures (groups, rings, vector spaces, ...), the theory of ∞-categories provides an analogous language for describing their homotopy-theoretic counterparts (loop spaces, ring spectra, chain complexes, ...). The power of this language is only beginning to be exploited.

Further Reading

[1] J. M. Boardman and R. M. Vogt, *Homotopy Invariant Structures on Topological Spaces*, Lecture Notes in Mathematics 347, Springer-Verlag, Berlin and New York, 1973.

[2] A. Joyal, Quasi-categories and Kan complexes, *Journal of Pure and Applied Algebra* **175** (2002), 207-222.

Book Review



The Indian Clerk

Reviewed by Heini Halberstam

The Indian Clerk
David Leavitt
Bloomsbury USA, 2007
US$24.95, 496 pages
ISBN 13: 978-15969-1040-9

The Indian Clerk is a fact-based work of fiction about the collaboration between Godfrey Harold Hardy and Srinivasa Ramanujan. David Leavitt, the author, is a very talented writer, and this is a very well written novel. Its protagonist is not as much Ramanujan, of whom there have been memoirs, movies, and biographies, as Hardy. The book follows Hardy in a series of flashbacks as, around the age of sixty, he muses on his collaboration with Ramanujan. While the book focuses primarily on the relationships between the characters, it is sprinkled with mathematical remarks to lend authenticity to the story. Knowledgable readers will easily be able to supply corrections where these are called for.

Readers of the *Notices* will be familiar with at least the outline of the Hardy-Ramanujan collaboration. Many will have enjoyed the excellent biography of Ramanujan by Robert Kanigel, *The Man Who Knew Infinity*, which includes also pretty well all that is known, and likely ever to be known, of the private life of G. H. Hardy, Ramanujan's "discoverer". And some will have read about and perhaps studied, the voluminous papers of Ramanujan as these have been collected or discovered, deciphered, supplied with proofs, and annotated over the years, by several scholars but in the last thirty years or so most notably by the dedicated labors of George Andrews, Bruce Berndt, and their associates. A sample of their enthusiastic explorations appeared in these pages as recently as January of this year. So, as far as the history of this mathematical episode is concerned, readers will find few surprises in *The Indian Clerk*.

Hardy was the principal architect of a renaissance in British pure mathematics. His passionate advocacy on its behalf was partly to balance the dominance of applied mathematics that had prevailed in the U.K. since Newton's day; but whether consciously or unconsciously, it also echoed Oscar Wilde's defense of art for its own sake. Wilde wrote in his "The Decay of Lying":

> Art never expresses anything but itself. It has an independent life, just as thought has, and develops purely on its own lines. It is not necessarily realistic in an age of realism, nor spiritual in an age of faith. So far from being the creation of its time, it is usually in direct opposition to it, and the only history that it preserves for us is the history of its own progress.

As of art, so of pure mathematics, Hardy thought; and he would argue along these lines later, in 1940, in his *A Mathematician's Apology*. He did make one "applied" contribution, to genetics, and this too has been the subject of a recent essay in the *Notices* (March 2008 issue).

In *The Indian Clerk* the reader meets Hardy for the first time at Harvard on the last day of August 1936, when he is about to launch into the first of his twelve lectures on Ramanujan; and in the very first lecture he describes his association with Ramanujan as "the one romantic incident" in his own life. Then, as he continues with descriptions of some of Ramanujan's discoveries, in his own mind he embarks on a parallel account of the romance as it evolved over five years against the grim background of the First World War; perhaps not quite as it happened, but as Leavitt imagined it.

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Ramanujan's famous letter to Hardy arrived in late January 1913. At that time Hardy was thirty-six years old, a Fellow of the Royal Society since 1910, and approaching the height of his powers; collaboration with the twenty-eight-year-old Littlewood had begun a couple of years earlier. Also at that time Ramanujan was ten years younger, very poor, married to a girl who was little more than a child, and under the domination of a formidable mother, Kamalatammal, who "was clever, possessive and exploitative". He already had many mostly unpublished results but only a clerical position with which to support substantial family responsibilities. He had by then failed to get a response from two other eminent British mathematicians.

Hardy studied the letter, passed it to Littlewood, who studied it too, and they decided that Ramanujan should come to Cambridge. As luck would have it, a young mathematical Fellow of Trinity, Eric Neville, and his wife, Alice, were about to leave for Madras, where he was to give some lectures at the university. Neville was charged with looking Ramanujan over and, if reassured, doing everything he could to persuade him to come to England. Neville was completely successful; not only did Ramanujan agree to come despite some religious objections, but Neville charmed Madras University into granting Ramanujan a stipend and travel expenses; and so all three, the Nevilles and Ramanujan, arrived in England in April 1914, just before the outbreak of war.

While they were waiting for this arrival, Hardy and Littlewood have been busy: Hardy has proved that the Riemann zeta function has infinitely many zeros on the critical line, and Littlewood has shown that, despite all available numerical evidence to the contrary, $\pi(x) - \ell i(x)$ changes sign infinitely often as x tends to infinity, for the first time unimaginably far out. These exciting results have sharpened their appetite for Ramanujan's arrival; perhaps he will settle the Riemann Hypothesis! Also in this intervening period, the reader is introduced to Hardy's social circle, the Apostles, at one of their regular Saturday meetings. The Apostles are a (not so) "secret" society that numbered among its members at that time some of the most brilliant and influential men of the age, many of them gay, as Hardy was: we meet the philosophers G. E. Moore, Bertrand Russell, Wittgenstein, McTaggart—who wrote an eloquent defense of love between men—the economist Maynard Keynes, the historian Trevelyan, the writer Lytton Strachey, the poet Rupert Brooke, and Hardy of course. E. M. Forster was of that number too, but there is no mention of him in the book—he described homosexuals as standing "at a slight angle to the universe", and was one himself. Hardy speaks of these gifted people as "the men who will determine England's future". The Apostles were dedicated to tolerance, open-mindedness, and free discussion of topics taboo in Victorian/Edwardian mores, homoeroticism for example; and at the meeting the reader encounters several homosexual affairs in full swing, but Hardy stands aloof on this occasion; he himself has had relations with Moore and Harry Norton, but just then (we are told) he dreams instead of Ramanujan, and visualizes him as not unlike a handsome Indian cricketer he has observed around town. His anticipation is keen.

As Hardy muses about the past, the reader learns about Hardy's youth, his smooth progress from Cranleigh prep school via Winchester to Trinity College Cambridge where, in 1900, he wins a Prize Fellowship; at the same time we learn about Ramanujan's early struggles. There is much about the mathematical Tripos, the formidable but atrophied examination hurdle that aspiring mathematicians had to overcome to get a foot on the career ladder; later Hardy would work hard to overhaul the system, but it remains formidable to this day, even if more in tune with the current state of the subject. In 1905 Littlewood had been Senior Wrangler, joint with James Mercer. Hardy had coached Mercer for the exam, and, Leavitt writes, had found Mercer attractive, with "his sea-glass beauty" and eyes that were "a luminous grey-green"; he felt proud of Mercer's success but realized that Mercer, coming from a modest background like his own, had reached his peak, whereas Littlewood, from a family with deep Cambridge roots and several years younger, stood fresh at the threshold of his career with all his powder dry. Littlewood's early mentor was Barnes, later Bishop of Birmingham, and he, noting Littlewood's talent early, had proposed the Riemann Hypothesis to him as a research problem!

At the time Hardy was coaching Mercer he was in the midst of a passionate affair with Russell K. Gaye, a promising classicist. They were sharing rooms and were devoted to each other and to their cats. Then Gaye lost his fellowship, and there is a suggestion in the book that perhaps Hardy's affection had cooled; later Gaye committed suicide by shooting himself. The affair is rarely far from Hardy's thoughts; self-reproach haunts him throughout the tale, and one feels that it will be with him for the rest of his life.

Early on the reader encounters Gertrude, Hardy's spinster sister, who is art mistress at St. Catherine's School, sister institution to Hardy's prep school in Cranleigh, Surrey, and also looks after their ailing mother. Watching Littlewood in Gertrude's company, Hardy realized that Littlewood liked women and that women liked him.

Alice Neville is a very engaging invention, based on the actual Mrs. Neville, and she is an important character in the story, often at odds with Hardy in the treatment of Ramanujan. The reader meets her first in Madras, in a hotel restaurant, observing the British colonials at their leisure and, with a guide-book at her side, dreaming of the mysterious

East that she would love to explore but knows she never will. Unlike Hardy or Littlewood, she shows a humane interest in Ramanujan's welfare and wants to mother him. Ramanujan lives with the Nevilles for his first six weeks in Cambridge, and Alice arranges dinner parties for him to meet university notables. She teaches him table manners and studies his dietary preferences; she understands from the first that food will be a major problem for him. She introduces him to Gilbert and Sullivan and to jig-saws, and falls in love with him. In contrast Hardy detests her cooking and is impatient to get Ramanujan away from her care and into mathematics. Later, in conversation with her husband, she will say:

> I've always had the sense that Hardy looks upon him…as a sort of mathematician machine, to be milked for everything he's worth before he breaks down. But he doesn't care at all about the poor man's happiness, about what he might need, or how he's managing with the cold weather. He works him like a dray horse.

This is not entirely fair, because Hardy does try to engage Ramanujan in conversation and to get to know him; it is not easy at first because Ramanujan "rarely speaks except when spoken to, and when he is questioned, almost always answers by dipping into a reserve of stock replies, no doubt purchased on the same shopping trip in Madras during which he was supplied with trousers, socks, and underwear. Replies such as: 'Yes, it is very lovely', 'Thank you, my mother and wife are well', 'The political situation is indeed very complex'. Hardy can't begin to penetrate his carapace of cultivated inscrutability." And when it comes to talking mathematics, Ramanujan just isn't interested in proofs or the aesthetics of mathematics argument; "Hardy feels the man's soul is a mystery," his mind a vessel of intuitions.

Ramanujan is not so helpless as far as social contacts are concerned; he gets to know Indians studying in Cambridge, dines with them, and sometimes makes excursions to London in their company. When he leaves the Nevilles to go into rooms in college, he cooks for himself, and he has supplies sent from home. As the war progresses this becomes difficult, and good vegetables are hard to come by. He is in regular correspondence with his mother, but he worries about his young wife, who does not write and whose whereabouts are often uncertain. One thing becomes clear—Ramanujan is not interested in sex; not with Alice, although she feels he likes her, and not with Hardy. As Kanigel remarked of the two men, "their friendship would never ripen into intimacy." Indeed, there is some question whether intimacy of any kind with anyone is within Ramanujan's capacity; before his marriage he had been operated on for a malignancy of the scrotum and could not have sex for a year—Leavitt writes, "he knew no conjugal happiness" with his wife Janaki. However my colleague Bruce Berndt tells me that when he last talked with Mrs. Ramanujan in 1993 (she died the following year aged 95), she was happy to contradict this remark! He learned also that when as a young woman she lived with her mother-in-law it would not have been proper for her to write directly to her husband; any messages she had for him would have had to be passed on by her mother-in-law.

Littlewood, straightforward, robust and confident of his powers, also has a secret private life, but in his case it is fulfilling; with Anne, his mistress hidden away in Treen in Cornwall, whom he visits at weekends as often as he can manage, and with whom eventually he has a daughter. Littlewood enlists early in the war in the Royal Artillery and spends the war years working on ballistics. His mathematical activity continues intermittently, and he finishes the war as a first lieutenant.

The war changes life in Cambridge. Young men enlist, word of casualties soon begins to trickle back, the college becomes a hospital, and landladies in the city suffer economic hardship. Russell is an ardent and vocal pacifist; Neville is a pacifist too, although he would have been excused service on medical grounds; and Hardy, though not a pacifist, strongly disapproves of the war and considers it to have been entirely unnecessary. He feels strong kinship with his German colleagues, especially those in Göttingen, the citadel of pure mathematics. Reports of German atrocities multiply and spread far and wide. The college authorities are strongly pro-war, increasingly so as the war progresses, and they come down heavily on fellows who oppose it. Hardy takes to visiting the wounded, and in the process the author has him initiate an affair with one soldier. Hardy himself has not enlisted, which at his age is not surprising. But if called up he'd serve; he views the trenches preferable to prison. Russell, vehemently against the war, would be arrested, sent to prison, and deprived of his Trinity Fellowship. Hardy defends Russell strenuously and works in vain to have him reinstated. However Russell doesn't mind being in prison, where he gets much work done. What would ruin an ordinary person leaves Russell's social status intact. Much later Hardy will write an account of the Russell affair for private circulation.

Eventually, Hardy did get past Ramanujan's "impenetrable" ways. He helped him to publish a paper in the *Oxford Quarterly Journal*, to get him off the ground, and he himself took up a subject that had been interesting Ramanujan for some time: the partition of integers; they began to work on $p(n)$, the numbers of ways of writing a natural number n as the sum of positive integers, and they arrived at a remarkably accurate formula

for it. Some readers will be familiar with the eloquent account Littlewood gave much later of this collaboration in his review of Ramanujan's *Collected Papers*. There was some heavy analysis that only Hardy could carry out, but on the way there, Ramanujan came up with two quite distinct, unexpected, and spectacular insights that were crucial, and Littlewood concluded: "We owe the theorem to a singularly happy collaboration of two men of quite unlike gifts, in which each contributed the best, most characteristic, and most fortunate work that was in him. Ramanujan's genius did have this one opportunity worthy of it." No less significant was the invention of the circle method in the course of this work; it led Hardy to his papers on the representation of numbers as sums of squares, and would lead Hardy and Littlewood, in the 1920s, to their famous sequence of papers on "Partitio Numerorum" and thence to a whole industry of work on Waring's Problem and allied additive questions. And there was their pioneering contribution to probabilistic number theory when they proved that almost all integers n have about $\log\log n$ prime divisors. There can be no doubt that Hardy was thrilled with these results. In 1917 he put Ramanujan up for a Trinity Fellowship, having previously secured for him, somehow, a Cambridge B.A.; but he failed, partly because of racial prejudice and partly because his anti-war advocacy had made him enemies. Undaunted, Hardy put Ramanujan up next for the Royal Society, having cleared the way with the physicist J. J. Thompson, then president of the R. S.; Ramanujan was elected at the first attempt—a remarkable achievement! It had taken Hardy himself three goes to get elected. Then Hardy and Littlewood put Ramanujan up again for a Trinity Fellowship, and this time they succeeded, not because prejudice had disappeared but because J. J. Thompson was now the new Master of Trinity and it would have been embarrassing to turn down an F.R.S.!

Hardy was all his adult life an active member of the London Mathematical Society (LMS); he would have seen it as a venue in which to promote the right kind of pure mathematics. He attended its meetings regularly and served twice as its secretary and twice as its president. Hardy used one occasion to present a result of Ramanujan's, and another time he lectured on their new joint work. In Leavitt's book it is reported that on neither occasion did it occur to Hardy to bring Ramanujan with him!

Hardy's mother dies, after lingering on the brink for many days. Gertrude struggles with her mother's demands in the last stages, with little help from her brother, who is preoccupied with his own affairs; also increasingly he is aware that Ramanujan is not well. There had been a break in their work on partitions when Ramanujan was ill, and Hardy had taken the opportunity to visit Harald Bohr in Denmark. On the occasion of the return crossing Hardy, a convinced atheist, tries to outwit God, his enemy; he sends out postcards to Littlewood and others, claiming that he had proved RH. God will not tolerate this, he knows, and therefore will bring him back safely to England!

Ramanujan's illness had indeed been getting worse, and from the middle of 1917 he moved through a sequence of nursing homes and sanatoria, subject to a succession of diagnoses, all of which turned out to be wrong, and treatments, none of which helped. On one trip to London he was caught in a zeppelin air-raid, which he saw later as judgment on himself for having inadvertently ingested some powdered egg in a drink of Ovaltine at his London lodging; and on another he attempted suicide at Marble Arch Underground station. Hardy managed on that occasion to get him out of trouble with the law by describing Ramanujan, a little prematurely, as a very distinguished mathematician and an F.R.S.

The war ended, and Ramanujan's health improved for a time. He began to work again and to prepare his return home. Now Madras University was proud of his fame and offered him arrangements that he regarded if anything as too generous. He was back in Madras in 1919, now very comfortably housed, and he worked intensely for another year, mostly on mock-theta functions. He died on April 26, 1920, with Janaki, his wife, by his side.

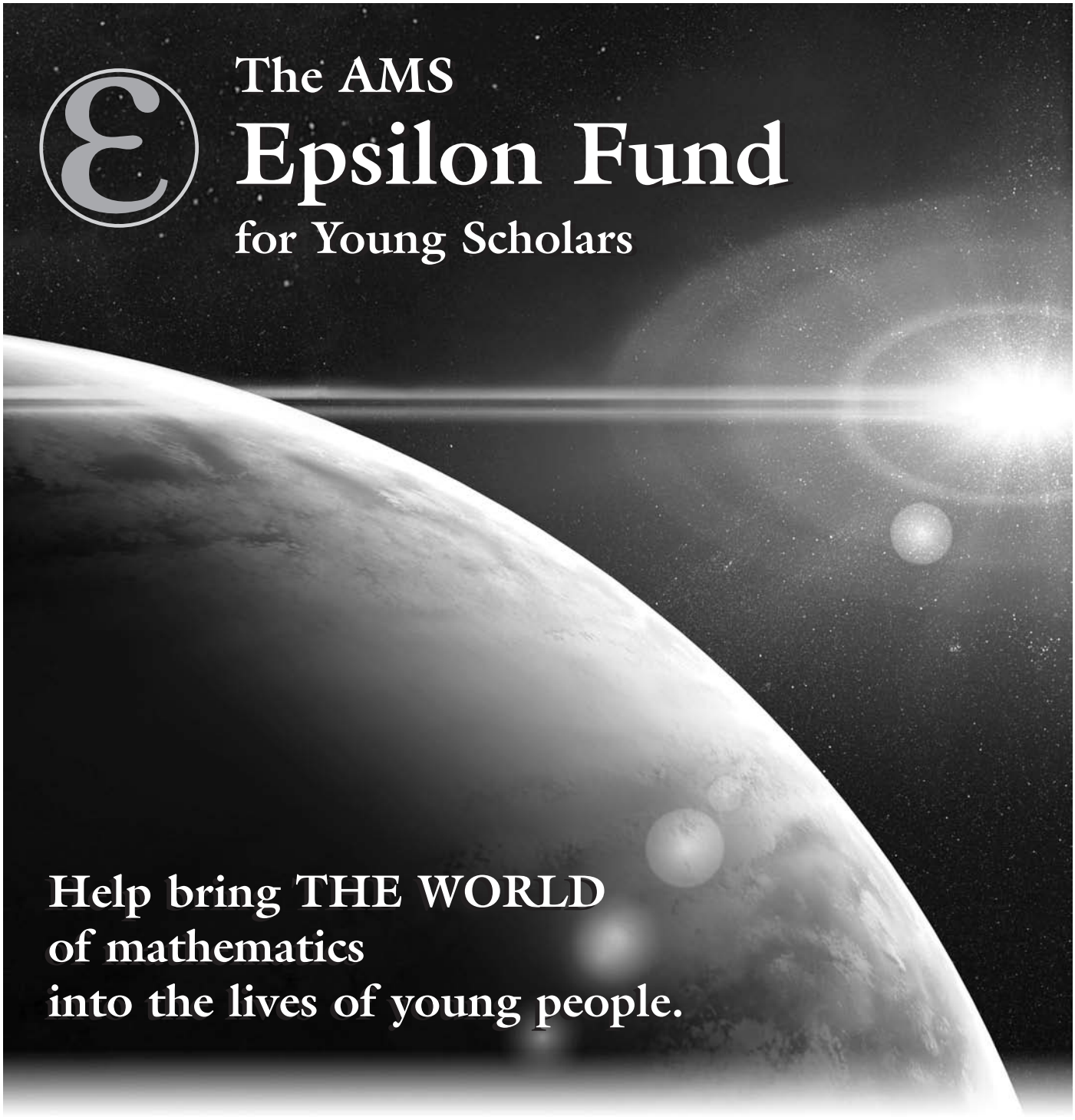
As a biographical fragment the story Leavitt tells is not far from the truth, but I have no way of telling whether Hardy was quite as self-absorbed, and as inattentive to Ramanujan's problems, as the book suggests. The story is beautifully told in a manner that Hardy, himself a brilliant writer of English prose, would have admired. I don't doubt that the author was attracted to Hardy's personality because Hardy was a closeted homosexual in the time of the Apostles and of Bloomsbury, where he had many friends. There will be readers who do not want to know about this aspect of Hardy's nature—there are always people who don't want to know. But perhaps even they will be persuaded to read, or re-read, C. P. Snow's Foreword to Hardy's *A Mathematician's Apology*, a portrait of Hardy that is more flattering than Leavitt's but not out of tune with it. And of course, for sheer quality of style, the *Apology* is always worth re-reading, as also is Hardy's Oxford inaugural lecture.

Hardy moved to Oxford in 1920, tired of the squabbles that had been linked to the Russell affair, but returned to Cambridge in 1931, partly because at Trinity he would not have to move out of his rooms on retirement. Retirement was more of a problem in those days when pensions did not exist; and Hardy saved carefully for his old age. He died in December 1947, and I remember the announcement on the BBC evening news. As Snow reported, he had had a coronary thrombosis

in 1937, and he had made, echoing Ramanujan, a unsuccessful suicide attempt the year before his death. He left all his savings to Gertrude, his sister, and she passed them on her death to the LMS. I happened to be on the Council of the LMS in the late 1950s when this news arrived, and I well remember the change that this, together with the royalties from his books, brought in the finances of the Society.

About Ramanujan's illness, there is a persuasive diagnosis by Dr. D. A. B. Young in an essay in *Ramanujan: Essays and Surveys*, edited by Bruce C. Berndt and Robert A. Rankin, published by the AMS and LMS as volume 22 of their *History of Mathematics* series in 2001; the conclusion is that he suffered from hepatic amoebiosis, a tropical disease, and, given the right treatment, might have been cured, even at quite a late stage. So the concerns attributed to Alice Neville in the story appear to have been justified, at least in some measure.

Neville lost his Trinity Fellowship as described in the book. He became professor of mathematics at the University of Reading, and I remember him, an amiable old gentleman with a head of white hair, from early meetings of the British Mathematical Colloquium. I did meet Littlewood a couple of times when dining at Trinity, but Oliver Atkin and Freeman Dyson, former students of Littlewood in this country, would have more vivid memories of him.



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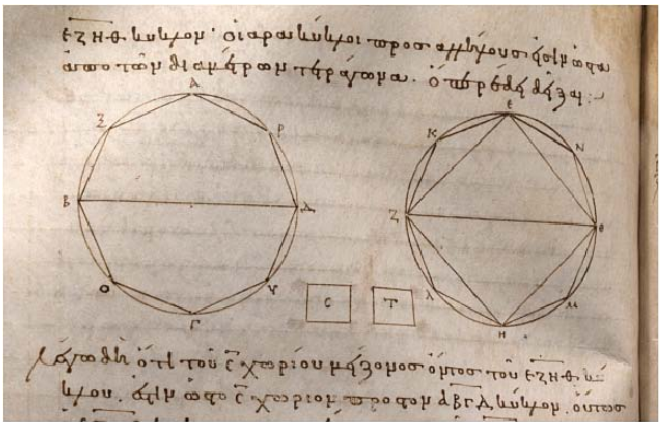
09/04

About the Cover

Measurement of a circle

This month's cover is the diagram accompanying XII.2 from Euclid's *Elements*, taken from the D'Orville manuscript, copied in 888 A. D. and now at the Bodleian Library of Oxford University. This is one of the two oldest extant complete manuscripts of the *Elements*. The entire manuscript has been photographed and made available at the Clay Institute's website `http://www.claymath.org/library/historical/euclid/`.



The cover loosely accompanies Len Berggren's review in this issue of *The Archimedes Codex* by Reviel Netz and Will Noel (see also the cover for the August issue of the *Notices*). Much of Archimedes' greatest mathematics involves what was a long time after him called the "method of exhaustion". He himself seems to attribute the technique to Eudoxus, a contemporary of Plato. But our source for Eudoxus' results is Book XII of the *Elements*, which applies it several times, including to the proof of XII.2. In modern notation the Proposition is stated like this: *Given two circles C_i of radii r_i with areas A_i*

$$A_1 : A_2 = r_1^2 : r_2^2 .$$

Euclid didn't have algebraic techniques available to him, but even so results of Book V of the *Elements* then imply that

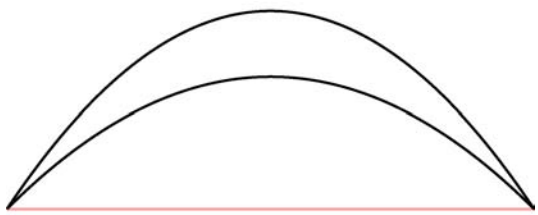
$$A_1 : r_1^2 = A_2 : r_2^2 .$$

The ratio A/r^2 must therefore be the same for all circles, and it's hard not to think that this must have occurred to Euclid. But he never mentions anything like it in anything that has come down to us.

The Greek notion of ratio is rather complicated, but it is essentially the same as what we would call a real number, and to us the invariant ratio is of course the number π. It was Archimedes who took the matter up in what was perhaps his most popular work, "Measurement of a circle". It has come down to us in a strange form, however—abbreviated, sloppily written, and with no trace of the Sicilian variant of the Doric dialect which is apparent in many of his other writings.This is one of the pieces contained in the Archimedes Palimpsest, and it would have been marvelous if the copy there gave us something new. Unfortunately, as Netz writes to us:

> Substantial fragments of "Measurement of a circle" survive in the Palimpsest. They present serious problems of legibility, as the parchment is very damaged. (They happen to come from pages positioned right at the end of the prayer book). Images are available but are not very informative. The text that can be recovered agrees very well indeed with that known from elsewhere so apparently no new light is thrown on the textual history of the treatise—which is indeed a well known puzzle.

One would like to understand what led Archimedes to look at the circle differently from Euclid, and to approximate π numerically. Was there any earlier discussion of this ratio? Or did Archimedes do something completely new? One technical point new in Archimedes is that he discusses confidently the lengths of curves. The question about the ratio A/r^2 arises without any reference to arc length, but one of Archimedes' insights was to translate it into a question about the length of the circumference of a circle. Modern mathematics defines this to be a limit, but we also know that the limit for arbitrary curves sometimes doesn't exist. Archimedes gets around this difficulty in a clever way, one that seems to me one of his most remarkable achievements. He deals with the problem of lengths of curved paths as well as the area of curved surfaces explicitly in his work "Sphere and cylinder"—he doesn't define the length of a curve, but he axiomatizes its properties for the restricted class of convex arcs. The important part of the characterization is that if one is given two convex arcs between two points P and Q with one arc inside the other, like this—



—then the length of the inside arc is less than or equal to that of the outer one. This is somewhat intuitively apparent, but doesn't seem quite obvious enough to qualify it as an axiom. The case where the inner arc is a single line segment and the outer one is a pair of them is Proposition I.20 of the *Elements*, and that in which both consist of a pair of segments is I.21. Other special cases were later discussed by Archimedes' sixth century commentator Eutocius (available in English in Netz' edition of Archimedes' works). The general case is then an application of mathematical induction. One can speculate that Archimedes was reassured by consideration of at least a few cases of this kind.

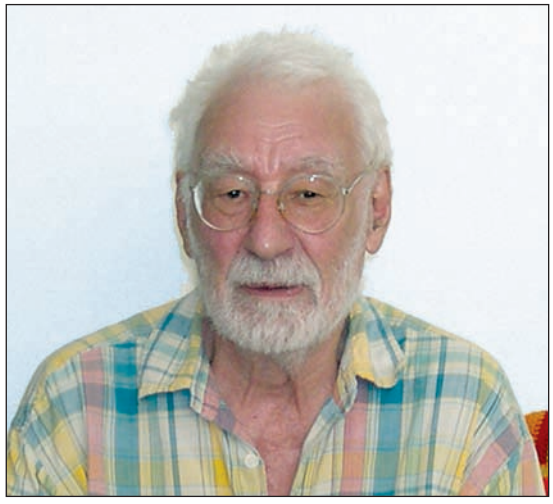
—Bill Casselman, Graphics Editor

Michel Kervaire 1927–2007

Shalom Eliahou, Pierre de la Harpe, Jean-Claude Hausmann, and Claude Weber

Michel Kervaire died on November 19, 2007, in Geneva. He was born in Poland on April 26, 1927. His secondary school education was in France and he studied mathematics at Eigdenössisches Technische Hochschule Zurich, defending his thesis in 1955 under the supervision of Heinz Hopf. He published a second thesis in France in 1965. He was a professor in New York (1959–1971) and in Geneva (1972–2007), with several long-term academic visits to Princeton, Paris, Chicago, Massachusetts Institute of Technology, Cambridge (UK) and Bombay. He was very active as editor of *Commentarii Mathematici Helvetici* (1980–2001) and chief editor of *L'Enseignement Mathématique* (1978–2007). He had an h.c. doctorate from Neuchâtel (1986).

Kervaire was an inspiring example that a mathematician can be both a generalist and a specialist at the highest level. As a generalist he knew how to appreciate a large range of subjects and encourage others to progress in their work. Among other things, he organized uncountably many meetings in the small mountain village of Les Plans-sur-Bex, mixing younger students with the best international specialists in all kinds of domains: Brauer groups, foliations, arithmetic, von Neumann algebras, knot theory, representations of Lie groups, the theory of codes, ergodic theory and finite groups (to name but a few). As a specialist, he made his mark in several subjects: he strongly contributed to changing differential topology and homotopy theory from the mid-1950s onwards; he created the subject of high-dimensional knots; he formulated a famous conjecture (still open) in abstract group theory and he made deep contributions on problems mixing algebra, number theory, and combinatorics.



Photograph by Teresa Dib.

Michel Kervaire, 2005.

The Kervaire Manifold and the Kervaire-Milnor Results

In his 1960 *Commentarii* paper, Kervaire constructed the first example in history of a closed topological manifold (indeed a PL manifold) that does not admit any differentiable structure, not

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The first author was one of the many Ph.D. students of Kervaire. The other three authors were colleagues of Kervaire in Geneva. The text of this article previously appeared in the European Mathematical Society Newsletter, *March 2008. A* longer version appeared in French in *La Gazette des Mathématiciens,* April 2008.

even up to homotopy type. This 10-dimensional manifold is now known as the Kervaire manifold. The main tools include an invariant of quadratic forms defined over the field of two elements (the Arf invariant) and deep results on stable homotopy groups of spheres; the closely related Kervaire invariant is now important in this subject.

In the mid-1950s Milnor had discovered that, on the sphere of dimension 7, there exists a differentiable structure that is not diffeomorphic to the standard one. In their 1963 *Annals* paper Kervaire and Milnor showed that the set of differentiable structures on S^n, which for $n \neq 3,4$ is also the set of h-cobordism classes of smooth homotopy n-spheres, is a finite abelian group. In particular, S^7 has exactly twenty-eight differentiable structures.

Thus a topological or a PL manifold can have zero or more than one differentiable structures. This was a revolution in our understanding of regularity conditions in topology. The work of Kervaire and Milnor (first independently and then jointly) is a gem from this flourishing time of the topology of manifolds. It announces most of the capital discoveries of the next period: Browder-Novikov, Wall, Sullivan, Kirby-Siebenmann and so on.

From High-dimensional Knots to the Kervaire Conjecture and to Later Work

In his French thesis (*Bull. Soc. Math. France*, 1965), Kervaire created the theory of high-dimensional knots, namely that of smooth embeddings of homotopy n-spheres in the $(n+2)$-sphere, for $n \geq 2$. His first result is a characterization by three purely group-theoretic conditions of those finitely presented groups that can be fundamental groups of knot complements $S^{n+2} \setminus S^n$, for any $n \geq 3$ (stating results for $n = 2$ would require too much space here). The proof involves completely original arguments, using the new technique of surgery. The same paper was also the origin of knot modules and of the cobordism of knots.

A by-product of this was the following conjecture, first stated by Kervaire in 1963–4 during conversations with G. Baumslag: let G be a group presented by generators and relations; if adding one generator and one relation gives rise to the trivial group, then G itself is (conjecturally) trivial. This has been solved in the torsion-free case by Klyachko (1993) but the full conjecture is still open.

Kervaire knew much more than the topics he published about; he was an expert on many subjects of arithmetic, algebra, and combinatorics: class field theory, quadratic forms, algebraic K-theory, etc. In the last twenty years he published nearly thirty papers, most of them on the borderline between algebra and combinatorics, covering subjects such as commutative algebra (the so-called Eliahou-Kervaire resolution for stable monomial ideals in polynomial rings), the Hadamard conjecture (on square matrices having ± 1 entries that are orthogonal up to a factor), the possible lengths of Golay complementary pairs of sequences of ± 1 (the original proof used properties of cyclotomic integers) and vast generalizations of the Cauchy-Davenport theorem from additive number theory (given integers $r, s \geq 1$ and a group G, say abelian here, the question is to compute the minimal size of all sets of sums $a + b$ where a, b range in subsets A, B of cardinality r, s respectively).

Michel Kervaire had a special gift for turning moments of life into celebration: at the blackboard; enjoying a coffee, offering great wines or memorable meals, sometimes in restaurants and sometimes at home with his wife, painter Aimée Moreau.

Grothendieck at 80, IHES at 50

Allyn Jackson

On March 28, 2008, Alexander Grothendieck turned eighty years old. Coincidentally, the day before that date was the kick-off of the fiftieth anniversary celebration of the Institut des Hautes Etudes Scientifiques (IHES). The names of Grothendieck and IHES will forever be linked, for he and Jean Dieudonné were the first professors appointed to the institute when it was founded by the businessman Léon Motchane in 1958. Grothendieck was really the one who launched the IHES as a thriving international center for mathematical research. With his abrupt resignation from the institute in 1970 he began a process not only of severing ties to the IHES and the mathematical community but of isolating himself from his friends and family, and indeed from all of human society, as Winfried Scharlau describes in his article "Who is Alexander Grothendieck?" in this issue of the *Notices*. Grothendieck's life today, spent in self-imposed isolation in a remote village in the Pyrenées, seems especially distant from the IHES in this anniversary year, as the institute celebrates its ever-rising profile as an established meeting point for researchers. Still, Grothendieck's impact on the IHES, and its impact on him, remain strong to this day.

Much has changed for the IHES in the past half-century. From a tiny two-professor enterprise that in 1958 did not even have its own quarters and that appeared to have a pretty precarious future, the institute has grown into a leading international center for mathematics and theoretical physics with a small but outstanding permanent faculty of six professors—half of them Fields Medalists—and an active visitor program. As befits its status in the world of research, the IHES is marking its sesquicentennial in grand style, with a year-long series of events in Paris, Chicago, New York, Japan, and China. Another part of the celebration is an exhibition, called *Les Déchiffreurs* in French and *The Unravelers* in English, which explores the lives and thoughts of people who do fundamental research. The exhibition will open in Paris in September and will travel to New York City in November. An accompanying book, with the same title as the exhibition, has been published in French by Belin, in English by A K Peters, and in Japanese by Springer. In honor of the fiftieth anniversary, mathematician and philanthropist James Simons, together with his wife Marilyn, gave the IHES a 6 million euro (about US$9 million) challenge gift. In addition, the institute has begun a fundraising campaign with the aim of collecting 20 million euros over the coming five years.

That the kick-off of the IHES anniversary celebration fell on the day before Grothendieck's eightieth birthday was pure coincidence: The date was dictated by the schedules of the invited speakers, particularly some high French government officials with jam-packed calendars. Unsurprisingly, Grothendieck did not attend, but his presence was keenly felt. Valentin Poénaru, a retired professor at the Université de Paris Orsay and a friend of Grothendieck's during the 1970s, attended the celebration and said he was struck by the strong presence of the "absent house-ghost" (Poénaru has written a brief memoir about Grothendieck, which also appears in this issue of the *Notices*). Grothendieck's name arose in many of the private conversations among attendees as well as in the lectures, particularly those by Yuri Manin, David Mumford, and David Ruelle, each of whom spoke extensively about Grothendieck and the importance of his work. His presence will grow yet stronger in this anniversary year, with the decision by the IHES to publish his massive treatise *Récoltes et Semailles*. The entire work has been available for some time on the Internet but has never appeared in published form in the original French (a

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Japanese translation was published in the 1990s). It is expected to come out in autumn 2008.

In his *Notices* article, Scharlau carries out a careful examination of what he sees as the probable causes of Grothendieck's withdrawal from the mathematical community. David Ruelle, a retired IHES physics professor who overlapped for some years with Grothendieck, provides his own perspective in his book *The Mathematician's Brain* (Princeton University Press, 2007), which contains a chapter about Grothendieck. Ruelle traces Grothendieck's withdrawal and isolation in part to his having been an outsider in the French system of research. In this system, Ruelle writes, "it is all important whether you are from the Ecole Normale [Supérieure] or the Ecole Polytechnique, in whose lab you were accepted, whether you are at the CNRS [Centre National de la Recherche Scientifique], the academy, a suitable political party, and so on." Being part of such a group means one can count on its help. Ruelle goes on to say:

> In the case of Grothendieck, he was nothing (not even having at the time French or any other citizenship). He was nobody's responsibility; he was just an embarassment.
>
> Understandably, some people would like to blame Grothendieck's exclusion entirely on Grothendieck himself: he went crazy and left mathematics. But this does not fit with the known facts and their chronology. Something shameful has taken place. And the disposal of Grothendieck will remain a disgrace in the history of twentieth-century mathematics.

IHES professor Laurent Lafforgue was appointed to the institute in 2000, long after Grothendieck's departure. He agrees that what happened to Grothendieck was "shameful" but is skeptical that being an outsider in the French system was an important factor. Grothendieck's overwhelming personality crushed some people, Lafforgue said, and his mathematical prowess inspired envy. As a result, many were relieved when Grothendieck started behaving in a radical fashion and thereby furnished a reason for them to turn away from him. But perhaps the crucial factor was Grothendieck's rejection of scientism, the belief that science is above everything else. "Here was one of the greatest scientists of the century appearing to want to question the value of science," Lafforgue wrote in an email message. "This is probably the thing that was the most scandalous for the whole scientific community (not only in France but the world over) and that provoked in this community a reaction of rejection towards him."

Six months to the day before the start of the IHES anniversary celebration, Grothendieck wrote to the institute with a request for books. The IHES sent him the books as quickly as it could. But the exchange of letters between Grothendieck and the IHES administration culminated in his writing a furious "open letter" recounting his view of the exchange, which he took as deeply insulting towards him. He requested that copies of the open letter be sent to all members of the IHES Scientific Council and explicitly states that this letter is public (though he also says he will make no efforts on his own to publicize it). Having seen the open letter, I can say that it conveys an extreme outrage that indicates how difficult it would be to conduct reasonable communication with him.

At the same time, the open letter reveals the vivid personal tie that Grothendieck clearly still feels to the IHES. The letter also reveals an isolated individual who is reaching out in the only way he is able. In one place he speaks of his open letter as being a letter of farewell ("adieu") to a world with which he no longer has anything in common. He ends on a note of apocalyptic foreboding, saying "that the time is near when…this letter, this *cry* will be known *by all*. In a world of the *living*." This cry does not seem to concern a misunderstanding over his original request for books. Rather, it speaks of anguish in the heart of one of the great mathematicians of modern times.

Grothendieck in the News

Grothendieck's eightieth birthday inspired several articles in the popular media, including the following:

"In höheren Dimensionen (In higher Dimensions)", by Winfried Scharlau, *Die Zeit*, March 27, 2008.

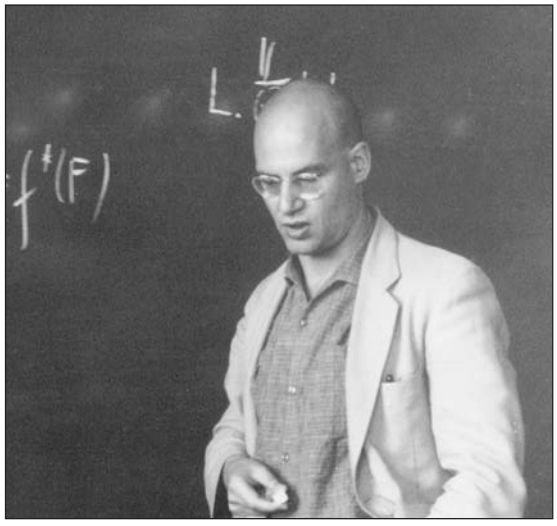
"Verschollenes Genie (Missing Genius)", *Neues Zürcher Zeitung*, by George Szpiro, April 27, 2008.

"Sensitivity to the Harmony of Things", by Julie Rehmeyer, *Science News Online*, May 9, 2008.

"Autour d'Alexandre Grothendieck" (Around Alexander Grothendieck), a broadcast on Radio France featuring Denis Guedj, Michel Demazure, and Laurent Lafforgue, June 2, 2008.

Memories of Shourik

Valentin Poénaru



Photograph courtesy of Friedrich Hirzebruch.

Alexander Grothendieck, around 1965.

I knew Alexander Grothendieck during the period 1962–1969, a time when we were very close. I arrived in Paris in mid-September 1962, after a fantastic departure from Romania (but that's another story)—or, more precisely, I arrived in Bures-sur-Yvette. My friend Barry Mazur and his very young wife Gretchen, who was 17 at the time, lived in the Residence Gratien of the Institut des Hautes Etudes Scientifiques (IHES). Barry was visiting the institute for the 1962–63 year, and right at the start of my adventure I stayed with him and his wife. This was how I quickly came to know Léon Motchane (IHES director), Annie Rolland (IHES secretary and later Motchane's wife), and of course Grothendieck. The IHES quickly decided to support me, and I have since that time remained more or less associated with the institute.

The Grothendieck I knew at this time was a very impressive person, and when I say this I am not thinking only of mathematics. Shourik, as I called him, was one of the strongest and most charismatic people I have ever met. I think of him as a character straight out of Dostoyevsky. He was also a person of great kindness and generosity. He seemed always to be in good spirits, with great mental equilibrium and also, in his own way, a certain *joie de vivre*.

At the time, he had the capacity to be able to sleep when he wanted to, and for the number of hours he wanted to, in order to take up his work all the better afterward. In fact, his capacity for work was to me something miraculous. His long workday was divided, in a very systematic and organized manner, between the redaction of *Eléments de Géométrie Algébrique* (one page of Grothendieck for four pages finalized by the pen of Dieudonné, who, with great technical virtuosity and little profundity, did not always understand what he was writing; I am quoting Grothendieck here, because one can be generous and nevertheless render severe judgments…), redaction of the *Séminaire de Géométrie Algébrique*, and the exploration of new directions, such as forming the outlines of étale and crystalline cohomology.

I learned from Shourik how to pursue several mathematical projects at the same time, in order to avoid turning in circles around a difficulty; one must pass on to something else in order to forget and then come back later with a fresh viewpoint. In fact, Grothendieck spent a lot of time on various problems that were quite different from what the world knows of his work: the Hauptvermutung and triangulability for topological varieties, division of distributions by a real analytic function (where he reached the theorem of gluing and the inequality of Lojasiewicz, without however succeeding in proving them), etc.

Although his culture suffered from certain lacunas, especially in the sciences outside of mathematics, he was very well informed about all

Valentin Poénaru is professor emeritus at the University of Paris, Orsay. His email address is valpoe@hotmail.com.

kinds of things. At the end of 1962 he was practically my only Parisian colleague who understood exactly what was happening in Eastern Europe at that time without letting himself become a prisoner of Communist propaganda, which was still very strong then. For a fresh refugee like myself, this was very important. I was often at the table of Shourik and his wife Mireille, who always received me royally; I had the impression of returning to my family house.

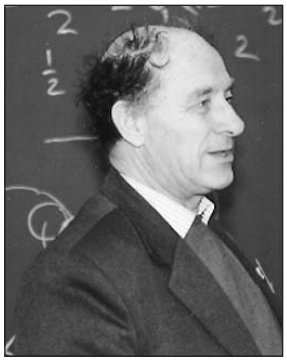
Around 1967 I sensed in Grothendieck some changes, as if a great crisis, personal and global, had commenced. The good spirits and the *joie de vivre*, which I mentioned earlier, started to disappear. His marriage started to break down; his affair with another woman certainly did not help matters.

But I think that above all, he started to tire of the style of doing mathematics that he had imposed on himself. In my opinion, this style deprived him of the elementary pleasures that mathematical activity can provide. Where we others would be exploring footpaths, he was building highways. Note in addition the contrast between the Grothdieck of the period of topological vector spaces, EGA, and SGA, and that of the period of *Esquisse d'un Programme*, the Grothdieck of *dessins d'enfants*, of motives, or of anabelian geometry. (I am thinking here not only of mathematics.)

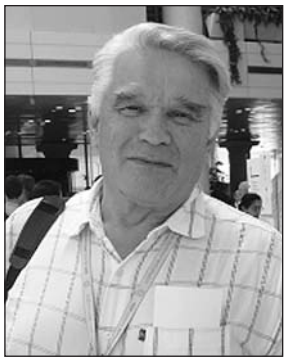
Then came 1968. I still remember very well how the Shourik that I had "always" known entered the tumultuous gatherings on the Orsay campus, in order to defend mathematics before the students and assistants who were in revolt. And there he was received with an enormous wave of rejection and hatred, which profoundly shocked him. The crisis that had been smoldering had already bifurcated in a brutal turning point, out of which emerged another Grothendieck, very different from the one I had known.

Our close relations continued for about two years more. During this time, Shourik sought another path. The group "Survivre" came into being, as did the absolute requirement to follow the new Messiah in all his tribulations. And, from that moment forward, we saw much less of him.

Arnold and Faddeev Receive 2008 Shaw Prize



Vladimir Arnold



Ludwig Faddeev

On June 10, 2008, the Shaw Foundation announced it would award its annual Shaw Prize in Mathematical Sciences to VLADIMIR ARNOLD and LUDWIG FADDEEV "for their widespread and influential contributions to Mathematical Physics". The prize carries a cash award of US$1 million.

The Shaw Prize in Mathematical Sciences committee made the following statement:

"Vladimir Arnold, together with Andrei Kolmogorov and Jürgen Moser, made fundamental contributions to the study of stability in dynamical systems, exemplified by the motion of the planets round the sun. This work laid the foundation for all subsequent developments right up to the present time.

"Arnold also produced extremely fruitful ideas, relating classical mechanics to questions of topology. This includes the famous Arnold Conjecture, which was only recently solved.

"In classical hydrodynamics the basic equations of an ideal fluid were derived by Euler in 1757, and major steps towards understanding them were taken by Helmholtz in 1858 and Kelvin in 1869. The next significant breakthrough was made by Arnold a century later, and this has provided the basis for more recent work.

"Ludwig Faddeev has made many important contributions to quantum physics. Together with Boris Popov he showed the right way to quantize the famous non-Abelian theory which underlies all contemporary work on sub-atomic physics. This led in particular to the work of 't Hooft and Veltman, which was recognized by the Nobel Prize for Physics of 1999.

"Faddeev also developed (jointly with Valentin Pavlov) the quantum version of the beautiful theory of integrable systems in two dimensions, which has important applications in solid state physics as well as in recent models of string theory.

"In another application of the scattering theory of differential operators, Faddeev discovered a surprising link with number theory and the famous Riemann Hypothesis."

Vladimir Arnold, born in 1937 in Odessa, Ukrainian SSR, is presently the chief scientist at the Steklov Mathematical Institute in Moscow and a professor at the Université de Paris Dauphine. He obtained his first degree in 1959 at Moscow State University, was awarded a candidate's degree (equivalent to a Ph.D.) in 1961, and became a professor in 1965. He is a member of the Russian Academy of Sciences.

Ludwig Faddeev, born in 1934 in Leningrad (now St. Petersburg), Russia, is a director of the Euler International Mathematical Institute, Petersburg Department of the Steklov Institute of Mathematics. He graduated from Leningrad State University in 1956 and received his Doctor of Physical and Mathematical Sciences degree in 1963. He has been a professor at Leningrad State University since 1967. During 1986–1990, he served as president of the International Mathematical Union. He is a member of the Russian Academy of Sciences, the U.S. National Academy of Sciences, and the French Academy of Sciences.

The Shaw Prize is an international award to honor individuals who are currently active in their respective fields and 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 award is dedicated to furthering societal progress, enhancing quality of life, and enriching humanity's spiritual civilization. Preference is given to individuals whose significant work was recently achieved.

The Shaw Prize consists of three annual awards: the Prize in Astronomy, the Prize in Life Science and Medicine, and the Prize in Mathematical Sciences. Each prize carries a monetary award of US$1 million. Established under the auspices of Run Run Shaw in November 2002, the prize is managed and administered by the Shaw Prize Foundation, based in Hong Kong.

Previous recipients of the Shaw Prize in Mathematical Sciences are Robert Langlands and Richard Taylor (2007), David Mumford and Wen-Tsun Wu (2006), Andrew Wiles (2005), and Shiing-Shen Chern (2004).

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American Mathematical Society

Citation Statistics: An IMU Report

In June 2008, the International Mathematical Union (IMU) issued the report "Citation Statistics", which addresses the use of quantitative measures in assessment of research. The report was prepared in cooperation with the International Congress of Industrial and Applied Mathematics (ICIAM) and the Institute of Mathematical Statistics (IMS), by a joint committee consisting of Robert Adler, Technion-Israel Institute of Technology; John Ewing (chair), American Mathematical Society; and Peter Taylor, University of Melbourne. The 26-page report is available on the IMU website at `http://www.mathunion.org/Publications/Report/CitationStatistics`*. What follows is the executive summary.*

This is a report is about the use and misuse of citation data in the assessment of scientific research. The idea that research assessment must be done using "simple and objective" methods is increasingly prevalent today. The "simple and objective" methods are broadly interpreted as *bibliometrics*, that is, citation data and the statistics derived from them. There is a belief that citation statistics are inherently more accurate because they substitute simple numbers for complex judgments, and hence overcome the possible subjectivity of peer review. But this belief is unfounded.

- Relying on statistics is not more accurate when the statistics are improperly used. Indeed, statistics can mislead when they are misapplied or misunderstood. Much of modern bibliometrics seems to rely on experience and intuition about the interpretation and validity of citation statistics.
- While numbers appear to be "objective", their objectivity can be illusory. The meaning of a citation can be even more subjective than peer review. Because this subjectivity is less obvious for citations, those who use citation data are less likely to understand their limitations.
- The sole reliance on citation data provides at best an incomplete and often shallow understanding of research—an understanding that is valid only when reinforced by other judgments. *Numbers are not inherently superior to sound judgments.*

Using citation data to assess research ultimately means using citation-based statistics to rank things—journals, papers, people, programs, and disciplines. The statistical tools used to rank these things are often misunderstood and misused.

- For journals, the impact factor is most often used for ranking. This is a simple average derived from the distribution of citations for a collection of articles in the journal. The average captures only a small amount of information about that distribution, and it is a rather crude statistic. In addition, there are many confounding factors when judging journals by citations, and any comparison of journals requires caution when using impact factors. Using the impact factor alone to judge a journal is like using weight alone to judge a person's health.
- For papers, instead of relying on the actual count of citations to compare individual papers, people frequently substitute the impact factor of the journals in which the papers appear. They believe that higher impact factors must mean higher citation counts. But this is often *not* the case! This is a pervasive misuse of statistics that needs to be challenged whenever and wherever it occurs.
- For individual scientists, complete citation records can be difficult to compare. As a consequence, there have been attempts to find simple statistics that capture the full complexity of a scientist's citation record with a single number. The most notable of these is the h-index, which seems to be gaining in popularity. But even a casual inspection of the h-index and its variants shows that these are naïve attempts to understand complicated citation records. While they capture a small amount of information

about the distribution of a scientist's citations, they lose crucial information that is essential for the assessment of research.

The validity of statistics such as the impact factor and h-index is neither well understood nor well studied. The connection of these statistics with research quality is sometimes established on the basis of "experience". The justification for relying on them is that they are "readily available". The few studies of these statistics that were done focused narrowly on showing a correlation with some other measure of quality rather than on determining how one can best derive useful information from citation data.

We do not dismiss citation statistics as a tool for assessing the quality of research—citation data and statistics can provide some valuable information. We recognize that assessment must be practical, and for this reason easily derived citation statistics almost surely will be part of the process. But citation data provide only a limited and incomplete view of research quality, and the statistics derived from citation data are sometimes poorly understood and misused. Research is too important to measure its value with only a single coarse tool.

We hope those involved in assessment will read both the commentary and the details of this report in order to understand not only the limitations of citation statistics but also how better to use them. If we set high standards for the conduct of science, surely we should set equally high standards for assessing its quality.

Editor's note: For additional commentary on the use of citation statistics in mathematics see "Impact factor and how it relates to quality of journals", by Vitali Milman (*Notices*, March 2006) and "The misuse of the impact factor", by Qaiser Mustaq (*Notices*, August 2007).

Mathematics People

Spielman and Teng Awarded Gödel Prize

Daniel A. Spielman of Yale University and Shang-Hua Teng of Boston University were named recipients of the Gödel Prize of the Association for Computing Machinery (ACM) at the International Colloquium on Automata, Languages, and Programming (ICALP), held July 6–13, 2008, in Reykjavik, Iceland. 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 Computing Theory of the ACM (ACM-SIGACT). The prize carries a cash award of US$5,000.

Spielman and Teng were recognized for their work in developing a rigorous framework to explain the practical success of algorithms on real data and real computers that could not be clearly understood through traditional techniques. Their technique, known as "smoothed analysis", relies on deep mathematical analysis and insight. It has been used as a basis for considerable research, confirming its importance to scientific computing. In a paper titled "Smoothed Analysis of Algorithms: Why the Simplex Algorithm Usually Takes Polynomial Time", the authors address a fundamental question about how algorithms function. Their research explains why the simplex algorithm, an important tool used by computers to solve a broad, basic class of optimization problems, works effectively in many practical areas, especially in business. It also represents a huge advance in addressing the challenge of predicting the performance of algorithms, which are clearly specified procedures guaranteed to give the correct answer, and heuristics, which are methods of solving problems through intelligent trial and error. Understanding the mathematical structure of these problems is necessary to designing efficient algorithms and software. The findings of Spielman and Teng were published in the *Journal of the Association for Computing Machinery* in 2004.

Spielman was awarded the ACM Doctoral Dissertation Award in 1995 and was honored with the Best Student Paper award at the ACM Symposium on Theory of Computing in both 1994 and 1995. He received his Ph.D. from the Massachusetts Institute of Technology and is a recipient of the Beckwith Prize in mathematics. Teng is an active participant in industry and collaborates with engineers and scientists in developing real-world products. He received his Ph.D. degree from Carnegie Mellon University.

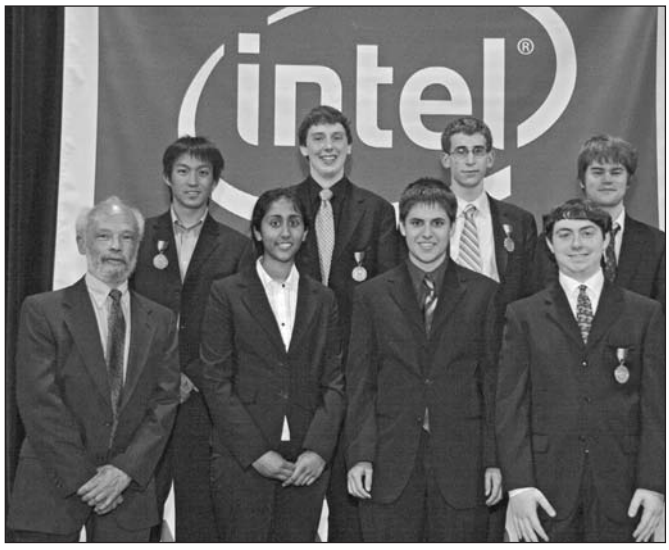
The Gödel Prize is named in honor of Kurt Gödel, an Austrian-American mathematician and philosopher who had a major impact on the foundations of computer science.

—From an ACM announcement

AMS Menger Awards at the 2008 ISEF

The 2008 Intel International Science and Engineering Fair (ISEF) was held May 11–16, 2008, in Atlanta, Georgia. This was the fifty-ninth year of the ISEF competition. More than fifteen hundred students in grades 9 through 12 from over fifty countries participated in the fair. Student finalists who compete at the ISEF go through a multistep process to qualify and have won an all-expense-paid trip to the fair. 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, sixty-seven federal agencies and professional and educational organizations, including the AMS, participated by giving special awards. Prizes given by the AMS included cash, certificates, books, and tote bags.

For the AMS this was the twenty-first year of participation, and it was the nineteenth year of the presentation of the Karl Menger Awards. The members of the 2007–2008 AMS Menger Prize Committee and AMS Special Awards Judges were Edward Connors, University of Massachusetts; Doron Levy, University of Maryland; and David Scott,



Menger Prize winners: front row, left to right: David Scott (committee chair), Shravani Mikkilineni, Matthew Wage, and David Rosengarten; back row, left to right: Alex Chen, Alexander Churchill, Paul Kominers, and Eric Larson.

University of Puget Sound (chair). The panel of judges reviewed all sixty projects in mathematics, as well as mathematically oriented projects in computer science and physics, 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): "Restrictions and Generalizations on Comma-Free Codes", ALEXANDER CHURCHILL, 18, Lincoln East High School, Lincoln, Nebraska.

Second-Place Awards (US$500): "Continued Fractions and Orbits of a Linear Fractional Transformation", SHRAVANI MIKKILINENI, 17, Detroit Country Day School, Beverly Hills, Michigan; "Rotation Curves in Five Dimensions", DAVID ROSENGARTEN, 18, John L. Miller Great Neck North High School, Great Neck, New York.

Third-Place Awards (US$250): "The DNA Inequality in Non-convex Regions", ERIC LARSON, 16, South Eugene High School, Eugene, Oregon; "On the Reducible Quintic Complete Base Polynomials", ALEX CHEN, 17, York High School, Yorktown, Virginia; "Chip-Firing Analysis of Stabilization Behaviors, Hitting Times, and Candy-Passing Games", PAUL KOMINERS, 17, Walt Whitman High School, Bethesda, Maryland; "On Lehmer-Type Questions for Special Classes of Arithmetic Functions", MATTHEW WAGE, 18, Appleton East High School, Appleton, Wisconsin.

Honorable Mention Awards: "Frequency Sequence: Structures and Properties", SWARA KOPPARTY, 17, Terre Haute South Vigo High School, Terre Haute, Indiana; "Computation of the Alexander-Conway Polynomial on the Chord Diagrams of Singular Knots", SANA RAOOF, 17, Jericho High School, Jericho, New York; "Problems of Ramsey Theory", NURLAN TAIGANOV, 16, Ekibastuz, Pavlodar, Kazakhstan; "Analogue of the Popoviciu's Inequality", ARTEM TIMOSHENKO, 16, Murmansk Polytechnic Lyceum, Murmansk, Russia; "Eisenstein Prime Magic Square", SARAH SELLERS, 17, Hedgesville High School, Hedgesville, West Virginia.

The Society for Science and the Public, the owner and administrator of the ISEF, changed the awards ceremony this year. In a departure from previous awards ceremonies, those receiving honorable mention were not publicly announced and called to the stage like the first-, second-, and third-place awardees. As a consequence, those receiving honorable mentions are not pictured with the other Menger Prize winners.

The panel of judges was impressed both by the quality and originality of the work and by the dedication and enthusiasm of the students. The projects covered a wide range of topics, including elementary number theory, knot theory, dynamic systems on graphs, arithmetic and geometric inequalities, algebraic structures, and mathematical games. To the extent that these young scholars represent the future of mathematics, the outlook for the field is indeed bright.

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. The income from the donation by the Menger family covers less than the amount of the awards. The balance, including the travel expenses of the judges, comes from the AMS's general fund. For more information about this program or to make contributions to this fund, contact the AMS Development Office, 201 Charles Street, Providence, RI, 02904-2294; or send email to `development@ams.org`; or phone 401-455-4151.

—David Scott, University of Puget Sound

Parlett and Moler Awarded Schneider Prize

BERESFORD PARLETT of the University of California, Berkeley, and CLEVE MOLER of The MathWorks have been awarded the Hans Schneider Prize in Linear Algebra for 2008 by the International Linear Algebra Society (ILAS). Parlett was honored for his theoretical and numerical contributions to numerical linear algebra, especially the symmetric eigenvalue problem. Moler was honored for his creation of MatLab, a computational and experimental tool in linear algebra that has influenced both research in and teaching of linear algebra.

The Hans Schneider Prize is awarded for research, contributions, and achievements at the highest level of linear algebra. It may be awarded for an outstanding scientific achievement or for lifetime contributions, and there may be more than one recipient. An invitation is extended to the recipient(s) to attend the award ceremony to receive the prize, and each is invited to present a talk at an ILAS meeting.

—Danny Hershkowitz for the ILAS Prize Committee

Prizes of the Mathematical Society of Japan

The Mathematical Society of Japan (MSJ) awarded a number of prizes in spring 2008.

HIDEO TAKAOKA of Kobe University has been awarded the 2008 Spring Prize for his outstanding contributions to the global theory 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 Publication Prize is given for distinguished contributions to the mathematical literature. The awardees for 2008 are: SUSUMU OTAKE for his life's work in publishing translations of Russian mathematics books; TAKESHI KITANO for televised programs of his mathematics classes at Comaneci University, in which he "showed the charm of mathematics" and contributed to the awareness and appreciation of mathematics; and to TAKAHIKO YAMAGUCHI and MITSUO SUGIURA for their monograph *An Introduction to Continuous Group Theory*.

Three mathematicians have received 2008 Algebra Prizes. They are OSAMU IYAMA of Nagoya University for his research on higher-dimensional Auslander-Reiten theory; YOSHINORI NAMIKAWA of Osaka University for his work on Calabi-Yau threefolds and holomorphic symplectic geometry; and TOSHIYUKI TANISAKI of Osaka City University for his contributions to the representation theory of Lie algebras and quantum groups.

—From a Mathematical Society of Japan announcement

Ford Foundation Diversity Fellowships Awarded

The Ford Foundation has named the recipients of its Diversity Fellowships for 2007. 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. MANUEL L. REYES of the University of California, Berkeley, was awarded a Predoctoral Fellowship of US$20,000 a year for up to three years. He is a student in the field of algebra.

—From a Ford Foundation announcement

Mathematics Opportunities

American Mathematical Society Centennial Fellowships

Invitation for Applications for Awards for 2009–2010
Deadline December 1, 2008

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 2009–2010 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, 1997, and September 1, 2006). 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 2009–2010 is expected to be US$75,000, with an additional expense allowance of about US$7,500. Acceptance of the fellowship cannot be postponed.

Deadline: The deadline for receipt of applications is **December 1, 2008**. Awards will be announced in February 2009 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 401-455-4060.

—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 *separate* 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, 2008,** is the deadline for the spring 2009 semester; **April 15, 2009,** is the deadline for scholarship applications for the fall 2009 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 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 full proposals is **September 9, 2008**. For further information contact the program officer, Susan Parris, 703-292-8711, sparris@nsf.gov; or visit the website http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5179&org=NSF.

—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 2008 is **October 1, 2008**; the deadlines for 2009 are **February 1, 2009; May 8, 2009**; and **October 1, 2009**. For the Mentoring Travel Grants program the deadline is **February 8, 2009**. 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 **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

News from the Fields Institute

The fall 2008 thematic program of the Fields Institute for Research in the Mathematical Sciences will be *Arithmetic Geometry, Hyperbolic Geometry, and Related Topics*, organized by John Bland (Toronto), Caterina Consani (Johns Hopkins), Stephen Kudla (Toronto), Min Ru (Houston), Paul Vojta (Berkeley), and Pit-Mann Wong (Notre Dame).

Two workshops will be held: *Arithmetic Geometry: Diophantine Approximation and Arakelov Theory*, October 20–24; and *Complex Hyperbolic Geometry and Related Topics*, November 17–21.

Henri Gillet (University of Illinois, Urbana-Champaign) will be the Clay Mathematics Institute Senior Scholar in the program. Yum-Tong Siu (Harvard) will be the University of Toronto Dean's Distinguished Visitor and will teach a graduate course related to the program, as well as deliver the *Distinguished Lecture Series*, November 10–14. Shou-Wu Zhang (Columbia) will give the *Coxeter Lecture Series*, September 29–October 3. Gillet and Siu will be in residence at the Institute for the fall term (September to December).

More information can be found at `http://www.fields.utoronto.ca/programs/scientific/08-09/arith_hypergeo/`.

The *Conference on Nonlinear Phenomena in Mathematical Physics*, dedicated to Cathleen Synge Morawetz on her eighty-fifth birthday, will be held September 18–20. See `http://www.fields.utoronto.ca/programs/scientific/08-09/math-physics/` for further information.

Future thematic programs include the following:

Winter/Spring 2009: O-Minimal Structures and Real Analytic Geometry, organized by David Marker (University of Illinois, Chicago), Chris Miller (Ohio State), Jean-Philippe Rolin (Bourgogne), Patrick Speissegger (McMaster), Carol Wood (Wesleyan), Edward Bierstone (Toronto), Lou van den Dries (UIUC), Robert Moussu (Bourgogne), and Alex Wilkie (Oxford).

Fall 2009: Foundations of Computational Mathematics, organized by Peter Borwein (Simon Fraser), Stephen A. Cook (Toronto), Teresa Krick (Buenos Aires), Adrian Lewis (Cornell), Michael Shub (Toronto), and Richard Schwartz (Brown).

Winter/Spring 2010: Quantitative Finance: Foundations and Applications, organized by Y. Ait-Sahalia (Princeton), M. Grasselli (McMaster), V. Henderson (Warwick), T. Hurd (McMaster), M. Rindisbacher (Toronto), and D. Rosen (R2 Financial Technologies).

Fall 2010: Asymptotic Geometric Analysis, organized by V. Milman (Tel-Aviv), V. Pestov (Ottawa), and N. Tomczak-Jaegermann (Alberta).

Winter/Spring 2011: Dynamics and Transport in Disordered Systems, organized by D. Dolgopyat, K. Khanin, R. de la Llave, A. Neishtadt, J. Quastel, and B. Toth.

Fall 2011: Discrete Geometry and Applications, organized by K. Bezdek, R. Connelly, A. Deza, H. Edelsbrunner, A. I. Weiss, and Yinyu Yi.

Winter/Spring 2012: Galois Representations, organized by F. Calegari, M. Emerton, M. Kisin, and S. Kudla.

Thanks to increased funding from the province of Ontario, Fields will be offering four Fields Ontario Postdoctoral Fellowships per year, two in connection with each thematic program during the academic year. These will be two- to three-year positions combining residency at Fields with a research-teaching position at an Ontario university. See the Fields website, `http://www.fields.utoronto.ca/programs/scientific/`, for application details and more information on these thematic programs and on all other activities at the Institute.

—Fields Institute announcement

Call for Nominations for Clay Research Fellows

The Clay Mathematics Institute (CMI) solicits nominations for its competition for the 2009 Clay Research Fellowships. Fellows are appointed for a period of two to five years. They may conduct their research at whatever institution or combination of institutions best suits their research. In addition to a generous salary, the Fellow receives support for travel, collaboration, and other research expenses.

The selection criteria are the quality of the candidate's research and promise to make contributions of the highest level. At the time of their selection, most recent appointees were graduating Ph.D. students. However, mathematicians within three years of the Ph.D. are sometimes appointed. Selection decisions are made by CMI's Scientific Advisory Board: Jim Carlson, Simon Donaldson, Gregory Margulis, Richard Melrose, Yum-Tong Siu, Andrew Wiles.

To nominate a candidate, please send the following items by **September 15, 2008**: (1) Letter of nomination; (2) Names and contact information of two other references; (3) Curriculum vitae for the nominee; and (4) Publication list for the nominee.

Nominations should be sent to the attention of Heather Spatz, Clay Mathematics Institute, One Bow Street, Cambridge, MA 02138. Electronic submissions are also accepted at `nominations@claymath.org`.

Information about the Clay Research Fellows is available on the CMI website at `http://www.claymath.org/research_fellows`. Additional information may be obtained by calling Heather Spatz at 617-995-2602 or emailing her at `spatz@claymath.org`.

Current and alumni Clay Research Fellows: Mohammed Abouzaid, Spyridon Alexakis, Artur Avila, Roman Bezrukavnikov, Manjul Bhargava, Daniel Biss, Alexei Borodin, Maria Chudnovsky, Dennis Gaitsgory, Soren Galatius, Daniel Gottesman, Ben Green, Sergei Gukov, Adrian Ioana, Bo'az Klartag, Elon Lindenstrauss, Ciprian Manolescu, Davesh Maulik, Maryam Mirzakhani, Sophie Morel, Mircea Mustata, Sam Payne, Igor Rodnianski, David Speyer, Terence Tao, András Vásy, Akshay Venkatesh, Teruyoshi Yoshida, Xinyi Yuan.

—Clay Mathematics Institute announcement

For Your Information

McCarthy Appointed AWM Executive Director

Maeve Lewis McCarthy of Murray State University has been named executive director of the Association for Women in Mathematics (AWM). She received both her B.Sc. in mathematical physics and her M.Sc. in mathematical sciences from the National University of Ireland, Galway. She earned her master's and doctoral degrees in computational and applied mathematics from Rice University. She was a 1998 Project NeXT fellow and has served on the editorial boards of *Focus*, the newsletter of the Mathematical Association of America, and *MAA Online*. She is a member of the Education Committee of the Society for Industrial and Applied Mathematics and an associate editor of *SIAM Undergraduate Research Online*.

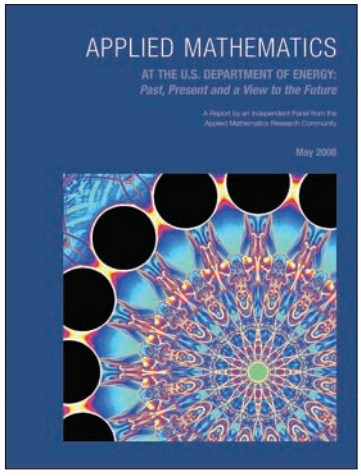
Maeve McCarthy

Her research interests include the application of eigenvalues to population dynamics and mechanical design. Her work in differential equations and inverse problems focuses on the identification of parameters in biological and physical applications. In 2006 she received a Presidential Research Fellowship from Murray State and an Academic Achievement Award from the Commonwealth of Kentucky for her research. She was instrumental in the development of BioMaPS (Biology and Mathematics in Population Studies), an undergraduate research program at Murray State, where her primary focus is teaching and mentoring undergraduates.

—From an AWM announcement

DoE Report on Applied Mathematics

In May 2008 an independent panel from the applied mathematics research community issued a report called "Applied Mathematics at the U.S. Department of Energy: Past, Present and a View to the Future". Focusing on the Applied Mathematics Program at the Department of Energy (DOE), the report takes a look back at the program's impact and a look forward at its potential to help the department tackle science and engineering challenges of the future. The chair of the panel was David L. Brown of Lawrence Livermore National Laboratory.



Cover image description: A cylindrical shock wave produces this intricate flow pattern as it converges from outside sixteen circular obstacles and diffracts. Researchers are interested in the structure of the solution near the focus (green region). This high-resolution numerical solution was computed using adaptive overlapping meshes.

One of the functions of the DOE is to provide science-based solutions to important science and engineering problems, particularly those connected to energy, the environment, and national security. To this end, the department runs a system of national laboratories and also funds research in universities through disciplinary programs, one of which is the Applied Mathematics Program (AMP).

According to the report, the AMP has had a significant impact in computational science by funding research in areas such as mathematical modeling, numerical analysis of differential equations, optimization theory, mesh generation for complex geometries, and adaptive algorithms. "High-performance mathematical software libraries developed through [the AMP] have contributed as much or more to the performance of modern scientific computer codes as the high-performance computers on which these codes run," the report states.

In August 2007 the panel, consisting of ten experts in applied, computational, and statistical mathematics, met for a day and a half in Berkeley, California. "[T]he panelists were not asked to speculate only on advances that might

be made in their own research specialties," the report says. "Instead, the guidance this panel was given was to consider the broad science and engineering challenges that the DOE faces and identify the corresponding advances that must occur across the field of mathematics for these challenges to be successfully addressed."

The panel concluded that one of the greatest needs was to develop mathematical understanding of increasingly complex physical and engineered systems. One goal is to produce effective ways to simulate and model such systems so that their behavior can be predicted. The report points out that it is not enough to simply break such systems down into smaller parts; what is needed is a focus on the "end goal" of developing mathematical approaches to understanding the systems themselves in all their complexity. Creating new mathematical ways to analyze large data sets is also a critical need. These data sets must be integrated into simulation and modeling in an essential way, a process the report calls "data-model fusion".

The report sets out three "high-level strategies" for filling the gaps in the mathematical understanding needed to meet DOE challenges:

- Predictive modeling and simulation of complex systems: Advance the fidelity, predictability, and sophistication of modeling and simulation methodologies for complex systems.
- Mathematical analysis of the behavior of complex systems: Address the challenges of analyzing and understanding the behavior of mathematical models for complex scientific and engineering systems.
- Using models of complex systems to inform policymakers: Develop the mathematics needed to inform policymakers based on the prediction, optimization, and understanding of complex systems.

The report recommends that the AMP encourage high-risk research by awarding long-term grants to researchers with proven track records, enhance the introduction of new ideas by supporting young researchers and providing ways for established researchers to interact in intensive environments such as workshops and summer schools, and promote exchange of ideas between mathematicians and colleagues in other areas of science and engineering.

The report is available on the website of the Society for Industrial and Applied Mathematics, `http://www.siam.org/`. SIAM has created a place where readers can contribute comments about the report.

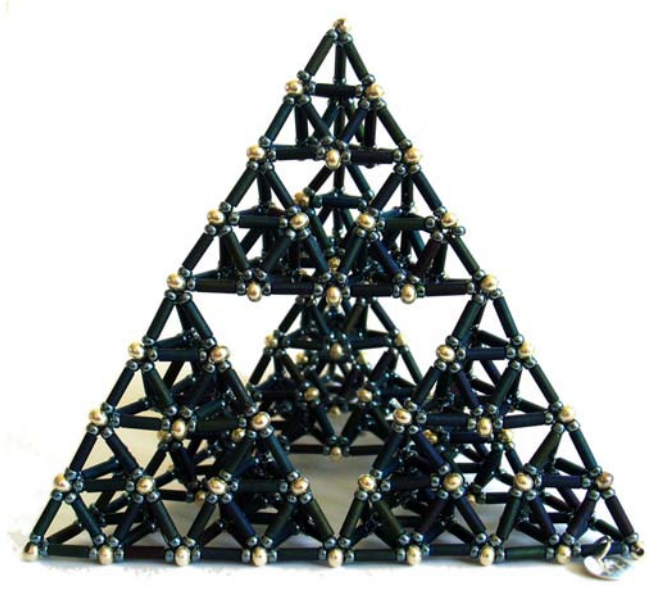
—Allyn Jackson

Inside the AMS

From the AMS Public Awareness Office

• **Author Rescource Center**. All mathematicians are invited to use the tools provided on the AMS Author Resource Center to prepare their work for publication. The Center includes tools for writing mathematics, *Mathematical Reviews* tools to create references and provide linking capabilities, and resources for AMS book and journal authors. Author packages for books and journals are available through a simple three-step process to download zip files containing templates, sample files, style files, guidelines, and instruction manuals. The Center also provides background on why the AMS is one of the world's leading publishers of mathematical literature, introduces AMS Publisher Sergei Gelfand and senior editors Edward Dunne and Ina Mette, and offers an FAQ as well as an opportunity for AMS authors to contact the Society for technical support. The extensive collection of information and downloadable tools and guides is at `http://www.ams.org/authors/`.

• **50-Year Set of Annual Survey Reports Online**. The Annual Survey of the Mathematical Sciences has been collecting and reporting data since 1957, when Sputnik changed the higher education job market in math and science. While the Annual Survey originally focused on starting salaries, over its fifty-year history the survey effort has expanded to include faculty salaries, data about departments of mathematics, and demographics and employment experience of new doctorates. Starting in the 1980s, various other societies (the Mathematical Association of America, Institute for Mathematical Statistics, American Statistical Association, and the Society for Industrial and Applied Mathematics) joined the survey effort as cosponsors. The complete set of Annual Survey reports going back to 1957 can now be found on the AMS website for those interested in tracing the history of various issues. See them all at `http://www.ams.org/employment/surveyreports.html`.



"Sierpinski Tetrahedron (View II)" in glass bugle beads, size 11/0 and 8/0 seed beads, and Fireline thread, by Gwen L. Fisher, California Polytechnic State University, San Luis Obispo, and beAd Infinitum (http://www.beadinfinitum.com).

• **Mathematical Imagery**. Recently added albums include "Jean-Francois Colonna: A Gateway between Art and Science", "Gwen L. Fisher: Woven Beads", and "Dejenie A. Lakew: Hyper Symmetries", and new sculptures by George Hart. All can be sent as e-postcards at `http://www.ams.org/mathimagery/`.

—Annette Emerson and Mike Breen, AMS Public Awareness Officers, `paoffice@ams.org`

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, 2008: Letters of intent for NSF Focused Research Groups. See http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5671&org=DMS.

August 15, 2008: Nominations for SASTRA Ramanujan Prize. See http://www.math.ufl.edu/sastra-prize/nominations-2008.html or email: sastraprize@math.ufl.edu.

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

September 9, 2008: Full proposals for NSF International Research Fellow

Where to Find It

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

Awards. See "Mathematics Opportunities" in this issue.

September 15, 2008: Nominations for Sloan Research Fellowships. See http://www.sloan.org/programs/fellowship_brochure.shtml or contact Sloan Research Fellowships, Alfred P. Sloan Foundation, 630 Fifth Avenue, Suite 2550, New York, New York 10111-0242.

September 19, 2008: Full proposals for NSF Focused Research Groups. See http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5671&org=DMS.

September 30, 2008: Applications for spring 2009 semester of Math in Moscow. See "Mathematics Opportunities" in this issue.

September 30, 2008: Nominations for 2008 Information-Based Complexity Young Researcher Award. Contact Joseph Traub at traub@cs.columbia.edu.

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

October 15, 2008: Applications for NSF Mathematical Sciences Postdoctoral Research Fellowships. See http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5301&org=DMS.

October 15, 2008: Proposals for NSA Mathematical Sciences Program research grants. See http://www.nsa.gov/msp/index.cfm or contact the program director, Michelle Wagner (mdwagn4@nsa.gov), or the program administrator, Barbara Johnson (bajohn1@nsa.gov), telephone 301-688-0400.

October 15, 2008: Proposals for NSF Postdoctoral Research Fellowships. See http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5301&org=DMS.

November 1, 2008: Applications for November review for the National Academies Postdoctoral and Senior Research Associateship Programs. See http://www7.nationalacademies.org/rap/index.html or contact Research Associateship Programs, National Research Council, Keck 568, 500 Fifth Street, NW, Washington, DC 20001; telephone 202-334-2760; fax 202-334-2759; email: rap@nas.edu.

November 15, 2008: Target date for receipt of applications for NSA Mathematics Sabbatical Program. See http://www.nsa.gov/msp/index.cfm or contact the program director, Michelle Wagner (mdwagn4@nsa.gov), or the program administrator, Barbara Johnson (bajohn1@nsa.gov), telephone 301-688-0400.

December 1, 2008: Applications for AMS Centennial Fellowships. See "Mathematics Opportunities" in this issue.

February 1, 2009: Applications for AWM Travel Grants. See "Mathematics Opportunities" in this issue.

February 8, 2009: Applications for AWM Mentoring Travel Grants. See "Mathematics Opportunities" in this issue.

April 15, 2009: Applications for fall 2009 semester of Math in Moscow. See "Mathematics Opportunities" in this issue.

May 8, 2009: Applications for AWM Travel Grants. See "Mathematics Opportunities" in this issue.

October 1, 2009: 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/

Ronald C. Rosier
Director
202-293-1170
Fax: 202-293-3412

Lisa R. Kolbe
Administrative Coordinator
202-293-1170
Fax: 202-293-3412

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.

Amongst Mathematicians: Teaching and Learning Mathematics at University Level, by Elena Nardi. Springer, November 2007. ISBN-13: 978-0-387-37141-2.

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

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 1-5602-5931-0. (Reviewed October 2007.)

Benjamin Franklin's Numbers: An Unsung Mathematical Odyssey, by

Paul C. Pasles. Princeton University Press, October 2007. ISBN-13: 978-0-6911-2956-3.

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

The Calculus Wars: Newton, Leibniz, and the Greatest Mathematical Clash of All Time, by Jason Socrates Bardi. Thunder's Mouth Press, April 2007. ISBN-13: 978-1-5602-5992-3.

A Certain Ambiguity: A Mathematical Novel, by Gaurav Suri and Hartosh Singh Bal. Princeton University Press, June 2007. ISBN-13: 978-0-6911-2709-5. (Reviewed February 2008.)

Descartes: A Biography, by Desmond Clarke. Cambridge University Press, March 2006. ISBN 0-521-82301-3. (Reviewed January 2008.)

Discovering Patterns in Mathematics and Poetry, by Marcia Birken and Anne C. Coon. Rodopi, February 2008. ISBN-13: 978-9-0420-2370-3.

Does Measurement Measure Up?: How Numbers Reveal and Conceal the Truth, by John Henshaw. Johns Hopkins University Press, March 2006. ISBN-13: 978-0-8018-8375-0.

Euclidean and Non-Euclidean Geometries: Development and History, fourth revised and expanded edition, by Marvin Jay Greenberg. W. H. Freeman, September 2007. ISBN-13: 978-0-7167-9948-1.

Flatland—The Movie: A Journey of Many Dimensions. Flatworld Productions, 2007. Special Educator Edition DVD, `http://store.flatlandthemovie.com`. (Reviewed November 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: 978-0-6911-2822-1. (Reviewed April 2008.)

Group Theory in the Bedroom, and Other Mathematical Diversions, by Brian Hayes. Hill and Wang, April 2008. ISBN-13: 978-0-8090-5219-6.

Guesstimation: Solving the World's Problems on the Back of a Cocktail Napkin, by Lawrence Weinstein and John A. Adam. Princeton University Press, April 2008. ISBN-13: 978-0-6911-2949-5.

A History of Abstract Algebra, by Israel Kleiner. Birkhäuser, October 2007. ISBN-13: 978-0-8176-4684-4.

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

How Round Is Your Circle, by John Bryant and Chris Sangwin. Princeton University Press, January 2008. ISBN-13: 978-0-6911-3118-4.

Impossible?: Surprising Solutions to Counterintuitive Conundrums, by Julian Havil. Princeton University Press, April 2008. ISBN-13: 978-0-6911-3131-3.

The Indian Clerk, by David Leavitt. Bloomsbury USA, September 2007. ISBN-13: 978-1-5969-1040-9. (Reviewed in this issue.)

An Introduction to Gödel's Theorems, by Peter Smith. Cambridge University Press, August 2007. ISBN-13: 978-0-521-67453-9.

Irreligion: A Mathematician Explains Why the Arguments for God Just Don't Add Up, by John Allen Paulos. Hill and Wang, December 2007. ISBN-13: 978-0-8090-591-95. (Reviewed August 2008.)

Karl Pearson: The Scientific Life in a Statistical Age, by Theodore M. Porter. Princeton University Press, (new edition) December 2005. ISBN-13: 978-0-6911-2635-7. (Reviewed December 2007.)

The Legacy of Mario Pieri in Geometry and Arithmetic, by Elena Anne Marchisotto and James T. Smith. Birkhäuser, May 2007. ISBN-13: 978-0-8176-3210-6.

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. (Reviewed March 2008.)

**Logic's Lost Genius: The Life of Gerhard Gentzen*, by Eckart Menzler-Trott, Craig Smorynski (translator), Edward R. Griffor (translator). AMS-LMS, November 2007. ISBN-13: 978-0-8218-3550-0.

Making Mathematics Work with Needlework: Ten Papers and Ten Projects, edited by Sarah-Marie Belcastro and Carolyn Yackel. A K Peters, September 2007. ISBN-13: 978-1-5688-1331-8.

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

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

Mathematical Mind-Benders, by Peter Winkler. A K Peters, August 2007. ISBN-13: 978-1-5688-1336-3.

The Mathematician's Brain, by David Ruelle. Princeton University Press, July 2007. ISBN-13: 978-0-6911-2982-2.

Mathematics at Berkeley: A History, by Calvin C. Moore. A K Peters, February 2007. ISBN-13: 978-1-5688-1302-8.

**The Mathematics of Egypt, Mesopotamia, China, India, and Islam: A Sourcebook*, by Victor J. Katz et al. Princeton University Press, July 2007. ISBN-13: 978-0-6911-2745-3.

Measuring the World, by Daniel Kehlmann. Pantheon, November 2006. ISBN 0-375-42446-6. (Reviewed June/July 2008.)

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

The Mind of the Mathematician, by Michael Fitzgerald and Ioan James. Johns Hopkins University Press, May 2007. ISBN-13: 978-0-8018-8587-7.

More Mathematical Astronomy Morsels, by Jean Meeus. Willmann-Bell, 2002. ISBN 0-943396743.

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. (Reviewed June/July 2008.)

Mr. Hopkins' Men: Cambridge Reform and British Mathematics in the 19th Century, by Alex D. D. Craik. Springer, February 2007. ISBN-13: 978-1-8480-0132-9.

Music and Probability, by David Temperley. MIT Press, January 2007. ISBN-13: 978-0-2622-0166-7.

Music: A Mathematical Offering, by David J. Benson. Cambridge University Press, December 2006. ISBN-13: 978-0-521-61999-8.

New Theories of Everything, by John D. Barrow. Oxford University Press, July 2007. ISBN-13: 978-0-192-80721-2.

Number Story: From Counting to Cryptography, by Peter M. Higgins.

REFERENCE & BOOK LIST

Springer, February 2008. ISBN-13: 978-1-8480-0000-1

The Numbers behind NUMB3RS: Solving Crime with Mathematics, by Keith Devlin and Gary Lorden. Plume, August 2007. ISBN-13: 978-0-4522-8857-7.

**A Passion for Discovery*, by Peter Freund. World Scientific, August 2007. ISBN-13: 978-9-8127-7214-5.

Perfect Figures: The Lore of Numbers and How We Learned to Count, by Bunny Crumpacker. Thomas Dunne Books, August 2007. ISBN-13: 978-0-3123-6005-4.

The Poincaré Conjecture: In Search of the Shape of the Universe, by Donal O'Shea. Walker, March 2007. ISBN-13: 978-0-8027-1532-6. (Reviewed January 2008.)

Poincaré's Prize: The Hundred-Year Quest to Solve One of Math's Greatest Puzzles, by George Szpiro. Dutton Adult, June 2007. ISBN-13: 978-0-525-95024-0. (Reviewed January 2008.)

The Presidential Election Game, by Steven J. Brams. A K Peters, December 2007. ISBN-13: 978-1-5688-1348-6.

The Probability of God: A Simple Calculation That Proves the Ultimate Truth, by Stephen D. Unwin. Three Rivers Press, October 2004. ISBN-13: 978-1-4000-5478-7. (Reviewed February 2008.)

Pursuit of Genius: Flexner, Einstein, and the Early Faculty at the Institute for Advanced Study, by Steve Batterson. A K Peters, June 2006. ISBN 1-56881-259-0. (Reviewed August 2008.)

The Pythagorean Theorem: A 4000-Year History, by Eli Maor. Princeton University Press, May 2007. ISBN-13: 978-0-6911-2526-8.

Random Curves: Journeys of a Mathematician, by Neal Koblitz. Springer, December 2007. ISBN-13: 978-3-5407-4077-3.

**Sacred Mathematics: Japanese Temple Geometry*, by Fukagawa Hidetoshi and Tony Rothman. Princeton University Press, July 2008. ISBN-13: 978-0-6911-2745-3.

Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart, by Ian Ayres. Bantam, August 2007. ISBN-13: 978-0-5538-0540-6.

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. (Reviewed February 2008.)

The Symmetries of Things, by John H. Conway, Heidi Burgiel, and Chaim Goodman-Strauss. A K Peters, May 2008. ISBN-13: 978-1-5688-1220-5.

Symmetry: A Journey into the Patterns of Nature, by Marcus du Sautoy. Harper, March 2008. ISBN-13: 978-0-0607-8940-4.

Thinking about Gödel and Turing: Essays on Complexity, 1970–2007, by Gregory J. Chaitin. World Scientific, August 2007. ISBN-13: 978-9-8127-0895-3.

The Triumph of Numbers: How Counting Shaped Modern Life, by I. B. Cohen. W. W. Norton, July 2006. ISBN-13: 978-0-393-32870-7. (Reviewed December 2007.)

**The Unfinished Game: Pascal, Fermat, and the Seventeenth-Century Letter That Made the World Modern*, by Keith Devlin. Basic Books, September 2008. ISBN-13: 978-0-4650-0910-7.

Unknown Quantity: A Real and Imaginary History of Algebra, by John Derbyshire. Joseph Henry Press, May 2006. ISBN 0-309-09657-X. (Reviewed May 2008.)

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. (Reviewed April 2008.)

The Volterra Chronicles: The Life and Times of an Extraordinary Mathematician, by Judith R. Goodstein. AMS, February 2007. ISBN-13: 978-0-8218-3969-0. (Reviewed March 2008.)

The Wraparound Universe, by Jean-Pierre Luminet. A K Peters, March 2008. ISBN-13: 978-1-5688-1309-7.

**Zeno's Paradox: Unraveling the Ancient Mystery behind the Science of Space and Time*, by Joseph Mazur. Plume, March 2008 (reprint edition). ISBN-13: 978-0-4522-8917-8.

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, 2009.
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

Career Development Grant, Selected Professions Fellowships, American Fellowships, International Fellowships

Description: All fellowships and grants eligible fields include mathematics and statistics. Selected Professions Fellowships: are awarded to women who are U.S. citizens or permanent residents and who intend to pursue a full-time course of study (during the fellowship year) in designated degree programs where women's participation traditionally has been low. American Fellowships: support women doctoral candidates completing dissertations and scholars seeking funds for postdoctoral research leave or for preparing completed research for publication. Applicants must be U.S. citizens or permanent residents. One-year postdoctoral research leave fellowships, dissertation fellowships, and summer/short-term research publication grants are offered. Career Development Grants: support women who hold a bachelor's degree and who are preparing to advance their careers, change careers, or re-enter the work force. Applicants must be U.S. citizens or permanent residents. International Fellowships: are awarded for full-time graduate or postgraduate study or research to women who are not U.S. citizens or permanent residents. Supplemental grants support community-based projects in the fellow's home country.

Deadline: Selected Professions: Master's and First Professional Awards: January 10; Engineering Dissertation Awards: December 15; American Fellowships: November 15; Career Development Grants: December 15; International Fellowships: December 1.

Application information: For more information contact: AAUW Educational Foundation, Dept. 60, 301 ACT Drive, Iowa City, IA 52243-4030; email: aauw@act.org; call 319-337-1716 ext. 60; 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 May.

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.

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, or 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, and a one time $1,000 foreign travel 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. Please note that a postdoctoral research program is not eligible for the fellowship. Members and employees of Zonta International or the Zonta International Foundation are also not eligible to apply for the fellowships.
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. One fellowship will be awarded for the 2009–10 academic year. A list of previous fellowship winners can be found at http://www.ams.org/prizes/centennial-fellowship.html.
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, 1997, and September 1, 2006). 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 2009–10 is expected to be $75,000, with an additional expense allowance of about $7,500. Acceptance of the fellowship cannot be postponed.
Deadline: The deadline for receipt of applications is December 1, 2008. Awards will be announced in February 2009 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 401-455-4105. 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

Library Resident Research Fellowships

Eligibility: The fellowships, funded by a number of generous benefactors, are open to both U.S. citizens and foreign nationals who are holders of the Ph.D. or the equivalent, Ph.D. candidates who have passed their preliminary examinations, and independent scholars. Applicants in any relevant field of scholarship may apply. Candidates who live 75 or more miles from Philadelphia will receive some preference.
Grant amount: The stipend is $2,000 per month, and the term of the fellowship is a minimum of one month and a maximum of three, taken between June 1 and May 31. Fellowships are usually of one month in duration, and seldom exceed two months. Fellows are required to be in residence at the Library for four to twelve consecutive weeks, depending upon the length of their award. The APS Library's extensive collections are fully described at http://www.amphilsoc.org/library.
Deadline: Applications are due no later than March 1. Notification is sent in May. This is a receipt deadline. Applicants will be informed by mail whether all materials were received. For additional information, call 215-440-3443 or send an email inquiry to Libfellows@amphilsoc.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: April 15, 2009.

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.

California Institute of Technology

Harry Bateman Research Instructorships in Mathematics

Description: Appointments are normally for two years. The academic year runs from approximately October 1 to June 1. Instructors are expected to teach one course per quarter for the full academic year and to devote the rest of their time to research. During the summer months there are no duties except research.

Eligibility: Open to persons who have recently received their doctorates in mathematics.

Deadline: January 1, 2009.

Application information: Please apply online at `http://mathjobs.org`. To avoid duplication of paperwork, your application may also be considered for an Olga Taussky and John Todd Instructorship. Caltech is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.

Fields Institute

Postdoctoral Fellowships

Description: Applications are invited for postdoctoral fellowship positions for the 2009–10 academic years. The Fall 2009 Thematic Program on Foundations of Computational Mathematics will take place at the Institute July to December 2009 and the Winter/Spring 2010 Thematic Program on Quantitative Finance: Foundations and Applications will take place at the Institute from January to June 2010. 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 a recent Ph.D. in either of these areas, or a related area of the mathematical sciences are encouraged to apply.

Deadline: December 15, 2008, 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 225 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: September 15 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 2008–09.

Eligibility: Candidates must give evidence of ability in research comparable at least with that expected for the Ph.D. degree.

Deadline: December 1, 2008.

Application information: Application forms 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 from 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 2009–2010 thematic program entitled *Complex Fluids and Complex Flows*. 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 2009–10 thematic program. The residency should fall in the period September 2009 through June 2010 (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 toward 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/. 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 Fellows are designed to prepare mathematicians for research careers in industry or involving industrial interaction. IMA industrial postdoctoral fellowships run two years starting September 1, 2009. They are funded jointly by the IMA and an industrial sponsor, and holders devote 50% effort working with industrial scientists and 50% effort on a combination of their own research and IMA activities.

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 degree received within the last three years.

Grant amount: Industrial postdoctoral fellows receive a salary of $50,000 annually, and a travel allowance.

Deadline: January 4, 2009.

Application information: Application forms and instructions are available at http://www.ima.umn.edu/docs/. 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 for 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 2009–10 academic year immersed in the thematic program at the IMA. Research professors will enjoy an excellent research environment and stimulating scientific program connecting Complex Fluids and Complex Flows and related areas of mathematics with a broad range of fields of application. New Directions Research Professors are expected to be resident and active participants in the program but are not assigned formal duties.
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 16, 2009.
Application information: Application forms and instructions are available at http://www.ima.umn.edu/docs/. 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 2009–10 thematic program entitled *Complex Fluids and Complex Flows*. 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 Complex Fluids and Complex Flows. IMA postdoctoral fellowships run one to two years, at the option of the holder, starting September 1, 2009. In the second year of the appointment there are a variety of options to enhance career development, including participation in the 2010–11 academic year program, 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 degree received within the last three years.
Grant amount: Postdoctoral fellows receive a salary of $50,000 annually, and a travel allowance.
Deadline: January 4, 2009.
Application information: Application forms and instructions are available at http://www.ima.umn.edu/docs/. 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)

Research Memberships

Description: The Institute will invite about 200 Research Members for stays of one month or more during 2009–10, when two semester-long programs (*Tropical Geometry*, August 17, 2009, to December 18, 2009; *Homology Theories of Knots and Links*, January 11, 2010, to May 21, 2010), and one academic year-long program (*Symplectic and Contact Geometry and Topology*, August 17, 2009, to May 21, 2010) will be featured. Some invitations will be made in other areas, so applications from candidates

in all fields are welcome. Further information on these programs is at http://www.msri.org/calendar/index_activities.
Eligibility: For mathematicians who at the postdoctoral or subsequent career stages.
Grant amount: While there is no set stipend for research members, MSRI often provides 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: At http://www.msri.org/propapps/applications/application_material. Please complete the online application form at http://www.mathjobs.org.
Deadline: Application files must be complete by December 1, 2008.

Mathematical Sciences Research Institute (MSRI)

Research Professorships

Description: The Institute will appoint about 40 Research Professors for stays of three months or more during 2009–10, when two semester-long programs (*Tropical Geometry*, August 17, 2009, to December 18, 2009; *Homology Theories of Knots and Links*, January 11, 2010, to May 21, 2010), and one academic year-long program (*Symplectic and Contact Geometry and Topology*, August 17, 2009, to May 21, 2010) will be featured. Some invitations may be made in other areas, so applications from candidates in all fields are welcome. Further information on these programs is at http://www.msri.org/calendar/index_activities.
Eligibility: For mathematicians who are at the tenured associate professor or subsequent stages of their careers.
Grant amount: The stipend is normally at a rate of up to $5,000/month, prorated for the duration of residency in the program, as well as travel support. Research professors can be nominated by program organizing committees for appointment as Simons Professors or Eisenbud Professors, as well as appointment as a UC Berkeley Chancellor's Professor, positions that can receive larger stipends. Applicants for research professorships are automatically considered for appointment to these "named" positions.
Application information: At http://www.msri.org/propapps/applications/application_material. Please complete the online application form at http://www.mathjobs.org.
Deadline: Application files must be complete by October 1, 2008.

Mathematical Sciences Research Institute (MSRI)

Postdoctoral Fellowships

Description: The Institute announces the availability of 31 semester-long postdoctoral fellowships during 2009–2010, when two semester-long programs (*Tropical Geometry*, August 17, 2009, to December 18, 2009; *Homology Theories of Knots and Links*, January 11, 2010, to May 21, 2010), and one academic year-long program (*Symplectic and Contact Geometry and Topology*, August 17, 2009, to May 21, 2010) will be featured. Some semester-long fellowships may be combined to allow fellows to participate in the full academic year program. Candidates with other interests may also apply for a semester fellowship in the Complementary Program. Further information on these programs is at http://www.msri.org/calendar/index_activities.
Eligibility: For new and recent Ph.D.'s, earned in 2004 or later.
Grant amount: The stipend will be $4,500 per month for five months for a one-semester fellowship, as well as round-trip travel support from the home institution, a research travel allowance of $600, and health insurance coverage. Fellowship applicants can be nominated by program organizing committees for appointment as one of two available Viterbi Family Foundation Postdoctoral Fellows, positions that carry a $5,000 monthly stipend.
Application information: At http://www.msri.org/propapps/applications/application_material. Please complete the online application form at http://www.mathjobs.org. Your file must include 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, 2008.

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. Eight fellows will be selected for three-year terms to begin September 1, 2009.
Eligibility: Candidates must have received the Ph.D. degree between June 1, 2006, and September 1, 2009.
Grant amount: The annual stipend will be $51,500.
Deadline: Completed applications due October 1, 2008.
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, 2004.
Grant amount: Stipends are $53,000 and are adjusted annually in June.
Deadline: The application deadline is January 5, 2009.
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) supports self-directed, unclassified research in the following areas of mathematics: Algebra, Number Theory, Discrete Mathematics, Probability, and Statistics. The program also supports conferences and workshops (typically in the range of $12,000–$15,000) in these five mathematical areas. The program does not entertain research or conference proposals that involve cryptology. Research support may include summer salary for faculty members, a modest amount for graduate student support, travel assistance, and other miscellaneous expenses. Proposals that involve participation by women and other individuals from underrepresented backgrounds are encouraged.
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 at the time of proposal submission.
Deadline: Please note that The Mathematical Sciences Program is no longer using a hardcopy submission system. Proposals must be submitted electronically by October 15, 2008, via the program website http://www.nsa.gov/msp/index.cfm. Details on the submission process will be forthcoming. Please check the website often for updates.

National Security Agency

Sabbatical Program

Description: NSA's Mathematics Sabbatical program offers mathematicians, statisticians, and computer scientists the unique opportunity to develop skills in directions that would be nearly impossible anywhere else. Sabbatical employees work side-by-side with other NSA scientists on projects that involve cryptanalysis, coding theory, number theory, discrete mathematics, statistics and probabilty, and many other subjects. Visitors spend 9–24 months at NSA, and most find that

within a very short period of time, they are able to make significant contributions. NSA pays 50% of salary and benefits during academic months and 100% of salary and benefits during summer months of the sabbatical detail. A monthly housing supplement is available to help offset the cost of local lodging. On average, three sabbatical positions are available per year.
Eligibility: Applicants must be U.S. citizens and must be able to obtain a security clearance.
Deadline: Applications should be submitted electronically by November 15, 2008, via the Sabbatical Program website http://www.nsa.gov/msp/index.cfm. Sabbatical details typically start by September of the following year.
Application information: Complete application includes cover letter and curriculum vitae with list of significant publications. The cover letter should describe the applicant's research interests, programming experience and level of fluency, and how an NSA sabbatical would affect teaching and research upon return to academia. For more detailed application information please consult the program website. For more information about the Grants or Sabbaticals Program, please contact the program office at 301-688-0400. You may also write to the Program Director, Dr. Michelle Wagner, mdwagn4@nsa.gov, or to the Program Administrator, Ms. Barbara Johnson, bajohn1@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, 2008.
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: Subject to budgetary approval, we expect to have positions for a Griffith Conrad Evans Instructorship and a VIGRE Lovett Instructorship beginning in the fall of 2008. These positions are two to three year appointments and are open to promising research mathematicians with research interests in common with the active research areas at Rice; particularly, geometric topology, geometric analysis, analysis, algebraic geometry, ergodic theory, differential geometry and combinatorics. Duties will include research and classroom teaching. We prefer that you submit your application online at http://www.mathjobs.org. If this is not possible, to apply, please have (1) three letters of recommendation (one of these letters must address your teaching skills), (2) a curriculum vitae, (3) a research description and (4) the AMS Cover Sheet for Academic Employment sent to Chair, Evans Committee Department of Mathematics, Rice University, P.O. Box 1892, Houston, TX 77251-1892.
Deadline: Applications received by December 1, 2008, will receive full consideration.
Application information: Inquiries should also be sent to the above address. Rice University is an Equal Opportunity Affirmative Action Employer and strongly encourages applications from women and underrepresented minority group members. For more information about the department and the VIGRE program, please visit http://math.rice.edu and http://www.vigre.rice.edu.

Alfred P. 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/.

Trinity College

Harold L. Dorwart Visiting Assistant Professorship

Description: The Department of Mathematics solicits applications for the Harold L. Dorwart Visiting Assistant

Professorship. This three-year, nonrenewable position offers a competitive salary and monetary support for research-related travel. The normal teaching load is five semester courses per year ("3/2"), one of which is a research seminar to be taught with a senior member of the faculty.
Eligibility: We are seeking applicants with a Ph.D. in mathematics and a specialization in functional analysis, continued fractions and special functions, geometric group theory, harmonic analysis, or microlocal analysis and spectral theory.
Deadline: There is no closing date for applications; however, the department will begin to read applications in early December, and those completed by December 1, 2008, will be assured full consideration.
Application information: Please send a letter of application; curriculum vitae; a statement of teaching philosophy; and three letters of reference, one of which addresses teaching, to: Search Committee, Department of Mathematics, Trinity College, 300 Summit Street, Hartford, CT 06106. Be sure to include email contact information. Representatives of the Search Committee will be at the Joint Mathematics Meetings in Washington, D.C., to participate in the Employment Center. Trinity College is an Affirmative Action/Equal Opportunity Employer. Women and members of minority groups are encouraged to apply. Applicants with disabilities should request in writing any needed accommodations in order to participate more fully in the application process.

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 2007 or later and who submit a completed application by December 15, 2008.
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 2009–10 salary will be at least $68,000.
Deadline: January 1, 2009.
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

Humboldt Research Fellowship

Description: Open to all nationalities and all disciplines. The Humboldt Research Fellowship enables highly-qualified scientists and scholars of all nationalities and disciplines to carry out research projects for extended periods of time in cooperation with academic hosts at research institutions in Germany. Fellowships are awarded on the basis of academic achievement, the quality and feasibility of the proposed research, and the applicant's publications.
Eligibility: Postdoctoral Researchers. Open to scientists and scholars who completed a doctoral degree within four years prior to the date the application is submitted. Allows for a stay of 6–24 months in Germany. Provides a monthly stipend of 2,250 EUR. Experienced Researchers. Open to scientists and scholars who completed a doctoral degree within twelve years prior to the date the application is submitted. Allows for a stay of 6–18 months in Germany. Fellowships may be divided into a maximum of three visits of at least three months each. Provides a monthly stipend of 2,450 EUR.
Grant amount: Additional allowances are available for accompanying family members, travel expenses, and German language instruction. Applications may be submitted to the Humboldt Foundation in Bonn at any time. The review process takes several months,

and the selection committee meets three times a year. For application forms and detailed information, see: http://www.humboldt-foundation.de/en/programme/stip_aus/stp.htm.

American-Scandinavian Foundation

Fellowships and Grants for Advanced Study of Research in Denmark, Finland, Iceland, Norway, and Sweden

Description: Projects should be planned to fall within the summer 2008–summer 2009 period. Grants are considered especially suitable for post-graduate scholars, professionals, and candidates in the arts to carry out research or study visits of one to three months duration. Fellowships are intended to support a year-long stay. Priority is given to candidates at the graduate level for dissertation-related study or research. The awards support project-related costs, including maintenance, trans-Atlantic round-trip travel, in-country travel, tuition and fees (where applicable) and materials expenditures (e.g., books, photocopying, art supplies). ASF awards may require supplementation from other sources, but they should not duplicate the benefits of additional awards (and vice versa). Candidates must notify the ASF if they have received other award offers. The ASF will not provide funds if, in its judgment, a proposal can be carried out without its assistance.

Eligibility: Applicants must have a well-defined research or study project that makes a stay in Scandinavia essential. Applicants must be United States citizens or permanent residents. Applicants must have completed their undergraduate education by the start of their project in Scandinavia. Team projects are eligible, but each member must apply as an individual, submitting a separate, fully-documented application. First priority will be given to applicants who have not previously received an ASF award. Only in exceptional cases will a third award be considered. The ASF considers it desirable that all candidates have at least some ability in the language of the host country, even if it is not essential for the execution of the research plan. For projects that require a command of one or more Scandinavian (or other) languages, candidates should defer application until they have the necessary proficiency.

Grant amount: The American-Scandinavian Foundation (ASF) offers fellowships (up to $20,000) and grants (normally $4,000) to individuals to pursue research or study in one or more Scandinavian country for up to one year. Awards are made in all fields.

Deadline: The deadline for completed applications is November 1, 2008. Decisions announced March 15, 2009.

Application information: Application forms are available online at http://www.amscan.org/.

Fulbright Postdoctoral Research in Israel

Description: Three postdoctoral research grants in the exact sciences—chemistry, computer science, mathematics, physics or related fields—will support individual projects at any institution in Israel starting in September 2000.

Eligibility: Applicants must be U.S. citizens and have completed the Ph.D. within the three years preceding August 1, 2008. Holders of tenure-track positions are not eligible.

Grant amount: The Fulbright award is $17,500 per academic year, for two academic years (20 months net in Israel).

Deadline: August 1, 2008.

Application information: Applicants must apply to potential host institutions in Israel, according to the guidelines of these institutions, in parallel to submission of their Fulbright applications. Prior to confirmation of a Fulbright award, candidates will be required to provide proof of acceptance as a postdoctoral research fellow at an accredited institution of higher education. Participating host institutions are required to provide fellows with their customary, basic postdoctoral award in addition to the Fulbright postdoctoral fellowship provided by the United States-Israel Educational Foundation.

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 five 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 2009, candidates must have graduated from their undergraduate college or university after April 2006 (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 2, 2008 (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 U.S. Student Fulbright 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 20.

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.us.fulbrightonline.org/`.

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 postdoctoral 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

2008 American Mathematical Society Election

CONTENTS

2008 AMS Elections

Special Section

List of Candidates–2008 Election

Vice President
(one to be elected)
Wen-Ching Winnie Li
Frank Morgan

Board of Trustees
(one to be elected)
David R. Morrison
Ronald J. Stern

Member at Large of the Council
(five to be elected)
Scott Jeremy Baldridge
Aaron Bertram
Hector Daniel Ceniceros
David Manderscheid
William A. Massey
Daniel K. Nakano
Panagiotis E. Souganidis
Michelle L. Wachs
David Wright
Horng-Tzer Yau

Nominating Committee
(three to be elected)
Irene Fonseca
Sheldon H. Katz
Chawne M. Kimber
David Kinderlehrer
Ellen E. Kirkman
Peter B. Shalen

Editorial Boards Committee
(two to be elected)
David C. Dobson
Michael T. Lacey
Michael F. Singer
Jack Xin

Ballots

AMS members will receive email with instructions for voting online by August 18, 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 7, 2008.

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, 2008, 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.

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 **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 13 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.

A Proposal for a Fellows Program of the AMS

The January 2008 Council directed that the following proposal be presented to the membership in 2008 for their vote to support or oppose the formation of an AMS Fellows Program. The Council further directed that the ballot be accompanied by this statement: "If more than 2/3 of the members voting on this issue are in favor, then the AMS will implement the program. A similar vote in 2006 gave 63.2% in favor of establishing a Fellows Program."

The Fellows program is created and updated by the Council of the AMS. The program below describes in general terms what a new Fellows program will look like. If approved, some details of the program may be changed by the AMS Council prior to implementation in order to address practical needs. Future Councils can make further changes, keeping in mind the intent of the membership in approving the initial program.

The goals of the Fellows Program are:

- To create an enlarged class of mathematicians recognized by their peers as distinguished for their contributions to the profession.
- To honor not only the extraordinary but also the excellent.
- To lift the morale of the profession by providing an honor more accessible than those currently available.
- To make mathematicians more competitive for awards, promotion, and honors when they are being compared with colleagues from other disciplines.
- To support the advancement of more mathematicians in leadership positions in their own institutions and in the broader society.

I. Program (steady-state)

A. The Fellows program of the American Mathematical Society recognizes members who have made outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics.

B. The responsibilities of Fellows are:

- To take part in the election of new Fellows,
- To present a "public face" of excellence in mathematics, and
- To advise the President and/or the Council on public matters when requested.

C. All AMS members are eligible to be elected Fellows.

D. The target number of Fellows will be determined by the AMS Council as a percentage of the number of eligible

members.[1] The target percentage will be revisited by the Council at least once every ten years and may be increased or decreased in light of the history of the nomination and election process. The intended size of each year's class of new Fellows should be set with this target size in mind.

E. Following an election process (see below), individuals are invited to become Fellows. They may decline and they may also resign as Fellows at any time.

F. Each year all Fellows are invited to a reception at the AMS annual meeting; and the new Fellows are announced at this reception followed by a press release. New Fellows receive a certificate and their names are listed on the AMS website. The names of new Fellows are also included in the *Notices*.

G. If they are not already Fellows, the AMS President and Secretary are made Fellows when they take office.

II. Election Process

A. New Fellows are elected each year after a nomination process. Eligible voters consist of current Fellows who are also members of the Society. Both the election and the nomination process are carried out under the direction of the Secretary with help from the AMS staff. The procedures for nominating AMS Fellows will be available on the AMS website.

B. The Election Committee will consist of nine members of the AMS who are also Fellows, each serving a three-year term, and with three new members appointed each year. The AMS president, in consultation with the Executive Committee of the Council, nominates the new members of the Election Committee in November of each year. At the same time, the President nominates a continuing member of the Election Committee to serve as Chair. The President's choices are approved by Council at its January meeting.

C. The Election Committee accepts nominations for Fellows between February 1 and March 31 each year. Nominations are made by members of the AMS. A member can nominate no more than 4 nominees a year.

D. To be eligible for nomination to Fellowship, an individual must be an AMS member for the year in which he or she is nominated as well as for the prior year.

E. A nominator must supply a package with the following information on the nominee:

1. A Curriculum Vitae of no more than five pages.
2. A citation of fifty words or less explaining the person's accomplishments.
3. A statement of cause of 500 words or less explaining why the individual meets the criteria of Fellowship.
4. The signatures of the nominator and three additional AMS members who support the nomination, with at least two of these individuals current Fellows.

F. Any person who appears on the ballot and is not elected a Fellow will remain an active nominee to be considered by the Election Committee for inclusion on the ballot for a further 2 years.

G. A person can be nominated no more than 3 times in a 5-year period.

H. Each year the January Council provides a guideline for the number of nominations to appear on the ballot. The Election Committee assembles the ballot from the nominations bearing in mind this guideline, diversity of every kind, and the quality and quantity of the external nominations. The Election Committee has the discretion to make nominations itself if necessary to fulfill the general goals of the fellowship.

I. The ballot is available electronically (only) and voting is conducted throughout the month of September of each year. The Curriculum Vitae and citation for each candidate will be available to all eligible voters. Election is by plurality with the top one-half of the candidates elected. In case of a tie, more than one-half of the candidates may be elected.

J. Those nominees elected are invited by the President to become new Fellows of the AMS as of January 1 of the following year.

III. Initial Implementation

A. In the initial year of the program, all eligible AMS members who have done one or more of the following are invited to become AMS Fellows.[2]

1. Given an invited AMS address (including at joint meetings).
2. Been awarded an AMS research prize.[3]
3. Given an invited address at an International Congress of Mathematicians (ICM) or an International Congress of Industrial and Applied Mathematicians (ICIAM).[4]

B. An additional 50 Fellows are selected by a committee appointed by the President with the advice of the Executive Committee of the Council. Particular attention will be paid to selecting AMS members recognized for their contributions to education and service to the profession.

C. For the initial "seed pool" of Fellows there is no length of AMS membership required. Any person who falls into one of the three categories above, and who is an AMS member during the year in which this program is initiated will be invited to be a Fellow.

D. At least ten (10), but no more than fifty (50), new Fellows are elected each year until the total number of Fellows reaches 95% of the targeted size of the Fellowship.[5]

[1] *This proposal's recommendation to Council is 5% of eligible members. At present there are about 30,000 eligible members so the number of Fellows would be about 1,500.*

[2] *The seeding process described in III.A would produce offers of Fellows status to more than 800 current AMS members. The group of invited address speakers also includes approximately 400 additional individuals who are not currently AMS members.*

[3] *These are the Birkhoff, Bôcher, Cole, Conant, Doob, Eisenbud, Fulkerson, Moore, Robbins, Satter, Steele, Veblen, Whiteman, and Weiner prizes.*

[4] *An invited address is one given at the invitation of the program committee.*

[5] *If 1,000 Fellows are named through the initial seeding, then we estimate that a steady state of 1,600 would be achieved in approximately 10–20 years under the proposed plan.*

Frequently Asked Questions about the AMS Fellows Proposal

Q. *How was the AMS Fellows program proposal developed?*

A. Over the past decade various committees and subcommittees of the AMS have discussed the possibility of instituting an AMS Fellows Program, partly influenced by the existence of such programs in a number of other scientific societies. In 2003 an ad hoc committee on Fellows gave a report to the Council in which arguments were presented for and against the concept. Because it is hard to judge a program in the abstract, a smaller committee was appointed with the charge to formulate a specific proposal. This committee included the Council members, John Franks, Susan Friedlander (Chair) and Sheldon Katz. After months of analysis of earlier committee reports, discussions with many AMS members, comparative research into other Fellows programs, and deliberation of what kind of program might suit the AMS, the committee reported back to the Council in 2006 with a specific proposal.

The Council, after strenuous debate, voted to put the proposal on the 2006 AMS ballot. The members could vote for or against the proposal with the information that if two-thirds of the vote was in favor, the program would be implemented. The vote in 2006 was 63.2% in favor.

The proposal that is being brought to the membership in 2008 is a modified version of the 2006 proposal. It takes into account certain issues raised by members and also benefits from feedback between the AMS proposal and a proposal for SIAM Fellows that will be put on the SIAM ballot in 2008.

Q. *Is excellence in research the only criterion for being a Fellow?*

A. Research excellence is certainly one possible criterion, but it is not meant to be the only one. The Fellows program is also intended to recognize excellence in educational activities and other forms of excellence directly related to the goals of the AMS.

Q. *What are the goals of the Fellows program?*

A. The goals are:

To create an enlarged class of mathematicians recognized by their peers as distinguished for their contributions to the profession.

To honor not only the extraordinary but also the excellent.

To lift the morale of the profession by providing an honor more accessible than those currently available.

To make mathematicians more competitive for awards, promotion, and honors when they are being compared with colleagues from other disciplines.

To support the advancement of more mathematicians in leadership positions in their own institutions and in the broader society.

Q. *What are arguments in favor of a Fellows program?*

A. Here are some of the arguments in favor:

1. There are too few opportunities to recognize achievement in mathematics, and a Fellows program will provide one more that will be available to a large number of people.
2. AMS Fellows and their departments may be more competitive for awards and other honors when competing with other disciplines for recognition.
3. Many other societies in other disciplines have fellows programs, and mathematicians sometimes must compete with their members for recognition.
4. Fellows may have more influence in the profession and in their own institutions.
5. Fellows may have a stronger connection with the AMS.

Q. *What are arguments against a Fellows program?*

A. Here are some of the arguments against:

1. The AMS has a long tradition of being welcoming and egalitarian. Having a Fellows program may not be consistent with this tradition.
2. Fellows are likely to be those people who already have been recognized in other ways.
3. Selection as a fellow of the AMS will not be especially important to people or institutions outside mathematics.
4. The process of selecting fellows will be political and may be divisive in various settings—in departments, in particular research groups, or in the Society itself.
5. Non-fellows may have a weaker connection with the AMS (and there are many more of them).

Q. *Where can I find more detailed discussions?*

A. Pro and con articles concerning an AMS Fellows program appeared in the AMS *Notices* in advance of the 2006 vote (Vol 53, Aug 2006, pp. 754–756, also found at `http://www.ams.org/notices/200607/fea-fellows.pdf`.)

Q. *Do other societies in the mathematical sciences have Fellows programs?*

A. Yes. For example, the American Statistical Association, Association for Computing Machinery, and INFORMS all have Fellows programs. The Society for Industrial and Applied Mathematics will bring a proposal for establishing a Fellows Program to its members in its 2008 ballot. If 50% of the vote is in favor, SIAM will implement a program whose details can be found at `http://Fellows.siam.org`.

Q. *How does the proposed AMS program compare to the size of the programs of other societies?*

A. In its steady state the proposed AMS Fellowship would be approximately 5% of the total membership (i.e., about 1,500 fellows out of about 30,000 members). In some other societies surveyed the Fellowship varies between about 5% and about 13%.

In its steady state it is expected that the number of new Fellows elected each year will be approximately 0.2% of the membership. Each year, the American Physical Society elects no more than 0.5 % of all members and the American Statistical Association elects no more than 0.33% of all members.

Q. How will the AMS Fellowship be started and how will new Fellows be elected?

A. This is spelled out in detail in the proposal itself.

Q. How many Fellows will there be in the "seed pool" and how will the steady state be achieved?

A. The seed process (see the proposal) is expected to generate approximately 1,000 Fellows. During the transition process, the proposal calls for 10–50 new Fellows each year. The expectation is that the number will be at the high end of this range, and therefore that the steady state of approximately 1,500 Fellows will be reached in roughly 10 years. Assuming a Fellow lives approximately 30 years after election on average, approximately 50 new Fellows will be elected each year to maintain the total at 1,500 (that is, approximately 5% of the total membership). The Council will revisit the target percentage at least once every 10 years.

Q. Why is there a start-up procedure?

A. There are several reasons for starting the program with a well defined set of criteria for selecting an initial set of Fellows.

If the program is worth having then it should be up and running from the start with a substantial number of Fellows, so that it is a healthy program.

Future Fellows will be elected by current Fellows, so a sizable and diverse collection of initial Fellows is required to jump start the election process.

A well specified algorithm is required to avoid an otherwise massive task of individual evaluation of the initial set of Fellows. The algorithm should be clear in advance to avoid questions after the fact regarding who was selected and why.

Q. What is the start up algorithm?

A. The specifics of the algorithm for the "seed pool" are given in the proposal. The body of the seed pool will be AMS members who have previously been selected to give an invited AMS address. This is not claimed to be the perfect way to start the Fellowship. However, bearing in mind that a fairly large well defined group is desirable to seed the Fellowship, this choice is practical and reasonable. Every person in the group has been selected by one of a very large number of AMS committees. There are approximately six AMS selection committees in operation every year and half their membership changes every year. Hence in the past 50 years a very significant percentage of the membership has had input in selecting the invited speakers. Of course the speaker selection criteria are not identical to the criteria the Election committee will use for future Fellows. However, there are a number of criteria in common, including excellence in mathematics. Furthermore, no other mechanism for creating the seed pool would immediately provide a group of about 1,000 Fellows whose selection involved many members of the AMS.

The seed pool will be augmented by some additional people. This includes 50 Fellows to be selected by an appointed AMS committee charged with increasing the number of Fellows recognized for their contributions to education and service to the profession and to increase the number of women and underrepresented minorities in the seed pool.

The start up procedure is not designed to select all worthy recipients, but to provide a feasible, rational way to begin the Fellowship. It is to be stressed that future Fellows will be elected without being constrained by the start up algorithm.

Q. How will the Fellows program be changed in the future?

A. The current proposal for the Fellows program was created by the Council, and it can be modified by the Council in the future. The details of administering the program may be changed in the future to address practical needs, even as the program is initially implemented.

Q. How can I find out more about the Fellows program?

A. Updated information will appear at

http://www.ams.org/secretary/fellows-info.

That site will also contain a form to ask questions about the program.

Biographies of Candidates 2008

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).

Vice President

Wen-Ching Winnie Li

Professor, Pennsylvania State University.

Born: December 25, 1948, Chia-yi, Taiwan.

Ph.D.: University of California, Berkeley, 1974.

AMS Committees: Committee on Human Rights of Mathematicians, 1992–1995, 2007–2010; Editorial Committees: *Transactions and Memoirs of the AMS*, 1992–1996; Proceedings of the AMS, 2002–2010.

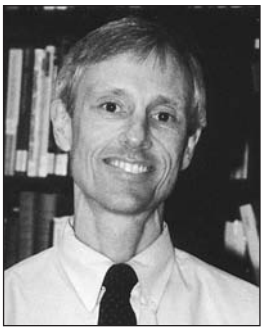
Selected Addresses: Invited Address, AMS Summer Meeting, Albany, 1983; Invited Lecture, First International Congress of Chinese Mathematicians, Beijing, 1998; Invited Plenary Address, Taiwanese Mathematical Society, Annual Meeting, Taipei, 2006; Invited Lecture, Fourth International Congress of Chinese Mathematicians, Hangzhou, 2007; Invited Address, Joint Mathematics Meetings, San Diego, 2008.

Additional Information: Alfred P. Sloan Fellow, 1981–1983; AMS Visiting Professorship for Women Award, 1991–1992; Editorial Boards: *Taiwanese Journal of Mathematics*, 1998–2010, *International Journal of Number Theory*, 2005—present, *Journal of Combinatorics and Number Theory*, 2008–2013; Center Scientist, National Center for Theoretical Sciences, Mathematics Division, Hsinchu, Taiwan, 2006–2007.

Selected Publications: 1. with A. O. L. Atkin, Twists of newforms and pseudo- eigenvalues of W-operators, *Invent. Math.*, **48** (1978), 221–243. MR**0508986 (80a:10040)**; 2. *Number Theory with Applications*, World Scientific, Singapore, 1996. MR**1390759 (98b:11001)**; 3. Ramanujan hypergraphs, *Geom. Funct. Anal.*, **14** (2004), 380–399. MR**206019 9(2005i:11172)**; 4. with R. Koetter, P. O. Vontobel and J. Walker, Characterizations of pseudo-codewords of LDPC codes, *Adv. Math.*, **213**, Issue 1 (2007), 205–229. MR**2331243**; 5. with A. O. L. Atkin and L. Long, On Atkin and Swinnerton-Dyer congruence relations. II. *Math. Ann.*, **340** (2008), No. 2, 335–358. MR**2368983**.

Statement: I strongly support the central role of the AMS in promoting mathematical research and the interests of mathematicians. The AMS is the main advocate of the profession. As such, it should play a leading role in enhancing the mathematics education of all levels. AMS should continue to publicize and promote the developments in not only the traditional areas of pure and applied mathematics, but also the rapidly evolving interdisciplinary areas to which mathematics could have essential applications. I hope to have the opportunity to work with the mathematical community in general and the AMS Council in particular towards these goals.

Frank Morgan



Atwell Professor of Mathematics, Williams College.
Born: USA.
Ph.D.: Princeton University, 1977.
AMS Offices: Member at Large of the Council, 1994–1997.
AMS Committees: Nominating Committee and others.
Selected Addresses: Joint Invited Address, Joint Mathematics Meetings, San Francisco, CA, 1991; Invited Address, MathFest, Madison, WI, 2001; Invited Address, Geometry Festival, 2006; Invited Lecture, ISASA, Granada, Spain, 2006.
Additional Information: NSF math advisory committee, 1987–1990; Haimo MAA national teaching award, inaugural winner, 1992; Second Vice-President, MAA, 2000–2002.
Selected Publications: 1. *Geometric Measure Theory: A Beginner's Guide*, Academic Press Inc., 1988; Japanese translation, 1989; second edition, 1995; third edition, 2000; Russian edition, 2006; fourth edition, 2008. MR**1775760 (2001j:49001)**; 2. *The Math Chat Book*, Mathematical Association of America, 2000 (based on live, call-in TV show). MR**1733304**; 3. with Michael Hutchings, Manuel Ritoré, and Antonio Ros, Proof of the double bubble conjecture, *Ann. of Math.* (2), **155** (2002), No. 2, 459–489. MR**1906593 (2003c:53013)**; 4. Manifolds with density, *Notices Amer. Math. Soc.*, **52** (2005), No. 8, 853–858. MR**2161354 (2006g:53044)**.
Statement: The American Mathematical Society stands for mathematics in the United States and throughout the world, supporting research and communication at all levels. We need and welcome all kinds of participation, from the frontiers of research to all areas of society, from all segments of our population, from research mathematicians and scientists, community college teachers, graduate students, undergraduates, public and private school teachers and students, the press, politicians, and all walks of life. Our doors should be open to new participants and new ideas: the world is full of opportunities for us.

Trustee

David R. Morrison

Professor of Mathematics and Physics, University of California, Santa Barbara.
Born: July 29, 1955, Oakland, California, USA.
Ph.D.: Harvard University, 1980.
AMS Offices: Member at Large of the Council, 2002–2005; Executive Committee of the Council, 2002–2005.
AMS Committees: Board of Trustees Committee on the Publication Program, 1994–1995; Committee on Publications, 2002–2005; Committee on Committees, 2005–2007; Eisenbud Prize Committee, 2006–2007.
Selected Addresses: AMS Invited Address, Lexington, KY, 1994; 45-minute address, International Congress of Mathematicians, Zurich, 1994.
Additional Information: AMS Centennial Fellow, 1992–1994; Clay Mathematics Institute Senior Scholar, 2005; Guggenheim Fellow, 2005–2006.
Selected Publications: 1. On *K3* surfaces with large Picard number, *Invent. Math.*, **75** (1984), 105–121. MR**0728142 (85j:14071)**; 2. with S. Katz, Gorenstein threefold singularities with small resolutions via invariant theory for Weyl groups, *J. Alg. Geom.*, **1** (1992), 449–530. MR**1158626 (93b:14030)**; 3. Mirror symmetry and rational curves on quintic threefolds: A guide for mathematicians, *J. Amer. Math. Soc.*, **6** (1993), 223–247. MR**1179538 (93j:14047)**; 4. with P. S. Aspinwall and B. R. Greene, Multiple mirror manifolds and topology change in string theory, *Phys. Lett. B*, **303** (1993), 249–259. MR**1214080 (94g:32031)**; 5. with B. R. Greene and A. Strominger, Black hole condensation and the unification of string vacua, *Nucl. Phys. B*, **451** (1995), 109–120. MR**1352415 (96m:83085)**.
Statement: The American Mathematical Society serves mathematics in three important ways: through meetings and conferences, facilitating interaction among mathematicians; through public outreach, helping mathematicians explain the role of mathematics to government representatives and the public at large; and through its publication program, which not only makes mathematical research available in print and online, but has supported the development and dissemination of key tools (TEX, and more recently the STYX fonts) which enable mathematicians to communicate their research with each other. I have been pleased to watch these three strands develop in forward-looking ways during my roughly thirty years as an AMS member; as Trustee, I will help ensure the financial stability and institutional flexibility which will allow the Society to continue its development in these directions.

Ronald J. Stern

Professor of Mathematics, University of California, Irvine.
Born: January 20, 1947, Chicago, Illinois.
Ph.D.: UCLA, 1973.
AMS Committees: Western Section Speaker Selection Committee (Chair), 1986–1988, 1992–1993; *Proc. Amer. Math. Soc.* Editorial Committee, 1992–1996; Subcommittee on Prizes (CoProf), 1993–1998; Committee on the Profession, 1993–1999; Working Group on Public Awareness of Mathematics, 1996–1997; Subcommittee on Membership (CoProf), 1997–1998; AMS-SMM Joint Program Committee, Denton Meeting, May, 1999, 1998–2000; LAC-UCLA Mathematical Challenges of the 21st Century, 1999–2000; Committee on Publications, 1999–2002; Graduate Studies in Mathematics, 1999–2002; Committee on Committees (Chair), 2000–2005; AMS Fellows Program Subcommittee, 2002–2005; *Mathematical Reviews* Editorial Committee, AMS Committee to Select the Winner of the 2007 Oswald

Veblen Prize, 2006–2008; AMS Science Policy Committee (Chair), 2007–2010.

Selected Addresses: MAA Invited Address, Eugene, Oregon, August 1984; AMS Invited Address, Laramie, Wyoming, August, 1985; Joint AMS-SMM Invited Address, Oaxaca, Mexico, 1997; Invited Speaker, International Congress of Mathematicians, Berlin, Germany, 1998; Plenary Address, DMV Jahrestagung, Heidelberg, Germany, 2004.

Additional Information: Secretary, MSRI Board of Trustees, 1992–1996; President and Chair of the Board of Governors of the *Pacific Journal of Mathematics*, 1995–; Sloan Foundation, Mathematics Selection Committee, 2000–2005; Editor, *Geometry and Topology*, 2001–; Distinguished Alumnus, Knox College, 2003; Board of Directors, Mathematical Sciences Publishers, 2004–; Dean, School of Physical Sciences, UCI, 1998– 2006; Steering Committee of IAS/Park City Summer Institute in Mathematics, 2007–.

Selected Publications: 1. with D. E. Galewski, Classification of simplicial triangulations of topological manifolds, *Ann. of Math.* (2), **111** (1980), No. 1, 1–34. MR**0558395 (81f:57012)**; 2. with R. Fintushel, The blowup formula for Donaldson invariants, *Ann. of Math.* (2), **143** (1996), No. 3, 529–546. MR**1394968 (97i:57036)**; 3. Rational blowdowns of smooth 4-manifolds. *J. Differential Geom.*, **46** (1997), No. 2, 181–235. MR**1484044(98j:57047)**; 4. with R. Fintushel, Knots, links, and 4-manifolds, *Invent. Math.*, **134** (1998), No. 2, 363–400. MR**1650308 (99j:57033)**; 5. with R. Fintushel, Surgery on nullhomologous tori and simply connected 4-manifolds with $b^+=1$, *Journal of Topology*, **1** (2008), No. 1, 1–15. MR**2365649**.

Statement: I would be honored to serve as a Trustee for an organization that represents my life-long passion. Keep in mind that the primary responsibility of the Board of Trustees is the fiduciary health of the Society. As such they determine the annual budget of the Society, prices of journals, salaries of employees, and investment policy for the Society's reserves. As former dean at a major research university and as either a current or former officer of several boards of governors and trustees of mathematical institutes and journals, I have, if elected, ample experience to hit the ground running. For a statement of how I view the role of the society within the scientific and broader communities, see the September 2005 issue of the *Notices*, pages 921–22.

Member at Large

Scott Jeremy Baldridge

Assistant Professor of Mathematics, Louisiana State University.

Born: September 5, 1970, Grand Rapids, MI, USA.

Ph.D.: Michigan State University, 2001.

Selected Addresses: AMS Special Session on New Developments in Symplectic Topology, San Antonio, 2006; AMS Special Session on Invariants of Low Dimensional Manifolds, Miami, Florida, 2006; Symplectic Geometry and Topology and Their Applications Conference, Poland, 2006; Interactions of Geometry and Topology in Low Dimensions Conference, BIRS, Banff, 2007; Georgia Topology Conference, Athens, Georgia, 2007.

Additional Information: VIGRE Postdoctoral Fellowship, Indiana University, 2001– 2004; Research Fellow, Institute for Pure and Applied Mathematics, 2003; NSF Disciplinary Grant in Topology, 2004–2008; Research Fellow, Park City Mathematics Institute, 2006; NSF Course, Curriculum, and Laboratory Improvement Grant, 2007; National Science Foundation CAREER awardee, 2008; Mathematics Adviser, LSU Geaux Teach Program; currently advising one graduate student. Member of the AMS, AWM, and MAA.

Selected Publications: 1. Seiberg-Witten invariants, orbifolds, and circle actions, *Trans. Amer. Math. Soc.*, **355** (2002), No. 4, 1669–1697. MR**1946410 (2003j:57050)**; 2. with Thomas H. Parker, *Elementary Mathematics for Teachers*, Sefton-Ash Publishing (2004), x+237 pages; 3. New symplectic 4-manifolds with $b_+=1$, *Math. Ann.*, **333** (2005), No. 3, 633–643. MR**2198801 (2006m:57035)**; 4. with P. Kirk, On symplectic 4-manifolds with prescribed fundamental group, *Comment. Math. Helv.*, **82** (2007), No. 4, 845–875. MR**2341842**; 5. with P. Kirk, A symplectic manifold homeomorphic but not diffeomorphic to $CP^2\#3\overline{CP}^2$, *Geom. Topol.*, to appear.

Statement: If elected to the Council I will do my best to advance the research efforts of all of its members. I believe we must articulate the beauty and importance of mathematics to our national and industrial leaders, and actively encourage Congress to support higher levels of research funding for mathematics, especially during the first year of a new administration. Ph.D. granting mathematics departments need support to continue to attract the best and brightest students from around the world. Mathematicians at liberal arts and regional universities are also in the process of building energetic, often interdisciplinary, research-friendly environments. By supporting their initiatives, we increase the number of attractive career options for new Ph.D. graduates. The remarkable work the AMS does through affordable online journals, MathSciNet, job fairs, undergraduate research, conferences and meetings clearly support these initiatives, and we should look for ways to do more. Finally, all AMS members are concerned with K–12 education and students (and K–16 teaching in general). We desire to help, but often cannot reach out to schools and teachers without diverting funds from the core missions: the mechanisms are not in place to make it easy to help. As national initiatives such as GK-12 grants are introduced, the AMS can and should be a strong advocate for involving mathematicians in K–12 education in ways that strengthen the core missions of the department.

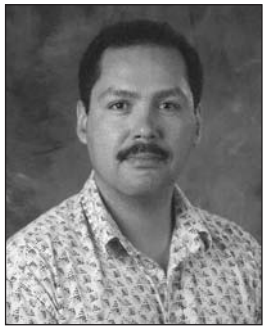
Aaron Bertram

Professor and Chair, University of Utah Mathematics Department.
Born: May 20, 1962, Los Angeles, CA, USA.
Ph.D.: UCLA, 1989.

Selected Addresses: "New moduli for K3 surfaces, or why Castelnuovo would have liked the derived category", Harvard Algebraic Geometry Seminar, May 7, 2006; "Constructing Bridgeland moduli spaces with Mukai flops", Princeton Algebraic Geometry Seminar, November 7, 2006; "Why does pi keep popping up?" Utah Undergraduate Colloquium, October 3, 2007; "Vanishing and Stability", Berkeley-Stanford joint Algebraic Geometry Colloquium, November 27, 2007; "Stability conditions in codimension two", UIC Algebraic Geometry Seminar, April 10, 2008.

Additional Information: NSF postdoctoral fellow, 1989–1993; Benjamin Peirce Assistant Professor (Harvard), 1989–1993; Sloan research fellow, 1993–1995; Co-Guru (with Ravi Vakil), Western Algebraic Geometry Seminars, 2001–present; Co-Organizer, Seattle Summer Institute in Algebraic Geometry, 2005; Steering Committee, IAS/Park City Mathematics Institute (PCMI), 2006–present.
Selected Publications: 1. with L. Ein and R. Lazarsfeld, Vanishing theorems, a theorem of Severi, and the equations defining projective varieties, *J. Amer. Math. Soc.*, **4** (1991), No. 3, 587–602. MR**1092845 (92g:14014)**; 2. Quantum Schubert calculus, *Adv. Math.*, **128** (1997), No. 2, 289–305. MR**1454400 (98j:14067)**; 3. Another way to enumerate rational curves with torus actions, *Invent. Math.*, **142** (2000), No. 3, 487–512. MR**1804158 (2001m:14077)**; 4. with I. Ciocan-Fontanine and B. Kim, Two proofs of a conjecture of Hori and Vafa, *Duke Math. J.*, **126** (2005), No. 1, 101–136. MR**2110629 (2006e:14077)**; 5. with I. Ciocan-Fontanine and B. Kim, Gromov-Witten invariants for abelian and nonabelian quotients, *J. Algebraic Geom.*, **17** (2008), No. 2, 275–294. MR**2369087**.
Statement: The duties of a member-at-large are "to legislate for the Society on matters concerned with the furtherance of the interests of mathematical scholarship and research." Over the past 20 years as a researcher and teacher, but especially over the past 3 years as chair of my mathematics department, I have thought a great deal about such matters. Three issues, in particular, stand out clearly. 1) How do we identify and nurture our most promising young mathematicians? The system of postdoctoral instructorships, governmental and private fellowships and grants seems to work well, on the whole. But we need to be vigilant to make sure that our talented Ph.D.'s do not fall through the cracks, particularly in a time of declining resources. 2) How do we adapt to the role of the Internet in the dissemination of mathematics? As publication prices continue to soar, the use of online journals will increase. We need to be careful about quality control. Diligent peer review of articles is immensely important, and seems increasingly difficult to obtain. 3) How do we, as a profession, recognize our most accomplished mathematicians? For example, as a departmental chair I can see both the advantage of a society of fellows (in negotiations with the dean) and the disadvantage (in the morale of those left out).

Hector Daniel Ceniceros



Professor of Mathematics, Department of Mathematics, University of California, Santa Barbara.
Born: March 13, 1967, Culiacan, Sinaloa, Mexico.
Ph.D: Courant Institute of Mathematical Sciences, New York University, 1995.
Selected Addresses: Invited Speaker, VI Workshop on Numerical Analysis for Free Boundary Problems, Braga, Portugal, November, 1998; Invited Speaker, International Conference on Scientific and Engineering Computing, Beijing, China, March, 2001; International Workshop on Free Boundary Problems in Fluid Mechanics, Nottingham, UK, September, 2003; Invited Speaker, International Conference of Free Boundary Problems, Theory and Applications, Coimbra, Portugal, June, 2005; Colloquium Lecture, Instituto de Matemática e Estatística, Universidade de São Paulo, Brazil, March, 2007.
Additional Information: Founding faculty advisor of the UCSB SACNAS Chapter; Member of the Society for Advancement of Chicanos and Native Americans in Science (SACNAS); The Mochizuki Teaching Award recipient, University of California, Santa Barbara, 2002; Faculty Career Development Award, University of California, Santa Barbara, 2003.
Selected Publications: 1. with T. Y. Hou, Convergence of a non-stiff boundary integral method for interfacial flows with surface tension, *Math. Comp.*, **67** (1998), No. 221, 137– 182. MR**1443116 (98c:76077)**; 2. with T. Y. Hou, An efficient dynamically adaptive mesh for potentially singular solutions, *J. Comput. Phys.*, **172** (2001), 609–639; 3. The effects of surfactants on the evolution and formation of capillary waves, *Phys. Fluids*, **15** (2003), No. 1, 245–256. MR**1971799 (2004b:76055)**; 4. with V. E. Badalassi and S. Banerjee, Computation of multiphase systems with phase field models, *J. Comput. Phys.*, **190** (2003), No. 2, 371–397. MR**2013023 (2004j:65149)**; 5. with G. Fredrickson, Numerical solution of polymer self-consistent field theory, *Multiscale Model. Simul.*, **2** (2004), No. 3, 452– 474. MR**2111703 (2005h:82120)**.
Statement: The AMS provides an essential professional network for our mathematical community and has played a key role in promoting research and education in mathematics. We need to support these efforts while enhancing our ability to communicate effectively to the public the beauty and the importance of mathematics in today's world. We need to outreach to pre-college students, especially in disadvantaged areas and we need to better educate the private sector about the connections of mathematics with real life problems.

David Manderscheid

Professor of Mathematics and Dean of the College of Arts and Sciences, University of Nebraska-Lincoln.

Born: March 7, 1955, Redwood City, California, USA.

Ph.D.: Yale University, 1981.

AMS Committees: AMS Representative to AMS-MAA Committee on Research in Undergraduate Mathematics Education, 2001–2004; AMS Advisory Board, Mathematics Research Communities, 2007.

Selected Addresses: AMS Special Sessions: Washington, DC and Hong Kong, 2000; Madison, 2002; San Antonio, 2006; New Orleans, 2007; San Diego, 2008; National Bureau of Economic Research, Diversifying the Science and Engineering Workforce, Harvard University, 2005; Dean's Summit, Rice University, 2007.

Additional Information: NSF Mathematical Sciences Postdoctoral Fellowship, 1985–1988; Member, MSRI, 1988, 1995; Member, Institute for Advanced Study, 1988–1989; University of Iowa, 1987–2007, Department Chair 2001–2007; Visiting Professor, Université Paris VII (Denis Diderot), 2001; University of Nebraska-Lincoln, 2007–; Presidential Award for Excellence in Science Mathematics and Engineering Mentoring, University of Iowa Department of Mathematics, NSF and the White House, 2005; Programs that Make a Difference Award, University of Iowa Department of Mathematics, AMS, 2006; Award for an Exemplary Program or Achievement in a Mathematics Department, University of Iowa Department of Mathematics, AMS, 2008; Co-organizer, Leadership Workshop, Finding and Keeping Diverse Graduate Students in the Mathematical Sciences, American Institute of Mathematics, 2006; Co-leader, AMS Workshop for Department Chairs and Department Leaders, 2006–2008; Member of the MAA and SIAM.

Selected Publications: 1. Supercuspidal duality for the two-fold cover of SL_2 and the split $\mathcal{O}_3$, *Amer. J. Math.*, **107** (1985), No. 6, 1305–1323. MR**0815764 (87e:22040)**; 2. with P. Kutzko, On intertwining operators of $GL_N(F)$ F a non-Archimedean local field, *Duke Math. J.*, **57** (1988), No. 1, 275–294. MR**0952235 (90c:22054)**; 3. Base change for p-adic SL(2) as a theta correspondence. II. Jacquet modules, *Pacific J. Math.*, **199** (2001), No. 2, 447–466. MR**1847141 (2002f:22031a)**; 4. Waldspurger's involution and types, *J. London Math. Soc.*, **70** (2004), No. 3, 567–586. MR**2096864 (2005j:11037)**; 5. Changing the culture of a mathematics department: The Iowa experience, *Mathematics and Education Reform (MER) Newsletter*, **16** (2006), No. 4, 1–4.

Statement: The AMS promotes mathematical research, acts to strengthen mathematics education, and fosters appreciation and awareness of the importance of mathematics. The Council plays a critical role in determining the direction and tenor of the Society in satisfying this three-part mission. I have a proven record of excellence, leadership, and innovation in each of these areas. I listen and question, argue effectively, and then get things done. As a dean, I would provide the perspective of one of the key partners, at least in academe, in moving mathematics forward and serving the needs of mathematicians. I am particularly concerned that we make mathematics stronger by engaging members of all groups, particularly those underrepresented, and by providing our students and faculty with the best opportunities to succeed. The AMS is a great organization. I would welcome the opportunity to help make it and the profession even better.

William A. Massey

Edwin S. Wilsey Professor, Department of Operations Research and Financial Engineering, Princeton University, Princeton, NJ.

Born: 1956, Jefferson City, Missouri.

Ph.D.: Stanford University, 1981.

Selected Addresses: Bandwidth Service Models for Provisioning and Pricing, SIAM Conference, Montréal, Canada, July, 2003; Queueing Networks with Time Varying Rates for Modeling Call Centers, Call Center Workshop, École Polytechnique, Montréal, Canada, August, 2004; The Mathematical Dimensions of Knowledge, National Association of Mathematicians Undergraduate MATHFest, Morehouse College, October, 2004; A Dynamical Systems Analysis for Stochastic Models of Call Centers, SIAM Applications of Dynamical Systems Meeting, Snowbird, Utah, May, 2005; Approximating Response Times for Dynamical Processor Sharing Queues, First Conference of African-American Researchers in the Computing Sciences, Auburn University, July, 2006; Dynamical Queueing Systems, Institute for Mathematics and its Applications (IMA) Special Workshop: Blackwell-Tapia Conference, Minneapolis, MN, November, 2006; Mathematics, Mentoring, Microphones and Minorities, Mathematics Colloquium, Teachers College, Columbia University, October, 2007; The Four Dimensions of Mathematics, Alabama Council of Teachers of Mathematics (ACTM) 2007 Fall Forum, Auburn University, Montgomery, Alabama, October, 2007; Dynamical Queueing Systems, QPA Workshop on Queueing theory without limits: transient and asymptotic analysis EURANDOM, Eindhoven, The Netherlands, October, 2007; Modified-Offered Load and Fluid Models for Workforce Management, Call Center Forum: Contact Center Management, Wharton School of Business, February, 2008.

Additional Information: Awarded an NSF Research Training Group for *Stochastic Analysis & Applications (Co-PI)*; Awarded an NSF Grant DMI-0323668 on *Telephone Call Centers—Performance, Design and Control of Time Varying Queues*; U.S. patent number 5,923,873 titled *Method for determining server staffing in management of finite server queueing systems*; Named Fellow of the Institute for Operations Research and Financial Engineering (INFORMS), 2006; Winner of the 2006 Blackwell-Tapia Prize; Distinguished Service Award from the National Association of Mathematicians.

Selected Publications: 1. with K. Leung and W. Whitt, Traffic models for wireless communications networks, *IEEE Journal on Selected Areas on Communications*, **12** (October 1994), 1353–1364; 2. with W. Whitt, Uniform acceleration expansions for Markov chains with time-varying rates, *Annals of Applied Probability*, **8** (1998), No. 4, 1130–1155. MR**1661164 (2000b:60176)**; 3. with A. Mandelbaum and M. I. Reiman, Strong approximations for Markovian service networks, *Queueing Systems and Their Applications*, **30** (1998), 149–201. MR**1663767 (99i:60163)**; 4. with R. C. Hampshire and M. Harchol-Balter, Fluid and diffusion limits for transient sojourn times of processor sharing queues with time varying rates, Special issue of *Queueing Systems and Their Applications* on Fair Resource Sharing, **53** (2006), No. 1–2, 19–30. MR**2230011 (2007a:60053)**; 5. with Z. Feldman, A. Mandelbaum, and W. Whitt, Staffing of time-varying queues to achieve time-stable performance, A special issue of *Management Science* on Call Centers. **54** (2008), 324-338.

Daniel K. Nakano

Professor of Mathematics, University of Georgia.
Born: July 30, 1964, Seattle, Washington, USA.
Ph.D.: Yale University, 1990.
Selected Addresses: Plenary Address, AMS Summer Research Conference, South Hadley, MA, 2002; Bristol-Leicester-Oxford Colloquium, UK, 2003; International AsiaLink Conference on Algebras and Representation Theory, Beijing, China, 2005; Distinguished Shoemaker Lectures, University of Toledo, 2007; One-Hour AMS Address, Murfreesboro, TN, 2007.
Additional Information: NSF Postdoctoral Fellow, Northwestern University, 1992–1995; EPSRC Research Fellow, Oxford University, 2003; Editor, *Communications in Algebra*, 2005–; Creative Research Medal, University of Georgia, 2007; PI for the NSF VIGRE Grant at the University of Georgia, 2008–; General Member, MSRI, 2008.
Selected Publications: 1. with J. Carlson and K. Peters, On the vanishing of extensions of modules over reduced enveloping algebras, *Math. Ann.*, **302** (1995), No. 3, 541–560. MR**1339926 (96f:17029)**; 2. with Z. Lin, Complexity for modules over finite Chevalley groups and classical Lie algebras, *Invent. Math.*, **138** (1999), No. 1, 85–101. MR**1714337 (2000m:20077)**; 3. with B. Parshall and D. Vella, Support varieties for algebraic groups, *J. Reine Angew. Math.*, **547** (2002), 15–49. MR**1900135 (2003b:20063)**; 4. with D. Hemmer, Specht filtrations for Hecke algebras of type A, *J. London Math. Soc.* (2), **69** (2004), No. 3, 623–638. MR**2050037 (2005f:20025)**; 5. with C. Bendel and C. Pillen, Second cohomology groups for Frobenius kernels and related structures, *Adv. Math.*, **209** (2007), No. 1, 162–197. MR**2294220 (2008c:20085)**.

Statement: Mathematicians are currently faced with the challenge of incorporating the traditions and rich history of the discipline with the present and future directions of the field. New trends towards the integration of mathematics across other disciplines and the use of computing are profoundly changing the way mathematicians conduct research. We are also witnessing a shift in demographics as many universities are replacing the professoriate hired in the 1960s.

I believe it is important for the AMS to be the leader in the ongoing transformation of the mathematical profession. In this time of change, it is important for elected officers in the AMS to make wise decisions about policies affecting its constituency. As an AMS Council Member, I would promote the continued strengthening of the collaborative national and international infrastructure in the mathematical sciences. Also, I would seek to create opportunities for professional development at all levels, and increase the current funding base for the profession. As part of these goals, the AMS needs to develop outreach opportunities for recruitment into the profession by generating public awareness of the utility and beauty of mathematics.

Panagiotis E. Souganidis

Distinguished Services Professor, Department of Mathematics, The University of Chicago.
Born: February 8, 1957, Peiraeus, Greece.
Ph.D.: University of Wisconsin-Madison, Mathematics, 1983.
Selected Addresses: AMS Sectional Meeting, Invited Lecture, Philadelphia, 1991; International Congress of Mathematicians, Partial Differential Equations Session, Zurich, 1994; Congrès de Mathématiques Appliquées à la mémoire de J.-L. Lions, Plenary Lecture, Collège de France, Paris, 2002; IMA 20th Anniversary Conference, Plenary Lecture, Minneapolis, 2003; PIMS Distinguished Speaker Seminar, Vancouver, 2006.
Additional Information: Presidential Young Investigator, 1987; Alfred P. Sloan Fellowship, 1989; Villas Associate Award, University of Wisconsin, Madison, 1996; Bodossaki Foundation Academic Prize, 1996; Asbel Smith Professor, The University of Texas at Austin, 2001–2003; Highly Cited Researcher, 2003; Pennzoil Company Regents Professor, The University of Texas at Austin, 2003–2005; R. L. Moore Chair, The University of Texas at Austin, 2005–2008; Distinguished Services Professor, The University of Chicago, 2008–. *Editorial Boards*: Co-Editor of *Communications in Partial Differential Equations*, 1992–; Associate Editor of *Electronic Journal on Differential Equations*, 1993–; *Bulletin of American Mathematical Society*, 2001–; *Annales de l'Institut Henri Poincaré, Analyse Non Linéaire*, 2001–; *Nonlinear Differential Equations and Applications*, 2008–.

Selected Publications: 1. with G. Barles, Convergence of approximations schemes for fully nonlinear second order equations, *Asymptotic Anal.*, **4** (1991), No. 3, 271–283. MR**1115933 (92d:35137)**; 2. with L. C. Evans and H. M. Soner, Phase transitions and generalized motion by mean curvature, *Comm. Pure Appl. Math.*, **45** (1992), No. 9,

1097– 1123. MR**1177477 (93g:35064)**; 3. with P.-L. Lions and Benoît Perthame, Existence and stability of entropy solutions for the hyperbolic systems of isentropic gas dynamics in Eulerian and Lagrangian coordinates, *Comm. Pure Appl. Math.*, **49** (1996), No. 6, 599– 638. MR**1383202 (97e:35107)**; 4. Stochastic homogenization of Hamilton-Jacobi equations and some applications, *Asymptotic Anal.*, **20** (1999), No. 1, 1–11. MR**1697831 (2000k:49038)**; 5. with L. Caffarelli and L. Wang, Homogenization of fully nonlinear, uniformly elliptic and parabolic partial differential equations in stationary ergodic media, *Comm. Pure Appl. Math.*, **58** (2005), No. 3, 319–361. MR**2116617 (2006b:35016)**.

Statement: Mathematics, with its rigor, elegance and everlasting impact, occupies a central place in the scientific universe. Despite its great contributions to scientific advancement, mathematics does not receive the attention and support it deserves. Mathematicians face problems with the quality of students and programs, research funding, compensation and resource availability.

Increasing the support for and the visibility of the mathematical sciences are tasks that are more pressing due to the current rapid progress in technology, medicine, biology, energy, etc. Mathematics has a critical role to play, and this progress requires ever greater mathematical infrastructure. New research directions are being defined and interdisciplinary fields are being created. The need for innovative cross-areas research and training programs has never been greater. It is very important to raise the awareness of how much mathematical training and knowledge are needed in order to make best progress in emerging scientific areas. The AMS is the ideal platform for promoting both the value of mathematics and, at the same time, future initiatives.

Recognition of the strong role of mathematics comes with a responsibility to continue basic research, to reach out to other disciplines, to produce the next generation of mathematical scientists, and to be sufficiently broad in our thinking and training.

Michelle L. Wachs

Professor of Mathematics, University of Miami.

Born: November 30, 1952, New York, New York.

Ph.D.: University of California, San Diego, 1977.

AMS Committees: Southeastern Section Program Committee, 1994–1996 (chair, 1995–1996).

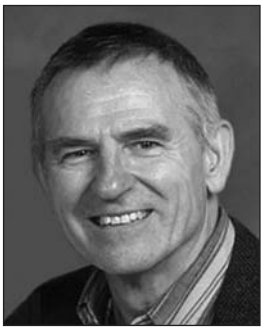
Selected Addresses: AMS Invited Hour Address, Knoxville, 1993; Plenary Address, International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), Minnesota, 1996 and San Diego, 2006; Invited Speaker, MSRI Workshops, 1996 and 1997; Graduate School Lecturer, IAS, Park City Mathematics Institute, Geometric Combinatorics Program, 5 lectures, 2004; Invited Speaker, Festive Combinatorics in honor of Anders Björner, KTH Stockholm, 2008.

Additional Information: Editorial Boards: *Advances in Applied Math.*, 1994–, *SIAM J. on Discrete Math.*, 1996–, *Order*, 1998–2005; Visiting Positions: UCSD (Visiting Associate Professor of Electrical Engineering and Computer Science, 1983–1984), Université Louis Pasteur, Strasbourg, France (Visiting Professor, June 1989), Mittag-Leffler Institute (May 1992 and May–June, 2005), MSRI (General Member, October 1996 and May 1997), KTH Stockholm (Guest Researcher, January–June, 1999), Isaac Newton Institute (Member, May–July, 2001), Cambridge University (Visiting Scholar, September–December, 2005); Conference Co-organization: AMS Special Session on Algebraic Combinatorics, Knoxville, 1993, and Louisville, 1998; MSRI Workshop on Enumeration and Posets, 1996; AMS Special Session on Combinatorial Representation Theory, Topological Combinatorics and Interactions Between Them, Bloomington, 2008; University of Miami Cooper Fellow, 2006–2009.

Selected Publications: 1. with A. Björner, Bruhat order of Coxeter groups and shellability, *Adv. Math.*, **43** (1982), No. 1, 87–100. MR**0644668 (83i:20043)**; 2. with A. Björner, Shellable nonpure complexes and posets. I., *Trans. Amer. Math. Soc.*, **348** (1996), No. 4, 1299–1327. MR**1333388 (96i:06008)**; 3. with J. Shareshian, Torsion in the matching complex and chessboard complex, *Adv. Math.*, **212** (2007), No. 2, 525–570. MR**2329312 (2008d:55012)**; 4. with J. Shareshian, q-Eulerian polynomials: excedance number and major index, *Electron. Res. Announc. Amer. Math. Soc.*, **13** (2007), 33–45. MR**2300004 (2008e:05010)**; 5. Poset topology: tools and applications, in *Geometric Combinatorics*, IAS/Park City Math. Ser., **13**, Amer. Math. Soc., Providence, RI, 2007, pp. 497–615. MR**2383132**.

Statement: It is my belief that we need the AMS now more than ever. We need the AMS to help us communicate effectively, to both the scientific and nonscientific communities, the view that there is just one mathematics, comprised of different fields, which interconnect and share the common goal of seeking a universal truth and beauty. We need the AMS to help us convincingly convey to non-mathematicians the importance of mathematics research and adequate funding for it through foundations such as the NSF. We need the AMS to help us attract and inspire the next generation of mathematicians. We need the AMS to maintain its strong commitment to promoting research and training in fundamental mathematics, as well as promoting the use of sophisticated mathematics in other fields such as physics, biology, and finance. I would be honored to serve the mathematics community as a Member at Large of the Council if elected.

David Wright



Professor and Chair, Department of Mathematics, Washington University, St. Louis, Missouri.
Born: December 1, 1949.
Ph.D.: Columbia University, 1975.
Selected Addresses: Invited Address, joint meeting of the American Mathematical Society and the Taiwan Mathematical Society in Taichung, Taiwan, December 16, 2005; Invited Address and minicourse, International School and Workshop on Polynomial Automorphisms and Related Topics, Institute of Mathematics, Hanoi, Vietnam, October 9–20, 2006; Invited Address, Conference on Affine Algebraic Geometry, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, January 7–13, 2007.
Additional Information: Expert in the areas of Affine Algebraic Geometry and Polynomial Automorphisms; Chair, Department of Mathematics, Washington University, 2004–; Co-organizer of the International School and Workshop on Polynomial Automorphisms and Related Topics, held at the Institute of Mathematics, Hanoi, Vietnam, October 9–20, 2006, funded in part by the Abus Sadam International Centre for Theoretical Physics, Trieste, Italy. A major goal of this event was to encourage mathematical research in underdeveloped countries. Taught one-week mini-course on Polynomial Automorphism Groups at the Hanoi conference mentioned above, and gave an Invited Address; Served on panel with H. Bass (Michigan) and S. Abhyankar (Purdue) fielding questions by members of the Vietnamese Mathematical Society on the role of mathematics in the 21st century, on October 18, 2006, in Hanoi, Vietnam.
Selected Publications: 1. with H. Bass and E. H. Connell, Locally polynomial algebras are symmetric algebras, *Invent. Math.*, **38** (1976/77), No. 3, 279–299. MR**0432626 (55 #5613)**; 2. Two dimensional Cremona groups acting on simplicial complexes, *Trans. Amer. Math. Soc.*, **331** (1992), No. 1, 281–300. MR**1038019 (92g:14008)**; 3. Affine surfaces fibered by affine lines over the projective line, *Illinois J. Math.*, **41** (1997), No. 4, 589–605. MR**1468868 (98j:14015)**; 4. with E. Hubbers, Triangular factorizations of special polynomial automorphisms, *J. Algebra*, **235** (2001), No. 2, 459–483. MR**1805468 (2002d:14100)**; 5. The Jacobian conjecture as a problem in combinatorics, in *Affine Algebraic Geometry*, Osaka Univ. Press, Osaka, 2007, pp. 483–503. MR**2330486**.
Statement: The AMS is the primary arm for the advocacy of mathematics in the United States (and elsewhere). Like most mathematicians I stand convinced that our discipline must be more fully supported at the level of fundamental research, advanced at all levels of education, more integrated with the fabric of other disciplines, and promoted amongst the general population. It is toward these ends that I would be happy to serve as Member at Large.

Horng-Tzer Yau

Professor, Harvard University.
Ph.D.: Princeton University, 1987.
Selected Address: Plenary Speech, International Congress of Mathematical Physics, 1997, 2000; Current Development in Mathematics, 1998; Medallion Lecture of Institute of Mathematical Statistics, 2004; Kuwait Lecture, Cambridge University, 2007.
Additional Information: Packard Foundation Fellowship, 1991–1996; Poincaré Prize, 2000; MacArthur Fellowship, 2000; Member of American Academy of Arts and Sciences, 2001; Morningside Gold Medal in Mathematics, 2001.
Selected Publications: 1. with S. Olla and S. R. S. Varadhan, Hydrodynamical limit for a Hamiltonian system with weak noise, *Comm. Math. Phys.*, **155** (1993), No. 3, 523–560. MR**1231642 (94k:60158)**; 2. with J. Quastel, Lattice gases, large deviations, and the incompressible Navier-Stokes equations, *Ann. of Math.* (2), **148** (1998), No. 1, 51–108. MR**1652971 (99j:60157)**; 3. $(\log t)^{2/3}$ law of the two dimensional asymmetric simple exclusion process, *Ann. of Math.* (2), **159** (2004), No. 1, 377–405. MR**2052358 (2005d:60156)**; 4. with L. Erdös and B. Schlein, Derivation of the cubic non-linear Schrödinger equation from quantum dynamics of many-body systems, *Invent. Math.*, **167** (2007), No. 3, 515–614. MR**2276262 (2007m:81258)**; 5. with L. Erdös and B. Schlein, Derivation of the Gross-Pitaevskii equation for the dynamics of Bose-Einstein condensate, to appear in *Ann. of Math.*

Nominating Committee

Irene Fonseca

Mellon College of Science Professor of Mathematics, Carnegie Mellon University.
Born: July 10, 1956, Lisbon, Portugal.
Ph.D.: University of Minnesota (Minneapolis), 1985.
AMS Offices: AMS Council, 2001–2004.
AMS Committees: Subcommittee to Review the Society's Co-sponsorship of Meetings and Conferences of Other Organizations and the Society's Conference Program in 2001– 2002; Committee on Meetings and Conferences, 2001–2003; Subcommittee of the AMS Council to consider the possibility of an AMS Fellows Program, 2002–2003.
Selected Addresses: Plenary Talk, SIAM Conference on Emerging Issues in Mathematics and Computation from the Materials Sciences, Pittsburgh, April 18–20, 1994; Invited Address, AMS Meeting, Atlanta, Georgia, October 10–12, 1997; Invited Address, SIAM Annual Meeting, University of Toronto, Canada, July 13–17, 1998; AWM-SIAM Sonia Kovalevsky Lecturer for 2006, SIAM Annual Meeting, Boston, MA, July, 2006; Plenary Talk, Conference on

Calculus of Variations and PDEs: Challenges and Applications, ICM 2006, Toledo, Spain, August 16–19, 2006.
Additional Information: Calouste Gulbenkian Fellowship, 1981–1985; Grande Oficial da Ordem Militar de Sant'Iago da Espada (Portuguese Decoration, Military Order of Saint James of the Sword), March 8, 1997; Mellon College of Science Professor of Mathematics (chair), 2003; Women of Distinction Award in Math and Technology, 2004; Member: American Mathematical Society, Society for Natural Philosophy, International Society for the Interaction of Mechanics and Mathematics, SIAM, Sociedade Portuguesa de Matemática
Selected Publications: 1. with Stefan Müller, $\mathcal{A}$-quasiconvexity, lower semicontinuity, and Young measures, *SIAM J. Math. Anal.*, **30** (1999), No. 6, 1355–1390. MR**1718306 (2000j:49020)**; 2. with Gianni Dal Maso, Giovanni Leoni, and Massimiliano Morini, Higher-order quasiconvexity reduces to quasiconvexity, *Arch. Ration. Mech. Anal.*, **171** (2004), No. 1, 55–81. MR**2029531 (2005a:49003)**; 3. with Giovanni Leoni and Jan Malý, Weak continuity and lower semicontinuity results for determinants, *Arch. Ration. Mech. Anal.*, **178** (2005), No. 3, 411–448. MR**2196498 (2006m:49020)**; 4. with N. Fusco, G. Leoni, and M. Morini, Equilibrium configurations of epitaxially strained crystalline films: existence and regularity results, *Arch. Ration. Mech. Anal.*, **186** (2007), No. 3, 477–537. MR**2350364**; 5. with Giovanni Leoni, *Modern methods in the calculus of variations: L^p spaces*, Springer Monographs in Mathematics. Springer, New York, 2007. MR**2341508**.

Sheldon H. Katz

Professor and Chair, Department of Mathematics, and Professor of Physics, University of Illinois at Urbana-Champaign.
Born: December 19, 1956, Brooklyn, New York, USA.
Ph.D.: Princeton University, 1980.
AMS Offices: Member at Large of the Council, 2005–2008.
AMS Committees: Committee on the Profession, 2000–2003; AMS Fellows Program Subcommittee, 2002–2003; AMS Fellows Program Council Subcommittee, 2005–2006; Committee on Science Policy, 2006–2008 (Chair, 2007–2008); *Bulletin* Editor Search Committee, 2007–2009.

Selected Addresses: Seven AMS Special Sessions, 1986–1994; AMS Summer Institute on Algebraic Geometry (2 lectures), Santa Cruz, 1995; Harvard-MIT-Brandeis-Northeastern Colloquium, Cambridge, 1997; AMS Invited Address, Chicago, 1998; IAS/Park City Mathematics Institute (15 lectures), Park City, 2001.

Additional Information: Visiting Positions: IAS, 1982–1983; University of Bayreuth, 1989; Duke University, 1991–1992; Mittag-Leffler Institute, 1997; Editorial Boards: *Communications in Algebra*, 1995–1999, *Advances in Theoretical and Mathematical Physics*, 2003–2008; Honors: Southwestern Bell Professor, Oklahoma State University, 1997–1999; Regents Professor, Oklahoma State University, 1999–2002.
Selected Publications: 1. with D. R. Morrison, Gorenstein threefold singularities with small resolutions via invariant theory for Weyl groups, *J. Algebraic Geom.*, **1** (1992), No. 3, 449–530. MR**1158626 (93b:14030)**; 2. with P. Candelas, X. de la Ossa, A. Font, and D. R. Morrison, Mirror symmetry for two parameter models. I, *Nuclear Phys. B*, **416** (1994), No. 2, 48–538. MR**1274436 (95k:32020)**; 3. with A. Klemm and C. Vafa, Geometric engineering of quantum field theories, *Nuclear Phys. B*, **497** (1997), No. 1-2, 173–195. MR**1467889 (98h:81097)**; 4. with D. A. Cox, *Mirror Symmetry and Algebraic Geometry*, Mathematical Surveys and Monographs, vol. 68, AMS, Providence, RI, 1999. MR**1677117 (2000d:14048)**; 5. *Enumerative Geometry and String Theory*, Student Math. Library, vol. 32, AMS, Providence, RI, 2006.
Statement: For the past 120 years, the AMS has done important work, promoting mathematics and mathematicians in numerous ways. The Nominating Committee identifies talented and energetic mathematicians to serve the Society in a correspondingly wide range of areas, including publications, meetings, education, prizes, and policy. If elected, I would strive to identify and then recruit individuals who are particularly well-suited for each of the needed committees, to carry out the important work of the Society.

Chawne M. Kimber

Associate Professor of Mathematics, Lafayette College, Easton, Pennsylvania.
Born: January 12, 1971.
Ph.D.: University of Florida, 1999.

AMS Committees: Committee on the Profession, 2006–2009.

Selected Addresses: Special Session on Commutative Algebra, Joint Mathematics Meetings, San Antonio, TX, January, 1999; Special Session on the Structure and Representation of Lattice-Ordered Groups and f-Rings, AMS Southeastern Sectional Meeting, Gainesville, FL, March, 1999; Workshop on Ordered Algebraic Structures, Vanderbilt University, Nashville, TN, March, 2000; Workshop on Ordered Algebraic Structures, University of Florida, Gainesville, FL, March, 2004; The Second Workshop on Diversity in Mathematics, Banff International Research Station, Banff, Canada, July, 2007.

Additional Information: MAA Project NExT Fellow, 2000 (gold dot); Editorial Board Member and Meetings Coordinator for Young Mathematicians' Network, 2004–2006; Coorganizer of the North American Workshop on Diversity in Mathematics, Banff International Research Station, 2006; Coorganizer of the second workshop on Mathematics and Social Justice, Middlebury College, 2007.

Selected Publications: 1. with A. Hager, Some examples of hyperarchimedean lattice-ordered groups, *Fund. Math.*,

182 (2004), No. 2, 107–122. MR**2100062 (2005g:06019)**; 2. with A. Hager and W. McGovern, Unique *a*-closure for some *l*-groups of rational valued functions, *Czechoslovak Math. J.*, **55** (**130**) (2005), No. 2, 409–421. MR**2137147 (2006b:06018)**; 3. with A. Hager, Clean rings of continuous functions, *Algebra Universalis*, **56** (2007), No. 1, 77–92. MR**2280440 (2007k:54025)**; 4. with A. Hager, Uniformly hyperarchimedean lattice-ordered groups, *Order,* **24** (2007), No. 2, 121–131. MR**236734**.

Statement: In order for the AMS to continue to fulfill its broad mission and grow as an organization, the best mathematicians who are willing and able should represent the Society; this state is only accomplished by composing diverse slates of strong candidates. If elected, I would consult widely in this process—via a range of networks of mathematicians—to contribute to the work of the committee.

David Kinderlehrer

Professor, Carnegie Mellon University.

Born: 1941, Allentown, Pennsylvania.

Ph.D.: University of California, Berkeley, 1968.

AMS Committees: AMS representative to the U. S. National Committee on Theoretical and Applied Mechanics, 2000–2003, 2005–2008.

Additional Information: Program coordinator, IMA Minneapolis, 1984–1985; Scientific Director Designate and Scientific Director, Army High Performance Computing Research Center, University of Minnesota, 1989–1990; Executive Committee, Center for Nonlinear Analysis, 1991–present (Director, 1994–1998); Executive Committee, Carnegie Mellon Materials Research Science and Engineering Center, 1996–present; Editorial Boards: *Applied Mathematics and Optimization, ESAIM: Control, Optimisation, and Calculus of Variations, Asymptotic Analysis, Archive for Rational Mechanics and Analysis, Communications in Contemporary Mathematics, Discrete and Continuous Dynamical Systems series B, Progress in Nonlinear Differential Equations and Their Applications (book series).*

Selected Publications: 1. with D. Heath and M. Kowalczyk, Discrete and continuous rachets: from coin toss to molecular motor, *Discrete Contin. Dyn. Syst.*, Ser. B, **2.2** (2002), 153–167. MR**1898134 (2003b:60017)**; 2. with I. Livshits, G. S. Rohrer, S. Ta'asan, and P. Yu, Mesoscale evolution of the grain boundary character distribution, Recrystallization and Grain Growth, *Materials Science Forum*, **467-470** (2004), 1063–1068; 3. Added dimensions to grain growth, *Nature*, **446** (2007), 995–996; 4. with S. Hastings and J. B. McLeod, Diffusion mediated transport in multiple state systems, *SIAM J. Math. Anal.*, **39** (2007/08), No. 4, 1208–1230. MR**2368900**; 5. with K. Barmak, M. Emelianenko, D. Golovaty, and S. Ta'asan, Towards a statistical theory of texture evolution, to appear in *SIAM J. Sci. Comp.*

Statement: The charge of this committee, to which I am committed, is to seek high level energetic colleagues to lead the Society, to represent the mathematics community, and to respond to the challenges, of which we are all aware, that the future is thrusting upon us.

Ellen E. Kirkman

Professor, Wake Forest University.

Born: July 28, 1948, Saint Paul, Minnesota, USA.

Ph.D.: Michigan State University, 1975.

AMS Committees: AMS Representative to the Joint AMS-ASA-IMS-MAA-SIAM Data Committee, 2000–2007 (Chair, 2003–2007); Southeastern Section Program Committee, 2004–2006 (Chair, 2005–2006).

Selected Addresses: Invited Hour Address, AMS Western Section Meeting, University of Southern California, Los Angeles, CA (1995); Department Colloquium, University of Wisconsin, Madison, WI (1997); Invited Hour Address, MAA Southeastern Section Meeting, Georgia Tech, Atlanta, GA (1997); Invited Address, "Workshop on Noncommutative Algebraic Geometry", Fudan University, Shanghai, China (2006); Special Session, Joint International Meeting of the AMS and the Sociedad Matemática Mexicana, Zacatecas, Mexico (2007).

Additional Information: Sabbaticals: University of Leeds, England (1984), UCSD (1989–1990 and 1999), and MSRI (2000); Southeastern Section MAA Governor (2007–2009); EDGE (Enhancing Diversity in Graduate Education) Program Advisory Board (2008–); Editorial Board, *Communications in Algebra* (2008–); Member: ASA, AWM, MAA.

Selected Publications: 1. with Edward Green and James Kuzmanovich, Finitistic dimension of finite dimensional monomial algebras, *J. Algebra*, **136** (1991), No. 1, 37–50. MR**1085118 (92a:16011)**; 2. with Claudio Procesi and Lance Small, A *q*-analog of the Virasoro algebra, *Comm. Algebra*, **22** (1994), No. 10, 3755–3774. MR**1280096 (96b:17016)**; 3. with Ian Musson and Donald Passman, Noetherian down-up algebras, *Proc. Amer. Math. Soc.*, **127** (1999), No. 11, 3161–3167. MR**1610796 (2000b:16042)**; 4. with James Kuzmanovich, Fixed subrings of Noetherian graded regular rings, *J. Algebra*, **288** (2005), no. 2, 463–484. MR**2146140 (2006b:16055)**; 5. with James Kuzmanovich and James Zhang, Rigidity of graded regular algebras, to appear in *Trans. Amer. Math. Soc.*

Statement: The AMS supports mathematics in many ways. Its primary mission is supporting research through its meetings, publications, and prizes, but it plays other important roles in promoting education, governmental support, and public awareness. Uncertain funding climates and tight job markets bring particular challenges. Hence it is important that the Nominating Committee identify talented, articulate, and energetic people who can represent the diverse AMS membership as elected officers who contribute to all of these important tasks. If elected, I will

work to find nominees who will strengthen mathematics and represent the broad spectrum of AMS members.

Peter B. Shalen

Professor, Department of Mathematics, Statistics, and Computer Science, University of Illinois at Chicago.
Born: July 23, 1946, New York, NY, USA.
Ph.D.: Harvard University, 1972.
AMS Committees: *Transactions and Memoirs* Editorial Committee, 1992–2000 (Chair and Managing Editor, 1994–2000); Ad-hoc Committee to review the AMS book publication program (appointed by Committee on Publications), 1998–1999
Selected Addresses: J. Clarence Karcher Lectures in Mathematics, University of Oklahoma, April, 1980; Invited one-hour address, AMS Regional Meeting, University of Wisconsin at Parkside, October, 1980; Invited 45-minute address, International Congress of Mathematicians, Berkeley, CA, August, 1986; Fourth annual Zabrodsky lecture, Hebrew University, Jerusalem, December, 1990; Distinguished Lecture Series (three lectures), Technion-IIT, Haifa, December, 2000.
Additional Information: Alfred P. Sloan Foundation Fellowship for Basic Research, 1977–1979; University Scholar award, University of Illinois, 1996; Affiliated Professor, University of Haifa, 2005–; A "Conference on 3-Manifold Topology in Honor of Peter Shalen's 60th Birthday" was held at the Centre de Recherches Mathématiques, Montreal, June, 2006.
Selected Publications: 1. with W. Jaco, Seifert fibered spaces in 3-manifolds, *Mem. Amer. Math. Soc.*, **21** (1979), No. 220. MR**0539411 (81c:57010)**; 2. with M. Culler, Varieties of group representations and splittings of 3-manifolds, *Ann. of Math.* (2), **117** (1983), No. 1, 109–146. MR**0683804 (84k:57005)**; 3. with J. Morgan, Degenerations of hyperbolic structures, I–III, *Ann. of Math. (2)*, **120** (1984), 401–476. MR**0769158 (86f:57011)**; **127** (1988), 403–456 and 457–519. MR**0932305 (89e:57010a)**, **MR0942518 (89e:57010b)**; 4. with M. Culler, C. Gordon and J. Luecke, Dehn surgery on knots, *Ann. of Math. (2)*, **125** (1987), No. 2, 237–300. MR**0881270 (88a:57026)**; 5. with J. Anderson, M. Culler and R. Canary, Free Kleinian groups and volumes of hyperbolic 3-manifolds, *J. Differential Geom.*, **43** (1996), No. 4, 738–782. MR**1412683 (98c:57012)**.
Statement: I have always felt that it's important for mathematicians to stick together. Over the long history of our discipline we have usually managed to function as a community, and this has contributed to the enormous impact of our work on the larger world. It would be great to have another opportunity to serve the mathematical community through the AMS.

Editorial Boards Committee

David C. Dobson

Professor, University of Utah.
Born: November 17, 1962, Salt Lake City, Utah, USA.
Ph.D.: Rice University, 1990.
Selected Addresses: Organizer, AMS-IMS-SIAM Summer Research Conference: Mathematical modeling of novel optical materials and devices, Snowbird, Utah, 2005; Invited Speaker, IUTAM Symposium: Topological design optimization of structures, machines and materials—status and perspectives, Rungstedgaard, Denmark, 2005; Invited Mini-Symposium Speaker, SIAM Conference on Analysis of Partial Differential Equations, Mesa, Arizona, 2007; Invited Speaker, International Conference on Applied Mathematics: Modeling, Analysis and Computation, Hong Kong, 2008; Invited Speaker, Workshop on Mathematical and Computational Challenges in PDE Eigenvalue Problems, Beijing, 2008.
Additional Information: Alfred P. Sloan Research Fellowship, 1997–1999; Felix Klein Prize, European Mathematical Society, 2000; Member, Society for Industrial and Applied Mathematics.
Selected Publications: 1. with Avner Friedman, The time-harmonic Maxwell equations in a doubly periodic structure, *J. Math. Anal. Appl.*, **166** (1992), No. 2, 507–528. MR**1160941 (92m:78015)**; 2. with Steven J. Cox, Maximizing band gaps in two-dimensional photonic crystals, *SIAM J. Appl. Math.*, **59** (1999), No. 6, 2108–2120. MR**1709799 (2000e:65065)**; 3. with Jayadeep Gopalakrishnan and Joseph E. Pasicak, An efficient method for band structure calculations in 3D photonic crystals, *J. Comp. Phys.*, **161** (2000), No. 2, 668–679. MR**1764252 (2001a:78047)**; 4. with Gang Bao, On the scattering by a biperiodic structure, *Proc. Amer. Math. Soc.*, **128** (2000), No. 9, 2715–2723. MR**1694448 (2000m:35051)**; 5. with Fadil Santosa, Optimal localization of eigenfunctions in an inhomogeneous medium, *SIAM J. Appl. Math.*, **64** (2004), No. 3, 762–774. MR**2068121 (2005d:35034)**.

Michael T. Lacey

Professor of Mathematics, Georgia Institute of Technology.
Born: September 26, 1959, Abilene, Texas, USA.
Selected Addresses: International Congress of Mathematicians, 1998; Plenary Address, AMS Southeastern Meeting, Atlanta, GA, 1998; Fabes-Rivière Symposium, University of Minnesota, 2002; Schrödinger Institute, Vienna, Austria, 2004; Pichorides Lectures, University of Crete, Greece, 2006; Trijinsky Lectures, Urbana, IL, 2007.
Additional Information: NSF Postdoctoral Fellowship, 1990; Salem Prize, 1997; Guggenheim Fellowship, 2004; Fulbright Fellowship, 2008; George Elliot Distinguished

Visitor, Fields Institute, 2008; Editorial Boards: *Proceedings of the AMS, J. Geom. Anal., J. Anal. Comb.* (online).
Selected Publications: 1. with Christoph Thiele, L^p estimates for the bilinear Hilbert transform, *Proc. Nat. Acad. Sci.*, **94** (1997), No. 1, 33–35. MR**1425870 (98e:44001)**; 2. with Christoph Thiele, On Calderón's conjecture for the bilinear Hilbert transform, *Proc. Natl. Acad. Sci.*, **95** (1998), No. 9, 4828–4830. MR**1619285 (99e:42013)**; 3. with Steve Hofmann and Alan McIntosh, The solution of the Kato problem for divergence form elliptic operators with Gaussian heat kernel bounds, *Ann. of Math. (2)*, **156** (2002), No. 2, 623–631. MR**1933725 (2004c:47096b)**; 4. with Pascal Auscher, Steve Hofmann, Alan McIntosh and Ph. Tchamitchian, The solution of the Kato square root problem for second order elliptic operators on $\mathbb{R}^n$, *Ann. of Math. (2)*, **156** (2002), No. 2, 633–654. MR**1933726 (2004c:47096)**; 5. with Sarah H. Ferguson, A characterization of product BMO by commutators, *Acta Math.*, **189** (2002), No. 2, 143–160. MR**1961195 (2004e:42026)**.
Statement: As a current editor of the *Proceedings*, I have been impressed by the breadth of submissions and worldwide stature that the AMS publications hold. The editors of the AMS publications play an essential role in maintaining and building upon the important role of AMS publications in the discipline. I will take seriously the charge of this committee, to identify and nominate editors for AMS publications.

Michael F. Singer

Professor of Mathematics, North Carolina State University.
Born: February 25, 1950, New York City, New York, USA.
Ph.D.: University of California, Berkeley, 1974.
AMS Offices: Member at Large of the Council, 2005–2008.
AMS Committees: Committee on Committees, 2005–2007; Committee on Science Policy, 2005–2007.
Selected Addresses: Invited Address, AMS Sectional Meeting, New York, 1996; Plenary Lecture, International Symposium on Symbolic and Algebraic Computation, Vancouver, 1999; Invited Address, International Society for Analysis, Applications and Computing Conference, Berlin, 2001; Invited Address, Foundations of Computational Mathematics, Minneapolis, 2002; Invited Lecture, London Mathematical Society, Edinburgh, 2006.
Additional Information: Editorial Boards: *Journal of Symbolic Computation, Algorithms and Computation in Mathematics, Journal of Algebra and Number Theory*; Associate Editor, *Applicable Algebra in Eng., Commun. and Comput.*
Selected Publications: 1. Liouvillian first integrals of differential equations, *Trans. Amer. Math. Soc.*, **333** (1992), No. 2, 673–688. MR**1062869 (92m:12014)**; 2. with M. van der Put, *Galois Theory of Difference Equations*, Lecture Notes in Mathematics, 1666, Springer-Verlag, Berlin, 1997. MR**1480919 (2000e:39008)**; 3. with M. van der Put, *Galois Theory of Linear Differential Equations*. Grundlehren der Mathematischen Wissenschaften, 328, Springer-Verlag, Berlin, 2003. MR**1960772 (2004c:12010)**; 4. with W. J. Cook and C. Mitschi, On the constructive inverse problem in differential Galois theory, *Comm. Algebra*, **33** (2005), No. 10, 3639–3665. MR**2175456 (2006j:34212)**; 5. with P. J. Cassidy, Galois theory of parameterized differential equations and linear differential algebraic groups, in *Differential Equations and Quantum Groups*, IRMA Lect. Math. Theor. Phys., 9, Eur. Math. Soc., Zürich, 2007, pp. 113–155. MR**2322329 (2008f:12010)**.
Statement: If elected, I will work to find the people best qualified to serve on the editorial boards and to insure the high standards and diverse goals of the AMS publications.

Jack Xin

Professor of Mathematics, University of California at Irvine.
Born: 1963, Beijing, China.
Ph.D.: Courant Institute, New York University, 1990.
Selected Addresses: Invited Address, International Congress of Chinese Mathematicians, 2001, 2004, 2007; Invited Address, AMS meeting, Lincoln, Nebraska, October, 2005; Invited SIAM session, Joint Mathematics Meetings, San Diego, January, 2008.
Additional Information: Kurt O. Friedrichs Prize, Courant Institute, 1991; NFR Fellow, Institut Mittag-Leffler, Sweden, 1994; ESI Fastbreaking Paper Author in Mathematics, 2002; John Simon Guggenheim Fellow, 2004. Editorial Boards: *Communications in Mathematical Sciences*, 2003–, *Dynamics of Partial Differential Equations*, 2004–, *Multiscale Modeling and Simulations*, SIAM Interdisciplinary Journal, 2006–.
Selected Publications: 1. Front propagation in heterogeneous media, *SIAM Rev.*, **42** (2000), No. 2, 161–230. MR**1778352 (2001i:35184)**; 2. Modeling light bullets with the two-dimensional sine-Gordon equation, *Phys. D.*, **135** (2000), No. 3-4, 345–368. MR**1731506 (2000i:78042)**; 3. with Y. S. Kim and Y.-Y. Qi, A study of hearing aid gain functions based on a nonlinear nonlocal feedforward cochlea model, *Hearing Research*, **215** (May 2006), Issues 1-2, 84–96; 4. with J. Nolen, A variational principle for KPP front speeds in temporally random shear flows, *Comm. Math. Phys.*, **269** (2007), No. 2, 493–532. MR**2274555 (2007k:35237)**; 5. with J. Liu and Y.-Y. Qi, A dynamic algorithm for blind separation of convolutive sound mixtures, *Neurocomputing* (2008), doi:10.1016/*j.neucom.*2007.12.010.
Statement: Publication of AMS journals and book series is essential for communicating the rapidly evolving mathematics and its applications to mathematicians, scientists and the general public. The editorial boards of AMS serve to maintain the standards of excellence and the broad impact of mathematics. As a member of the Editorial Boards Committee, I shall work closely with the editors to identify and select individuals with expertise to best carry out the missions of AMS journals and promote mathematical development in emerging areas of health, science and technology.

CALL FOR Suggestions

Your suggestions are wanted by:

The Nominating Committee, for the following contested seats in the 2009 AMS elections:
vice president, trustee,
and five members at large of the Council

Deadline for suggestions: November 5, 2008

The President, for the following contested seats in the 2009 AMS elections:
three members of the Nominating Committee
two members of the Editorial Boards Committee

Deadline for suggestions: February 26, 2009

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

2009 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 2009. 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 26 February 2009.
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 2009 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, 2010

Return petitions by 26 February 2009 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

Please submit conference information for the Mathematics Calendar through the Mathematics Calendar submission form at `http://www.ams.org/cgi-bin/mathcal-submit.pl`. The most comprehensive and up-to-date Mathematics Calendar information is available on the AMS website at `http://www.ams.org/mathcal/`.

September 2008

1–5 **Combinatorics and Representation Theory (The 8th International Conference by the Graduate School of Mathematics, Nagoya University)**, Graduate School of Mathematics, Nagoya University, Nagoya, Japan. (Jun./Jul./ 2008, p. 736)
Description: The main theme is combinatorics and representation theory, and we will emphasize their interactions and their connections to other fields such as mathematical physics, probability theory, geometry, etc. Invited speakers: Francesco Brenti, Vyjayanthi Chari, Philippe Di Francesco, Takeshi Ikeda, Masao Ishikawa, Noriaki Kawanaka, Rinat Kedem, Ronald C. King, Anatol N. Kirillov, Alexander Kleshchev, Atsuo Kuniba, Thomas Lam, Cedric Lecouvey, Sho Matsumoto, Jorn B. Olsson, Arun Ram, Piotr Sniady, John Stembridge, Takeshi Suzuki.
Organizers and Information: Soichi Okada (Chair), Akihito Hora, Hiroyuki Ochiai, Masato Okado, Hiro-Fumi Yamada. `http://www.math.nagoya-u.ac.jp/en/research/conference/2008/nagoya.html`.

1–5 **Conference in Numerical Analysis (NumAn 2008) recent approaches to numerical analysis: Theory, methods and applications honoring Richard S. Varga on his 80th birthday**, Kalamata, Greece. (Feb. 2008, p. 308)
Description: The aims of the conference are: (1) to bring together and bequeath scientific activities, directions and pursuits of scientists on subjects that pertain to the conference, (2) to foster an exchange of views and ideas, (3) to study the theoretical background required for methods, algorithms and techniques used in applications, (4) to search directions of theoretical results towards applications, (5) to highlight open problems and future directions of numerical analysis.
Information: `http://www.math.upatras.gr/numan2008/`.

1–5 **Summer School on Functional Analytic Methods in PDEs**, Leibniz University Hannover, Hannover, Germany. (Jun./Jul./ 2008, p. 736)
Description: The Summer School is devoted to recent developments in the field of functional analytic methods in partial differential equations. This school addresses young scholars working toward a master or Ph.D. degree. Distinguished experts will each give three talks on new research results and the underlying mathematical methods and techniques.
Topics: Include nonlinear evolutions, maximal regularity, H-infinity calculus, pseudodifferential operators, moving boundaries, and weak compactness methods.
Organizers: Christoph Walker, Jörg Seiler, Elmar Schrohe, Joachim Escher.
Speakers: Dieter Bothe, Adrian Constantin, Robert Denk, Giovanni Dore, Joachim Escher, Philippe Laurencot, Elmar Schrohe, Lutz Weis.
Information: `http://www.math-conf.uni-hannover.de/pde08`; email: `walker@ifam.uni-hannover.de`.

1–6 **School (and Workshop) on the Geometry of Algebraic Stacks**, Fondazione Bruno Kessler-IRST, Povo, Trento, Italy. (Jun./Jul./ 2008, p. 736)
Description: The meeting is articulated in a School and in a Workshop. The school will give the students and young researchers the opportunity of learning the subject from experts in the area. Professors B. Fantechi (SISSA Trieste) and A. Kresch (Zuerich) will deliver a short course of five lessons of one hour-and-a-half on the subject. Dr.

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 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. 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/`.

E. Mann (SISSA Trieste) will deliver some exercises and complements classes coordinating himself with Professors Fantechi and Kresch. The workshop on the state of art gives the opportunity to senior researchers to compare each other.
Confirmed invited speakers are: F. Catanese (Bayreuth), G. Farkas (Berlin), E. Sernesi (Roma Tre), A. Verra (Roma Tre), A. Vistoli (Pisa).
Scientific Organizers: G. Casnati, C. Fontanari, R. Notari, M.L. Spreafico (Torino).
Information: http://calvino.polito.it/~geometri/2008-1.htm; email: michelet@science.unitn.it.

1–6 **Workshop on Random Tilings, Random Partitions and Stochastic Growth Processes**, Centre de recherches mathématiques, Université de Montréal, Montréal, Québec, Canada. (Jan. 2008, p. 78)
Information: http://www.crm.umontreal.ca/Mathphys2008.
Description: Tiling problems have a long tradition in combinatorics and in statistical mechanics. One of the central problems is understanding the statistical structure of the patterns obtained when randomly tiling a large domain. As noticed by N. Elkies and J. Propp a decade ago, random tilings of a large planar domain may exhibit phase segregation; the density of tiles has a smooth (non-constant) variation in some regions of the domain in coexistence with a frozen region where the density of tiles is constant. In the corresponding surface picture the frozen region corresponds to a facet of constant slope while in the complement one has a rounded surface.

1–12 **School on Algebraic Topics of Automata**, Complexo Interdisciplinar da Universidade de Lisboa Av. Prof. Gama Pinto, 2 1649-003, Lisboa, Portugal. (May 2008, p. 634)
Description: This school aims to present to the scientific communities, in particular to post-graduate students, various topics on algebraic theory of automata, delivered as courses, advanced seminars and student's seminars.
Topics: The programme includes eight courses on various aspects of algebraic theory of automata, plus an advanced seminar on mainstream topics and a student's seminar on their research work.
Sponsor: By the project automata: from mathematics to applications (AutoMathA) of the European Science Foundation (ESF).
Organizer: Within the activities of Centro de Algebra da Universidade de Lisboa (CAUL) and Centro de Matematica da Universidade do Porto (CMUP).
Information: http://caul.cii.fc.ul.pt/SATA2008/; email: patricia@cii.fc.ul.pt.

* 2–3 **CRM-University of Ottawa Mini-Workshop: Introduction to infinite-dimensional topological groups**, Department of Mathematics and Statistics, University of Ottawa, Ottawa, Ontario, Canada.
Description: The workshop will consist of 8 hours of lectures given in turn by Vladimir Uspenskij (Ohio University) and Stefano Ferri (Universidad de los Andes) over two days.
Event organizers: Vladimir Pestov (University of Ottawa) and Matthias Neufang (Carleton University).
Registration: There is no registration fee, and very limited financial support for out-of-town graduate students may be available.
Information: http://aix1.uottawa.ca/~vpest283/varia/workshop.html; email: vpest283@uottawa.ca.

2–4 **2008 MBI Workshop for Young Researchers in Mathematical Biology (WYRMB)**, Mathematical Biosciences Institute, The Ohio State University, Columbus, Ohio. (May 2008, p. 634)
Description: The workshop is intended to broaden the scientific perspective of young researchers in mathematical biology and to encourage interactions with other scientists. Workshop activities include plenary talks and poster sessions, as well as group discussions on issues relevant to mathematical biologists. We cordially invite young mathematical biologists to participate.
Application deadline: April 17, 2008.
Information: http://www.mbi.ohio-state.edu/postdocworkshop/wyrmb2008.html; email: jday@mbi.osu.edu.

2–5 **Introductory Workshop on Analysis of Singular Spaces**, Mathematical Sciences Research Institute, Berkeley, California. (Jun./Jul./2008, p. 737)
Description: This four-day program will be an introduction to the main themes of the analysis of singular spaces program, geared toward graduate students and postdocs. It will consist of several minicourses, covering topics in spectral and scattering theory, index theory, and L^2-cohomology, as well as developing the technical tools needed as background.
Organizers: Gilles Carron, Eugénie Hunsicker, Richard Melrose, Michael Taylor, Andras Vasy and Jared Wunsch.
Information: http://www.msri.org/calendar/workshops/WorkshopInfo/443/show_workshop.

2–5 **X Spanish Meeting on Cryptology and Information Security (X RECSI)**, Hospederia Fonseca, Salamanca, Spain. (Dec. 2007, p. 1536)
Description: The Spanish Meeting on Cryptology and Information Security is a biennial conference that can be considered as the most important Spanish conference that works on Cryptology and Information Security. X RECSI will be the tenth of a series. The main goals of X RECSI are two: To show the most important and recent advances in the design, development, implementation, realisation and application of efficient and secure cryptographic algorithms, and to review the first two years of the establishment of the DNI-e. Three lectures will be presented by international researchers of prestige as for the Cryptology and Information Security community. Also people from Spanish government and private sector will present another four lectures. Moreover several contributions will be presented in two parallel sessions (Cryptology and Information Security) and a roundtable will be organized whose participants belong to the most important Spanish security companies.
Information: http://www.usal.es/xrecsi/english/main.htm.

2–7 **International Conference "Geometry, Dynamics, Integrable Systems"**, Mathematical Institute SANU, Belgrade, Serbia. (Jun./Jul./2008, p. 737)
Description: The International Conference "Geometry, Dynamics, Integrable Systems" will be held under the auspices of the Mathematical Institute SANU (Belgrade), V.A. Steklov Mathematical Institute RAS (Moscow), and "Regular and Chaotic Dynamics" journal.
Goal: To bring together the best scientists to intensify the exchange of experience, methods and ideas, and encourage collaboration among diverse groups in community. In order to achieve an effective communication between participants the number of active participants will be limited. Anticipated attendance of the meeting is approximately 50 persons.
Topics: Main topics of the meeting: Integrable systems in classical mechanics; Nonholonomic mechanics; Rigid body dynamics; Lie algebras and Lax representation; Separation of variables.
Organizers: The organizers of the conference are V. V. Kozlov, A. V. Borisov and V. Dragovic.
Information: http://www.mi.sanu.ac.yu/~gdis08/.

3–6 **Fifth International Workshop on Numerical Analysis and Lattice QCD**, University of Regensburg, Regensburg, Germany. (Jun./Jul 2008, p.737)
Description: The aim of this workshop is to bring together applied mathematicians and theoretical physicists to stimulate the exchange of ideas between leading experts in the fields of lattice QCD and numerical analysis. The algorithms used for QCD computations have been growing in sophistication over the years, making use of mathematical methods including stochastic processes, linear algebra, approximation theory, multi-scale techniques, and symplectic integrators. The interplay between physicists and mathematicians has become more valuable as the level of sophistication increases, with both sides contributing innovative and powerful new approaches.
Information: http://www.homepages.uni-regensburg.de/~blj05290/qcdna08.

3–6 **XVII International Fall Workshop on Geometry and Physics**, CIEM Centro Internacional de Encuentros Matemáticos, Castro Urdiales, Cantabria, Spain. (Jun./Jul./ 2008, p. 737)
Description: The Fall Workshops on Geometry and Physics have been held yearly since 1992, and bring together Spanish and Portuguese geometers and physicists, along with an ever increasing number of participants from outside the Iberian peninsula. The main topics of the meeting are: Lie algebroids and mechanics, Lorentz and Poisson geometries, Riemannian geometry, symplectic and contact geometries, mechanics of continuous media, quantum mechanics, relativity, supergravity and supersymmetry, integrable systems, control theory, classical theory of fields, and string theory.

Information: email: fioravam@unican.es; http://www.ciem.unican.es/encuentros/ifwgp08/index.html.

3–9 **10th International Congress on Algebraic Hyperstructures and its Applications AHA 2008**, University of Defence, Brno, Czech Republic. (Jun./Jul./ 2008, p. 737)
Description: This congress follows the previous AHA, which where held in Iran (Babolsar 2005), Greece (Samotraki 2002, Xanthi 1990), Italy (Taormina 1978, 1983, 1999, Udine 1985), Taomania (Iasi 1993) and Czech Republic (Prague 1996). Union of Czech Mathematicians and Physicists will organize this congress with the collaboration of the University of Defence. AHA 2008 aims to provide a forum for researchers and practitioners to present their work and to exchange their views on developments and future directions.
Topics: Hypergroupoids, Semi-hypergroups, hypergroups, hyperrings, hyperfields, hypermodules, hyperspaces, hyperalgebras, hv -structures, non-associative and feebly associative hypergroups, join spaces, hyperstructures associated to geometric spaces, ordered hyperstructures, fuzzy algebraic hyperstructures, (Fuzzy) BCK-algebras, hypergraphs. generalizations and applications.
Information: http://www.unob.cz/en/veda.aspx?id=1829; email: aha2008@seznam.cz.

8–9 **Drexel University Workshop on Topology and Physics**, Departments of Mathematics and Physics, Drexel University, Philadelphia, Pennsylvania. (Aug. 2008, p. 868)
Description: The purpose of the workshop is to bring together mathematicians, physicists, and students interested in the interaction between topology and physics. Six invited lectures will describe various classical and current aspects of this interaction at a level appropriate to an audience of non-specialists. Poster sessions and extended discussion periods will provide the opportunity for participants to exchange ideas and establish contacts and collaborations.
Invited speakers include: Tony Pantev (University of Pennsylvania), Amir Hajian (Princeton University), Wilma Olson and Irwin Tobias (Rutgers University), Robert Gilmore (Drexel University), Eric Sharpe (Virginia Tech), and Randall D. Kamien (University of Pennsylvania).
Information: http://www.pages.drexel.edu/~gln22/Workshop.htm; email: gln22@drexel.edu.

8–10 **Calculus of Variations and Its Applications From Engineering to Economy**, Departamento de Matemática Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa Caparica, Portugal. (May 2008, p. 634)
Description: The aim of this event is to promote the scientific exchange of ideas and methods in such a broad and useful area as the calculus of variations. With the goal of applications to different areas such as mathematics, mechanics, engineering, economy, finances, chemistry, biology, just to name a few, models and methods have been developed, with apparent different languages that are susceptible of an unified analytical and numerical treatment. Taking into account the most recent developments in this area of mathematics, we wish to address problems associated with partial differential equations, optimal control, finite or infinite dimension optimization, shape optimization in structural engineering, together with the associated computational aspects.
Information: email: mcm@fct.unl.pt; http://ferrari.dmat.fct.unl.pt/cva2008/.

8–10 **GLAM, Global Analysis on Manifolds**, University of Rome "La Sapienza", Rome, Italy. (Aug. 2008, p. 868)
Description: On the occasion of the 60th birthday of Sylvestre Gallot.
Scientific Committee: V. Ancona (Italy, Univ. Firenze), W. Ballmann (Germany, Univ. Bonn), P. Berard (France, Institut Fourier), J. P. Bourguignon (France, CNRS-IHES - Bures-sur-Yvette), J. Cheeger (U.S.A., N.Y.U.), H. Karcher (Germany, Univ. Bonn), S. Marchiafava (Italy, Univ. Roma La Sapienza), S. Salamon (Italy, Politecnico Torino).
Organizing Committee: G. Besson (France, Institut Fourier), M. Bordoni (Italy, Univ. Roma La Sapienza), G. D'ÒAmbra (Italy, Univ. Cagliari), A. El Soufi (France, Univ. Tours), B. Franchi (Italy, Univ. Bologna), R. Grimaldi (Italy, Univ. Palermo), O. Hijazi (France, Univ. Nancy), A. Sambusetti (Italy, Univ. Roma La Sapienza), A. Savo (Italy, Univ. Roma La Sapienza).
Information: http://www.dmmm.uniroma1.it/glam; email: leon@dmmm.uniroma1.it.

8–11 **Logic, Algebra and Truth Degrees**, College Santa Chiara, Siena, Italy. (Mar. 2008, p. 412)
Description: This is the first official meeting of the working group on Mathematical Fuzzy Logic (http://www.cs.cas.cz/mathfuzzlog/). Mathematical Fuzzy Logic is a subdiscipline of Mathematical Logic which studies the notion of comparative truth. The assumption that "truth comes in degrees" has revealed very useful in many, both theoretical and applied, areas of Mathematics, Computer Science and Philosophy. The main goal of this meeting is to foster collaboration between researchers in the area of Mathematical Fuzzy Logic, and to promote communication and cooperation with members of neighbouring fields.
Programme Committee: Franco Montagna (chair), Roberto Cignoli, Petr Cintula, Francesc Esteva, Hiroakira Ono.
Invited speakers: Stefano Aguzzoli, Matthias Baaz, Xavier Caicedo, Christian Fermüller, Lluís Godo, Petr Hájek, Kazushige Terui, Constantine Tsinakis.
Information: http://www.mat.unisi.it/~latd2008/.

8–12 **International Workshop on Orthogonal Polynomials and Approximation Theory 2008. Conference in honor of professor Guillermo López Lagomasino in his 60th Anniversary**, Universidad Carlos III de Madrid, Madrid, Spain. (Apr. 2008, p. 525)
Description: It is well known the increasing attention paid in the last decades to the theory of Orthogonal Polynomials. Numerous applications of these mathematical objects in different areas of Mathematics like numerical integration, spectral methods, interpolation, combinatorics, mathematical physics, quantum physics, and approximation theory among others have been particularly relevant.
Topics: The topics to be considered are: Approximation theory; Numerical analysis, in particular quadrature formulas; orthogonal polynomials and special functions; analytic properties and applications; integrable systems.
Information: http://www.uc3m.es/iwopa08.

8–12 **Long Program: Internet Multi-Resolution Analysis: Foundations, Applications and Practice**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Feb. 2008, p. 308)
Description: The focus of this IPAM program will be on innovations and breakthroughs in the theoretical foundations and practical implementations of a network-centric multi-resolution analysis (MRA). Participants will learn about Internet MRA from the perspectives of mathematics, statistics, computer science and engineering–and will meet a diverse group of people and have an opportunity to form new collaborations. There will be opening tutorials, four workshops, and a culminating workshop at Lake Arrowhead.
Organizing Committee: Paul Barford, John Doyle, Anna Gilbert, Mauro Maggioni, Craig Partridge, Matthew Roughan, and Walter Willinger.
Application: An application form is available at: http://www.ipam.ucla.edu/programs/mra2008/. Applications for individual workshops will be posted on individual workshop home pages. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.
Information: http://www.ipam.ucla.edu/programs/mra2008/.

8–12 **Topology of Stratified Spaces**, Mathematical Sciences Research Institute, Berkeley, California. (Jun./Jul./ 2008, p. 737)
Description: This workshop will bring together researchers interested in the topology of stratified spaces. It will focus roughly on four topics: topology of complex varieties, signature theory on singular spaces, and intersection cohomology, and mixed Hodge theory and singularities. Aside from talks on current research, there will be a series of introductory lectures on these themes. These talks will be aimed at strengthening the connections among the various topology research groups and the connections between topology researchers and researchers at the program on Analysis of Singular Spaces, running concurrently.
Organizers: Greg Friedman, Eugénie Hunsicker, Anatoly Libgober, and Laurentiu Maxim.
Information: email: jz@msri.org; http://www.msri.org/calendar/workshops/WorkshopInfo/469/show_workshop.

10 **Nonlinear Differential Equations, A Tribute to the work of Patrick Habets & Jean Mawhin on the occasion of their 65th birthdays**, Académie Royale de Belgique, Brussels, Belgium. (Mar. 2008, p. 412)
Speakers: Antonio Ambrosetti, Cristian Bereanu, Denis Bonheure, Haïm Brezis, Colette De Coster, Thierry De Pauw, Jean-Pierre Gossez, Jean-Pierre Kahane, Louis Nirenberg, Pierpaolo Omari, Rafael Ortega, Miguel Ramos, Luis Sanchez, Didier Smets, James Serrin, Michel Willem, Fabio Zanolin.
Organizing committee: D. Bonheure (Université catholique de Louvain) J.P. Gossez (Université libre de Bruxelles) J. Van Schaftingen (Université catholique de Louvain) M. Willem (Université catholique de Louvain).
Information: http://www.uclouvain.be/node2008.html.

11–13 **Ricci flow in Mathematics and in Physics**, Institut de Recherche Mathématique Avancée (Universit'e Louis Pasteur), Strasbourg, France. (Jun./Jul./ 2008, p. 737)
Description: Ricci Flow in Mathematics and in Physics.
Organizers: Vincent Maillot and Athanase Papadopoulos.
List of speakers: G. Besson (Grenoble), M. Carfora (Pavia), D. Friedan (Rutgers U.), W. Graf (Wien), J. Keller (Marseille), F. Luo (Rutgers U.), P. Topping (Warwick), B. Wilking (Muenster).
Information: Financial support for speakers. For more information please visit: http://www-irma.u-strasbg.fr/article678.html; email: papadop@math.u-strasbg.fr.

* 12 **Herb Keller Memorial Workshop**, California Institute of Technology, Pasadena, California.
Description: The Applied and Computational Mathematics Department at Caltech is hosting this day-long workshop in memory of Herb Keller, Professor Emeritus of Applied and Computational Mathematics.
Featured speakers include: Tony Chan, Roland Glowinski, Thomas Hagstrom, Michael Holst, Arieh Iserles and Peter Lax.
Registration: Attendance is free, but registration is required.
Information: http://www.acm.caltech.edu/hbk08/ for more information. email: sydney@caltech.edu.

13 **63rd Algebra Day**, Carleton University, Ottawa, Canada.
Speakers: Osamu Iyama (Nagoya), Bernhard Keller (Paris), Claus Michael Ringel (Bielefeld), Paul Smith (Washington). (May 2008, p. 634)
Informatin: billig@math.carleton.ca, bsteinbg@math.carleton.ca or vdlab@math.carleton.ca.

15–18 **Information Security Conference 2008 (ISC 2008)**, Taipei, Taiwan. (Mar. 2008, p. 412)
Description: Information Security Conference (ISC 2008) is an annual international conference covering research in theory and applications of Information Security. ISC aims to attract high quality papers in all technical aspects of information security. It was first initiated as a workshop in Japan in 1997 (ISW'97, LNCS 1396). ISC 2008 will be held in Taipei, a beautiful city with a vibrant blend of traditional culture and cosmopolitan life. For more information, please see http://isc08.twisc.org/.
Information: http://isc08.twisc.org.

* 15–18 **MODSIM World 2008 Conference & Expo**, Virginia Beach Convention Center, Virginia Beach, Virginia.
Description: Sponsored by the Virginia Modeling, Analysis and Simulation Center (VMASC) and NASA Langley Research Center, MODSIM World 2008 is a unique, multi-disciplinary International Conference and Exposition for the exchange of modeling and simulation knowledge, research, and technology across academia, industry, and government. MODSIM World promotes the application of modeling and simulation technologies across disciplines and fields of practice to support and enhance leadership and management and to improve decision-making. MODSIM World 2008 is divided into the following tracks: Health & Medicine; Transportation & Logistics; Homeland Security & Defense; Engineering & Technology; and Education & Training. The conference also features cross-cutting sessions that explore the conceptual and technological connections between the disciplines represented by the main tracks. The cross-cutting sessions this year will focus on Game-Based Technology [Serious Games].
Information: http://www.modsimworld2008.com; email: thomas.e.pinelli@nasa.gov.

15–19 **International Conference on K-Theory and Homotopy Theory**, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. (Jun./Jul./ 2008, p. 738)
Description: Proceedings of the conference will be published in Journal of Homotopy and Related Structures (http://rmi.acnet.ge/jhrs/).
Organizers: Nick Inassaridze (A. Razmadze Math.Inst., Georgia and Univ. de Vigo, Spain), Manuel Ladra (Univ. de Santiago de Compostela, Spain).
Scientific Committee: Andrew Baker (Univ.of Glasgow,UK), Pilar Carrasco (Univ. de Granada, Spain), Carles Casacuberta (Univ. de Barcelona, Spain), Guillermo Cortiñas (Univ. de Buenos Aires, Argentina), Hvedri Nassaridze (A. Razmadze Math. Inst., Georgia), Ryszard Nest (Univ. of Copenhagen, Denmark), Lionel Schwartz (Univ. Paris 13, France), Aydin Shahbazov (Inst. Math. and Mech. of NAS, Azerbaijan), Rainer Vogt (Univ. Osnabrück, Germany), Charles Weibel (Rutgers University, USA).
Important Dates: Deadline for submission of abstracts: May 23, 2008. Deadline for answering with presentations acceptance: June 6, 2008. Deadline for submission of articles: December 31, 2008
Information: email: niko.inas@gmail.com; http://www.usc.es/regaca/ktht/.

15–21 **Ninth Crimean Workshop on the Method of Lyapunov Functions and Its Applications**, Alushta, Crimea, Ukraine. (May 2008, p. 634)
Description: The conference is dedicated to 70th anniversary of Academician A. M. Samoilenko.
Focus: The workshop will bring together researchers in the theory of stability and related fields of pure and applied mathematics, in particular, qualitative theory of differential equations, mechanics, mathematical modelling and control.
Program Committee: A. M. Samoilenko (chairman), I. V. Gaishun, M. M. Khapaev, D. Ya. Khusainov, V. I. Korobov, A. M. Kovalev, A. I. Malikov, A. A. Martynyuk, N. A. Perestyuk, S. N. Vassilyev.
Organizing Committee: O. V. Anashkin (chairman), E. P. Belan, V. I. Shostka, V. V. Zhuravlev.
Information: Oleg V. Anashkin; email: anashkin@crimea.edu.

16–19 **Conference on Boundary Value Problems: Mathematical Models in Engineering, Biology and Medicine**, University of Santiago de Compostela, Santiago de Compostela, Spain. (Feb. 2008, p. 308)
Description: The Conference on Boundary Value Problems, "Mathematical Models in Engineering, Biology and Medicine" tries to keep in touch some of the most relevant experts in these fields. It is prepared under the auspices of the International Federation of Nonlinear Analysts and is organized by the Nonlinear Analysis Group of the Department of Mathematical Analysis of the University of Santiago de Compostela.
Topics: Theory of differential and difference equations in a broad sense, with special attention to nonlinear and singular phenomena arising in the mathematical models that appear in engineering, biology and medicine.
Information: http://www.usc.es/congresos/bvp2008/.

16–19 **Rings and Modules, in honour of Patrick F. Smith's 65th birthday**, Complexo Interdisciplinar da Universidade de Lisboa, Portugal. (Jun./Jul./ 2008, p. 738)
Invited Speakers: T. Albu (Bucharest, Romania); A. Facchini (Padova, Italy); J. L. Gómez Pardo (Santiago de Compostela, Spain); C. Hajarnavis (Warwick, UK); C. Lomp (Porto, Portugal); S. Lopez-Permouth (Ohio, USA); B. Osofsky (Rutgers, USA); D. Passman (Wisconsin-Madison, USA); M. Prest (Manchester, UK); E. Puczylowski (Warsaw, Poland); A. Tercan (Hacettepe, Turkey); R. Wisbauer (D ̧sseldorf, Germany).
Organizing Committee: N. V. Dung (Ohio, USA); P. A. Guil Asensio (Murcia, Spain); R. J. Marsh (Leeds, UK); C. Santa-Clara (Lisboa, Portugal).
Scientific Committee: K. A. Brown (Glasgow, UK); J. Clark (Otago, New Zealand); J. L. GÛmez Pardo (Santiago de Compostela, Spain); D. V. Huynh (Ohio, USA); B. Osofsky (Rutgers, USA); R. Wisbauer (Duesseldorf, Germany).
Information: The programme will also include short talks. For logistic reasons, the number of participants is limited, so please register as soon as possible. Contact the organizers at pfs2008@cii.fc.ul.pt; http://pfs2008.cii.fc.ul.pt/.

16–20 **International Conference of Numerical Analysis and Applied Mathematics 2008 (ICNAAM 2008)–Honoring John Butcher on the occasion of his 75th birthday**, Hotel Kypriotis Village-Kypriotis Panorama-Kypriotis International Conference Center, Psalidi, Kos, Greece. (Mar. 2008, p. 413)
Description: The aim of ICNAAM 2008 is to bring together leading scientists of the International Numerical & Applied Mathematics community and to attract original research papers of very high quality.
Invited Speakers so far: Prof. Dr. John Butcher, New Zealand; Prof. Dr. Gotz Alefeld, Germany; Prof. Dr. Uri Ascher, Canada; Prof. Dr. Martin Berzins, USA; Prof. Dr. Peter Deuflhard, Germany; Dr. Adrian Hill, United Kingdom; Prof. Dr. Zdzislaw Jackiewicz, USA; Prof. Dr. Rolf Jeltsch, Switzerland; Prof. Dr. Daniel W. Lozier, USA; Prof. Dr. Christian Lubich, Germany; Prof. Dr. Brynjulf Owren, Norway; Prof. Dr. Stefan Vandewalle, Belgium.
Information: http://www.icnaam.org/.

17–19 **First Summer School on Copulas**, Johannes Kepler University, Linz, Austria. (Aug. 2008, p. 868)
Description: The Summer School aims at providing a meeting point for exchanging ideas and presenting new directions on the theory of copulas and related applications.
Information: http://www.flll.jku.at/ssc; email: fabrizio.durante@jku.at.

18–20 **MTISD08: Methods, models and information technologies for decision making**, Lecce, Italy. (Jun./Jul./ 2008, p. 738)
Information: http://www.mtisd2008.unile.it; email: squillan@unisannio.it.

19–26 **Harmonic Analysis and Approximations, IV (International Conference)**, Tsaghkadzor, Armenia. (Apr. 2008, p. 525)
Description: The Conference continues the series of International Conferences organized in Armenia (HAA I - Nor Amberd, 1998, HAA II - Nor Amberd, 2001, HAA III - Tsaghkadzor, 2005) which were attended by 177 participants from 19 countries. This conference is dedicated to the 80th anniversary of academician Alexandr Talalian. The program of the conference will consist of invited 50-minute plenary lectures and contributed 20-minutes talks.
Speakers: The following mathematicians have agreed to give a plenary lecture at the conference: Sergey Konyagin (Russia), Thomas Korner (UK), Michael Lacey (USA), Konstantin Oskolkov (USA), Allan Pinkus (Israel), Vilmos Totik (USA), Przemyslaw Wojtaszczyk (Poland).
Information: http://math.sci.am/conference/sept2008/conf.html.

21–24 **Applied Statistics 2008**, Hotel Ribno, Ribno, Slovenia. (May 2008, p. 634)
Description: The conference, organized in Ribno in the vicinity of the beautiful Lake Bled, 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. Cross-discipline and applied paper submissions are especially welcome. A three day program consists of invited paper presentations, contributed paper sections from diverse topics, and finishes with a workshop. Selected papers will be published in *Advances in Methodology and Statistics*, a peer-reviewed journal of the statistical society of Slovenia.
Keynote Speakers: Jaak Billiet, Katholieke Universiteit Leuven, Belgium; Ornulf Borgan, University of Oslo, Norway; William S. Cleveland, Purdue University, USA.
Important Dates: Abstract Submission: June 1, 2008. Registration: July 1, 2008.
Contact: Andrej Blejec, info.AS@nib.si.
Information: http://conferences.nib.si/AS2008; email: andrej.blejec@nib.si.

22–26 **Multiscale Representation, Analysis and Modeling of Internet Data and Measurements**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (May 2008, p. 635)
Overview: We will discuss the structure of the Internet and of network traffic on the Internet. Topics will include current tools to measure and infer the connectivity structure of the Internet, and the modeling of both the emergence of network structures and traffic patterns. Challenges and opportunities in constructing multiscale models for such complex networks and traffic patterns will be studied from various perspectives.
Organizing Committee: Mauro Maggioni, Paul Barford, Anna Gilbert, Morley Mao, Rob Nowak.
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/mraws1/. If you don't intend to request financial support, you may simply register. We urge you to apply as early as possible. Applications received by August 11, 2008 will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.
Information: email: sbeggs@ipam.ucla.edu; http://www.ipam.ucla.edu/programs/mraws1/.

22–28 **A joint conference of 5th Annual International Conference on Voronoi Diagrams in Science and Engineering and 4th International Kyiv Conference on Analytic Number Theory and Spatial Tessellations**, Drahomanov National Pedagogical University, Kyiv, Ukraine. (Feb. 2008, p. 308)
Main topics: a) Voronoi Diagrams. b) Fields in Pure Mathematics founded by Voronoï.
Organizers: Inst. of Mathematics of the NAS of Ukraine; Dragomanov Pedagogical University, Ukraine; Voronoi Diagram Research Center, Seoul, Korea; Inst. of Mathematics of the PAS, Warsaw, Poland; Steklov Mathematical Inst. of the RAS, Moscow, Russia.
Registration deadline: March 15, 2008. Abstract Submission deadline: March 22, 2008.
Information: email: voronoi@imath.kiev.ua; http://www.imath.kiev.ua/~voronoi.

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/.

26–28 **Fourth Yamabe Symposium: "Geometry and Analysis"**, School of Mathematics, University of Minnesota, Minneapolis, Minnesota. (Aug. 2008, p. 868)
Confirmed speakers are: Simon Brendle, Stanford University; Alice Chang, Princeton University; Gerhard Huisken, Albert Einstein Institute, Potsdam; Ngaiming Mok, Hong Kong University; Leon Simon, Stanford University; Yum-Tong Siu, Harvard University; Neil Trudinger, Australian National University; and Burkhard Wilking, University of Muenster.
Support: From the National Science Foundation will be used to defray workshop expenses for a number of participants, with highest preference given to younger scientists (grad students, postdocs, young faculty or researchers at most five years after Ph.D.), although all active people are eligible. Women and minorities are especially encouraged to apply.
Deadline: The application deadline for full consideration for funding is Thursday, August 7, 2008.
Information: http://www.math.umn.edu/yamabe/; email: gulliver@math.umn.edu.

26–28 **2008 Southern Regional Algebra Conference (With Recognition of the Retirement of K. M. Rangaswamy)**, University of Colorado at Colorado Springs, Colorado Springs, Colorado. (Jun./Jul./ 2008, p. 738)
Description: The University of Colorado at Colorado Springs will host the 2008 Southern Regional Algebra Conference. The conference this year will in particular honor the 70th birthday and retirement of Professor K. M. Rangaswamy. We will follow the usual SRAC format of 25 minute talks. As usual, there is no financial support provided by the host institution for SRAC participants. The conference is open to all interested participants. Algebraists from the Southern Region of the United States are encouraged to attend. Talks in all areas of algebra are welcome, but especially in those areas related to Professor Rangaswamy's work. Deadline for abstracts is August 15, 2008. For more specific information visit the conference website at http://www.uccs.edu/~math/News/RangafestMain.htm, or contact the conference organizer, Gene Abrams, at abrams@math.uccs.edu or 719-262-3182.

27 **Illinois/Missouri Applied Harmonic Analysis Seminar**, Southern Illinois University, Edwardsville, Illinois. (Aug. 2008, p. 868)

Description: The Seminar is an ongoing sequence of meetings fostering research interactions among mathematicians, engineers, and physicists who develop and apply techniques from harmonic analysis.
Theoretical topics of interest include: Wavelets, Gabor systems (time-frequency analysis), frames and Riesz bases, approximation theory, X-ray type transforms.
Applications of interest include: All kinds of signal and image analysis, processing and reconstruction, both analogue and digital.
Support: This conference is supported in part by the National Science Foundation and the Institute for Mathematics and its Applications (IMA) through its Participating Institution (PI) Program. PI members may use IMA/PI funds to support travel of their personnel to this conference.
Registration: Conference registration is free, and all interested researchers are invited to attend.
Information: For more information, please visit the conference website or contact the local organizer: Myung-Sin Song; msong@siue.edu; http://www.siue.edu/~msong/IMAHA/IMAHA4.html.

27–29 **Discrete Analysis and Applications (Walsh-Fourier Series, Symbolic Sequences-Complexity and Cryptography)**, Department of Informatics, Aristotle University of Thessaloniki, Thessaloniki, Greece. (Apr. 2008, p. 525)
Description: The aim of this workshop is to focus on both theoretical–applied results and new potentialities of applications of Discrete Analysis. Special attention is given to Walsh-Fourier analysis, symbolic sequences analysis, complexity, non-linearity and cryptography.
Information: http://web.auth.gr/DiscreteAnal08/.

29–October 3 **13th GAMM–IMACS International Symposium on Scientific Computing, Computer Arithmetic, and Verified Numerical Computations SCAN'2008**, El Paso, Texas. (Apr. 2008, p. 525)
Description: The conference continues the series of international SCAN symposia held under the joint sponsorship of GAMM (International Association of Applied Mathematics and Mechanics) and IMACS (International Association for Mathematics and Computers in Simulation). These symposia have covered the numerical and algorithmic aspects of scientific computing, with a strong emphasis on verification of computed results, as well as on arithmetic, programming, and algorithmic tools for this purpose. Their objectives have been both to propagate current applications and research and to promote a greater understanding and increased awareness of the subject matters. SCAN 2008 strives to become a forum for the researchers of various fields in numerical verification to discuss many existing verification tools and approaches.
Information: http://www.cs.utep.edu/interval-comp/scan08.html; email: vladik@utep.edu.

29–October 4 **Workshop on Quantum Many-Body Systems, Bose-Einstein Condensation**, Centre de recherches mathématiques, Université de Montréal, Montréal, Québec, Canada. (Jan. 2008, p. 78)
Description: The physics of ultracold quantum gases and Bose-Einstein condensation is currently a very active field of both experimental and theoretical research worldwide. Unveiling the fascinating properties of such quantum many-body systems by rigorous mathematical analysis is an important and difficult challenge for mathematical physics. Considerable progress has been made in recent years involving a variety of mathematical techniques, such as spectral theory of partial differential operators with a large number of variables, nonlinear partial differential equations, random walks on lattices and functional integration. Several of the most basic questions are still unanswered, however, and there is much to be learned. The workshop will bring together experts with different backgrounds to review the current status of mathematical results in the field and to discuss new developments where a mathematical approach is potentially fruitful.
Information: http://www.crm.umontreal.ca/Mathphys2008.

October 2008

3–5 **II Iberian Mathematical Meeting**, Departamento de Matemáticas, Universidad de Extremadura, 06071 Badajoz, Spain. (May 2008, p. 635)
Description: The II Iberian Mathematical Meeting, jointly organized by the Spanish Royal Mathematical Society (http://www.rsme.es/), the Portuguese Mathematical Society (http://www.spm.pt/), and the Department of Mathematics of the University of Extremadura (http://matematicas.unex.es/), will be held on October 3–5, 2008 in Badajoz (Spain). In this second meeting , the main scientific areas will be: Algebra and Algebraic Methods; Functional Analysis–Statistics and Biometry.
Information: http://imm2.unex.es; email: ojedamc@unex.es; tel: +34924289568; fax: +34924272911; email: imm2@unex.es.

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.

* 4–5 **Number Theory and Related Topics: Conference in honour of Professor Paulo Ribenboim on the occasion of his 80th birthday**, Laval University, Quebec City, Canada.
Information: For further information, contact J.-M. De Koninck (jmdk@mat.ulaval.ca) or C. Levesque (cl@mat.ulaval.ca).

5–12 **International Conference on Differential Equations, Function Spaces, and Approximation Theory: Dedicated to the 100th anniversary of the birthday of S. L. Sobolev**, Sobolev Institute of Mathematics, Novosibirsk, Russia. (Apr. 2008, p. 525)
Description: October 6, 2008, will be the 100th anniversary of the birthday of Sergei L'vovich Sobolev (1908-1989), an outstanding mathematician of the 20th century. The Sobolev Institute of Mathematics of the Siberian Branch of the Russian Academy of Sciences jointly with Novosibirsk State University are organizing the International Conference on Differential Equations, Function Spaces, and Approximation Theory dedicated to this significant event.
Topics: Ordinary differential equations; partial differential equations; equations of mathematical physics; operator theory; spectral theory; function spaces; embedding theorems; numerical methods; approximation theory; cubature formulas; mathematical modeling.
Information: email: sobolev100@math.nsc.ru; http://www.math.nsc.ru/conference/sobolev100/english.

6–10 **Conference on Arithmetic Algebraic Geometry on the occasion of Michael Rapoport's 60th birthday**, Universitaet Bonn, Bonn, Germany. (Feb. 2008, p. 308)
Description: The conference is an activity of the Sonderforschungsbereich Mainz/Bonn/Essen on Periods, Moduli Spaces, and Arithmetic of Algebraic Varieties, and is supported by the Hausdorff Center for Mathematics (Bonn).
Information: For further information, please see the conference web site: http://aag-bonn08.sfb45.de.

6–10 **Partial differential equations and differential Galois theory: A conference on the occasion of the 80th birthday of Bernard Malgrange**, Centre International de Rencontres Mathématiques (CIRM), Marseille, France. (Aug. 2008, p. 868)
Description: The purpose of this meeting is to exchange ideas on algebraic structures of Pde's going back to Elie Cartan, Lie and Galois while celebrating the birthday of one of the most active mathematicians in this field. Main topics will be differential Galois theory, groupoids, Cartan's involutivity, non linear algebraic partial differential equations. The scientific committee is composed of L. Boutet de Monvel, J.P. Ramis, C. Sabbah and the two organizers Y. Laurent and L. Stolovitch.
Information: http://www.cirm.univ-mrs.fr/liste_rencontre/Rencontres2008/Renc319/Renc319.html; email: stolo@picard.ups-tlse.fr.

9–11 **Algebra, Geometry and Mathematical Physics, Baltic-Nordic Workshop**, University of Tartu, Tartu, Estonia. (Apr. 2008, p. 526)
Description: The aim of this conference is to strengthen interaction between algebra, differential geometry and theoretical physics. The scope of conference includes the following topics: noncommutative geometry, operad and group theoretical methods, generalizations of Lie algebras, non-associative systems, quantum groups, Hopf algebras, categorical physics, integrable systems.
Information: email: viktor.abramov@ut.ee; http://www.agmf.astralgo.eu/tartu08/.

10–11 **Twenty-Eighth Southeastern Atlantic Regional Conference on Differential Equations (SEARCDE)**, University of Arkansas at Little Rock, Little Rock, Arkansas. (Jun./Jul./ 2008, p. 739)

Speakers: Martin Bohner (Missouri University of Science and Technology), Jerry Bona (University of Illinois at Chicago), Om. P. Agrawal (Southern Illinois University).
Deadlines: The deadline for abstracts in contributed session is September 20, 2008. The deadline for conference rates for hotels ranges from September 10, 2008, to September 30, 2008, depending on the hotel. The deadline for application for travel support is September 15, 2008.
Information: In addition to the plenary speakers, there will be sessions of twenty minute contributed talks. Pending funding from the National Science Foundation, travel support funds will be available for advanced graduate students and recent Ph.D. recipients (2004 or later). Women and minorities are especially encouraged to participate in this conference and to apply for support. Please visit the conference website at http://www.ualr.edu/SEARCDE28/ for information on registration, lodging, submission of abstracts, and application for support.
Information: email: erkaufmann@ualr.edu; http://www.ualr.edu/SEARCDE28/.

11–12 **AMS Eastern Section Meeting**, Wesleyan University, Middletown, Connecticut. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/sectional.html.

11–13 **International Conference on Applied Mathematics and Approximation Theory 2008**, University of Memphis, Memphis, Tennessee. (Mar. 2008, p. 413)
Description: Honoring 80th Birthday of P. L.Butzer (AMAT08).
Plenary Speakers: C. Bardaro, J. Bona, B. Berndt, F. Deutsch, K. Diethelm, S. Dragomir, J. Goldstein, M. Ismail, M. J. Lai, H. Mhaskar, J. Prestin, S. Samko, R. Stens, A. Zayed.
Organizer: George Anastassiou.
Information: http://www.msci.memphis.edu/AMAT2008/.

* 13 **Teachers Workshop**, The Marriott Wardman Park Hotel, Washington, District of Columbia.
Description: A Workshop for Middle/High School/Community College Mathematics and Science Teachers, 8:30a.m. to 4:00p.m., by the Public Awareness Committee, as part of the Institute for Operations Research and the Management Sciences, Washington General Meeting.
Purpose: The workshop provides teachers with applications that can stimulate their students' interest in mathematics. Participants become aware of real-world applications that can be shared with their students. Teachers also receive a generous packet of take-away materials, including work modules and videos.
Information: email: paulette.bronis@informs.org;

13–16 **Scaling up for modeling transport and flow in porous media**, Centre for Advanced Academic Studies, Dubrovnik, Croatia. (Apr. 2008, p. 525)
Description: The aim of the conference is to bring together researchers, scientists, engineers, and students to exchange and share their experiences, new ideas, and research results about upscaling for modeling, analysis and simulation of flow and transport in porous media and application to problems including subsurface hydrology, petroleum exploration, contaminant remediation, carbon sequestration and nuclear waste storage.
Topics: Flow and transport in heterogeneous porous media, multiphase flows, multiscale phenomena, scaling and heterogeneity, scaling in porous media, in particular scaling of processes from the microscale to the mesoscale, the use of coarse grid descriptions in modeling multiphase flow phenomena, numerical homogenization, numerical simulation of multiphase flow in heterogeneous porous media, mathematical modeling of multiphase flow in porous media.
Information: email: brahim.amaziane@univ-pau.fr; http://web.math.hr/~jurak/Dubrovnik08/.

13–17 **Applications of Internet MRA to Cyber-Security**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Aug. 2008, p. 868)
Overview: Internet-security is a large and complex problem space with profound implications for our society. On one side are defenders who are responsible for creating systems, protocols, policies, and other mechanisms to protect an IT infrastructure from unwanted access. On the other side are attackers who conduct malicious activity in the Internet for recognition, profit, or more sinister reasons. This workshop will assemble a group of leading researchers and cyber-security professionals to discuss several key challenges for defenders.
Organizing Committee: Bill Aiello, Paul Barford, Tal Malkin, Niels Provos, Mike Reiter, Matthew Roughan.
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/mraws2/. Applications received by September 1, 2008 will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.

17–19 **AMS Central Section Meeting**, Western Michigan University, Kalamazoo, Michigan. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/sectional.html.

18–19 **Bachman Memorial Conference**, Polytechnic University, Brooklyn, New York. (Jun./Jul. 2008, p.739)
Description: Memorial Conference.

18–20 **The Second International Workshop on Post-Quantum Cryptography (PQCrypto 2008)**, University of Cincinnati, Cincinnati, Ohio. (May 2008, p. 635)
Description: Can we build large quantum computers? What will they do to the cryptographic world, in particular, public key cryptographic world? PQCrypto 2008 is the second of the new series of workshops on Post-Quantum cryptography, which is devoted to the cryptographic research in preparing us for the world of the possible future quantum computers.
Organizers: This series of workshop is organized due to the growing interest from academic researchers, industries and governments in this area. PQCrypto 2008 will serve as a forum for researchers to present results and exchange ideas in post-quantum cryptography.
Information: email: ding@math.uc.edu; http://math.uc.edu/~aac/pqcrypto2008/.

* 19–22 **IV Congress of the Mathematicians of Republic of Macedonia**, Struga, Republic of Macedonia.
Description: Conference is devoted to all areas of mathematics.
Information: http://smmk.pmf.ukim.edu.mk; email: nikita@iunona.pmf.ukim.edu.mk.

20–22 **International Conference on Analysis and Its Applications**, Aligarh Muslim University, Aligarh, India. (May 2008, p. 635)
Information: http://www.amudirectory.com/ICAA08. For update informations: http://ICAA-08.tripod.com

20–22 **10th International Conference on Information and Communications Security (ICICS'08)**, Birmingham, United Kingdom. (Aug. 2008, p. 868)
Description: The event, which started in 1997, brings together individuals involved in multiple disciplines of Information and Communications Security, in order to foster the exchange of ideas.
Organizers: ICICS 2008 will be organized by the School of Computer Science, University of Birmingham, in co-operation with HP Laboratories (Bristol, UK), the UK Engineering and Physical Sciences Research Council (EPSRC), and the International Communications and Information Security Association (ICISA).
Information: email: a.j.brown@cs.bham.ac.uk; http://events.cs.bham.ac.uk/icics08/.

22–23 **DIMACS Workshop on Nanotechnology and Biology**, DIMACS Center, CoRE Building, Rutgers University, Piscataway, New Jersey. (Aug. 2008, p. 868)
Short Description: Recent years have witnessed the development of fabrication and characterization technologies to manipulate and analyze matter at the nanoscale. These technologies have applications in myriad areas, including in biology, where nature has evolved its own nanotechnologies that inspire many contemporary engineered nanodevices. As first generation nanotechnologies have provided proofs of principle for many exciting applications, the need for better understanding of biology and physics at the nanoscale through modeling and computation has become apparent. This workshop will explore the foundations of nanoscale assembly in natural and engineered systems. Natural systems may include viruses, organelles, or multi-molecular machines as they self-assemble and take shape in processes that might include, for example, development, adaptation, or cancer. Engineered systems under development

include smart drug delivery systems, DNA-based fabrication, layer-by-layer assembly and electrospun nanofibers. The ability to model and understand the natural systems will accelerate the development of engineered nanosystems. While efforts to attain better understanding through modeling and computation are of primary interest, the integration of modeling and experiments is quite relevant and necessary to advance our understanding of self-assembly at the nanoscale. Because this field is so interdisciplinary, we envision an audience that includes biologists, chemists, physicists, computer scientists and engineers.
Organizers: Stan Dunn, Rutgers University; email: smd@occlusal.rutgers.edu; Yannis Androulakis, Rutgers University, email: yannis@rci.rutgers.edu; Charlie Roth, Rutgers University, email: cmroth@rci.rutgers.edu.
Local Arrangements: Workshop Coordinator, DIMACS Center, email: workshop@dimacs.rutgers.edu; 732-445-5928; http://dimacs.rutgers.edu/Workshops/Nanotechnology/index.html.

22–23 **The Second Conference on Mathematical Sciences (CMS'2008)**, Department of Mathematics. Faculty of Science and Information Technology, Zarqa Private University, Zarqa 13110, Jordan. (Apr. 2008, p. 526)
Scope: Pure Mathematics, Applied Mathematics and Statistics and its Techniques.
Languages: Arabic or English.
Deadlines: For Abstract Submission: March 30th, 2008. Full Paper Submission: May 30th, 2008. Notification of Acceptance: July 31st, 2008.
Information: There is no registration fee. http://www.zpu.edu.jo/cms/cms.htm.

22–24 **International Conference in Modeling Health Advances 2008**, San Francisco, California. (Apr. 2008, p. 526)
Description: To tackle these illnesses, the cooperation of modelers, mathematicians, statisticians, computer scientists, and others, and of researchers from the medical community is absolutely essential. Modeling is important because it gives important insight into the method of treatment. In the case of HIV/AIDS, for example, mathematical modeling indicated that a combination of both protease inhibitors and reverse transcriptase inhibitors would be far more effective than any one of these two drugs. The purpose of this conference is to bring all the people working in the area of epidemiology under one roof and encourage mutual interaction.
Information: http://www.iaeng.org/WCECS2008/ICMHA2008.html.

22–24 **Twenty-Second Midwest Conference on Combinatorics, Cryptography, and Computing (MCCCC)**, University of Nevada, Las Vegas (UNLV), Las Vegas, Nevada. (Aug. 2008, p.869)
Description: The title of the conference is fairly descriptive of the subjects discussed.
Invited speakers: Gary Chartrand, Western Michigan University; Ronald Graham, University of California, San Diego; Spyros Magliveras, Florida Atlantic University; Doug Stinson, University of Waterloo, Canada; and Catherine Yan, Texas A&M University.
Talks: Twenty-minute contributed talks are invited.
Information: http://www.mcccc.info; email: ebrahim.salehi@unlv.edu.

23–25 **Second Workshop on Mathematical Cryptology (WMC 2008)**, University of Cantabria, Santander, Spain. (Jun./Jul./ 2008, p. 739)
Description: There is growing interest among mathematicians and cryptographers in cryptosystems based on algebraic problems and in related cryptanalysis. The Workshop on Mathematical Cryptology (WMC 2008) is the second of a series of meetings where the main purpose is to learn and discuss recent developments and emerging open problems derived from Cryptology and having mathematical interest. Topics for WMC 2008 include, but are not limited to: Primality and integer factorization. Secure encryption schemes based on group theory. Multivariate polynomial cryptosystems. Gröbner Bases. Elliptic and hyperelliptic curve cryptosystems. Computational complexity. Lattice-based cryptosystems. Computational number theory in Cryptology. Pseudorandom sequence generators for stream ciphers. Public key cryptosystem based on algebraic coding theory. Quantum Cryptography. Information security with mathematical emphasis. The workshop will consist of invited lectures, short contributed talks and posters.
Information: http://grupos.unican.es/amac/wmc-2008; email: jaime.gutierrez@unican.es.

24–26 **AMS Southeastern Section Meeting**, University of Alabama, Huntsville, Alambama. (Jun/Jul 2007, p. 784)
Information: http://www.ams.org/amsmtgs/sectional.html.

* 25 **2008 Harvey Mudd Mathematics Conference: Nonlinear Functional Analysis**, Harvey Mudd College, Claremont, California
Description: Five lectures, accessible to upper division undergraduates in mathematics, on the state of the art in Nonlinear Functional Analysis will presented by: Peter Bates (Mathematical excursions inspired by material science), Monica Clapp (Classical and recent results on elliptic problems with critical nonlinearity), Yanyan Li (A Liouville theorem and a Harnack inequality), Ratnasingham Shivaji (Population dynamics with diffusion), and Zhi-Qiang Wang (A twisting condition, resonances, and periodic solution to Hamiltonian systems.
Information: http://www.math.hmc.edu/conferences/2008/nonlinear; email: castro@math.hmc.edu.

27–29 **DIMACS Workshop on Models/Methodological Problems of Botanical Epidemiology**, DIMACS Center, CoRE Building, Rutgers University, Piscataway, New Jersey. (Aug. 2008, p. 869)
Description: Presented under the auspices of the Special Focus on Computational and Mathematical Epidemiology. This workshop will gather experts from the botanical epidemiology and genetics communities together with mathematicians interested in modeling using differential equations, discrete systems, and stochastic processes to investigate modeling and methodological problems of spread of disease in plants. The workshop will investigate modeling approaches including ode, pde, individual-based models including percolation, random graph, stochastic, spatially-explicit and spatially-implicit (moment closure and pairwise approximation) and metapopulation models. We will also discuss data and model testing issues, such as parameter estimation for spatially-explicit and spatially-implicit models with and without unobserved compartments; data collection for model testing and parameter estimation from lattice crops, row crops, continuum and mosaics; optimization of experimental design for parameter estimation and model discrimination; and analysis of microcosm data to distinguish demographic and environmental stochasticity.
Organizers: Chris Gilligan, Cambridge; cag1@cus.cam.ac.uk.
Local Arrangements: Workshop Coordinator, DIMACS Center, workshop@dimacs.rutgers.edu, 732-445-5928.
Information: http://dimacs.rutgers.edu/Workshops/Botanical/.

27–31 **Elliptic and Hyperbolic Equations on Singular Spaces**, Mathematical Sciences Research Institute, Berkeley, California. (Jun./Jul./ 2008, p. 739)
Description: This workshop will focus on the study of PDEs on singular spaces and their connections with the spaces' underlying geometry. Topics will be cohomology theory, index theory, and spectral geometry on the elliptic side; and wave propagation and associated inverse problems on the hyperbolic. A unifying theme will be asymptotic expansions of solutions in various regimes, as for instance high frequency eigenfunction expansions, which draws techniques from hyperbolic equations into the elliptic theory.
Organizers: Gilles Carron, Eugenie Hunsicker, Richard Melrose, Michael Taylor, Andras Vasy and Jared Wunsch.
Information: email: jz@msri.org; http://www.msri.org/calendar/workshops/WorkshopInfo/444/show_workshop.

28–30 **The Second International Conference on Mathematics and Natural Sciences (ICMNS) 2008**, Institut Teknologi Bandung, Bandung, Indonesia. (Jun./Jul./ 2008, p. 739)
Description: The International Conference on Mathematics and Natural Sciences (ICMNS) 2008 aims to promote interdisciplinary research in science and technology, to promote the development of science and their roles in the development of science-based technology, and to disseminate research in various field of mathematics and natural sciences. The scope of this conference is, but not limited to, in the fields of Health sciences, Environmental sciences, Biosciences and biotechnology, Physical sciences, Material sciences, Mathematics,

Computer science and computational science, Instrumentation, and Earth and space sciences.
Information: email: rino@math.itb.ac.id; http://www.fmipa.itb.ac.id/icmns2008.

* 29–31 **The 2nd International Conference: E-Medical Systems E-MEDISYS 2008**, Sfax, Tunisia.
Information: You can find details in: http://www.setit.rnu.tn/E-Medisys. The paper submission can be done on-line at: http://www.setit.rnu.tn/E-Medisys/submission/.

November 2008

3–4 **International Workshop on New Trends in Science and Technology**, Cankaya University, Ankara, Turkey. (Mar. 2008, p. 413)
Description: This workshop will provide a place to exchange recent developments and progresses on nanoscience and nanotechnology, nonlinear science and complexity in mathematics, physics and engineering as well as on symmetries, supersymmetries and integrable systems. The applications of the nanotechnology in the renewable energy production and storage as well as the nanostructured materials for nanoelectronics, energy and sensing will be discussed.The experimental details of detection of cancer cell, the development of censors and the multi purpose thin films are going to be presented in the perspectives of the nanoscience point of view.
Purpose: The purpose of the workshop is to bring together scientists whose common interests are the nanoscience, nonlinear science and complexity, the symmetries, supersymmetries and integrability.
Information: http://ntst08.cankaya.edu.tr/index.html.

3–7 **Beyond Internet MRA: Networks of Networks**, Institute for Pure and Applied Mathematics (IPAM), UCLA Los Angeles, California. (Aug. 2008, p. 869)
Overview: This workshop will bring together domain experts from the fields of engineering, biology, mathematics, and critical infrastructure protection to develop the foundation of a nascent theory in support of the networks of networks concept. In particular, we will use the Internet as a case study to illustrate how early verbal observations and arguments with deep engineering insight have led via an interplay with mathematics and measurements to increasingly formal statements and powerful theoretical developments.
Organizing Committee: Walter Willinger (chair), David Alderson, John Doyle, Ramesh Govindan, Craig Partridge.
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/mraws3/. Applications received by September 22, 2008, will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.

3–7 **Discrete Rigidity Phenomena in Additive Combinatorics**, Mathematical Sciences Research Institute, Berkeley, California. (Jun./Jul./2008, p. 739)
Organizers: Ben Green, Bryna Kra, Emmanuel Lesigne, Anthony Quas, and Mate Wierdl.
Description: This workshop will explore environments in which rigid structural information can be deduced from rather soft combinatorial hypotheses. There will be a particular focus on finite and quantitative questions, although an important aspect of the workshop will be to explore connections with corresponding infinite and qualitative questions in ergodic theory, where as a general rule more is known. Topics include (but are not be limited to) the following: 1. Freiman's theorem concerning the structure of sets with small doubling; 2. The Gowers Inverse Conjecture, concerning the structure of sets containing many parallelepipeds; 3. Finite versions of Ratner's theorem, concerning the structure of finite unipotent orbits in dynamical systems.
Information: http://www.msri.org/calendar/workshops/WorkshopInfo/440/show_workshop.

* 3–7 **Hitting, returning and matching in dynamical systems, information theory and mathematical biology**, EURANDOM, Eindhoven, The Netherlands.
Description: This workshop aims at gathering people from various areas dealing with probabilistic aspects of the occurence and the repetition of rare events. The following themes will be covered: Entropy, hitting and return times in ergid theory; Sequence alignment and occurrence of words in biological sequences; Occurrence and matching of patterns in stochastic processes and random fields; Pattern matching and data compression in information theory. There will be three minicourses (ergodic theory, information theory and mathematical biology) and around 15 one hour lectures.
Information: http://www.eurandom.nl; email: redig@math.leidenuniv.nl.

3–14 **Structural Probability**, Erwin Schrödinger International Institute for Mathematical Physics (ESI), Vienna, Austria. (Jun./Jul./ 2008, p. 739)
Description: The workshop is a continuation of a series of earlier programmes at ESI: special semester "Random Walks" (2001), RDSES/ESI Educational Workshop on Discrete Probability (2006), workshop "Algebraic, geometric and probabilistic aspects of amenability" (2007). We plan to mostly concentrate on the following 3 areas of discrete structural probability: random walks, percolation on groups and graphs, random groups. Limited financial support is available.
Information: Applications (deadline: August 31) and further information: Visit http://aesi@esi.ac.at; email: v.kaimanovich@jacobs-university.de.

4–6 **Multi-Scale Phenomena In Biology**, OIST Seaside House, Okinawa, Japan. (Aug. 2008, p. 869)
Description: A multitude of biological phenomena are described at multiple levels. What are the commonalities and differences between neuroscience, evolutionary biology, molecular biology and ecology in this regard? How can mathematics help in describing these phenomena?
Confirmed Speakers: Bjorn Engquist; The University of Texas at Austin; Hans Othmer; University of Minnesota; Eric Vanden-Eijnden; Courant Institute; Keiko Takahashi, Earth Simulator Center; Dan Rockmore, Dartmouth College; Terry Sejnowski, Salk Institute; Diego Rasskin-Gutman, Konrad Lorenz Institute for Evolution and Cognition Research; Tony Bell, Redwood Center for Theoretical Neuroscience; Robert Warner, University of California; Walter R. Tschinkel, Florida State University; Klaus M. Stiefel, OIST.
Support: Travel scholarships are available. We encourage applications by graduate students and postdocs whose research interests touch these subjects. To apply please contact Ryoko Uchida or Shino Fibbs (multi@oist.jp).
Information: http://www.irp.oist.jp/tenu/multi.html.

5–7 **Fractional Differentiation and its Applications**, Ankara, Turkey. (Mar. 2008, p. 413)
Description: The scope of the workshop is to present the state of the art on fractional systems, both on theoretical and application aspects. The growing research and development on fractional calculus in the areas of mathematics, physics and engineering, both from university and industry, motivates this international event gathering and unifying the whole community. Main Areas: Representation tools; modeling vibration insulation; analysis tools; identification filtering synthesis tools; observation pattern recognition simulation tools; control edge detection.
Deadlines: For submission of proposals: April 15, 2008. Notification for acceptance of proposals: June 6, 2008.
Information: http://www.cankaya.edu.tr/fda08/.

7–9 **Applications of Geometry to Topology and Physics: A conference in honor of the 70th birthday of Herman Gluck**, Rutgers-Newark, Newark, New Jersey. (Aug. 2008, p. 869)
Description: This conference, in honor of the 70th birthday of Herman Gluck, will address two topics in the application of geometry to other fields: (1) calibrated geometry and its applications to physics; (2) the application of geometry to knot theory, including topics such as Freedman's Mobius energy and Nabutovsky's ropelength.
Speakers tentatively include: Thomas Banchoff, Jason Cantarella, Robert Connelly, Dennis DeTurck, David Gabai, Weiqing Gu, Blaine Lawson, David Singer, Dennis Sullivan, and Gang Tian.
Support: Some financial support is available.
Information: email: parslerj@wfu.edu; http://www.math.uga.edu/gluckfest.

10–12 **International Conference on Recent Trends in Mathematical Sciences**, Manama, Kingdom of Bahrain. (May 2008, p. 635)
Description: The aim of the conference is to bring together the teachers, researchers and scientists working in the field of pure mathemat-

ics, applied mathematics, statistics and operation areas including operation research.
Organizer: The International Department of Mathematics, College of Science, University of Bahrain.
Information: email: mabdelaty@sci.uob.bh; http://www.icrms.uob.edu.bh/page-1.htm.

11–14 **2nd International Conference of Young Mathematicians on Differential Equations and Applications dedicated to Ya. B. Lopatinskii**, Department of Differential Equations, Donetsk National University, Universitetskaya, 24, Donetsk, 83055, Ukraine. (Aug. 2008, p. 869)
Topics: General theory of boundary value problems for PDEs, Lopatinskii condition. Investigations of boundary value problems for classes of PDEs. Nonlinear PDEs, free boundary problems. Qualitative theory of PDEs. Differential and integral operators, operator methods, difference equations. Algebraic, geometrical and topological methods in the theory of ODEs and PDEs. Ordinary DEs, dynamical systems, optimal control. Mathematical physics and other applications of DEs in natural-science, technical and social studies.
Aim: Bringing together young and some venerable researchers in above areas in order to get acquainted, to communicate, and to understand what directions are actual and perspective. The word "young" in the title means a general direction of the conference but doesn't mean any age limitations for the participants.
Information: http://www.donnu.edu.ua/en/index.asp (then click button from conferenceannouncementinleft-side column); email: icde2008@matfak.dongu.donetsk.ua; tel: +38(062)3054628 +38(062)3029260; fax: +38(062)3054628.

13–16 **Third International Conference on Differential Algebra and Related Topics**, Rutgers University at Newark, Newark, New Jersey. (Jun./Jul./ 2008, p. 740)
Description: The Third International Conference on Differential Algebra and Related Topics (DART-III) is the third in a series of conferences after DART in 2000 and DART-II in 2007, on the subject of differential algebra and related topics. There will be sessions for contributed talks and for posters. Limited funding is available.
Information: email: liguo@rutgers.edu; http://andromeda.rutgers.edu/~liguo/DARTIII/diffalg.html;

17–21 **Analytic theory of GL(3) automorphic forms and applications**, American Institute of Mathematics, Palo Alto, California. (Jun./ Jul./ 2008, p. 740)
Description: This workshop, sponsored by AIM and the NSF, has the goal of providing a description of GL_3 automorphic forms and their L-functions amenable to analytic number theorists and to explain the various approaches available to perform harmonic analysis on these spaces. A second objective will be to discuss the extension of some of the important tools existing in the GL_2 theory to the GL_3 context: a typical example is Kuznetzov's formula. A third objective will be to list some important problems known for GL_2 and to identify the main obstructions to the extension of these to GL_3: typical problems are non-vanishing problems for central values of L-functions and subconvexity problem. To achieve these goals we plan to bring together analytic number theorists and specialists from the theory of automorphic forms and related fields who are interested in analytic questions.
Information: email: farmer@aimath.org; http://aimath.org/ARCC/workshops/gl3.html.

17–21 **New Mathematical Frontiers in Network Multi-Resolution Analysis**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Aug. 2008, p. 740)
Description: This workshop will bring together researchers in mathematics, computer science, electrical engineering, and statistics to develop new mathematical foundations in network-centric multiresolution analysis and to explore and define new mathematical or algorithmic techniques in network MRA. These techniques include methods of analysis, representation, and synthesis of large networks, as well as visualization, analysis, and representation of network measurements.
Organizing Committee: Robert Calderbank, Anna Gilbert, Peter Jones, Steven Low, Matthew Roughan, Denis Zorin.
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/mraws4/. Applications received by October 6, 2008, will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.

December 2008

1–4 **SGT-in-Rio: Workshop on Spectral Graph theory with applications on Computer Science, Combinatorial Optimization and Chemistry**, Military Institute of Engineering, Rio de Janeiro, Brazil. (May 2008, p. 635)
Description: The theory of graph spectra is now a well established field of research in Mathematics and in several applied sciences (e.g. chemistry, computer science and operational research), and many results have been published over the last few decades.
Goals: The main goals of the workshop are to bring together the leading researchers on graph spectra and related topics, to establish the state of the art, and to discuss recent achievements and challenges.
Topics: The topics include applications of graph spectra to computer science, combinatorial optimization, chemistry and other branches of science.
Organizer: In recognition of the strong developments in the subject, this workshop has been organized as a forum for the many researchers around the world.
Information: email: nair@pep.ufrj.br; http://www.sgt.pep.ufrj.br/~tegrio.

1–5 **Nonnegative Matrix Theory: Generalizations and Applications**, American Institute of Mathematics, Palo Alto, California. (Jun./Jul./ 2008, p. 740)
Description: This workshop, sponsored by AIM and the NSF, will be devoted to the study of nonnegative matrices and their generalizations. The goal is to make progress both in specific areas and on the global themes that unify this subject.
Information: email: farmer@aimath.org; http://aimath.org/ARCC/workshops/nonnegmatrix.html.

5–8 **International Conference on Partial Differential Equations and Applications in honour of Professor Philippe G. Ciarlet's 70th birthday**, City University of Hong Kong, Kowloon, Hong Kong. (Aug. 2008, p. 870)
Description: The objectives of the Conference are to review and discuss some of the latest trends in the field of partial differential equations and applications. The conference is dedicated to Professor Philippe G. Ciarlet, professor emeritus, Université Pierre et Marie Curie, and chair professor, City University of Hong Kong, on the occasion of his 70th birthday, in recognition of his mathematical achievements and of his dedication to the mathematical community.
Information: http://www6.cityu.edu.hk/rcms/ICPDEA2008/; email: mclbj@cityu.edu.hk.

8–12 **FEMTEC 2008 (Finite Element Methods in Engineering and Science)**, University of Texas at El Paso, Texas. (Jun./Jul./ 2008, p. 740)
Description: The goal of FEMTEC 2008 is to advance the frontiers in performance and reliability of finite element methods, and broaden their interdisciplinary applications in engineering and sciences.
Topics: Include multi-scale and multi-physics problems, model adaptivity, adaptivity and error control for stationary and nonstationary problems, higher-order methods, meshfree, generalized, and enriched methods, reliability of FEM models, sensitivity analysis and uncertainty quantification, and advanced engineering and scientific applications. FEMTEC has a single-session format with limited number of participants.
Information: email: solin@utep.edu; http://servac.math.utep.edu/femtec_2008/home.

8–12 **Small Ball Inequalities in Analysis, Probability and Irregularities of Distribution**, American Institute of Mathematics, Palo Alto, California. (May 2008, p. 635)
Description: This workshop, sponsored by AIM and the NSF, will be devoted to a theme common to irregularity of distributions, approximation theory, probability theory and harmonic analysis. In each of these subjects, there are outstanding conjectures in dimensions three and higher that stipulate that functions which satisfy certain conditions on its mixed derivative are necessarily large in sup norm. This workshop will survey these conjectures, seeking both commonalities

and differences, describe recent advances, and discuss proof techniques and strategies.
Information: http://aimath.org/ARCC/workshops/smallballineq.html.

8–22 **Algebraic Topology, Braids and Mapping Class Groups**, Institute for Mathematical Sciences, National University of Singapore, Singapore. (Jun./Jul./ 2008, p. 740)
Description: The recent progress in topology has shed light on many deep connections between algebraic topology and the theory of braids. A successful program on Braids was organized in May-July, 2007. This present program is going to explore further the connections between algebraic topology and braids, and to establish further research collaborations in algebraic topology in Asia. The present program will consist of a conference on algebraic topology, and a workshop on special topics. 1. The Second East Asia Conference on Algebraic Topology, December 8–12, 2008. 2. Workshop on Homotopy, Braids and Mapping Class Groups, December 13–22, 2008.
International Organizers for conference 1: Haibao Duan (China), Jianzhong Pan (China), Akira Kono (Japan), Norio Iwase (Japan), Yongjin Song (Korea).
Information: email: imscec@nus.edu.sg; http://www.ims.nus.edu.sg/Programs/braids08/index.htm.

10–14 **Ninth Pacific Rim Geometry Conference**, National Taiwan University, Taipei, Taiwan. (Jun./Jul./ 2008, p. 740)
Description: The Pacific Rim Geometry Conference has been held every two years since 1992, with previous meetings occurring at Murramarang, Australia (2006), Shanghai (2004), Hong Kong (2002), Sendai (2000), Vancouver (1998), Seoul (1996), Singapore (1994), and Hong Kong (1992). The main purpose of the conference is to bring together researchers from Pacific Rim countries that are interested in areas related to geometry. The conference serves as a means to disseminate the most recent research developments and to cultivate working relationships among its participants.
Organizers: Robert Bartnik (Monash University, Australia), Yng-Ing Lee (National Taiwan University), Chang-Shou Lin (National Taiwan University), Richard Schoen (Stanford University, USA), Mao-Pei Tsui (University of Toledo, USA), Mu-Tao Wang (Columbia University, USA).
Information: email: mao-pei.tsui@utoledo.edu; http://www.math.ntu.edu.tw/~prg2008/.

13–17 **The 48th American Society for Cell Biology Annual Meeting**, The Moscone Center, San Francisco, California. (May 2008, p. 636)
Deadlines: Abstract Deadline (to be considered for minisymposia presentations): August 7, 2008. Abstract Deadline (to be considered for poster presentations only): September 3, 2008. Late Abstract Deadline (to be considered for poster presentations only): October 16, 2008.
Information: For more information, visit: http://ascb.org/meetings/.

15–19 **4th International Conference on Combinatorial Mathematics and Combinatorial Computing (4ICC)**, University of Auckland, Auckland, New Zealand. (Jun./Jul./ 2008, p. 740)

Description: The ICC is held every 10 years. This year it includes the annual ACCMCC meeting of the Combinatorial Society of Australasia, and the New Zealand leg of the map conferences held annually in Slovenia/Slovakia/Arizona-Portugal/New Zealand. Note: this event is held during summer in New Zealand.
Invited speakers (accepted unless stated): Alexander Barvinok, University of Michigan; Peter Cameron, Queen Mary College, London; Jan de Gier, University of Melbourne; Jesus de Loera, University of California-Davis; Robin Pemantle, University of Pennsylvania (tentative); Cheryl Praeger, University of Western Australia; Chris Rodger, Auburn University; Paul Seymour, Princeton University (tentative); Mike Steel, University of Canterbury; Carsten Thomassen, Technical University of Denmark (tentative); Nick Wormald, University of Waterloo; Doron Zeilberger, Rutgers University.
Information: email: mcw@cs.auckland.ac.nz; http://www.cs.auckland.ac.nz/research/groups/theory/4ICC/.

15–19 **The 13th Asian Technology Conference in Mathematics (ATCM 2008)**, Suan Sunandha Rajabhat University, Bangkok, Thailand. (Mar. 2008, p. 413)
Description: The ATCM 2008 is an international conference held in Thailand 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 hand-held devices, the effectiveness of our teaching and learning, and the horizon of our research in mathematics and its applications continue to grow rapidly.
Aim: 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.
Language: English is the official language of the conference. There will be over 300 participants coming from over 26 countries around the world.
Deadline: Submitting abstracts: June 15, 2008. Submitting full papers: July 30, 2008.
Information: http://atcm.mathandtech.org.

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.

18–20 **Pre-ICM International Convention on Mathematical Sciences**, University of Delhi, Delhi, India. (Jun./Jul. 2008, p. 741)
Description: On the initiative of Department of Science and Technology (DST), Government of India, an activity cell to organize "India Mathematics Year 2009 (IMY2009) as Pre-ICM activity" has been set up in the Department of Mathematics, University of Delhi. To launch IMY-2009, we are organizing: Pre-ICM International Convention on Mathematical Sciences (ICMS2008) at the Department of Mathematics, University of Delhi during December 18–20, 2008. The academic programme of the convention will include activities like workshops, symposia, brain-storming sessions, panel discussions, group discussions, seminars, poster sessions, tutorials, compact sessions etc. on various topics of mathematical sciences including interdisciplinary aspects.
Information: Write to Prof. B. K. Dass, icmsdu@gmail.com or http://icms2008.du.ac.in.

19–21 **Centenary Celebration of Calcutta Mathematical Society: International Symposium on Recent Advances in Mathematics and its Applications: (ISRAMA 2008)**, Calcutta Mathematical Society at AE-374, Sector-1, Salt Lake City Kolkata (Calcutta) 700064, India. (Aug. 2008, p. 870)
Description: The Calcutta Mathematical Society is organizing an International Symposium on Recent Advances in Mathematics and its Applications (ISRAMA 2008) on occasion of its Centenary.
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.
Deadline: Last Date: August 31, 2008, for receipt of full paper along with an abstract and registration.
Information: email: cms.centenary@gmail.com; http://www.calmath.org/forthcoming.html.

22–23 **Mathematical Sciences for Advancement of Science and Technology (MSAST 2008)**, Institute for Mathematics, Bioinformatics, Information Technology and Computer Science (IMBIC), Salt Lake City, Kolkata (Calcutta), India. (Aug. 2008, p. 870)
Call for Papers: Authors are requested to submit the full paper related to the theme of the Conference: "Mathematical Sciences for Advancement of Science and Technology" with an abstract indicating the motivation of the problem, its method of solution and important results to the Secretary of IMBIC. All the papers are to be screened for presentation in the Conference. All deliberations of the Symposium shall take place in English. All correspondences in respect of the Conference are to be addressed to Dr Avishek Adhikari, Secretary, IMBIC, AE 317, Salt Lake City, Sector II, Kolkata 700091, West Bengal, India; email: E-mail avishek.adh@gmail.com.
Information: http://www.imbic.org/forthcoming.html.

23–26 **International Conference on Computer Analysis of Science and Technology problems**, Tajik State National University (TSNU), Dushanbe, Tajikistan. (Mar. 2008, p. 413)
Description: The Second International Conference on Computer Analysis and its applications in Information Technology will be held on the beautiful campus of TSNU in December 2008 over four days.
Topics: Computer analysis of economical and ecological systems; Computer analysis of singular problems of science and technology; Theoretical problems of Computer analysis; Problems of Computer and Information Security.
Scientific Committee: Mahmadyusuf Yunusi, Dmitrii Logofet, Zafar Usmanov, Zahra Afsharnejat, Aleksandr Uspensky, Tasleem Mustafa.
Deadlines: Submission of one full page abstract: September 1, 2008. Notification of Acceptance of Abstract: October 1, 2008. Registration: September 1, 2008. Abstracts could be written in: WORD. Not to exceed one page, and can be sent by email to: icca2008@mail.tj.
Information: http://www.yunusi.com/conference; email: myu@yunusi.com.

January 2009

* Jan.—Mar. **I-Math Winter School DocCourse Combinatorics and Geometry 2009: Discrete and Computational Geometry**, Centre de Recerca Matematica, Bellaterra, Spain.
Co-ordinators: Marc Noy, Ferran Hurtado and Julian Pfeifle (Universitat Politacnica de Catalunya).
Intensive Courses: Jiri Matousek (Charles University, Prague) "Metric embeddings"; Günter Ziegler (Technical University, Berlin) "Convex Polytopes: Examples and Conjectures"; Thematic Seminars: Oswin Aichholzer, Imre Bárány, Stefan Felsner, Sergey Fomin, Peter Gruber, Martin Henk, Gil Kalai, and Michel Pocchiola.
Information: http://www.crm.cat/DOCCOURSE2009.

4–6 **ACM-SIAM Symposium on Discrete Algorithms (SODA09)**, New York Marriott Downtown, New York, New York. (Aug. 2008, p. 870)
Description: 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.
Information: http://www.siam.org/meetings/da09/; email: wilden@siam.org.

5–8 **Joint Mathematics Meetings**, Washington, District of Columbia. (Aug. 2008, p. 870)
Information: http://www.ams.org/amsmtgs/national.html.

4–9 **Workshop on Random Functions and Random Surfaces and Interfaces**, Centre de recherches mathématiques, Université de Montréal, Montréal, Québec, Canada. (Jan. 2008, p. 78)
Description: This workshop is devoted to random fields such as Gaussian random fields $ai(w)ji(x)$ where {ji} is an orthonormal basis for a Hilbert space H and where the coefficients $ai(w)$ are independent (real or complex) Gaussian random variables of mean zero and variance one. Motivated by such physical models as (i) the large scale matter distribution in the universe or (ii) landscape statistics in string theory or (iii) the random wave model in quantum chaos or (iv) limit shapes of phase interfaces in statistical mechanics, the workshop will largely focus on the zeros or critical points of random fields.
Information: http://www.crm.umontreal.ca/Mathphys2008.

5–8 **Joint Mathematics Meetings**, Washington, D.C. (May 2008, p. 636)
Information: http://www.ams.org/amsmtgs/national.html.

5–16 **Group Theory, Combinatorics and Computation**, The University of Western Australia, Perth, Australia. (May 2008, p. 636)
Description: Special Theme Program on group theory, combinatorics and computation at the University of Western Australia.
Invited Speakers: Rosemary Bailey, Peter Cameron, Marston Conder, Marcel Herzog, Kathy Horadam, Sasha Ivanov, William Kantor, Cai Heng Li, Charles Leedham-Green, Martin Liebeck, Brendan McKay, Peter Neumann, Eamonn O'Brien, Tim Penttila, Jan Saxl, Akos Seress.
Topics: Week 1: An international conference in honour of Professor Praeger's 60th birthday. It will contain invited 1 hour talks and short contributed talks by participants. Week 2: An informal week of short courses, workshops and problem sessions, especially benefical to early career researchers and postgraduate students.
Information: http://sponsored.uwa.edu.au/gcc09/welcome; email: alice@maths.uwa.edu.au.

* 8–10 **2009 International Joint Conference**, Singapore.
Description: This international conference is jointed by the 3rd Conference on MDIS (http://mdis2009.org/), the 3rd Conference on e-CASE (Commerce, Administration, Society, Education) (http://e-case.org/), and the 1st Conference on e-Technology (http://www.e-case.org/etech2009/). Notably, competitive papers will be selected from this international conference and have opportunities to be awarded as Best Papers with US $500 cash and to be published in Emerging Markets Finance and Trade (an SSCI journal), International Journal of Business and Information (IJBI), and International Journal of Cyber Society and Education (IJCSE).
Information: The related information such as Paper Awards, Publication Opportunities, and Submission Deadline can be browsed via the website http://www.e-case.org/ and http://mdis2009.org/.

12–16 **Quantitative and Computational Aspects of Metric Geometry**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Aug. 2008, p. 870)
Overview: We have witnessed a recent revival of interest in the rich structure and profound properties of metric spaces. Much contemporary research on metric geometry is motivated by the discovery of unexpected connections linking fundamental questions in geometry and analysis with combinatorial optimization, computational complexity, and statistics. This has led to the emergence of an impressive and growing repertoire of common problems and techniques.
Organizing Committee: Subhash Khot, Bruce Kleiner, Manor Mendel, Assaf Naor, Yuval Rabani.
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/mg2009/. Applications received by December 1, 2008, will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications. You may also simply register and attend without IPAM funding.
Information: email: sbeggs@ipam.ucla.edu; http://www.ipam.ucla.edu/programs/mg2009/.

12–May 22 **Algebraic Geometry**, Mathematical Sciences Research Institute, Berkeley, California. (Jun./Jul. 2008, p. 741)
Organizers: William Fulton, Joe Harris, Brendan Hassett, János Kollár, Sándor Kovács, Robert Lazarsfeld, Ravi Vakil.
Description: This semester-long "jumbo" program on algebraic geometry will emphasize cross-fertilization between different areas, including classical and complex algebraic geometry, linear series techniques, moduli spaces, enumerative geometry, varieties with group actions, birational geometry, rational curves on algebraic varieties, and classification theory. The full resources of MSRI will be devoted to a comprehensive discussion of these topics. The organizers hope to convey the essential unity of the subject, especially to young researchers and established mathematicians in other fields who use algebraic geometry in their research.
Information: http://www.msri.org/calendar/programs/programinfo/251/show_program.

12–June 26 **Algebraic Lie Theory**, Isaac Newton Institute for Mathematical Sciences, 20 Clarkson Road, Cambridge CB3 OEH, United Kingdom. (Aug. 2008, p. 870)
Description: Lie theory has profound connections to many areas of pure and applied mathematics and mathematical physics. In the 1950s, the original "analytic" theory was extended so that it also makes sense over arbitrary algebraically closed fields, in particular, fields of positive characteristic. Understanding fundamental objects such as Lie algebras, quantum groups, reductive groups over finite or p-adic fields and Hecke algebras of various kinds, as well as their representation theory, are the central themes of "Algebraic Lie The-

ory". It is anticipated that the activities of the programme will lead to a focalisation and popularisation of the various recent methods, advances and applications of Algebraic Lie Theory.
Organizers: Professor M. Geck (Aberdeen), Professor A. Kleshchev (Oregon) and Professor G. Röhrle (Ruhr-Universität Bochum).
Information: email: s.penton@newton.cam.ac.uk; http://www.newton.ac.uk/programmes/ALT/index.html.

14–16 **International Conference on Modeling of Engineering and Technological Problems and 9th National Conference of Indian Society of Industrial & Applied Mathematics**, BMAS Engineering College, Sharda Group, Agra, India. (Aug. 2008, p. 870)
Information: Details can be found at the website: http://www.bmas.edu.in and http://www.siam-india.org. Those who are interested in participating in this conference may visit the websites and contact: Prof. Abul Hasan Siddiqi, Convener, Scientific Committee, through email: Siddiqi.abulhasan@gmail.com or mobile # 00 91 9837069944.

19–July 3 **Discrete Integrable Systems**, Isaac Newton Institute for Mathematical Sciences, Cambridge, England. (Aug. 2008, p. 871)
Description: The programme will focus on a number of aspects which are likely to become of major importance for subsequent developments, such as: the connection between integrable dynamical maps and the algebraic geometry of rational surfaces, the issue of irreducibility of nonlinear special functions defined through discrete equations and the underlying Galois theory of difference equations, the underlying spectral theory and isomonodromic deformations of linear difference equations, the connection with modern developments in representation theory such as cluster algebras and affine Weyl groups, the emergence of Diophantine problems of number theory and p-adic analysis in connection with the integrability of analytic difference equations, the problem of finding symmetries and conservation laws for discrete systems, and the primary role discrete integrable systems play in quantum mechanics, in particular quantum groups and quantum field theory on the space-time lattice.
Information: email: info@newton.ac.uk; http://www.newton.ac.uk/programmes/DIS/.

22–24 **Connections for Women: Algebraic Geometry and Related Fields**, Mathematical Sciences Research Institute, Berkeley, California. (Jun./Jul. 2008, p. 741)
Organizers: Angela Gibney, Brendan Hassett, Sándor Kovács, Diane Maclagan, Jessica Sidman, and Ravi Vakil.
Description: Twenty-first century algebraic geometry is a broad subject, with mathematicians on different frontiers sharing little background. This workshop will consist of colloquium-style talks introducing some of its subfields to people, particularly postdocs, working in other areas. The workshop is part of the semester program on Algebraic Geometry, and some additional funding will be available for participants to attend the associated introductory workshop "Classical algebraic geometry", January 26–30, 2009.
Information: http://www.msri.org/calendar/workshops/WorkshopInfo/471/show_workshop.

22–30 **Numerical Approaches to Quantum Many-Body Systems**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Aug. 2008, p. 871)
Overview: The aim of this workshop is to bring together an interdisciplinary group of researchers from mathematics, physics, quantum information, computer science, and other fields to discuss advances in the computational description of quantum many-body systems. On January 22–24, we will offer a short course for young researchers with lectures and hands-on tutorials on state-of-the-art numerical techniques. The second week will feature lectures and discussions by experts in the field.
Organizing Committee: Ulrich Schollwöck, Simon Trebst, Guifre Vidal.
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/qs2009/. Applications received by December 11, 2008, will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications. You may also simply register for the second week and attend without IPAM funding.
Information: email: sbeggs@ipam.ucla.edu; http://www.ipam.ucla.edu/programs/qs2009/.

26–30 **Classical Algebraic Geometry**, Mathematical Sciences Research Institute, Berkeley, Califonia. (Jun./Jul., p.741)
Organizers: Lucia Caporaso, Brendan Hassett, James McKernan, Mircea Mustata, Mihnea Popa. (Jun/Jul 2008, p. 741)
Description: The main theme of the workshop will be to explore modern approaches to problems originating in Classical Algebraic Geometry, and at the same time offer an introduction to various subfields to the younger participants in the semester-long program. Topics will include: (1) Birational geometry; (2) Moduli spaces of curves; (3) Moduli spaces of vector bundles; (4) Abelian varieties.
Information: http://www.msri.org/calendar/index_workshops_by_date.

February 2009

9–13 **Laplacian Eigenvalues and Eigenfunctions: Theory, Computation, Application**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Aug. 2008, p. 871)
Overview: The investigation of eigenvalues and eigenfunctions of the Laplace operator in a bounded domain or a manifold is a subject with a history of more than two hundred years, and is still a central and active area in mathematics, physics, engineering, and computer science. This workshop will be an exciting opportunity to discuss various aspects of new or long-standing problems in the field with experts in different fields, including mathematics, physics, biology, and computer sciences.
Organizing Committee: Denis Grebenkov, Peter Jones, Naoki Saito.
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/le2009/. Applications received by December 15, 2008, will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications. You may also simply register and attend without IPAM funding.
Information: email: sbeggs@ipam.ucla.edu; http://www.ipam.ucla.edu/programs/le2009/.

23–27 **Modern Moduli Theory**, Mathematical Sciences Research Institute, Berkeley, California. (Aug. 2008, p. 871)
Organizers: I. Coskun, S. Katz, A. Marian, R. Pandharipande, R. Thomas, H. H. Tseng, R. Vakil.
Description: This workshop will convene experts specializing on the minimal model program, derived categories and moduli spaces in an informal environment to facilitate the cross-fertilization of ideas across these different fields of algebraic geometry.
Information: http://www.msri.org/calendar/workshops/WorkshopInfo/472/show_workshop.

23–27 **Rare Events in High-Dimensional Systems**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Aug. 2008, p. 871)
Overview: It is a significant theoretical and computational challenge to quantify the rates and mechanisms of rare events. While there is a growing consensus on the open questions, it is still not clear how well current theoretical and computational techniques address them. The aim of the workshop is to address these issues through discussions with and presentations by mathematicians, chemists, physicists, and engineers.
Organizing Committee: Giovanni Ciccotti, Kristen Fichthorn, Ioannis Kevrekidis, Christof Schuette, Eric Vanden-Eijnden, Arthur Voter.
Application/Registration: An application/registration form is available at http://www.ipam.ucla.edu/programs/re2009/. Applications received by January 12, 2009 will receive fullest consideration. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications. You may also simply register and attend without IPAM funding.
Information: http://www.ipam.ucla.edu/programs/re2009/; email: sbeggs@ipam.ucla.edu.

March 2009

9–June 12 **Quantum and Kinetic Transport: Analysis, Computations, and New Applications**, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, California. (Apr. 2008, p. 526)
Overview: This long program will focus on the mathematical analysis, computational challenges and new applications of quantum and kinetic transport theory. Besides applied mathematicians, we will invite researchers in science and engineering, representing academic, national lab and industrial research.
Organizing Committee: Irene Gamba and Shi Jin (chairs), Eric Carlen, Pierre Degond, Frank Graziani, Karl Kempf, Dave Levermore, Peter Markowich, Stanley Osher, Christian Ringhofer, Marshall Slemrod.
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. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.
Application: Please apply online to request financial support to attend and participate for extended periods up to the entire length of the program. The application is available online.
Information: http://www.ipam.ucla.edu/programs/kt2009/.

* 14 **Statistical Methods for Complex Data: A conference in honor of the 60th birthday of Raymond J. Carroll**, Texas A&M University, Department of Statistics, College Station, Texas.
Description: The conference, which is open to the public, will feature presentations by internationally recognized researchers engaged in statistical methods for complex data in a variety of fields—many revolutionized by Raymond J. Carroll and his worldwide legion of protégés.
Topics: Will be grouped into three sessions: Nonparametric and semiparametric regression; measurement error and inverse problems; statistical methods in biology, genetics and population science.
Keynote speakers: Mitchell Gail (National Cancer Institute) and Peter Hall (University of Melbourne).
Registration: Is required for the conference, which is scheduled to coincide with the 2009 International Biometric Society (ENAR) meeting, slated for March 16–18 in San Antonio, Texas.
Information: http://www.stat.tamu.edu/carroll/. For scientific questions, contact Xihong Lin, program committee chair, at: xlin@hsph.harvard.edu. For logistical issues, please contact Joyce Sutherland, conference coordinator, at (979) 845-5528 or joyce@stat.tamu.edu. Contact: Shana K. Hutchins, (979) 862-1237 or shutchins@science.tamu.edu.

15–20 **ALGORITMY 2009 Conference on Scientific Computing**, Hotel Permon, Podbanske, High Tatra Mountains, Slovak Republic. (Jun./Jul. 2008, p. 741)
Topics: The main topics of the ALGORITMY 2009 conference are: computational fluid dynamics, heat transfer and porous media flow, nonlinear conservations laws, free boundary problems, inverse problems, image processing and computer vision, computer graphics and computational geometry, computational finance, computational biology and medicine, computational geosciences, high-scale and parallel computing, direct and iterative methods for large linear algebraic systems, preconditioning techniques, optimization and nonlinear algebraic problems, scientific visualization, software for scientific computations. In solving the above mentioned real-world problems, the main attention is given to a new development and advanced applications of modern numerical methods as finite element, finite volume and level set methods, applied on structured and unstructured adaptive grids and accompanied by a fast and stable solution of arising systems of equations.
Information: email: algoritm@math.sk; http://www.math.sk/alg2009.

18–20 **IAENG International Conference on Scientific Computing ICSC 2009**, Regal Kowloon Hotel, Kowloon, Hong Kong. (Aug. 2008, p. 871)
Description: The conference ICSC'09 is held under the International MultiConference of Engineers and Computer Scientists 2009. The IMECS 2009 is organized by the International Association of Engineers (IAENG), and serves as good platforms for the engineering community members to meet with each other and to exchange ideas. The last IMECS 2008 has attracted more than one thousand participants from over 50 countries. All submitted papers will be under peer review and accepted papers will be published in the conference proceeding (ISBN: 978-988-17012-2-0). The abstracts will be indexed and available at major academic databases. The accepted papers will also be considered for publication in the special issues of the journal Engineering Letters, in IAENG journals and in edited books.
Important Dates: Draft Manuscript submission deadline: December 8, 2008. Camera-Ready Papers Due & Registration Deadline: January 10, 2009. ICCA 2009: March 18–20, 2009.
Information: http://www.iaeng.org/IMECS2009/ICSC2009.html; email: imecs@iaeng.org.

23–27 **Combinatorial, Enumerative and Toric Geometry**, Mathematical Sciences Research Institute, Berkeley, California. (Aug. 2008, p. 871)
Organizers: Michel Brion, Anders Buch, Linda Chen, William Fulton, Sándor Kovács, Frank Sottile, Harry Tamvakis, and Burt Totaro.
Description: This workshop will present the state of the art in combinatorial, enumerative, and toric algebraic geometry. It will highlight this part of modern algebraic geometry within the context of the broader semester-long parent program at MSRI, and convey its scope to young researchers.
Information: http://www.msri.org/calendar/workshops/WorkshopInfo/473/show_workshop.

27–29 **AMS Central Section Meeting**, University of Illinois at Urbana-Champaign, Urbana, Illinois. (Aug. 2008, p. 871)
Information: http://www.ams.org/amsmtgs/sectional.html.

April 2009

4–5 **AMS Southeastern Section Meeting**, North Carolina State University, Raleigh, North Carolina. (Aug. 2008, p. 872)
Information: http://www.ams.org/amsmtgs/sectional.html.

6–10 **The 3D Euler and 2D surface quasi-geostrophic equations**, American Institute of Mathematics, Palo Alto, California. (May 2008, p. 636)
Description: This workshop, sponsored by AIM and the NSF, will be devoted to the 3D Euler equations of incompressible fluids and the 2D surface quasi-geostrophic (QG) equation of geophysical flows.
Information: email: farmer@aimath.org; http://aimath.org/ARCC/workshops/3deuler.html.

19–26 **NoDIA-2009: Nonlinear Differential Equations, Integrability and Applications**, Cape Town, South Africa. (May 2008, p. 636)
Description: The conference aims to bring together both experts and young researchers in the subject of nonlinear differential equations, with emphasis on the following subjects: integrability of differential equations and systems, hierarchies and sequences of equations, singularity analysis, symmetry analysis and applications. The meeting is financed partially by SIDA (Sweden) and NRF (South Africa).
Information: http://www.sm.luth.se/~norbert/nodia09.html; email: norbert@sm.luth.se.

25–26 **AMS Eastern Section Meeting**, Worcester Polytechnic Institute, Worcester, Massachusetts. (Aug. 2008, p. 872)
Information: http://www.ams.org/amsmtgs/sectional.html.

25–26 **AMS Western Section Meeting**, San Francisco State University, San Francisco, California. (Aug. 2008, p. 872)
Information: http://www.ams.org/amsmtgs/sectional.html.

27–May 1 **Combinatorial Challenges in Toric Varieties**, American Institute of Mathematics, Palo Alto, California. (Jun/Jul 2008, p. 741)
Description: This workshop, sponsored by AIM and the NSF, will be devoted to a selection of problems on lattice polytopes that arise in the theory of toric varieties. Besides structural results, we will work on search strategies and computational approaches to these questions.
Information: email: farmer@aimath.org; http://aimath.org/ARCC/workshops/toricvarieties.html.

May 2009

10–15 **ICMI Study 19: Proof and Proving in Mathematics Education**, Taipei, Taiwan. (May 2008, p. 636)
Call for contributions: Participation in the conference is by invitation to the authors of accepted contributions following a refereeing process. The International Program Committee (IPC) invites individuals or groups to submit original contributions. A submission should represent a significant contribution to knowledge about learning and teaching proof. It may address questions from one or more of the study themes, or further issues relating to these, but it should identify its primary focus. The Study themes are set out in the Discussion Document which is available on the ICMI Study 19 website (still under construction but functional) http://jps.library.utoronto.ca/ocs/index.php?cf=8 (or via Google: ICMI 19). Submissions will be a maximum of 6 pages, including references and figures, written in english, the language of the conference. Further technical details about the format of submissions will be available on the study website.
Important dates: By 30 June 2008: Potential authors upload their papers to the conference website. By 15 November 2008: Potential authors receive the result of the refereeing process. Invitations to participate in the conference are sent to authors whose papers are accepted.
ICMI Executive Advisors: Hyman Bass (USA); Mariolina Bartolini-Bussi (Italy).

12–16 (NEW DATE) **First Buea International Conference on the Mathematical Sciences**, University of Buea, Cameroon. (Mar. 2008, p. 408)
Description: The Department of Mathematics at the University of Buea, Cameroon, is organizing its first International Conference on Mathematical Sciences, with the aim of bringing together academicians and professionals with cross-disciplinary interests related to Mathematical Sciences, to demonstrate the vital role that mathematics plays in society, and to bridge as well as nurture understanding and collaboration between global and Cameroon regional mathematical scientists and practictioners
Information: http://www.bueaconference.com.

17–22 **Topology, C*-Algebras, and String Duality—an NSF/CBMS Regional Conference in the Mathematical Sciences**, Texas Christian University, Fort Worth, Texas. (Jun./Jul. 2008, p. 742)
Description: Principal Lecturer: Jonathan Rosenberg (Univ. of Maryland). The subject of the conference will involve a number of mathematical "spin-offs" of string theory into pure mathematics, and the way they connect with other topics in topology and operator algebras that were initially developed for other purposes. The conference will focus largely on the rich interaction between these and other important concepts of current interest. Topics from pure mathematics will include K-theory and twisted K-theory, continuous-trace algebras and the Dixmier-Douady invariant, crossed product C*-algebras and their K-theory, bundles, and homotopy theory. The lecturer will develop parts of these subjects in their own right, as well as discussing their relevance to the very active current research in mathematical physics concerning dualities between various string theories, especially T-duality and S-duality.
Information: http://faculty.tcu.edu/gfriedman/CBMS/.

18–23 **Workshop on Interacting Stochastic Particle Systems**, Centre de recherches mathématiques, Université de Montréal, Montréal, Québec, Canada. (Jan. 2008, p. 78)
Description: Statistical mechanics provides the formalism of Gibbsian ensembles for computing properties of equilibrium systems from a knowledge of the microscopic interactions between the constituent particles. Our understanding of nonequilibrium situations is less satisfactory. In the field of interacting stochastic particle systems nonequilibrium questions are studied in simplified models that are amenable to mathematically rigorous analysis. This workshop brings together researchers from interacting stochastic systems and related areas to survey recent successes and to map out promising future directions
Information: http://www.crm.umontreal.ca/Mathphys2008.

27–June 1 **The International Conference "Infinite Dimensional Analysis and Topology"**, Yaremche, Ivano-Frankivsk, Ukraine. (May 2008, p. 636)
Topics: The main scientific topics to be presented at the conference are: Infinite dimensional holomorphy, topological tensor products, Banach space theory, operator theory, general topology, set-theoretic topology, geometric and infinite dimensional topology.
Language: Official language of the Conference is English.
Deadline: For registration is May 1, 2009.
Organizers: The organizers of the conference are: Precarpathian National University, Ivano-Frankivsk, Ukraine; Lviv Ivan Franko National University, Lviv, Ukraine; Institute for Applied Problems of Mechanics and Mathematics, Lviv, Ukraine; Institute of Mathematics of National Academy of Sciences, Kyiv, Ukraine.
Information: email: andriyzag@yahoo.com; http://www.idat.frankivsk.org.

June 2009

* 3–5 **Conference on Character Theory of Finite Groups in honor of Martin Isaacs**, Universitat de Valencia, Spain.
Main Speakers: E. Dade, P. Diaconis, P. Fong, S. Gagola, G. Glauberman, D. Gluck, R. Gow, R. Guralnick, T. Keller, A. Mann, A. Moretó, G. Robinson, R. Solomon, J. Thompson and A. Turull.
Organizers: M. Lewis, G. Navarro, D. Passman and T. Wolf.
Information: http://www.uv.es/isaacs09/; email: gabriel.navarro@uv.es.

8–12 **Computational Methods and Function Theory 2009**, Bilkent University, Ankara, Turkey. (Jun./Jul. 2008, p. 742)
Description: The general theme of the meeting concerns various aspects of interaction of complex variables and scientific computation, including related topics from function theory, approximation theory and numerical analysis. Another important aspect of the CMFT meetings, previously held in Valparaiso 1989, Penang 1994, Nicosia 1997, Aveiro 2001, and Joensuu 2005, is to promote the creation and maintenance of contacts with scientists from diverse cultures. The organizers are Mefharet Kocatepe (Bilkent University, Ankara, Turkey), Ilpo Laine (University of Joensuu, Finland), Stephan Ruscheweyh (University of Würzburg, Germany) and Edward Saff (Vanderbilt University, Nashville).
Information: email: cmft@bilkent.edu.tr.

8–13 **Workshop on Disordered Systems: Spin Glasses**, Centre de recherches mathématiques, Université de Montréal, Montréal, Québec, Canada. (Jan. 2008, p. 78)
Organizers: G. Ben Arous (Courant Institute), E. Bolthausen (Z¸rich), M. Mézard (Paris-Sud), D. Stein (New York).
Information: http://www.crm.math.ca/Mathphys2008.

14–20 **Stochastic Analysis and Random Dynamical Systems**, Ivan Franko National University of Lviv, Ukraine. (Aug. 2008, p. 872)
Description: The Conference is devoted to the modern aspects of the theory of random dynamical systems. The Conference is aimed to bring together knowledge from different fields of probability theory and stochastic processes related to this subject. The Conference will take place in Lviv, one of the oldest and most beautiful cities of Ukraine. It will be held in the building of Ivan Franko National University of Lviv. During the Conference Social and Cultural Program will be organized.
Information: http://www.imath.kiev.ua/~sard/; email: sard@imath.kiev.ua.

15–19 **Waves 2009: The 9th International Conference on Mathematical and Numerical Aspects of Waves Propagation**, Pau, France. (Jun./Jul. 2008, p. 742)
Description: This conference is one of the main venues where significant advances in the analysis and computational modeling of wave phenomena and exciting new applications are presented. Conference themes include but are not limited to forward and inverse scattering, nonlinear wave phenomena, fast computational techniques, high performance computing, numerical analysis, absorbing layers and approximate boundary conditions, analytic and semi-analytic techniques for wave problems, domain decomposition, guided waves, random media etc.
Information: email: julien.Diaz@inria.fr; http://waves-2009.bordeaux.inria.fr/.

22–26 (NEW DATE) **5th Asian Mathematical Conference (AMC 2009)**, Penang /Kulalumpur, Malaysia. (Jun./Jul. 2008, p. 742)

Description: Activities of the conference will include the following; Keynote addresses by internationally renowned mathematicians; Invited talks by prominent regional mathematicians; Contributed papers; Workshops Focus Areas of this conference are; Algebra; Algebraic Geometry; Analysis; Operator Algebra & Functional Analysis; Lie Groups and Lie Algebras; Number Theory; Combinatorics; Logic & Foundations of Mathematics; Ordinary Differential Equations and Dynamical Systems; Partial Differential Equations; Topology; Mathematical Aspects of Computer Science; Numerical Analysis and Scientific Computing; Control Theory, Optimization and Operations Research; Probability and Stochastic Process; Statistics; Application of Mathematics in Sciences.
Information: email: vravi@maths.du.ac.in; http://math.usm.my/amc2009.

* 28–July 18 **IAS/Park City Mathematics Institute (PCMI) 2009 Summer Session: Arithmetic of L-functions**, Park City, Utah.
Description: This will be the 19th annual PCMI Summer Session for research mathematicians, graduate students, undergraduate students, undergraduate faculty, and secondary school teachers.
Organizers: Cristian Popescu, Karl Rubin, Alice Silverberg. Director: Robert L. Bryant.
Sponsor: PCMI is sponsored by the Institute for Advanced Study, Princeton, NJ. PCMI lecture notes are published by the American Mathematical Society.
Deadline: For application will be January 30, 2009.
Information: Applications and detailed program information will be available as of November of 2009; http://pcmi.ias.edu/.

July 2009

6–10 **26th Journées Arithmétiques**, Université de Saint-Etienne, Saint-Etienne, France. (Jun./Jul. 2008, p. 742)
Description: About 12 invited talks; parallel sessions of 20 minutes communications in all branches of Number Theory.
Information: ja2009@univ-st-etienne.fr; http://ja2009.univ-st-etienne.fr/.

* 6–10 **First PRIMA Pacific Rim Congress of Mathematicians**, University of New South Wales, Sydney, Australia.
Description: The Pacific Rim Mathematical Association (PRIMA) is an association of mathematical sciences institutes, departments and societies from around the Pacific Rim. It was established in 2005 to to promote and facilitate the development of the mathematical sciences throughout the Pacific Rim region. As one of its activities, PRIMA aims to hold an international congress every four years. As well as plenary addresses by eleven leading international speakers there will be a range of special sessions on topics reflecting the breadth and diversity of research in the mathematical sciences across the region.
Information: http://www.primath.org/prima2009; email: lind@math.washington.edu.

6–10 **Journées de Géométrie Arithmétique de Rennes**, Institut de Recherche Mathématique de Rennes, Université de Rennes 1, Rennes, France. (Jun./Jul 2008, p. 742)
Description: The conference will cover the following subjects : ramification theory, vanishing cycles, rigid geometry, arithmetic D-modules, geometric and p-adic aspects of the Langlands Correspondence and related topics.
Information: email: ahmed.abbes@univ-rennes1.fr; http://perso.univ-rennes1.fr/ahmed.abbes/jgar.html.

13–17 **9th International Conference on Finite Fields and Applications**, University College Dublin, Dublin, Ireland. (Jun./Jul. 2008, p. 742)
Description: The aim of this conference is to bring together researchers from all aspects of finite fields: theory, computation and applications. Previous meetings have been in Las Vegas (USA), Glasgow (Scotland), Waterloo (Canada), Augsburg (Germany), Oaxaca (Mexico), Toulouse (France) and Melbourne (Australia). As in previous years we intend to publish conference proceedings with one of the major scientific publishers.
Topics: Of interest include, but are not limited to, the following. Theory: additive and multiplicative structure, polynomials, curves, varieties, character sums, function fields. Computation: polynomial factorisation, decomposition and irreducibility testing, finding primitive and other special elements of finite fields, algorithms for polynomials, codes, curves, varieties, and other objects over finite fields. Applications: cryptography, codes, information theory, combinatorics, quantum information science.
Information: http://www.shannoninstitute.ie/fq9/; email: gary.mcguire@ucd.ie.

20–24 **Equadiff 12**, Brno, Czech Republic. (Aug. 2008, p. 872)
Description: Under the name "Equadiff" a series of important international conferences on differential equations have been organized in Europe during the last decades. The first one took place in Prag (1962) and the second one in Bratislava (1966). From 1970 on the location alternated between Czech Republic/Slovakia and various countries of Western Europe. The most recent Equadiff conferences took place in Vienna (2007), Bratislava (2005), Hasselt (2003), Prag (2001), and Berlin (1999).
Information: email: dosly@math.muni.cz; http://www.math.muni.cz/~equadiff/.

20–December 18 **Non-Abelian Fundamental Groups in Arithmetic Geometry**, Isaac Newton Institute for Mathematical Sciences, Cambridge, England. (Aug. 2008, p. 872)
Description: In the 1980's Grothendieck formulated his anabelian conjectures that brought to an hitherto-unexplored depth the interaction between topology and arithmetic. This suggested that the study of non-abelian fundamental groups could lead to a new understanding of deep arithmetic phenomena, including the arithmetic theory of moduli and Diophantine finiteness on hyperbolic curves. A certain amount of work in recent years linking fundamental groups to Diophantine geometry intimates deep and mysterious connections to the theory of motives and Iwasawa theory, with their links with arithmetic problems on special values of L-functions such as the conjecture of Birch and Swinnerton-Dyer. The goal of this programme is to investigate the ideas and problems of anabelian geometry within the global context of mainstream arithmetic geometry.
Organisers: M. Kim (UCL), J. Coates (Cambridge), F. Pop (Pennsylvania), M. Saidi (Exeter), P. Schneider (Münster).
Information: email: info@newton.ac.uk; http://www.newton.ac.uk/programmes/NAG/.

27–31 **33rd Conference on Stochastic Processes and their Applications**, Berlin, Germany. (May 2008, p. 636)
Main Venue: Will be the Mathematics Institute of Technische Universitaet, located in the center of Berlin.
Description: The conference is the major annual meeting for researchers working in the field of Stochastic Processes. The conference covers a wide range of active research areas, in particular featuring 20 invited plenary lectures presented by leading specialists. In addition, there will be a large variety of special sessions, consisting of three talks each.
Confirmed Plenary Speakers: J. Baik, S. Chatterjee, F. Delbaen, A. Dembo, S. Hamadène, C. Klüppelberg, J. Martin, S. Martinez, P. Mathieu, J. Mattingly, P. Mörters, E. Perkins, G. Reinert, L. Saloff-Coste, S. Smirnov, A. Schied, G. Slade, M. Takeda, F. Y. Wang, A. Wakolbinger.
Information: email: roelly@math.uni-potsdam.de; http://www.math.tu-berlin.de/SPA2009.

29–July 24 **The Cardiac Physiome Project**, Isaac Newton Institute for Mathematical Sciences, Cambridge, England. (Aug. 2008, p. 872)
Description: Predicting physiological behaviour from experimental data combined with environmental influences is a compelling, but unfulfilled, goal of post-genomic biology. This undeniably ambitious goal is the aim of the Physiome Project and its subset the Cardiome Project which is an international effort to build a biophysically based multi-scale mathematical model of the heart. To achieve this goal requires further development of the current generation of advanced cardiac models which span an already diverse set of mathematical representations from stochastic sub-cellular regulation models to whole organ based sets of coupled partial differential equations. The focus of this programme will be on the development and application of the mathematical techniques which underpin the ongoing extension of this approach.
Organizers: R. H. Clayton (Sheffield); P. Hunter (Auckland); N. Smith (Oxford); S. Waters (OCIAM).
Information: email: info@newton.ac.uk; http://www.newton.ac.uk/programmes/CPP/.

August 2009

12–December 18 **Dynamics of Discs and Planets**, Isaac Newton Institute for Mathematical Sciences, Cambridge, England. (Aug. 2008, p. 872)
Description: This programme will bring together world-leading researchers in disciplines including accretion disc theory, planet formation, planet-disc interaction and solar system dynamics. With such a group we seek to provide a firm theoretical basis for our understanding of extrasolar planetary systems and their formation in protoplanetary discs. The programme encompasses three themes: (1) dynamics of astrophysical discs and the numerical and analytical methods used to study them (i.e., the study of gaseous accretion discs); (2) dynamics specific to discs in which planets are forming including that formation process (i.e. the study of how solid material interacts with gaseous discs); (3) dynamics that is relevant once planets have formed (i.e. the study of solid body interactions).
Organizers: A Morbidelli (Observatoire de Nice); R. P. Nelson (Queen Mary, London); Gl. Ogilvie (Cambridge); J. M. Stone (Princeton), M. C. Wyatt (Cambridge).
Information: email: info@newton.ac.uk; http://www.newton.ac.uk/programmes/DDP/.

* 17 **Symplectic and Contact Geometry and Topology**, Mathematical Sciences Research Institute, Berkeley, California.
Description: The goals of the 2009-2010 program at MSRI are to. I. Promote the cross-pollination of ideas between different areas of symplectic and contact geometry; II. Help assess and formulate the main outstanding fundamental problems and directions in the field; III. Lead to new breakthroughs and solutions of some of the main problems in the area; IV. Discover new applications of symplectic and contact geometry in mathematics and physics; V. Educate a new generation of young mathematicians, giving them a broader view of the subject and the capability to employ techniques from different areas in their research. To achieve these goals, the program will concentrate on three broad, interrelated themes that encompass many of the modern trends in symplectic geometry: algebraic structures associated to holomorphic curves; symplectic and contact geometry in low-dimensional topology; and symplectic topology and dynamics.
Information: http://www.msri.org/calendar/programs/ProgramInfo/257/show_program; email: jz@msri.org.

17–21 **Modular forms on noncongruence groups**, American Institute of Mathematics, Palo Alto, California. (Aug. 2008, p. 872)
Description: This workshop, sponsored by AIM and the NSF, will explore the arithmetic and analytic properties of noncongruence modular forms and their potential applications. A special focus will be on the connection between Scholl representations attached to noncongruence cuspforms and automorphic forms by applying modularity lifting theorems.
Information: http://aimath.org/ARCC/workshops/noncongruence.html; email: farmer@aimath.org.

* 17–December 18 **Tropical Geometry**, Mathematical Sciences Research Institute, Berkeley, California.
Description: Tropical Geometry is the algebraic geometry over the min-plus algebra. It is a young subject that in recent years has both established itself as an area of its own right and unveiled its deep connections to numerous branches of pure and applied mathematics. From an algebraic geometric point of view, algebraic varieties over a field with non-archimedean valuation are replaced by polyhedral complexes, thereby retaining much of the information about the original varieties. From the point of view of complex geometry, the geometric combinatorial structure of tropical varieties is a maximal degeneration of a complex structure on a manifold. The goal of this program is, through its workshops and various other activities, to bring together researchers from the broad range of research areas involved, and to provide an extended forum of interaction on Tropical Geometry while it is still in its forming phase.
Information: http://www.msri.org/calendar/programs/ProgramInfo/255/show_program; email: jz@msri.org.

* 24–28 **Relative trace formula and periods of automorphic forms**, American Institute of Mathematics, Palo Alto, California.
Description: This workshop, sponsored by AIM and the NSF, will be devoted to the study of the relative trace formula and periods of automorphic forms. In particular, we hope to formulate a precise general conjecture for the exact value of period integrals which encompasses all known and conjectured cases.
Information: http://aimath.org/ARCC/workshops/traceformula.html; email: farmer@aimath.org.

September 2009

12–18 (NEW DATE) **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.

October 2009

16–18 **AMS Central Section Meeting**, Baylor University, Waco, Texas. (Aug. 2008, p. 872)
Information: http://www.ams.org/amsmtgs/sectional.html.

24–25 **AMS Eastern Section Meeting**, Pennsylvania State University, University Park, Pennsylvania. (Aug. 2008, p. 872)
Information: http://www.ams.org/amsmtgs/sectional.html.

30–November 1 **AMS Southeastern Section Meeting**, Florida Atlantic University, Boca Raton, Florida. (Aug. 2008, p. 872)
Information: http://www.ams.org/amsmtgs/sectional.html.

November 2009

7–8 **AMS Western Section Meeting**, University of California, Riverside, California. (Aug. 2008, p. 872)
Information: http://www.ams.org/amsmtgs/sectional.html.

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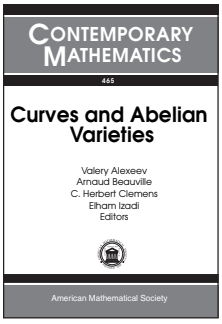
To subscribe to email notification of new AMS publications, please go to http://www.ams.org/bookstore-email.

Algebra and Algebraic Geometry



Curves and Abelian Varieties

Valery Alexeev, *University of Georgia, Athens, GA*, **Arnaud Beauville**, *Université de Nice, France*, **C. Herbert Clemens**, *Ohio State University, Columbus, OH*, and **Elham Izadi**, *University of Georgia, Athens, GA*, Editors

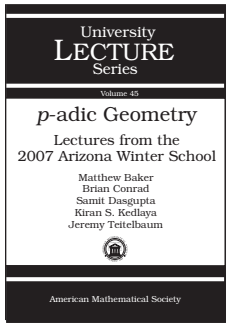
This book is devoted to recent progress in the study of curves and abelian varieties. It discusses both classical aspects of this deep and beautiful subject as well as two important new developments, tropical geometry and the theory of log schemes.

In addition to original research articles, this book contains three surveys devoted to singularities of theta divisors, of compactified Jacobians of singular curves, and of "strange duality" among moduli spaces of vector bundles on algebraic varieties.

Contents: L. Caporaso, Compactified Jacobians, Abel maps and theta divisors; **S. Casalaina-Martin**, Singularities of theta divisors in algebraic geometry; **O. Debarre**, The diagonal property for abelian varieties; **I. Dolgachev** and **D. Lehavi**, On isogenous principally polarized abelian surfaces; **M. Green**, **P. Griffiths**, and **M. Kerr**, Néron models and boundary components for degenerations of Hodge structure of mirror quintic type; **V. Kanev** and **H. Lange**, Polarization type of isogenous Prym-Tyurin varieties; **A. Marian** and **D. Oprea**, A tour of theta dualities on moduli spaces of sheaves; **G. Mikhalkin** and **I. Zharkov**, Tropical curves, their Jacobians and theta functions; **M. Olsson**, Logarithmic interpretation of the main component in toric Hilbert schemes; **A. Verra**, On the universal principally polarized abelian variety of dimension 4.

Contemporary Mathematics, Volume 465

August 2008, 274 pages, Softcover, ISBN: 978-0-8218-4334-5, LC 2008014250, 2000 *Mathematics Subject Classification:* 14H10, 14H40, 14K10, 14K30, **AMS members US$63**, List US$79, Order code CONM/465



p-adic Geometry

Lectures from the 2007 Arizona Winter School

Matthew Baker, *Georgia Institute of Technology, Atlanta, GA*, **Brian Conrad**, *University of Michigan, Ann Arbor, MI*, **Samit Dasgupta**, *Harvard University, Cambridge, MA*, **Kiran S. Kedlaya**, *Massachusetts Institute of Technology, Cambridge, MA*, **Jeremy Teitelbaum**, *University of Illinois at Chicago, IL*, and **edited by David Savitt** and **Dinesh S. Thakur**, *University of Arizona, Tucson, AZ*

In recent decades, *p*-adic geometry and *p*-adic cohomology theories have become indispensable tools in number theory, algebraic geometry, and the theory of automorphic representations. The Arizona Winter School 2007, on which the current book is based, was a unique opportunity to introduce graduate students to this subject.

Following invaluable introductions by John Tate and Vladimir Berkovich, two pioneers of non-archimedean geometry, Brian Conrad's chapter introduces the general theory of Tate's rigid analytic spaces, Raynaud's view of them as the generic fibers of formal schemes, and Berkovich spaces. Samit Dasgupta and Jeremy Teitelbaum discuss the *p*-adic upper half plane as an example of a rigid analytic space, and give applications to number theory (modular forms and the *p*-adic Langlands program). Matthew Baker offers a detailed discussion of the Berkovich projective line and *p*-adic potential theory on that and more general Berkovich curves. Finally, Kiran Kedlaya discusses theoretical and computational aspects of *p*-adic cohomology and the zeta functions of varieties. This book will be a welcome addition to the library of any graduate student and researcher who is interested in learning about the techniques of *p*-adic geometry.

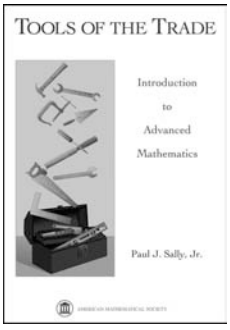
Contents: V. Berkovich, Non-archimedean analytic geometry: first steps; **B. Conrad**, Several approaches to non-archimedean geometry; **S. Dasgupta** and **J. Teitelbaum**, The *p*-adic upper half plane; **M. Baker**, An introduction to Berkovich analytic spaces and non-archimedean potential theory on curves; **K. S. Kedlaya**, *p*-adic cohomology: from theory to practice.

University Lecture Series, Volume 45

September 2008, 203 pages, Softcover, ISBN: 978-0-8218-4468-7, LC 2008023597, 2000 *Mathematics Subject Classification:* 14G22; 11F85, 14F30, **AMS members US$36**, List US$45, Order code ULECT/45

Analysis

COURSE ADOPTION



Tools of the Trade

Introduction to Advanced Mathematics

Paul J. Sally, Jr., *University of Chicago, IL*

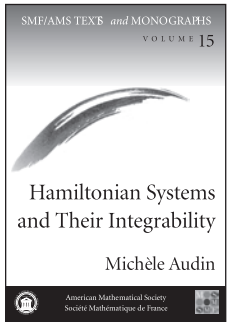
This book provides a transition from the formula-full aspects of the beginning study of college level mathematics to the rich and creative world of more advanced topics. It is designed to assist the student in mastering the techniques of analysis and proof that are required to do mathematics.

Along with the standard material such as linear algebra, construction of the real numbers via Cauchy sequences, metric spaces and complete metric spaces, there are three projects at the end of each chapter that form an integral part of the text. These projects include a detailed discussion of topics such as group theory, convergence of infinite series, decimal expansions of real numbers, point set topology and topological groups. They are carefully designed to guide the student through the subject matter. Together with numerous exercises included in the book, these projects may be used as part of the regular classroom presentation, as self-study projects for students, or for Inquiry Based Learning activities presented by the students.

Contents: Sets, functions, and other basic ideas; Linear algebra; The construction of the real and complex numbers; Metric and Euclidean spaces; Complete metric spaces and the p-adic completion of $\mathbb{Q}$; Index.

September 2008, approximately 199 pages, Hardcover, ISBN: 978-0-8218-4634-6, LC 2008024594, 2000 *Mathematics Subject Classification:* 26-01; 26A03, 26A06, 12J25, **AMS members US$39**, List US$49, Order code MBK/55

Differential Equations



Hamiltonian Systems and Their Integrability

Michèle Audin, *Institut de Recherche Mathématique Avancée, Université Louis Pasteur*

From a review of the French edition:

The book is addressed to graduate students without previous exposure to these topics … this is a refreshing attempt at giving a bird's eye view of disparate techniques that enter the geometric/differential nature of integrability of certain Hamiltonian systems. … The book is intended to be readable by a non-expert; … Several examples conclude each chapter, a good feature as they are workable and instructive …

– Mathematical Reviews

Hamiltonian systems began as a mathematical approach to the study of mechanical systems. As the theory developed, it became clear that the systems that had a sufficient number of conserved quantities enjoyed certain remarkable properties. These are the completely integrable systems. In time, a rich interplay arose between integrable systems and other areas of mathematics, particularly topology, geometry, and group theory.

This book presents some modern techniques in the theory of integrable systems viewed as variations on the theme of action-angle coordinates. These techniques include analytical methods coming from the Galois theory of differential equations, as well as more classical algebro-geometric methods related to Lax equations.

Audin has included many examples and exercises. Most of the exercises build on the material in the text. None of the important proofs have been relegated to the exercises. Many of the examples are classical, rather than abstract.

This book would be suitable for a graduate course in Hamiltonian systems.

This item will also be of interest to those working in mathematical physics, geometry and topology, and algebra and algebraic geometry.

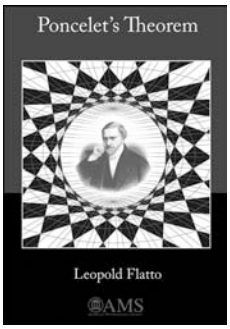
Titles in this series are co-published with Société Mathématique de France. SMF members are entitled to AMS member discounts.

Contents: Introduction to integrable systems; Action-angle variables; Integrability and Galois groups; An introduction to Lax equations; Appendix A: What one needs to know about differential Galois theory; Appendix B: What one needs to know about algebraic curves; Bibliography; Index.

SMF/AMS Texts and Monographs, Volume 15

October 2008, 149 pages, Softcover, ISBN: 978-0-8218-4413-7, LC 2008023869, 2000 *Mathematics Subject Classification:* 70H05, 53C15, 12Hxx, 34A30, 14H10, 14Pxx, **AMS members US$44**, List US$55, Order code SMFAMS/15

Geometry and Topology



Poncelet's Theorem

Leopold Flatto

Poncelet's theorem is a famous result in algebraic geometry, dating to the early part of the nineteenth century. It concerns closed polygons inscribed in one conic and circumscribed about another. The theorem is of great depth in that it relates to a large and diverse body of mathematics. There are several proofs of the theorem, none of which is elementary. A particularly attractive feature of the theorem, which is easily understood but difficult to prove, is that it serves as a prism through which one can learn and appreciate a lot of beautiful mathematics.

This book stresses the modern approach to the subject and contains much material not previously available in book form. It also discusses the relation between Poncelet's theorem and some aspects of queueing theory and mathematical billiards.

The proof of Poncelet's theorem presented in this book relates it to the theory of elliptic curves and exploits the fact that such curves are endowed with a group structure. The book also treats the real and degenerate cases of Poncelet's theorem. These cases are interesting in themselves, and their proofs require some other considerations. The real case is handled by employing notions from dynamical systems.

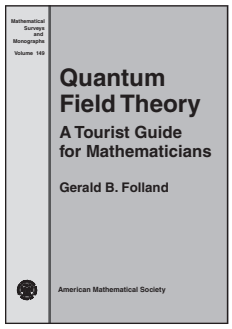
The material in this book should be understandable to anyone who has taken the standard courses in undergraduate mathematics. To achieve this, the author has included in the book preliminary chapters dealing with projective geometry, Riemann surfaces, elliptic functions, and elliptic curves. The book also contains numerous figures illustrating various geometric concepts.

This item will also be of interest to those working in analysis.

Contents: Introduction; *Projective geometry:* Basic notions of projective geometry; Conics; Intersection of two conics; *Complex analysis:* Riemann surfaces; Elliptic functions; The modular function; Elliptic curves; *Poncelet and Cayley theorems:* Poncelet's theorem; Cayley's theorem; Non-generic cases; The real case of Poncelet's theorem; *Related topics:* Billiards in an ellipse; Double queues; *Supplement:* Billiards and the Poncelet theorem; *Appendices:* Factorization of homogeneous polynomials; Degenerate conics of a conic pencil. Proof of Theorem 4.9; Lifting theorems; Proof of Theorem 11.5; Billiards in an ellipse. Proof of Theorem 13.1; References.

November 2008, approximately 235 pages, Softcover, ISBN: 978-0-8218-4375-8, LC 2008025623, 2000 *Mathematics Subject Classification:* 51-01, 51M04, 51N15, **AMS members US$39**, List US$49, Order code MBK/56

Mathematical Physics



Quantum Field Theory

A Tourist Guide for Mathematicians

Gerald B. Folland, *University of Washington, Seattle, WA*

Quantum field theory has been a great success for physics, but it is difficult for mathematicians to learn because it is mathematically incomplete. Folland, who is a mathematician, has spent considerable time digesting the physical theory and sorting out the mathematical issues in it. Fortunately for mathematicians, Folland is a gifted expositor.

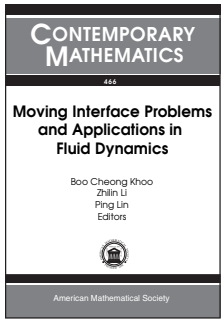
The purpose of this book is to present the elements of quantum field theory, with the goal of understanding the behavior of elementary particles rather than building formal mathematical structures, in a form that will be comprehensible to mathematicians. Rigorous definitions and arguments are presented as far as they are available, but the text proceeds on a more informal level when necessary, with due care in identifying the difficulties.

The book begins with a review of classical physics and quantum mechanics, then proceeds through the construction of free quantum fields to the perturbation-theoretic development of interacting field theory and renormalization theory, with emphasis on quantum electrodynamics. The final two chapters present the functional integral approach and the elements of gauge field theory, including the Salam–Weinberg model of electromagnetic and weak interactions.

Contents: Prologue; Review of pre-quantum physics; Basic quantum mechanics; Relativistic quantum mechanics; Free quantum fields; Quantum fields with interactions; Renormalization; Functional integrals; Gauge field theories; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 149

September 2008, 325 pages, Hardcover, ISBN: 978-0-8218-4705-3, LC 2008021019, 2000 *Mathematics Subject Classification:* 81-01; 81T13, 81T15, 81U20, 81V10, **AMS members US$71**, List US$89, Order code SURV/149



Moving Interface Problems and Applications in Fluid Dynamics

Boo Cheong Khoo, *National University of Singapore, Singapore*, **Zhilin Li**, *North Carolina State University, Raleigh, NC*, and **Ping Lin**, *University of Dundee, United Kingdom*, Editors

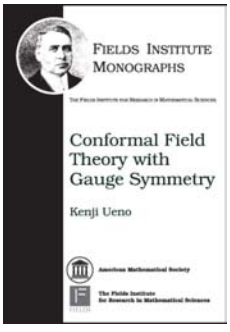
This volume is a collection of research papers presented at the program on Moving Interface Problems and Applications in Fluid Dynamics, which was held between January 8 and March 31, 2007 at the Institute for Mathematical Sciences (IMS)

of the National University of Singapore. The topics discussed include modeling and simulations of biological flow coupled to deformable tissue/elastic structure, shock wave and bubble dynamics and various applications including biological treatments with experimental verification, multi-medium flow or multi-phase flow and various applications including cavitation/supercavitation, detonation problems, Newtonian and non-Newtonian fluid, and many other areas. Readers can benefit from some recent research results in these areas.

Contents: R. Dillon, **M. Owen**, and **K. Painter**, A single-cell-based model of multicellular growth using the immersed boundary method; **J. Hua**, **P. Lin**, and **J. F. Stene**, Numerical simulation of gas bubbles rising in viscous liquids at high Reynolds number; **K. Ito** and **Z. Qiao**, A high order finite difference scheme for the Stokes equations; **S. Jiang** and **G. Ni**, An efficient γ-model BGK scheme for multicomponent flows on unstructured meshes; **D. V. Le**, **B. C. Khoo**, and **Z. Li**, An implicit-forcing immersed interface method for the incompressible Navier-Stokes equations; **A. Naber**, **C. Liu**, and **J. J. Feng**, The nucleation and growth of gas bubbles in a Newtonian fluid: An energetic variational phase field approach; **X. Pan**, Critical fields of liquid crystals; **J. Palacios** and **G. Tryggvason**, The transient motion of buoyant bubbles in a vertical Couette flow; **X. S. Wang**, Issues of immersed boundary/continuum methods; **H. Xie**, **K. Ito**, **Z. Li**, and **J. Toivanen**, A finite element method for interface problems with locally modified triangulations.

Contemporary Mathematics, Volume 466

September 2008, approximately 190 pages, Softcover, ISBN: 978-0-8218-4267-6, LC 2008015355, 2000 *Mathematics Subject Classification:* 34-XX, 35-XX, 49-XX, 65-XX, 74-XX, 76-XX, 92-XX, **AMS members US$47**, List US$59, Order code CONM/466



Conformal Field Theory with Gauge Symmetry

Kenji Ueno, *Kyoto University, Japan*

This book presents a systematic approach to conformal field theory with gauge symmetry from the point of view of complex algebraic geometry. After presenting the basic facts of the theory of compact Riemann surfaces and the representation theory of affine Lie algebras in Chapters 1 and 2, conformal blocks for pointed Riemann surfaces with coordinates are constructed in Chapter 3. In Chapter 4 the sheaf of conformal blocks associated to a family of pointed Riemann surfaces with coordinates is constructed, and in Chapter 5 it is shown that this sheaf supports a projective flat connection—one of the most important facts of conformal field theory. Chapter 6 is devoted to the study of the detailed structure of the conformal field theory over $\mathbb{P}^1$.

Recently it was shown that modular functors can be constructed from conformal field theory, giving an interesting relationship between algebraic geometry and topological quantum field theory. This book provides a timely introduction to an intensively studied topic of conformal field theory with gauge symmetry by a leading algebraic geometer, and includes all the necessary techniques and results that are used to construct the modular functor.

This item will also be of interest to those working in algebra and algebraic geometry.

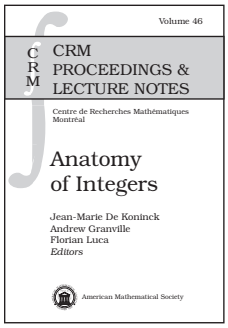
Titles in this series are co-published with The Fields Institute for Research in Mathematical Sciences (Toronto, Ontario, Canada).

Contents: Riemann surfaces and stable curves; Affine Lie algebras and integrable highest weight representations; Conformal blocks and correlation functions; Sheaf of conformal blocks; Projectively flat connections; Vertex operators and KZ equations; Appendix; Bibliography; Index.

Fields Institute Monographs, Volume 24

September 2008, 168 pages, Hardcover, ISBN: 978-0-8218-4088-7, LC 2008022192, 2000 *Mathematics Subject Classification:* 81T40, 81R10, 14D21, 17B81, **AMS members US$47**, List US$59, Order code FIM/24

Number Theory



Anatomy of Integers

Jean-Marie De Koninck, *Université Laval, Québec, QC, Canada*, **Andrew Granville**, *Université de Montréal, QC, Canada*, and **Florian Luca**, *Universidad Nacional Autonoma de México, Morelia, México*, Editors

The book is mostly devoted to the study of the prime factors of integers, their size and their quantity, to good bounds on the number of integers with different properties (for example, those with only large prime factors) and to the distribution of divisors of integers in a given interval. In particular, various estimates concerning smooth numbers are developed. A large emphasis is put on the study of additive and multiplicative functions as well as various arithmetic functions such as the partition function. More specific topics include the Erdős–Kac Theorem, cyclotomic polynomials, combinatorial methods, quadratic forms, zeta functions, Dirichlet series and L-functions. All these create an intimate understanding of the properties of integers and lead to fascinating and unexpected consequences. The volume includes contributions from leading participants in this active area of research, such as Kevin Ford, Carl Pomerance, Kannan Soundararajan and Gérald Tenenbaum.

Titles in this series are co-published with the Centre de Recherches Mathématiques.

Contents: V. Blomer, Ternary quadratic forms, and sums of three squares with restricted variables; **R. de la Bretèche**, Entiers ayant exactement r diviseurs dans un intervalle donné; **P. Erdős**, **F. Luca**, and **C. Pomerance**, On the proportion of numbers coprime to a given integer; **K. Ford**, Integers with a divisor in $(y, 2y]$; **H. A. Helfgott**, Power-free values, repulsion between points, differing beliefs and the existence of error; **H. Maier**, Anatomy of integers and cyclotomic polynomials; **J.-L. Nicolas**, Parité des valeurs de la fonction de partition $p(n)$ et anatomie des entiers; **K. Soundararajan**, The distribution of smooth numbers in arithmetic progressions; **G. Tenenbaum** and **J. Wu**, Moyennes de certaines fonctions multiplicatives sur les entiers friables, 4; **A. Akbary** and **M. R. Murty**, Uniform distribution of zeros of Dirichlet series; **S. Baier** and **L. Zhao**, On primes represented by quadratic polynomials; **W. D. Banks**, **A. M. Güloğlu**,

C. W. Nevans, and **F. Saidak**, Descartes numbers; **E. Croot**, A combinatorial method for developing Lucas sequence identities; **J.-M. De Koninck** and **F. Luca**, On the difference of arithmetic functions at consecutive arguments; **A. Granville** and **K. Soundararajan**, Pretentious multiplicative functions and an inequality for the zeta-function; **R. Khan**, On the distribution of $\omega(n)$; **W. Kuo** and **Y.-R. Liu**, The Erdős–Kac theorem and its generalizations; **J. Liu**, **E. Royer**, and **J. Wu**, On a conjecture of Montgomery-Vaughan on extreme values of automorphic L-functions at 1; **N. Ng**, The Möbius function in short intervals; **P. Pollack**, An explicit approach to hypothesis H for polynomials over a finite field; **C. L. Stewart**, On prime factors of integers which are sums or shifted products; **E. B. Wong**, Simultaneous approximation of reals by values of arithmetic functions.

CRM Proceedings & Lecture Notes, Volume 46

August 2008, 297 pages, Softcover, ISBN: 978-0-8218-4406-9, LC 2008020012, 2000 *Mathematics Subject Classification:* 11-06, 11N25, 11N36, 11N60; 11L07, 11L20, 11L40, 11N37, 11N56, 11P83, **AMS members US$79**, List US$99, Order code CRMP/46

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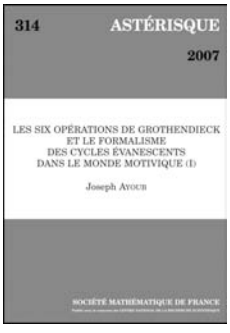

Les Six Opérations de Grothendieck et le Formalisme des Cycles Évanescents dans le Monde Motivique (I)

Joseph Ayoub, *Université Paris 13, France*

By the work of Morel, Voevodsky, and other mathematicians, one has the notion of the *stable motivic homotopy type* of a smooth S-scheme. This object lives in the *stable homotopy category* of S-schemes $\mathbf{SH}(S)$.

This work consists of two volumes and each of them is divided into two chapters. In the first chapter, the author shows that from the viewpoint of functoriality, the categories $\mathbf{SH}(S)$ behave like the derived categories of l-adic sheaves. Indeed, the formalism of Grothendieck operations f^*, f_*, $f_!$ and $f^!$ extends to the motivic world. In the second chapter, the author studies the constructibility of motives and develops Verdier duality. The third chapter deals with the theory of nearby motives and vanishing motives. The last chapter provides a self-contained treatment of the construction of the categories $\mathbf{SH}(S)$.

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: Les quatre opérations de Grothendieck dans un cadre motivique; Compléments sur les 2-foncteurs homotopiques stables et les quatre opérations; Bibliographie.

Astérisque, Number 314

September 2007, 464 pages, Softcover, ISBN: 978-2-85629-244-0, 2000 *Mathematics Subject Classification:* 14-02, 14C25, 14F20, 14F35, 14F42, 18A40, 18F10, 18F20, 18F25, 18G55, 19E15, **Individual member US$119**, List US$132, Order code AST/314

Differential Equations

Mathematical Study of the Betaplane Model: Equatorial Waves and Convergence Results

Isabelle Gallagher, *Université Paris VII, France*, and **Laure Saint-Raymond**, *Université Paris VI, France*

The authors are interested in a model of rotating fluids, describing the motion of the ocean in the equatorial zone. This model is known as the Saint-Venant, or shallow-water type system, to which a rotation term is added whose amplitude is linear with respect to the latitude; in particular it vanishes at the equator. After a physical introduction to the model, the authors describe the various waves involved and study in detail the resonances associated to those waves. They then exhibit the formal limit system (as the rotation becomes large), obtained as usual by filtering out the waves, and prove its wellposedness. Finally they prove three types of convergence results: a weak convergence result towards a linear, geostrophic equation, a strong convergence result of the filtered solutions towards the unique strong solution to the limit system, and a "hybrid" strong convergence result of the filtered solutions towards a weak solution to the limit system. In particular the authors obtain that there are no confined equatorial waves in the mean motion as the rotation becomes large.

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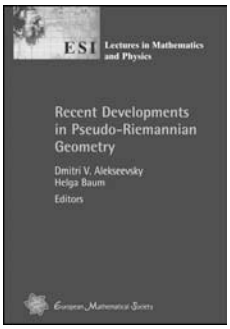
Contents: Introduction; Equatorial waves; The envelope equations; Convergence results; Bibliography; Notation index.

Mémoires de la Société Mathématique de France, Number 107

December 2006, 116 pages, Softcover, ISBN: 978-2-85629-228-0, 2000 *Mathematics Subject Classification:* 35Q30, 35P99, 76U05, 86A10, **Individual member US$35**, List US$39, Order code SMFMEM/107

Geometry and Topology



Recent Developments in Pseudo-Riemannian Geometry

Dmitri V. Alekseevsky, *Edinburgh University, Scotland*, and **Helga Baum**, *Humboldt-Universität, Berlin, Germany*, Editors

This book provides an introduction to and survey of recent developments in pseudo-Riemannian geometry, including applications in mathematical physics, by leading experts in the field. Topics covered are:

- Classification of pseudo-Riemannian symmetric spaces
- Holonomy groups of Lorentzian and pseudo-Riemannian manifolds
- Hypersymplectic manifolds
- Anti-self-dual conformal structures in neutral signature and integrable systems
- Neutral Kähler surfaces and geometric optics
- Geometry and dynamics of the Einstein universe
- Essential conformal structures and conformal transformations in pseudo-Riemannian geometry
- The causal hierarchy of spacetimes
- Geodesics in pseudo-Riemannian manifolds
- Lorentzian symmetric spaces in supergravity
- Generalized geometries in supergravity
- Einstein metrics with Killing leaves

The book is addressed to advanced students as well as to researchers in differential geometry, global analysis, general relativity and string theory. It shows essential differences between the geometry on manifolds with positive definite metrics and on those with indefinite metrics, and highlights the interesting new geometric phenomena, which naturally arise in the indefinite metric case. The reader finds a description of the present state of the art in the field as well as open problems, which can stimulate further research.

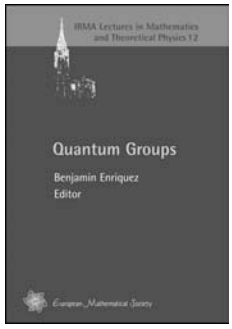
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: I. Kath and **M. Olbrich**, The classification problem for pseudo-Riemannian symmetric spaces; **A. Galaev** and **T. Leistner**, Holonomy groups of Lorentzian manifolds: classification, examples, and applications; **A. Dancer** and **A. Swann**, Hypersymplectic manifolds; **M. Dunajski** and **S. West**, Anti-self-dual conformal structures in neutral signature; **B. Guilfoyle** and **W. Klingenberg**, A neutral Kähler surface with applications in geometric optics; **T. Barbot**, **V. Charette**, **T. Drumm**, **W. M. Goldman**, and **K. Melnick**, A primer on the $(2 + 1)$ Einstein universe; **C. Frances**, Essential conformal structures in Riemannian and Lorentzian geometry; **W. Kühnel** and **H.-B. Rademacher**, Conformal transformations of pseudo-Riemannian manifolds; **E. Minguzzi** and **M. Sánchez**, The causal hierarchy of spacetimes; **A. M. Candela** and **M. Sánchez**, Geodesics in semi-Riemannian manifolds: geometric properties and variational tools; **J. Figueroa-O'Farrill**, Lorentzian symmetric spaces in supergravity; **F. Witt**, Metric bundles of split signature and type II supergravity; **G. Vilasi**, Einstein metrics with 2-dimensional Killing leaves and their physical interpretation; List of contributors; Index.

ESI Lectures in Mathematics and Physics, Volume 4

June 2007, 549 pages, Softcover, ISBN: 978-3-03719-051-7, 2000 *Mathematics Subject Classification:* 53-00, 53C50, **AMS members US$62**, List US$78, Order code EMSESILEC/4

Mathematical Physics



Quantum Groups

Benjamin Enriquez, *IRMA (CNRS), Strasbourg, France*, Editor

The volume starts with a lecture course by P. Etingof on tensor categories (notes by D. Calaque). This course is an introduction to tensor categories, leading to topics of recent research such as realizability of fusion rings, Ocneanu rigidity, module categories, weak Hopf algebras, Morita theory for tensor categories, lifting theory, categorical dimensions, Frobenius–Perron dimensions, and the classification of tensor categories.

The remainder of the book consists of three detailed expositions on associators and the Vassiliev invariants of knots, classical and quantum integrable systems and elliptic algebras, and the groups of algebra automorphisms of quantum groups. The preface puts the results presented in perspective.

Directed at research mathematicians and theoretical physicists as well as graduate students, the volume gives an overview of the ongoing research in the domain of quantum groups, an important subject of current mathematical physics.

A publication of the European Mathematical Society. Distributed within the Americas by the American Mathematical Society.

Contents: D. Calaque and **P. Etingof**, Lectures on tensor categories; **J. Lieberum**, The Drinfeld associator of gl(1|1); **A. Odesskii** and **V. Rubtsov**, Integrable systems associated with elliptic algebras; **N. Andruskiewitsch** and **F. Dumas**, On the automorphisms of $U_q^+(\mathfrak{g})$.

IRMA Lectures in Mathematics and Theoretical Physics, Volume 12

June 2007, 141 pages, Softcover, ISBN: 978-3-03719-047-0, 2000 *Mathematics Subject Classification:* 81R50, 81R12, **AMS members US$42**, List US$52, Order code EMSILMTP/12

Number Theory

Arc Spaces and Additive Invariants in Real Algebraic and Analytic Geometry

Michel Coste, *Université de Rennes 1, France*, **Toshizumi Fukui**, *Saitama University, Urawa, Japan*, **Krzysztof Kurdyka**, *Université de Savoie, Le Bourget-du-Lac, France*, **Clint McCrory**, *University of Georgia, Athens, GA*, **Adam Parusiński**, *Université d'Angers, France*, and **Laurentiu Paunescu**, *University of Sydney, Australia*

In this volume the authors present some new trends in real algebraic geometry based on the study of arc spaces and additive invariants of real algebraic sets. Generally, real algebraic geometry uses methods of its own that usually differ sharply from the more widely known methods of complex algebraic geometry. This feature is particularly apparent when studying the basic topological and geometric properties of real algebraic sets; the rich algebraic structures are usually hidden and cannot be recovered from the topology. The use of arc spaces and additive invariants partially obviates this disadvantage. Moreover, these methods are often parallel to the basic approaches of complex algebraic geometry.

The authors' presentation contains the construction of local topological invariants of real algebraic sets by means of algebraically constructible functions. This technique is extended to the wider family of arc-symmetric semialgebraic sets. Moreover, the latter family defines a natural topology that fills a gap between the Zariski topology and the euclidean topology.

In real equisingularity theory, Kuo's blow-analytic equivalence of real analytic function germs provides an equivalence relation that corresponds to topological equivalence in the complex analytic set-up. Among other applications, arc-symmetric geometry, via the motivic integration approach, gives new invariants of this equivalence, allowing some initial classification results.

The volume contains two courses and two survey articles that are designed for a wide audience, in particular students and young researchers.

This item will also be of interest to those working in analysis.

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: **M. Coste**, Real algebraic sets; **K. Kurdyka** and **A. Parusiński**, Arc-symmetric sets and arc-analytic mappings; **C. McCrory** and **A. Parusiński**, Algebraically constructible functions: real algebra and topology; **T. Fukui** and **L. Paunescu**, On blow-analytic equivalence; References.

Panoramas et Synthèses, Number 24

November 2007, 126 pages, Softcover, ISBN: 978-2-85629-236-5, 2000 *Mathematics Subject Classification:* 14Pxx, 14P05, 14P10, 14P25, 32B20, 32C05, 58A07, **Individual member US$48**, List US$53, Order code PASY/24

Compactification des Champs de Chtoucas et Théorie Géométrique des Invariants

Tuan Ngo Dac, *CNRS-Université de Paris Nord, Villetaneuse, France*

In the proof of Drinfeld and Lafforgue of the Langlands correspondence for GL_r over function fields, the most difficult part is to construct compactifications of moduli spaces (or stacks) classifying Drinfeld's shtukas. If one hopes to prove the Langlands correspondence over function fields for other reductive groups G, it is natural to generalize the above constructions for the stacks of G-shtukas. However, the approach of Lafforgue, based on the semistable reduction due to Langton, seems difficult to carry out.

In this article, the author uses the geometric invariant theory to give a new method to construct compactifications of moduli spaces of Drinfeld's shtukas. This not only rediscovers the compactications constructed by Drinfeld and Lafforgue but also gives rise to new families of compactications.

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Contents: Introduction; Chtoucas de Drinfeld : rappels; Variation des quotients; Semistabilité; Compactification des champs de chtoucas de Drinfeld; Propreté; Nouvelles compactifications des champs de chtoucas de Drinfeld; Compactifications des champs de chtoucas à modifications multiples; Bibliographie.

Astérisque, Number 313

June 2007, 122 pages, Softcover, ISBN: 978-2-85629-243-3, 2000 *Mathematics Subject Classification:* 11R58, 11G09, 14G35, 14D20, 14L24, **Individual member US$36**, List US$40, Order code AST/313

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000043

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Full Professor
2008 Advertising

The Department of Mathematics invites applications for one or more positions at the Associate Professor or Full Professor level in general areas of analysis, algebra, topology, number theory, and mathematical physics beginning fall 2009 or later.

To submit your applications go to 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 directly to: Appointments Committee, Department of Mathematics, Johns Hopkins University, 404 Krieger Hall, Baltimore, MD 21218. Application should include a vita, at least four letters of recommendation of which one specifically comments on teaching, and a description of current and planned research. Write to: cpoole@jhu.edu for questions concerning these positions. Applications received by November 17, 2008, will be given priority. The Johns Hopkins University is an Affirmative Action/Equal Opportunity Employer. Minorities and women candidates are encouraged to apply.

000045

JOHNS HOPKINS UNIVERSITY
Department of Mathematics
Non-Tenure-Track J. J. Sylvester Assistant Professor
2008 Advertising

Subject to availability of resources and administrative approval, the Department of Mathematics solicits applications for non-tenure-track Assistant Professor positions beginning fall 2009.

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 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 directly to: Appointments Committee, Department of Mathematics, Johns Hopkins University, 404 Krieger Hall, Baltimore, MD 21218. Application should include a vita, at least four letters of recommendation of which one specifically comments on teaching, and a description of current and planned research. Write to: cpoole@jhu.edu for questions concerning these positions. Applications received by November 17, 2008, will be given priority. The Johns Hopkins University is an Affirmative Action/Equal Opportunity Employer. Minorities and women candidates are encouraged to apply.

000046

TEXAS

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 2009. 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 three-year appointments 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. A complete dossier should be received by December 15, 2008. Early applications are encouraged since the department will start the review process in October 2008. Applicants should send the completed "AMS Application Cover Sheet", a vita, a summary statement of research and teaching experience; 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.

000039

Texas A&M University
Department of Mathematics
IAMCS-KAUST Postdoctoral Fellowships

The Institute for Applied Mathematics and Computational Science (IAMCS) at Texas

A&M University is pleased to invite applications for its IAMCS-KAUST Postdoctoral Fellowships.

IAMCS is an interdisciplinary research institute at Texas A&M University recently named as one of the four inaugural King Abdullah University of Science and Technology (KAUST) Global Research Partner Centers. Its core members number more than two dozen faculty from the fields of Mathematics, Statistics, Computer Science, and Engineering.

Fostering collaboration and interdisciplinary research anchored in the mathematical sciences are at the heart of IAMCS's mission. To that end, IAMCS emphasizes among its activities annual research themes. Its first two annual themes are Computational Earth Science and Computational Material Science and Engineering. IAMCS postdoctoral candidates should have demonstrated interest and involvement in interdisciplinary research, and successful candidates will be encouraged to participate in the annual theme activities and to establish research collaborations exploring theme year topics. Moreover, each fellow will be invited to establish collaborations with KAUST faculty, postdocs, and students as well as all of the KAUST Global Research Partner institutions and individual investigators. This offers an unprecedented opportunity for postdoctoral fellows to join a remarkable network of leading research institutions and eminent scholars assembled through the KAUST GRP program.

KAUST is a new graduate research university being rapidly developed by the Kingdom of Saudi Arabia at a site along the Red Sea a short distance north of Jeddah. When it opens in September 2009, it will offer world class, state-of-the-art research and instructional facilities supporting its core research and graduate programs in earth sciences, materials science and engineering, biosciences, and applied mathematics and computational science. A key element in KAUST's development as a premier graduate research university is its Global Research Partnership (GRP) program. The GRP consists of its Academic Excellence Alliance Partners, Research Center Partners, and Individual Research Scholar Partners.

The IAMCS-KAUST Postdoctoral Fellowships at Texas A&M University are two-year appointments with the possibility of extension to a third year. The fellowship stipend is US$50K over 12 months plus fringe benefits. Interested individuals should submit their application materials (CV, research statement, and three letters of recommendation) to the email address: KAUST@tamu.edu by December 15, 2008. IAMCS intends to select up to four IAMCS-KAUST Fellows.

Texas A&M University is an Equal Opportunity Employer. The university is dedicated to the goal of building a culturally diverse pluralistic faculty and staff committed to teaching and working in a multicultural environment and strongly encourages applications from women, minorities, and individuals with disabilities.

000042

WISCONSIN

UNIVERSITY OF WISCONSIN-MADISON
Department of Mathematics

The Department of Mathematics advertises for two positions to begin August 24, 2009, 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.

An application package should include a completed AMS Standard Cover Sheet, a curriculum vitae which includes a publication list, and brief descriptions of research and teaching. All application materials should be submitted electronically to: http://www.mathjobs.org.

Applicants should also arrange to have sent, through the above URL 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 10, 2008. 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. Employment may require a criminal background check.

000041

UNIVERSITY OF WISCONSIN-MILWAUKEE
Department of Mathematical Sciences
Milwaukee, WI 53201-0413

The Department of Mathematical Sciences, University of Wisconsin-Milwaukee (UWM), invites applications to fill one faculty position at the assistant (tenure-track) or associate professor level in mathematical sciences. Starting date is August 2009.

The department is seeking an outstanding candidate with a Ph.D. or equivalent in mathematics, statistics, or a closely related field, and with research and teaching interests in the broad area of biomathematics. Candidates with expertise in systems biology, ecological modeling at the population, community or ecosystem levels, disease dynamics, physiology, genomics, biological aspects of climate modeling, computational biology or similar fields, including those with an aquatic focus, are especially welcome. The position is one of two (the other being in biology) in UWM's ongoing initiative targeting interdisciplinary research, at all levels, among the mathematical and the biological sciences departments and the UWM Great Lakes WATER Institute.

Candidates for this position must have a strong research record and a demonstrated commitment to teaching excellence. The appointee is expected to develop a strong externally funded interdisciplinary research program. Responsibilities include teaching two courses per semester and taking active roles in the undergraduate, Masters, and Doctoral programs. A competitive compensation, benefits, and research start-up package is provided. Additional information is available at: http://www.math.uwm.edu.

Applications must be completed through http://www.jobs.uwm.edu/applicants/Central?quickFind=50619. In addition, applicants must arrange to have three letters of recommendation (at least one should address the candidate's teaching abilities) sent to the chairperson at: adbell@uwm.edu or Department of Mathematical Sciences University of Wisconsin-Milwaukee, Milwaukee, WI 53201-0413

Review of applications will start by October 17, 2008, and will continue until the position is filled.

UW-Milwaukee is an AA/EEO employer.

000038

CALL FOR PAPERS/JOURNAL FOR SALE

Manuscripts covering any aspect of wavelet theory may be submitted for possible publication in the *Journal of Wavelet Theory and Applications*, a new journal, to the Editor-in-Chief J. N. Pandey by email at: JWTAeditor@gmail.com or to any of the associate editors listed on the website http://www.ripublication.com, containing detailed information about the journal, the publisher, and the subscription, etc.

000044

Mathematical Sciences Employment Center

Marriott Wardman Park Hotel, Washington, DC
January 5, 6, 7, and 8, 2009

2009 Employment Center Schedule

October 22, 2008 Registration deadline for inclusion in Winter List books

December 15, 2008 Advance registration deadline. After this date, all registration activities will happen on site in Washington.

NEW HOURS:

Monday, January 5

8:00 a.m.–4:00 p.m. Registration and materials pickup

8:00 a.m.–7:00 p.m. Interview Center open (doors open at 8:00 a.m.; do not schedule before 9:00 a.m.)

Tuesday, January 6

8:00 a.m.–7:00 p.m. Interview Center open

Wednesday, January 7

8:00 a.m.–7:00 p.m. Interview Center open

Thursday, January 8

9:00 a.m.–12:00 noon Interview Center open

Note: Computer scheduling is no longer provided at the Employment Center. When deciding on a date for arriving, keep in mind that some employers will use Monday for making arrangements, and some employers will conduct interviews on Monday.

Changes for the 2009 Employment Center

The Employment Center no longer offers computer scheduling of appointments. Employers will be inviting candidates for interviews either by email or phone in advance of the meeting, or on site through messaging. All appointments will be set by employer invitation only, so an applicant has no guarantee of interviews.

The second major change for 2009 is the introduction of table types which better accommodate various stages in the hiring process. Tables for one or two interviewers per institution are offered in the "Quiet Area". Tables for employers needing three to six interviewers are located in the "Committee Table" area. Employers may opt for additional privacy in a curtained booth.

The Winter List of Employers and Winter List of Applicants books will still be printed and distributed to those who register by the October 22 deadline. Forms are not currently browsable on the Web, however, spreadsheets of applicant data will be sent to registered employers. It is impossible for any employers or applicants to participate privately; all names are displayed on lists posted on site.

The Employment Center offers a convenient and practical meeting place for those already present at the Joint Meetings. The focus of the Employment Center is on Ph.D. level mathematical scientists and those that seek to hire them from academia, business, and government. In the current job market, the majority of employers are seeking to meet a short list of applicants who applied for their open positions during the fall. Opportunities to meet employers with whom no previous contact was made still exist, but are more limited.

The Employment Center takes place on the first three days of the Joint Mathematics Meetings and the morning only of the last day. Registration for the JMM is required for those seeking to register for the Employment Center.

Employers: Important Changes To Note

New in 2009, all employers will be setting their own schedules, either in advance or on site. Computer scheduling has been discontinued. Table choices have been expanded to allow suitable accommodations at various stages of the hiring process:

- one or two interviews per table in the "Quiet Area" (US$250)
- three to six interviewers per table in the "Committee Table" area (US$350)
- one to four interviewers in the curtained booths (US$425)

Also new in 2009 is the simplified schedule; 8:00 a.m. to 7:00 p.m. on Monday, Tuesday, and Wednesday, and 9:00 a.m.–noon on Thursday.

To set up interviews, employers are advised to peruse the Winter List for potential or existing applicants, and

contact those applicants in advance either by email or phone to arrange interview times. To set additional appointments on site, there is a paper Message Center with a folder for each participant; messages can be exchanged there.

Interviews are limited to open hours, which are Monday through Wednesday 8:00 a.m. to 7:00 p.m. and Thursday 9:00 a.m. to noon. Outside of those times, the room is completely unavailable, so, for instance, do not set an appointment to begin at 7:00 p.m. There are paper forms available on site to speed the issuing of invitations. All scheduling is the responsibility of the employer; computer scheduling is no longer offered.

Registered employers will be offered a spreadsheet of applicant data in early November, and a final version in December. However, the applicants can only depend on the printed Winter List books to learn about the employers so it is important for all employers to get their job listing form submitted online before the print deadline of October 22. See registration instructions, below. If the application deadline will have passed before January, or some other difficulty with accepting new applications exists, that should be mentioned on the listing form.

About the Winter List of Applicants

This booklet contains hundreds of résumés of applicants who registered by October 22 for the Employment Center. It will be mailed in December to all registered employers. 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. Additionally, a spreadsheet of applicant data will be emailed to all registered employers in October and a secondary set of data will be emailed in December.

Employers Not Planning To Interview

Employers who wish to display a one-page handout on site, but not obtain a table or conduct interviews, may do so at no charge by bringing their job ad to the Employment Center desk during the open hours. There is no charge for this service. Please note that sets of handouts will not be accepted or allowed in the room. Forms for employers not interviewing will no longer be included in the Winter List book.

Employers: How To Register

Each interviewer should register and pay for the Joint Mathematics Meetings. One interviewer should also register for the Employment Center by completing the following steps:

Indicate on the Joint Meetings registration form (available electronically in early September 2008 at `http://www.ams.org/amsmtgs/2110_intro.html`) payment for the Employment Center employer fee. Indicate choice of tables. Mark all that apply.

Submit an Employer (job listing) Form electronically at `http://www.ams.org/emp-reg`. This form will be printed in the Winter List of Employers if it is received by October 22; otherwise it will be displayed on site.

It is important to register by the October 22 deadline in order for the employer form to be included in the Winter List of Employers. However, registration will be accepted up to December 15 for the normal fees or on site in Washington 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, each table type has a limit for the number of interviewers that can be present at the same time). If possible, interviewer 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.

The table types and fees have changed for 2009. Quiet Area tables accommodate up to two interviewers per table. They cost US$250 if reserved in advance, and US$330 if reserved after December 15. After the purchase of any table, a second Quiet Area table may be purchased for US$100. Committee Tables accommodate between three and six interviewers and cost US$350 in advance or US$430 after December 15. Lastly, a Curtained Booth accommodating between one and six interviewers is available in advance for US$425. Curtained Booths offer a slightly larger than normal table, and a little more visual privacy (although the noise level remains unchanged). Curtained Booths must be reserved by December 15; they cannot be obtained on site. 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 15 may register on site in Washington at the Joint Meetings registration desk. They must bring their receipt to the Employment Center desk between 8:00 a.m. and 4:00 p.m. on Monday, January 5, to receive their materials. Please

note that only Quiet Area and Committee Tables are available on site.

Applicants: Appointments Are by Invitation Only

The traditional system of computer scheduling is no longer offered at the Employment Center. Appointments are now set by employers by invitation, either in advance or on site in Washington. Employing institutions may look to the Winter List for new potential applicants, but the reality of today's job market is that by January, many deadlines have passed and many employers will use the Employment Center to meet existing candidates of interest. Applicants who have made job applications the previous fall and are on various short lists will find themselves with numerous interviews during the Employment Center. Applicants just beginning a job search will find themselves at a serious disadvantage.

Applicants: Making the Decision To Participate

For those who are currently on the job market, the Employment Center is a central meeting place for employers and applicants who are attending the Joint Mathematics Meetings. Interviews are arranged either in advance or on site by invitation of the employer. The Employment Center is a great resource not only for interviewing purposes, but also for finding out what jobs are available in the mathematical community, meeting other applicants, and making a personal connection with employers not possible on paper. However, there is no guarantee of interviews, and in fact some qualified applicants may find themselves with no interviews at all.

Many of the employers are academic mathematical sciences departments. There are a few nonacademic employers each year. There will ordinarily be no research-oriented postdoctoral positions listed or discussed at the Employment Center. Attention generally goes to versatile candidates who are well suited for teaching positions at bachelor's-granting colleges. Many appointments will go to applicants who applied for jobs in the fall and are now being sought out by the institutions for in person meetings during the Joint Mathematics Meetings. Through the Winter Lists and on-site lists, those employers who are still open to the possibility of recruiting new applicants will be arranging some interviews on site.

This year's list of participating employers will be printed in the Winter List of Employers, and mailed to registered applicants in December. The website (`http://www.ams.org/emp-reg`) maintains a list of employers who used the service in prior years.

Applicants pay a fee of US$25 if registering in advance, and their forms are printed in the Winter List of Applicants. They receive the Winter List of Employers in the mail in December. On site, they have a personal Message Center folder for paper messages.

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. Last year, those who responded to a follow-up survey reported an average of three to six interviews in the Interview Center.

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.

Keep in mind that interviews arranged by the Employment Center represent only an initial contact with the employers and that hiring decisions are not made during or immediately following such interviews. A good outcome, in the following weeks or months, would be an invitation for a campus visit. In a recent survey, 65 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; 46 percent reported receiving at least one job offer in the months following the Employment Center. Of all responding applicants, 16 percent reported (in May) having no new job offers from any source.

Applicants are advised to bring:

- Many copies of a brief resume. The best format is back and front of one sheet. These may be given to employers at an interview, left with a note in the message center box of an employer, or left in one's own message folder for public use. Photocopying at a convention center or hotel is expensive.
- A few copies of standard application documents: generic cover letter, teaching/research statements, full vita, preprints, etc.
- Bring a list of job applications already made.
- Pack suitable clothing for job interviews; these could be scattered over a period of 3–4 days.

Applicants: REGISTER before October 22, 2008

Applicants will be registered when they have completed the following steps:

1. Register and pay for the Joint Mathematics Meetings. Look for "Registration" on the Joint Meetings website (available in early September, 2008).

2. Mark the "Employment Center Applicant fee" box on the Joint Meetings registration form and pay the appropriate fee.

3. Submit an Applicant (brief resume) Form electronically. Successful submission of the form will generate an on-screen acceptance message and an automatic email reply to the address given on the form. Each applicant form will be reproduced in a booklet, the Winter List of Applicants, and distributed to all registered employers. Applicant forms received after October 22, 2008, cannot be included in the booklet. The booklet allows employers more time to examine each candidate's qualifications in advance.

Advance registration fees for applicants using the Employment Center services are US$25 plus Joint Meetings registration fee, vs. US$40 on-site registration fee plus Joint Meetings registration fee. Applicants registered by October 22 will receive their Employment Center materials two to three weeks in advance unless they request otherwise. The package will include all job announcements received from employers registered in advance.

After the October 22 Deadline

Registration for the Employment Center will continue after the October 22 deadline until the final registration deadline of December 15; however, the applicant form will NOT be included in the Winter List but will be posted on site at the Employment Center (a serious disadvantage). Those who do not register by December 15 must register on site at the Joint Meetings Registration Desk and pay the higher fees.

Registering on Site

Registering on site is possible, at the US$40 rate, on Monday. 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. Most employers will not notice an applicant form which arrives on Monday. Registration on site is advisable only for those who already have interview invitations and would like a message center folder for employers to leave messages in.

Applicants who need to register on site for the Employment Center must go to the Joint Meetings registration desk and pay for the Employment Center. They should receive a receipt which needs to be brought to the Employment Center to complete the registration process.

Questions about Employment Center registration and participation can be directed to Steve Ferrucci, AMS Membership and Programs Department, at 800-321-4267, ext. 4113 or, by email to `emp-info@ams.org`.

Photos on previous pages are courtesy of Joe Orlando, Inc.

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.

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: 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

Freeman Dyson, Institute for Advanced Study, *Birds and Frogs* (Einstein Public Lecture in Mathematics).

Richard Kenyon, Brown University, *Branched polymers in two and three dimensions.*

Alexander S. Kleshchev, University of Oregon, *Representation theory of symmetric groups.*

Mark Lewis, University of Alberta, *Population spread and the dynamics of biological invasions.*

Audrey A. Terras, University of California San Diego, *Ihara zeta functions and quantum chaos.*

Special Sessions

Algebraic Topology and Related Topics, **Alejandro Adem**, University of British Columbia, and **Stephen Ames Mitchell**, University of Washington.

Algorithmic Probability and Combinatorics, **Manuel Lladser**, University of Colorado, **Robert S. Maier**, University of Arizona, **Marni Mishna**, Simon Fraser University, and **Andrew Rechnitzer**, University of British Columbia.

Applications of Algebraic Geometry, **Elizabeth S. Allman**, University of Alaska Fairbanks, and **Rekha R. Thomas**, University of Washington.

Combinatorial Representation Theory, **Sara C. Billey**, University of Washington, **Alexander S. Kleshchev**, University of Oregon, and **Stephanie Jane Van Willigenburg**, University of British Columbia.

Convex and Discrete Geometry and Asymptotic Analysis, **Karoly Bezdek**, University of Calgary, and **A. E. Litvak**, University of Alberta.

Harmonic Analysis and Related Topics, **Malabika Pramanik**, University of British Columbia, and **Burak Erdogan**, University of Illinois at Urbana-Champaign.

Hilbert Functions and Free Resolutions, **Susan Cooper**, California Polytechnic State University, **Christopher A. Francisco**, Oklahoma State University, and **Benjamin P. Richert**, California Polytechnic State University.

History and Philosophy of Mathematics, **Shawnee L. McMurran**, California State University San Bernardino, and **James J. Tattersall**, Providence College.

Knotting and Linking of Macromolecules, **Eric J. Rawdon**, University of Saint Thomas, and **Kenneth C. Millett**, University of California Santa Barbara.

Moduli Spaces and Singularity Theory, **James B. Carrell**, **Patrick Brosnan**, and **Kalle Karu**, University of British Columbia.

Noncommutative Algebra and Geometry, **Jason Bell**, Simon Fraser University, and **James Zhang**, University of Washington.

Noncommutative Geometry, **Raphael Ponge**, University of Toronto, **Bahram Rangipour**, University of New Brunswick, and **Heath Emerson**, University of Victoria.

Nonlinear Waves and Coherent Structures, **Bernard Deconinck**, University of Washington, and **Jeffrey DiFranco**, Seattle University.

Probability and Statistical Mechanics, **David Brydges**, University of British Columbia, and **Richard Kenyon**, Brown University.

Special Functions and Orthogonal Polynomials, **Mizanur Rahman**, Carleton University, and **Diego Dominici**, State University of New York New Paltz.

Wavelets, Fractals, Tilings and Spectral Measures, **Dorin Ervin Dutkay**, University of Central Florida, **Palle E. T. Jorgensen**, University of Iowa, and **Ozgur Yilmaz**, University of British Columbia.

West End Number Theory, **Nils Bruin**, Simon Fraser University, **Matilde N. Lalin**, University of Alberta, and **Greg Martin**, University of British Columbia.

p-adic Groups and Automorphic Forms, **Clifton L. R. Cunningham**, University of Calgary, and **Julia Gordon**, University of British Columbia.

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: 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

Pekka Koskela, University of Jyväskylän, *Definitions of quasiconformality*.

Monika Ludwig, Polytechnic Institute of NYU, *SL(n)invariant notions of surface area*.

Duong Hong Phong, Columbia University, *Flows and canonical metrics in Kaehler geometry*.

Thomas W. Scanlon, University of California, Berkeley, *Polynomial dynamics*.

Special Sessions

Algebraic Geometry, **Eyal Markman** and **Jenia Tevelev**, University of Massachusetts, Amherst.

Algebraic Topology, **Mark A. Hovey**, Wesleyan University, and **Kathryn Lesh**, Union College.

Analysis on Metric Measure Spaces and on Fractals, **Piotr Hajlasz**, University of Pittsburgh, **Luke Rogers**, University of Connecticut, **Robert S. Strichartz**, Cornell University, and **Alexander Teplyaev**, University of Connecticut.

Complex Geometry and Partial Differential Equations, **Jacob Sturm** and **Jian Song**, Rutgers University.

Computability Theory and Effective Algebra, **Joseph S. Miller**, **David Reed Solomon**, and **Asher Kach**, University of Connecticut.

Convex and Integral Geometry, **Monika Ludwig**, Polytechnic University of New York, **Daniel Klain**, University of Massachusetts, Lowell, and **Franz Schuster**, Vienna University of Technology.

Geometric Function Theory and Geometry, **Petra Bonfert-Taylor**, Wesleyan University, **Katsuhiko Matsuzaki**, Okayama University, and **Edward C. Taylor**, Wesleyan University.

Geometric Group Theory and Topology, **Matthew Horak**, University of Wisconsin-Stout, **Melanie Stein**, Trinity College, and **Jennifer Taback**, Bowdoin College.

History of Mathematics, **Robert E. Bradley**, Adelphi University, **Lawrence A. D'Antonio**, Ramapo College of New Jersey, and **Lee J. Stemkoski**, Adelphi University.

Low-Dimensional Topology, **Constance Leidy**, Wesleyan University, and **Shelly Harvey**, Rice University.

Model Theory and Its Applications, **Thomas Scanlon**, University of California, Berkeley, and **Philip A. Scowcroft** and **Carol S. Wood**, Wesleyan University.

Number Theory, **Wai Kiu Chan** and **David Pollack**, Wesleyan University.

Real and Complex Dynamics of Rational Difference Equations with Applications, **Mustafa Kulenovic** and **Gerasimos Ladas**, University of Rhode Island.

Riemannian and Lorentzian Geometries, **Ramesh Sharma**, University of New Haven, and **Philippe Rukimbira**, Florida International University.

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: 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

M. Carme Calderer, University of Minnesota, *Title to be announced.*

Alexandru Ionescu, University of Wisconsin, *Title to be announced.*

Boris S. Mordukhovich, Wayne State University, *Title to be announced.*

David Nadler, Northwestern University, *Title to be announced.*

Special Sessions

Affine Algebraic Geometry, **Shreeram Abhyankar**, Purdue University, **Anthony J. Crachiola**, Saginaw Valley State University, and **Leonid G. Makar-Limanov**, Wayne State University.

Computation in Modular Representation Theory and Cohomology, **Christopher P. Bendel**, University of Wisconsin-Stout, **Terrell L. Hodge**, Western Michigan University, **Brian J. Parshall**, University of Virginia, and **Cornelius Pillen**, University of South Alabama.

Computational Group Theory, **Luise-Charlotte Kappe**, State University of New York Binghamton, **Arturo Magidin**, University of Louisiana–Lafayette, and **Robert F. Morse**, University of Evansville.

Graph Labeling, Graph Coloring, and Topological Graph Theory, **Arthur T. White**, Western Michigan University, and **David L. Craft**, Muskingum College.

Homotopy Theory, **Michele Intermont**, Kalamazoo College, and **John R. Martino** and **Jeffrey A. Strom**, Western Michigan University.

Linear Codes Over Rings and Modules, **Steven T. Dougherty**, University of Scranton, and **Jay A. Wood**, Western Michigan University.

Mathematical Finance, **Qiji J. Zhu**, Western Michigan University, and **George Yin**, Wayne State University.

Mathematical Knowledge for Teaching, **Kate Kline** and **Christine Browning**, Western Michigan University.

Nonlinear Analysis and Applications, **S. P. Singh**, University of Western Ontario, **Bruce B. Watson**, Memorial University, and **Mahi Singh**, University of Western Ontario.

Optimization/Midwest Optimization Seminar, **Jay S. Treiman** and **Yuri Ledyaev**, Western Michigan University, and **Ilya Shvartsman**, Penn State Harrisburg.

Quasigroups, Loops, and Nonassociative Division Algebras, **Clifton E. Ealy Jr.** and **David Richter**, Western Michigan University, and **Petr Vojtechovsky**, University of Denver.

Representations of Real and P-adic Lie Groups, **Alessandra Pantano**, University of California Irvine, **Annegret Paul**, Western Michigan University, and **Susana Alicia Salamanca-Riba**, New Mexico State University.

Topological Field Theory, **David Nadler**, Northwestern University.

Variational Analysis and its Applications, **Yuri Ledyaev** and **Jay S. Treiman**, Western Michigan University, **Ilya Shvartsman**, Penn State Harrisburg, and **Qiji J. Zhu**, Western Michigan University.

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: 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

Mark Behrens, Massachusetts Institute of Technology, *Congruences amongst modular forms and the stable homotopy groups of spheres.*

Anthony M. Bloch, University of Michigan, Ann Arbor, *Variational principles and nonholonomic dynamics.*

Roberto Camassa, University of North Carolina, Chapel Hill, *Spinning rods, microfluidics, and propulsion by cillia in biological systems.*

Mark V. Sapir, Vanderbilt University, *Geometry of groups, random walks, and polynomial maps over finite fields.*

Special Sessions

Applications of PDEs and ODEs (in honor of Karen Ames), **Suzanne M. Lenhart** and **Philip W. Schaefer**, University of Tennessee, Knoxville.

Applications of Topology to Dynamical Systems, **John C. Mayer** and **Lex G. Oversteegen**, University of Alabama at Birmingham.

Applied Probability, **Moonyu Park** and **Boris Kunin**, University of Alabama in Huntsville.

Dynamics and Applications of Differential Equations, **Wenzhang Huang** and **Shangbing Ai**, University of Alabama in Huntsville, and **Weishi Liu**, University of Kansas.

Gaussian Analysis and Stochastic Partial Differential Equations, **Davar Khoshnevisan**, University of Utah, and **Dongsheng Wu**, University of Alabama in Huntsville.

Geometric Mechanics, Control, and Integrability, **Anthony M. Bloch**, University of Michigan, Ann Arbor, and **Dmitry Zenkov**, North Carolina State University.

Graph Decompositions, **Robert A. Beeler** and **Robert B. Gardner**, East Tennessee State University.

Graph Theory, **Peter J. Slater** and **Grant Zhang**, University of Alabama in Huntsville.

Homotopy Theory and Algebraic Topology, **Mark Behrens**, Massachusetts Institute of Technology, and **Michael Hill**, University of Virginia.

Inverse Limits and Their Applications, **Judy A. Kennedy**, Lamar University.

Mathematical Biology: Modeling, Analysis, and Simulations, **Jia Li**, University of Alabama in Huntsville, **Azmy S. Ackleh**, University of Louisiana at Lafayette, and **Maia Martcheva**, University of Florida.

Nonlinear Operator Theory and Partial Differential Equations, **Claudio H. Morales**, University of Alabama in Huntsville, and **Pei-Kee Lin**, University of Memphis.

Probability on Discrete and Algebraic Structures, **Kyle T. Siegrist**, University of Alabama in Huntsville.

Random Matrices, **Leonard N. Choup**, University of Alabama in Huntsville.

Set-Theoretic Topology, **Gary Gruenhage**, Auburn University, and **Peter J. Nyikos** and **Robert M. Stephenson, Jr**, University of South Carolina.

Shanghai, People's Republic of China

Fudan University

December 17–21, 2008

Wednesday – Sunday

Meeting #1045

First Joint International Meeting Between the AMS and the Shanghai Mathematical Society
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: June 2008
Program first available on AMS website: Not applicable
Program issue of electronic *Notices*: Not applicable
Issue of *Abstracts*: Not applicable

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: October 31, 2008

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/internmtgs.html`.

Invited Addresses

Robert J. Bryant, University of California Berkeley, *Title to be announced.*

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.*

Xiaoping Yuan, Fudan University, *Title to be announced.*

Weiping Zhang, Chern Institute, *Title to be announced.*

Special Sessions

Biomathematics: Newly Developed Applied Mathematics and New Mathematics Arising from Biosciences, **Banghe Li**, Chinese Academy of Sciences, **Reinhard C. Laubenbacher**, Virginia Bioinformatics Institute, and **Jianjun Paul Tian**, College of William and Mary.

Combinatorics and Discrete Dynamical Systems, **Reinhard C. Laubenbacher**, Virginia Bioinformatics Institute, **Klaus Sutner**, Carnegie Mellon University, and **Yaokun Wu**, Shanghai Jiao Tong University.

Differential Geometry and Its Applications, **Jianguo Cao**, University of Notre Dame, and **Yu Xin Dong**, Fudan University.

Dynamical Systems Arising in Ecology and Biology, **Qishao Lu**, Beijing University of Aeronautics & Astronautics, and **Zhaosheng Feng**, University of Texas-Pan American.

Elliptic and Parabolic Nonlinear Partial Differential Equations, **Changfeng Gui**, University of Connecticut, and **Feng Zhou**, East China Normal University.

Harmonic Analysis and Partial Differential Equations with Applications, **Yong Ding**, Beijing Normal University, **Guo-Zhen Lu**, Wayne State University, and **Shanzhen Lu**, Beijing Normal University.

Integrable System and Its Applications, **En-Gui Fan**, Fudan University, **Sen-Yue Lou**, Shanghai Jiao Tong University and Ningbo University, and **Zhi-Jun Qiao**, University of Texas-Pan American.

Integral and Convex Geometric Analysis, **Deane Yang**, Polytechnic University, and **Jiazu Zhou**, Southwest University.

Lie Algebras, Vertex Operator Algebras and Related Topics, **Hu Nai Hong**, East China Normal University, and **Yi-Zhi Huang**, Rutgers University.

Nonlinear Systems of Conservation Laws and Related Topics, **Gui-Qiang Chen**, Northwestern University, and **Shuxing Chen** and **Yi Zhou**, Fudan University.

Optimization and Its Application, **Shu-Cherng Fang**, North Carolina State University, and **Xuexiang Huang**, Fudan University.

Quantum Algebras and Related Topics, **Naihuan N. Jing**, North Carolina State University, **Quanshui Wu**, Fudan University, and **James J. Zhang**, University of Washington.

Recent Developments in Nonlinear Dispersive Wave Theory, **Jerry Bona**, University of Illinois at Chicago, **Bo Ling Guo**, Institute of Applied Physics and Computational Mathematics, **Shu Ming Sun**, Virginia Polytech Institute and State University, and **Bingyu Zhang**, University of Cincinnati.

Representation of Algebras and Groups, **Birge K. Huisgen-Zimmermann**, University of California Santa Barbara, **Jie Xiao**, Tsinghua University, **Jiping Zhang**, Beijing University, and **Pu Zhang**, Shanghai Jiao Tong University.

Several Complex Variables and Applications, **Siqi Fu**, Rutgers University, **Min Ru**, University of Houston, and **Zhihua Chen**, Tongji University.

Several Topics in Banach Space Theory, **Gerard J. Buskes** and **Qingying Bu**, University of Mississippi, and **Lixin Cheng**, Xiamen University.

Stochastic Analysis and Its Application, **Jiangang Ying**, Fudan University, and **Zhenqing Chen**, University of Washington.

Topics in Partial Differential Equations and Mathematical Control Theory, **Xiaojun Huang**, Rutgers University, **Gengsheng Wang**, Wuhan University of China, and **Stephen S.-T. Yau**, University of Illinois at Chicago.

Washington, District of Columbia

Marriott Wardman Park Hotel and Omni Shoreham Hotel

January 5–8, 2009

Monday – Thursday

Meeting #1046

Joint Mathematics Meetings, including the 115th Annual Meeting of the AMS, 92nd Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).

Associate secretary: Bernard Russo
Announcement issue of *Notices*: October 2008
Program first available on AMS website: November 1, 2008
Program issue of electronic *Notices*: January 2009
Issue of *Abstracts*: Volume 30, Issue 1

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: September 16, 2008

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/national.html`.

Joint Invited Addresses

Douglas N. Arnold, University of Minnesota, Minneapolis, *Title to be announced* (AMS-MAA Invited Address).

Maryam Mirzakhani, Princeton University, *Title to be announced* (AMS-MAA Invited Address).

AMS Invited Addresses

Luis A. Caffarelli, University of Texas at Austin, *Nonlinear problems involving integral diffusions*.

Mikhail Khovanov, Institute for Advanced Study, *Categorification of quantum groups and link invariants*.

Grigorii A. Margulis, Yale University, *Title to be announced* (AMS Colloquium Lectures).

Ken Ono, University of Wisconsin-Madison, *Unearthing the visions of a master: The web of Ramanujan's mock theta functions in number theory*.

Christor Papadimitriou, University of California Berkeley, *On Nash, Brouwer, and other nonconstructive proofs*.

Oded Schramm, Microsoft, *Title to be announced* (AMS Josiah Willard Gibbs Lecture).

James A. Sethian, University of California Berkeley, *Advances in advancing interfaces*.

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 Cryptography and Generic Complexity (Code: SS 41A), **Vladimir Shpilrain**, The City College of New York, and **Yesem Kurt**, Randolph College.

Algebraic Structures in Knot Theory (Code: SS 33A), **Sam Nelson**, Claremont McKenna College, and **Alissa S. Crans**, Loyola Marymount University.

Asymptotic Geometric Analysis (Code: SS 45A), **Alexander E. Litvak**, University of Alberta, and **Dmitry Ryabogin** and **Artem Zvavitch**, Kent State University.

Asymptotic Methods in Analysis with Applications (Code: SS 19A), **Diego Dominici**, SUNY New Paltz, and **Peter A. McCoy**, U.S. Naval Academy (AMS-SIAM).

Automorphic and Modular Forms in Number Theory (Code: SS 55A), **Ken Ono** and **Amanda Folsom**, University of Wisconsin-Madison, and **Sharon A. Garthwaite**, Bucknell University.

Categorification and Link Homology (Code: SS 58A), **Aaron Lauda** and **Mikhail Khovanov**, Columbia University.

Commutative Rings (Code: SS 1A), **Jay A. Shapiro**, George Mason University, **David E. Dobbs**, University of Tennessee, Knoxville, **Shane P. Redmond**, Eastern Kentucky University, and **Joe A. Stickles**, Millikin University.

Complex Dynamics and Complex Function Theory (Code: SS 16A), **Stephanie Edwards**, Hope College, and **Rich L. Stankewitz**, Ball State University.

Computational Algebra and Convexity (Code: SS 9A), **Dan Bates**, IMA, University of Minnesota, **Tsung-Lin Lee**,

Michigan State University, **Sonja Petrovic**, University of Kentucky, and **Zach Teitler**, Texas A&M University.

Computational Algebraic and Analytic Geometry for Low-dimensional Varieties (Code: SS 48A), **Mika K. Seppälä**, Florida State University, **Tanush Shaska**, Oakland University, and **Emil J. Volcheck**, Association for Computing Machinery.

Conformal Geometry, Twistor Theory, and Integrable Systems (Code: SS 36A), **Dana Mihai**, Carnegie Mellon University, and **George Sparling**, University of Pittsburgh.

Continued Fractions (Code: SS 50A), **James G. McLaughlin**, West Chester University, and **Nancy J. Wyshinski**, Trinity College.

Convex and Discrete Geometry (Code: SS 10A), **Wlodzimierz Kuperberg**, Auburn University, and **Valeriu Soltan**, George Mason University.

Difference Equations (Code: SS 4A), **Michael Radin**, Rochester Institute of Technology.

Discrete Dynamical Systems in Periodic Environments (Code: SS 38A), **M. R. S. Kulenović** and **Orlando Merino**, University of Rhode Island, and **Abdul-Aziz Yakubu**, Howard University.

Dynamical Systems and Differential Equations: Theory and Applications (Code: SS 44A), **Annalisa Crannell**, Franklin & Marshall College, and **Suzanne Sindi**, Brown University.

Experimental Mathematics (Code: SS 27A), **Tewodros Amdeberhan**, **Luis A. Medina**, and **Victor H. Moll**, Tulane University.

Financial Mathematics (Code: SS 42A), **Erhan Bayraktar**, University of Michigan, and **Tim Siu-Tang Leung**, Princeton University.

Function Theoretic Operator Theory (Code: SS 13A), **John B. Conway**, George Washington University, **Sherwin Kouchekian**, University of South Florida, and **William T. Ross**, University of Richmond.

Geometry, Algebra, and Topology of Character Varieties (Code: SS 29A), **Sean Lawton**, Instituto Superior Tecnico, and **Elisha Peterson**, United States Military Academy.

Group Actions on Curves (Code: SS 31A), **Darren Glass**, Gettysburg College, and **Amy E. Ksir**, United States Naval Academy.

Group Actions on Homogeneous Spaces and Applications (Code: SS 57A), **Dimtry Y. Kleinbock**, Brandeis University, **Gregory A. Margulis**, Yale University, and **Hee Oh**, Brown University.

Harmonic Analysis (Code: SS 49A), **Paul A. Hagelstein**, Baylor University, and **Alexander M. Stokolos**, DePaul University.

Heavy-Tailed Behavior: Theory and Applications (Code: SS 28A), **Thomas B. Fowler**, **Marty Fischer**, and **Denise Masi**, Noblis Incorporated, and **John F. Shortle**, George Mason University.

History of Mathematics (Code: SS 17A), **Joseph W. Dauben**, Lehman College, **Karen H. Parshall**, University of Virginia, **Patti Hunter**, Westmont College, and **Deborah Kent**, Hillsdale College (AMS-MAA).

Homotopy Theory and Higher Categories (Code: SS 3A), **Thomas M. Fiore**, University of Chicago, **Mark W. Johnson**, Penn State Altoona, **James M. Turner**, Calvin College, **W. Stephen Wilson**, Johns Hopkins University, and **Donald Yau**, Ohio State University at Newark.

Infinite Dimensional Analysis, Path Integrals and Related Fields (Code: SS 46A), **Tepper L. Gill**, Howard University, **Lance W. Nielsen**, Creighton University, and **Woodford W. Zachary**, Howard University.

Inquiry-Based Learning (Code: SS 35A), **William B. Jacob**, University of California Santa Barbara, **Paul J. Sally**, University of Chicago, **Ralf J. Spatzier**, University of Michigan, and **Michael Starbird**, University of Texas at Austin (AMS-MAA).

Logic and Dynamical Systems (Code: SS 12A), **Stephen G. Simpson**, Pennsylvania State University (AMS-ASL).

Mathematical Models of Biological Structures and Function (Code: SS 32A), **Chandrajit Bajaj** and **Andrew K. Gillette**, University of Texas at Austin.

Mathematics and Education Reform (Code: SS 52A), **William H. Barker**, Bowdoin College, **William G. McCallum**, University of Arizona, and **Bonnie S. Saunders**, University of Illinois at Chicago (AMS-MAA-MER).

Mathematics and Mathematics Education in Fiber Arts (Code: SS 30A), **Sarah-Marie Belcastro**, The Hampshire College Summer Studies in Mathematics, and **Carolyn A. Yackel**, Mercer University.

Mathematics of Computation (Code: SS 43A), **Susanne C. Brenner**, Louisiana State University, and **Chi-Wang Shu**, Brown University.

Model Theoretic Methods in Finite Combinatorics (Code: SS 18A), **Martin Grohe**, Humboldt University, and **Johann A. Makowsky**, Technion Israel Institute of Technology (AMS-ASL).

New Connections Between Topology, Combinatorics, and Physics (Code: SS 23A), **Paul Fendley** and **Slava Krushkal**, University of Virginia.

Noncommutative Algebra (Code: SS 39A), **Greg Marks** and **Ashish K. Srivastava**, St. Louis University.

Nonlinear Evolution Equations and Their Applications (Code: SS 34A), **Gaston N'Guerekata**, **Alexander A. Pankov**, **Guoping Zhang**, and **Xuming Xie**, Morgan State University, and **Zhijun Qiao**, University of Texas Pan American.

Nonlinear Partial Differential Equations and Applications (Code: SS 20A), **Gui-Qiang G. Chen**, Northwestern University, and **Cleopatra C. Christoforou**, University of Houston.

Nonsmooth Analysis in Inverse and Variational Problems (Code: SS 47A), **M. Zuhair Nashed**, University of Central Florida, and **Otmar Scherzer**, University of Innsbruck.

Orderings in Logic and Topology (Code: SS 54A), **Valentina S. Harizanov** and **Jozef H. Przytycki**, George Washington University.

Recent Advances in Mathematical Modeling in Medicine (Code: SS 21A), **David Chan**, **John W. Cain**, and **Rebecca A. Segal**, Virginia Commonwealth University.

Recent Trends in Coding Theory (Code: SS 14A), **Gretchen L. Matthews**, Clemson University, and **Judy L. Walker**, University of Nebraska.

Representation Theory of Lie Algebras and Algebraic Groups (Code: SS 15A), **David G. Taylor**, Roanoke College,

Terrell L. Hodge, Western Michigan University, and **Daniel K. Nakano**, University of Georgia.

Research in Mathematics by Undergraduates (Code: SS 22A), **Darren A. Narayan**, Rochester Institute of Technology, **Jacqueline A. Jensen**, Sam Houston State University, **Carl V. Lutzer**, Rochester Institute of Technology, **Vadim Ponomarenko**, San Diego State University, and **Tamas Wiandt**, Rochester Institute of Technology (AMS-MAA-SIAM).

Role of Generalized Maximal Monotonicity Frameworks in Optimization and Control Theory with Applications (Code: SS 6A), **Ram U. Verma**, International Publications.

SAGE and Mathematical Research Using Open Source Software (Code: SS 2A), **William A. Stein**, University of Washington, Seattle, **David Saunders**, University of Delaware, **David Harvey**, Harvard University, and **David Joyner**, U.S. Naval Academy.

Scientific Computing and Advanced Computation (Code: SS 8A), **Edward Castillo, Jr**, University of California Irvine, **James M. Rath**, University of Texas at Austin, and **Sarah A. Williams**, University of California Davis.

Spectra of Matrix Patterns and Applications to Dynamical Systems (Code: SS 40A), **Bryan L. Shader**, University of Wyoming, **Luz M. DeAlba**, Drake University, **Leslie Hogben**, Iowa State University, and **In-Jae Kim**, Minnesota State University.

Stochastic, Large-Scale, and Hybrid Systems with Applications (Code: SS 26A), **Aghalaya S. Vatsala**, University of Louisiana at Lafayette, and **G. S. Ladde** and **K. Ramachandran**, University of South Florida.

Teichmüller Theory and Low-Dimensional Topology (Code: SS 7A), **Richard P. Kent**, Brown University, and **Madlena Tomova**, Rice University.

The Mathematics of Information and Knowledge (Code: SS 53A), **Ronald R. Coifman**, Yale University, **James G. Glimm**, SUNY at Stony Brook, **Peter W. Jones**, Yale University, and **Stephen Smale**, Toyota Institute.

The Redistricting Problem (Code: SS 51A), **Daniel Goroff**, Harvey Mudd College, and **Dan Ullman**, George Washington University.

The Scholarship of Teaching and Learning (Code: SS 24A), **Curtis D. Bennett** and **Jacqueline M. Dewar**, Loyola Marymount University (AMS-MAA).

Topological Methods in Applied Mathematics (Code: SS 56A), **Yongwu Rong**, George Washington University.

Von Neumann Algebras (Code: SS 37A), **Pinhas Grossman**, Vanderbilt University, and **Remus Nicoara**, University of Tennessee.

Urbana, Illinois

University of Illinois at Urbana-Champaign

March 27–29, 2009

Friday – Sunday

Meeting #1047

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: Expired
For consideration of contributed papers in Special Sessions: December 9, 2008
For abstracts: February 3, 2009

The scientific information listed below may be dated. For the latest information, see `www.ams.org/amsmtgs/sectional.html`.

Invited Addresses

Jacob Lurie, Massachusetts Institute of Technology, *Title to be announced.*

Gilles Pisier, Texas A&M University, *Title to be announced.*

Akshay Venkatesh, New York University-Courant Institute, *Title to be announced.*

Special Sessions

Algebra, Geometry and Combinatorics (Code: SS 10A), **Rinat Kedem**, University of Illinois at Urbana-Champaign, and **Alexander T. Yong**, University of Minnesota.

Algebraic Methods in Statistics and Probability (Code: SS 3A), **Marlos A. G. Viana**, University of Illinois at Chicago.

Complex Dynamics and Value Distribution (Code: SS 11A), **Aimo Hinkkanen** and **Joseph B. Miles**, University of Illinois at Urbana-Champaign.

Differential Geometry and Its Applications (Code: SS 16A), **Stephanie B. Alexander**, University of Illinois at Urbana-Champaign, and **Jianguo Cao**, University of Notre Dame.

Geometric Function Theory and Analysis on Metric Spaces (Code: SS 6A), **Sergiy Merenkov**, **Jeremy Taylor Tyson**, and **Jang-Mei Wu**, University of Illinois at Urbana-Champaign.

Geometric Group Theory (Code: SS 2A), **Sergei V. Ivanov**, **Ilya Kapovich**, **Igor Mineyev**, and **Paul E. Schupp**, University of Illinois at Urbana-Champaign.

Graph Theory (Code: SS 4A), **Alexander V. Kostochka** and **Douglas B. West**, University of Illinois at Urbana-Champaign.

Holomorphic and CR Mappings (Code: SS 9A), **John P. D'Angelo**, **Jiri Lebl**, and **Alex Tumanov**, University of Illinois at Urbana-Champaign.

Local and Homological Methods in Commutative Algebra (Code: SS 13A), **Florian Enescu**, Georgia State University, and **Sandra Spiroff**, University of Mississippi.

Mathematical Visualization (Code: SS 7A), **George K. Francis**, University of Illinois at Urbana-Champaign, **Louis H. Kauffman**, University of Illinois at Chicago, **Dennis Martin Roseman**, University of Iowa, and **Andrew J. Hanson**, Indiana University.

Number Theory in the Spirit of Erdős (Code: SS 14A), **Kevin Ford** and **A. J. Hildebrand**, University of Illinois at Urbana-Champaign.

Operator Algebras and Operator Spaces (Code: SS 8A), **Zhong-Jin Ruan**, **Florin P. Boca**, and **Marius Junge**, University of Illinois at Urbana-Champaign.

Probabilistic and Extremal Combinatorics (Code: SS 5A), **Jozsef Balogh** and **Zoltan Furedi**, University of Illinois at Urbana-Champaign.

Time, Scale and Frequency Methods in Harmonic Analysis (Code: SS 15A), **Richard S. Laugesen**, University of Illinois at Urbana-Champaign, and **Darrin M. Speegle**, St. Louis University.

Topological Field Theories, Representation Theory, and Algebraic Geometry (Code: SS 12A), **Thomas Nevins**, University of Illinois at Urbana-Champaign, and **David Ben-Zvi**, University of Texas at Austin.

q-Series and Partitions (Code: SS 1A), **Bruce Berndt**, University of Illinois at Urbana-Champaign, and **Ae Ja Yee**, Pennsylvania State University.

Raleigh, North Carolina

North Carolina State University

April 4–5, 2009

Saturday – Sunday

Meeting #1048

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 8, 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`.

Invited Addresses

Nathan Dunfield, University of Illinois at Urbana-Champaign, *Title to be announced.*

Reinhard C. Laubenbacher, Virginia Biomathematics Institute at Virginia Tech, *Title to be announced.*

Jonathan C. Mattingly, Duke University, *Stochastically forced fluid equations: Transfer between scales and ergodicity.*

Raman Parimala, Emory University, *Title to be announced.*

Special Sessions

Advancements in Turbulent Flow Modeling and Computation (Code: SS 8A), **Leo G. Rebholz**, Clemson University, and **Traian Iliescu**, Virginia Polytechnic Institute and State University.

Applications of Algebraic and Geometric Combinatorics (Code: SS 2A), **Seth M. Sullivant**, Harvard University, and **Carla D. Savage**, North Carolina State University.

Enumerative Geometry and Related Topics (Code: SS 7A), **Richard L. Rimanyi**, University of North Carolina, Chapel Hill, and **Leonardo C. Mihalcea**, Duke University.

Geometry of Differential Equations (Code: SS 9A), **Thomas A. Ivey**, College of Charleston, and **Irina A. Kogan**, North Carolina State University.

Homotopical Algebra with Applications to Mathematical Physics (Code: SS 3A), **Thomas J. Lada**, North Carolina State University, and **Jim Stasheff**, University of North Carolina, Chapel Hill.

Kac-Moody Algebras, Vertex Algebras, Quantum Groups, and Applications (Code: SS 1A), **Bojko N. Bakalov**, **Kailash C. Misra**, and **Naihuan N. Jing**, North Carolina State University.

Low-Dimensional Topology and Geometry (Code: SS 4A), **Nathan M. Dunfield**, University of Illinois at Urbana-Champaign, **John B. Etnyre**, Georgia Institute of Technology, and **Lenhard Ng**, Duke University.

Recent Advances in Symbolic Algebra and Analysis (Code: SS 5A), **Michael F. Singer** and **Agnes Szanto**, North Carolina State University.

Rings, Algebras, and Varieties in Combinatorics (Code: SS 6A), **Patricia Hersh**, North Carolina State University, **Christian Lenart**, SUNY Albany, and **Nathan Reading**, North Carolina State University.

Worcester, Massachusetts

Worcester Polytechnic Institute

April 25–26, 2009

Saturday – Sunday

Meeting #1050

Eastern Section
Associate secretary: Steven H. Weintraub
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

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Invited Addresses

Octav Cornea, Université de Montréal, *Title to be announced.*

Fengbo Hang, Courant Institute of New York University, *Title to be announced.*

Umberto Mosco, Worcester Polytechnic Institute, *Title to be announced.*

Kevin Whyte, University of Illinois at Chicago, *Title to be announced.*

Special Sessions

Number Theory (Code: SS 4A), **John T. Cullinan**, Bard College, and **Siman Wong**, University of Massachusetts, Amherst.

Symplectic and Contact Topology (Code: SS 1A), **Peter Albers**, Courant Institute of Mathematical Sciences, and **Basak Gurel**, Université de Montréal.

The Mathematics of Climate Change (Code: SS 3A), **Catherine A. Roberts**, College of the Holy Cross, **Mary Lou Zeeman**, Bowdoin College, and **Gareth E. Roberts**, College of the Holy Cross.

Topological Robotics (Code: SS 2A), **Li Han** and **Lee N. Rudolph**, Clark University.

San Francisco, California

San Francisco State University

April 25–26, 2009

Saturday – Sunday

Meeting #1049

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

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Invited Addresses

Yehuda Shalom, University of California Los Angeles, *Title to be announced.*

Roman Vershynin, University of California Davis, *Title to be announced.*

Karen Vogtmann, Cornell University, *Title to be announced.*

Efim Zelmanov, University of California Los Angeles, *Title to be announced.*

Special Sessions

Banach Algebras, Topological Algebras and Abstract Harmonic Analysis (Code: SS 1A), **Thomas V. Tonev**, University of Montana-Missoula, and **Fereidoun Ghahramani**, University of Manitoba.

Concentration Inequalities (Code: SS 3A), **Sourav Chatterjee**, University of California Berkeley, and **Roman Vershynin**, University of California Davis.

Nonlinear Dispersive Equations (Code: SS 4A), **Sebastian Herr**, University of California Berkeley, and **Jeremy L. Marzuola**, Columbia University.

Recent Progress in Geometric Group Theory (Code: SS 2A), **Seonhee Lim** and **Anne Thomas**, Cornell University.

Waco, Texas

Baylor University

October 16–18, 2009
Friday – Sunday

Meeting #1051
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

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Invited Addresses

David Ben-Zvi, University of Texas at Austin, *Title to be announced.*

Alexander A. Kiselev, University of Wisconsin, *Title to be announced.*

Michael C. Reed, Duke University, *Title to be announced.*

Igor Rodnianski, Princeton University, *Title to be announced.*

Special Sessions

Commutative Algebra: Module and Ideal Theory (Code: SS 4A), **Lars W. Christensen**, Texas Tech University, **Louiza Fouli**, University of Texas at Austin, and **David Jorgensen**, University of Texas at Arlington.

Dynamic Equations on Time Scales: Analysis and Applications (Code: SS 1A), **John M. Davis**, **Ian A. Gravagne**, and **Robert J. Marks**, Baylor University.

Mathematical Models of Neuronal and Metabolic Mechanisms (Code: SS 3A), **Janet Best**, Ohio State University, and **Michael Reed**, Duke University.

Numerical Solutions of Singular or Perturbed Partial Differential Equation Problems with Applications (Code: SS 2A), **Peter Moore**, Southern Methodist University, and **Qin Sheng**, Baylor University.

Topological Methods for Boundary Value Problems for Ordinary Differential Equations (Code: SS 5A), **Richard Avery**, Dakota State University, **Paul W. Eloe**, University of Dayton, and **Johnny Henderson**, Baylor University.

University Park, Pennsylvania

Pennsylvania State University

October 24–25, 2009
Saturday – Sunday

Meeting #1052
Eastern Section
Associate secretary: Steven H. Weintraub
Announcement issue of *Notices*: August 2009
Program first available on AMS website: September 24, 2009
Program issue of electronic *Notices*: October 2009
Issue of *Abstracts*: To be announced

Deadlines
For organizers: March 24, 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

Meeting #1053
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

The scientific information listed below may be dated. For the latest information, see www.ams.org/amsmtgs/sectional.html.

Invited Addresses

Spyros Alexakis, Princeton University, *Title to be announced.*

Kai-Uwe Bux, University of Virginia, *Title to be announced.*

Dino J. Lorenzini, University of Georgia, *Title to be announced.*

Eduardo D. Sontag, Rutgers University, *Title to be announced*.

Special Sessions

Constructive Mathematics (Code: SS 1A), **Robert Lubarsky**, **Fred Richman**, and **Martin Solomon**, Florida Atlantic University.

Riverside, California

University of California

November 7–8, 2009

Saturday – Sunday

Meeting #1054

Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of *Notices*: To be announced
Program first available on AMS website: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: April 6, 2009
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

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), **Christopher Hacon**, University of Utah, and **Ziv Ran**, University of California Riverside.

Noncommutative Geometry (Code: SS 2A), **Vasiliy Dolgushev** and **Wee Liang Gan**, University of California Riverside.

San Francisco, California

Moscone Center West and the San Francisco Marriott

January 13–16, 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

St. Paul, Minnesota

Macalester College

April 10–11, 2010

Saturday – Sunday
Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: To be announced
Program first available on AMS website: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: September 10, 2009
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Albuquerque, New Mexico

University of New Mexico

April 17–18, 2010
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 17, 2009
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Notre Dame, Indiana

Notre Dame University

September 18–19, 2010
Saturday – 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: February 19, 2010
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Los Angeles, California

University of California Los Angeles

October 9–10, 2010
Saturday – Sunday
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of *Notices*: To be announced
Program first available on AMS website: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines
For organizers: March 10, 2010
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: Steven H. Weintraub
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: 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: 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 Annual 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

San Antonio, Texas

Henry B. Gonzalez Convention Center and Grand Hyatt San Antonio

January 10–13, 2015

Saturday – Tuesday
Joint Mathematics Meetings, including the 121st Annual Meeting of the
AMS, 98th 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 of Symbolic Logic, with sessions
contributed by the Society for Industrial and Applied Mathematics
(SIAM).
Associate secretary: Steven H. Weintraub
Announcement issue of *Notices*: October 2014
Program first available on AMS website: To be announced
Program issue of electronic *Notices*: January 2015
Issue of *Abstracts*: To be announced

Deadlines

For organizers: April 1, 2014
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Meetings and Conferences of the AMS

Associate Secretaries of the AMS

Western Section: Michel L. Lapidus, Department of Mathematics, University of California, Surge Bldg., Riverside, CA 92521-0135; e-mail: lapidus@math.ucr.edu; telephone: 951-827-5910.

Central Section: **Susan J. Friedlander**, Department of Mathematics, University of Illinois at Chicago, 851 S. Morgan (M/C 249), Chicago, IL 60607-7045; e-mail: susan@math.nwu.edu; telephone: 312-996-3041.

Eastern Section: **Lesley M. Sibner** (until January 31, 2009), Department of Mathematics, Polytechnic University, Brooklyn, NY 11201-2990; e-mail: lsibner@duke.poly.edu; telephone: 718-260-3505. **Steven H. Weintraub** (after January 31, 2009), Department of Mathematics, Lehigh University, Bethlehem, PA 18105-3174; e-mail: steve.weintraub@lehigh.edu; telephone: 610-758-3717.

Southeastern Section: **Matthew Miller,** Department of Mathematics, University of South Carolina, Columbia, SC 29208-0001, e-mail: miller@math.sc.edu; telephone: 803-777-3690.

2009 Washington, DC, Meeting: Bernard Russo, Department of Mathematics, University of California, Irvine, CA 92697-3875, e-mail: brusso@math.uci.edu; telephone: 949-824-5505.

The Meetings and Conferences section of the *Notices* gives information on all AMS meetings and conferences approved by press time for this issue. Please refer to the page numbers cited in the table of contents on this page for more detailed information on each event. Invited Speakers and Special Sessions are listed as soon as they are approved by the cognizant program committee; the codes listed are needed for electronic abstract submission. For some meetings the list may be incomplete. **Information in this issue may be dated. Up-to-date meeting and conference information can be found at** www.ams.org/meetings/.

Meetings:

Important Information Regarding AMS Meetings

Potential organizers, speakers, and hosts should refer to page 95 in the January 2008 issue of the *Notices* for general information regarding participation in AMS meetings and conferences.

Abstracts

Speakers should submit abstracts on the easy-to-use interactive Web form. No knowledge of LaTeX is necessary to submit an electronic form, although those who use LaTeX may submit abstracts with such coding, and all math displays and similarly coded material (such as accent marks in text) must be typeset in LaTeX. Visit http://www.ams.org/cgi-bin/abstracts/abstract.pl. Questions about abstracts may be sent to abs-info@ams.org. Close attention should be paid to specified deadlines in this issue. Unfortunately, late abstracts cannot be accommodated.

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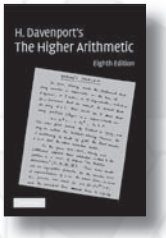

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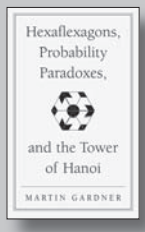
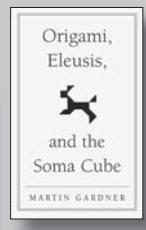
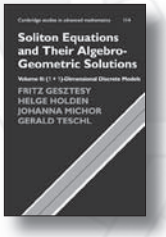




New Volume!

Soliton Equations and their Algebro-Geometric Solutions
Volume 2: (1+1)-Dimensional Discrete Models
Fritz Gesztesy, Helge Holden, Johanna Michor, and Gerald Teschl
Cambridge Studies in Advanced Mathematics
$150.00: Hb: 978-0-521-75308-1: 456 pp.



Soliton Equations and their Algebro-Geometric Solutions
Volume 1: (1+1)-Dimensional Continuous Models
Fritz Gesztesy and Helge Holden
Cambridge Studies in Advanced Mathematics
$123.00: Hb: 978-0-521-75307-4: 518 pp.

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Groups and Analysis
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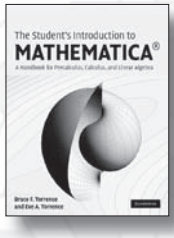
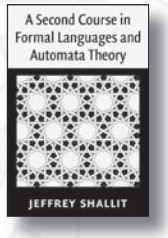
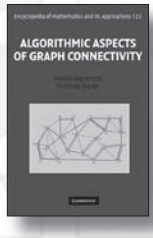


A Second Course in Formal Languages and Automata Theory
Jeffrey Shallit
$60.00: Hb: 978-0-521-86572-2: 260 pp.



Algorithmic Aspects of Graph Connectivity
Hiroshi Nagamochi and Toshihide Ibaraki
Encyclopedia of Mathematics and its Applications
$95.00: Hb: 978-0-521-87864-7: 392 pp.



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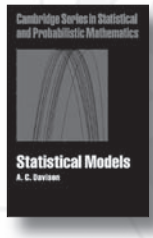

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IMA INDUSTRIAL POSTDOCTORAL FELLOWSHIPS are designed to prepare mathematicians for research careers in industry or involving industrial interaction. IMA industrial postdoctoral fellowships run two years starting September 1, 2009. They are funded jointly by the IMA and an industrial sponsor, and holders devote 50% effort working with industrial scientists and 50% effort on a combination of their own research and the IMA activities. Deadline January 4, 2009.

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