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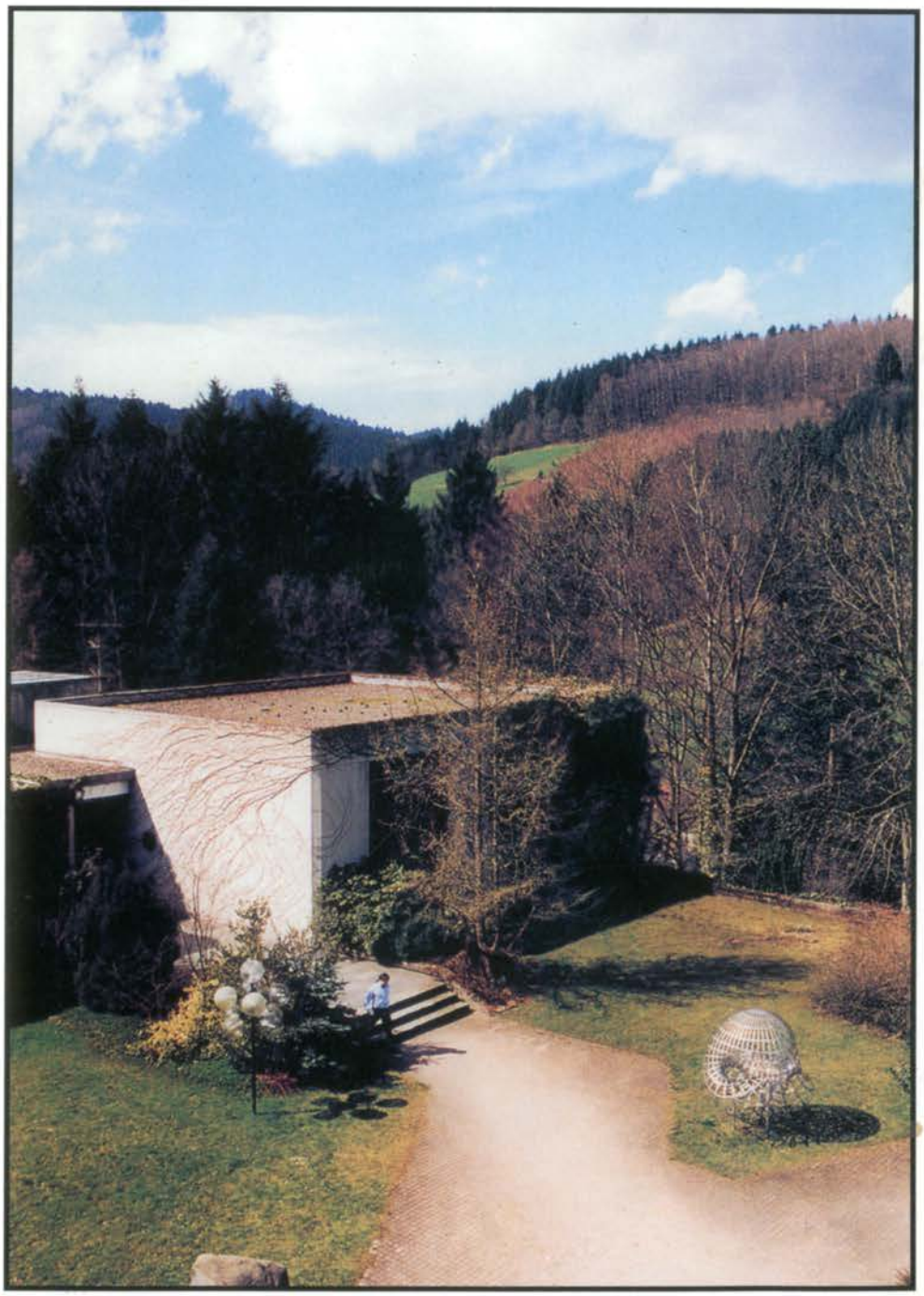

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AMS in the Twentieth Century

Sites of the AMS Headquarters

Naturally enough, as the successor to the New York Mathematical Society the AMS was housed initially in New York City. Everett Pitcher, in his history book, writes succinctly, "During its first fifty years and beyond, the business and editorial office of the Society was at Columbia University in one of several locations. The move of the office of the Society from New York to Providence was connected with three problems of the Society, office space, library, and finances."

The history book by Raymond Archibald gives some perspective on this description. He writes, "For many years the office of the Society was on the top floor of East House at Columbia University. But since the fire hazard there seemed great, arrangements were made for removal to another building, thought safer, where the U. in 1913 provided, and partly furnished, an office. This was destroyed by fire on the early morning of 10 October 1914, with complete loss of files and records and a considerable stock of volumes of the *Bulletin* and *Transactions*. The first ten v. of the *Bulletin* were completely destroyed and also the Council minutes from 1907 to 1914."

The AMS library was begun in 1891, and early volumes were acquired by gifts and by exchanges for the *Bulletin* and *Transactions*. Notable among the gifts were about 500 volumes from J. E. McClintock (second president, 1891–1894) and the first 65 volumes of *Comptes Rendus* from G. W. Hill (third president, 1895–1896). As of 1950 the library was still housed in Low Library at Columbia and had grown to about 13,000 volumes. The library required staff and space, and the AMS was short of office space. The thought was to solve these problems by giving ownership of the library to Columbia in return for more office space. Negotiations with Columbia went slowly.

In 1950, as Pitcher says, the "Council went on record in favor of the purchase of a building, not necessarily in New York, adequate for all the offices of the Society." Brown and Yale were added to the list of universities near which the AMS might relocate. In 1951 the Society sold its library to the University of Georgia for $66,000 and moved to a building at 80 Waterman Street in Providence that was owned by Brown University.

Over the next twenty-three years the Society headquarters moved four times, always in the vicinity of Brown University. In 1968 the AMS moved into a building where it had an option to buy but a few years later chose to build instead. Pitcher writes, "The Society built a one-story building of about 22,000 square feet at 201 Charles Street in an area of redevelopment in Providence and occupied it on 15 May 1974. In an effort to keep the cost down, the structure was not planned to allow for a second story, a decision that one has come to regret. Subsequent enlargements have included two wings totaling 2700 square feet completed in 1978. The interior has been repeatedly remodeled through the use of modular cubicles to accommodate people more efficiently and assure freedom from distraction in working conditions."

In the early 1990s the AMS headquarters building underwent substantial renovations. The warehouse, which had been in one of the added wings, was moved off site to Pawtucket, a city just north of Providence. The transformation of that wing into offices helped considerably to ease space problems. The entrance of the building was moved, and the lobby substantially enlarged. The building now has several small conference rooms for meetings, including one named in honor of Einar Hille (29th president, 1947–1948). To complement the interior design, the Society purchased several works of art and commissioned one, a painting by longtime AMS employee and well-known Rhode Island artist John Riedel. A detail of the painting, which features mathematical themes, appeared on the cover of the September 1999 issue of the *Notices*.

—Allyn Jackson and Anthony Knapp

Commentary

In My Opinion

Raise Salaries, Support Research

President Clinton's proposed federal budget for 2001 includes a substantial increase in funding for basic science research. As National Science Foundation (NSF) director Rita Colwell announced to the Society in her opening banquet address at the Joint Mathematics Meetings in January, the $700 million of new money will include a large increase in the Foundation's Division of Mathematical Sciences Program. The decision to start a major science policy initiative like this one, at this level, obviously depends on many factors, from finances to election cycles. But one component surely has to be the recent willingness of the major scientific societies to present a united front in the effort to educate political policymakers about science-funding needs. The AMS, through both its volunteer leadership and its Washington office and Providence staff, has been a leader in this movement. In addition to regular programs that expose congresspeople and their staffs to the central role of mathematics in modern science and society, the AMS has been a partner and a leader in coordinating joint statements from a wide range of, and widely credible, scientific research associations. AMS leaders and staff deserve credit for helping spark the president's initiative.

The Society has also put some serious resources into these policy education efforts: running that Washington office, for example, costs money for space and people. There is no question that a significant increase in NSF funding for mathematics research (increases of the order of 22 percent are being discussed) will greatly benefit mathematics. NSF should be able to significantly increase its support for initiatives, for pre- and postdoctoral fellowships, for meetings and conferences, for education, and for direct support to investigator-initiated core research. The funding, of course, is not yet in hand. Society members may want to contact their representatives to urge passage of the budget proposal: those represented by Democrats can urge the representative to vote for the president's plan; those represented by Republicans can urge raising the new money, say, to $1 billion. Nonetheless, I want to look beyond to another possible research funding intiative the Society could be engaged in.

About half of the AMS's 30,000 members are graduate students, emeritus members, or foreign associates who live abroad. Of the remainder—that is, the actively employed U.S.-resident mathematicians—a conservative estimate is that half, or 7,500, are currently engaged in mathematics research scholarship. Virtually all have enjoyed at least some indirect support from NSF programs, perhaps at a conference or through a fellowship or travel grant for themselves or their students. Again estimating conservatively, only about 1,500 of these enjoy direct research support for compensation from the NSF. Even if an NSF budget increase translated directly to a proportional increase in the number of mathematicians directly supported by NSF, there would still be considerably less than 2,000 directly compensated.

Now in fact most of the AMS members active in mathematics research (including those with federal research grant support) also have their research directly supported from another source, namely, their employer (usually a college or university), through the mathematician's salary. The Society could, as well, be working for increasing this sort of funding.

I assume that most Society members would be sympathetic to having the AMS invest resources in efforts designed to enhance support for mathematics research through raising mathematics faculty salaries. Identifying projects that would stand a chance of accomplishing this is much harder. Perhaps one place to start would be trying to reprise the Society's role in the federal funding initiative by trying to reach cooperative agreements on the importance of this sort of funding enhancement with other scientific societies.

In any event, the possible benefit to mathematics research from a concerted effort to raise faculty salaries and the large number of Society members whose research could be better served if they were better compensated suggest that this is an area where the AMS should be creating a presence.

—Andy Magid
Associate Editor

Letters to the Editor

Disposing of a Personal Mathematical Library

Recently retired, I now face the daunting task of disposing of a run of 25 years of *Mathematical Reviews* and a professional library numbering more than 1,000 volumes.

Does the Society have any thoughtful advice to help its aging members make rational choices about the disposition of their mathematical libraries? What are the alternatives, and what are the advantages and disadvantages, tax and otherwise, of each? This problem will eventually confront every responsible member of the Society, and competent profession-based advice would be most helpful.

—John E. Wetzel
University of Illinois, Urbana-Champaign

(Received March 31, 2000)

Editor's Note: The AMS cannot provide systematic advice to individuals about disposing of personal mathematics libraries, and the general advice here is from the editor as one person.

Some general alternatives are charitable gift, noncharitable gift, sale, and abandonment. The situation with charitable gifts is more complicated than is at first evident. Some factors that enter into the question are one's goals for the books, realization of money vs. good future use of the books, one's personal finances and estate plan, and the amount of any tax deduction taken on the books at the time of their purchase. Particularly in the case of a relatively large library, it is a good idea to consult attorneys or accountants who can provide the necessary expert advice.

Giving a personal library to a university library sounds like an attractive option, but mathematicians are sometimes disappointed by what happens to their gift. The end result may be a better use of the books if the books are made available for free to the faculty and students in one's department. For a department with available space and with a mathematics library at a fair distance, it may be possible to give a collection of books as a start toward a reading room within the department.

The Internet can provide help that was not readily available a few years ago. Some names of appraisers can be found by beginning with a Web search for "appraise books". There is a network of used-book dealers on the Web, and one can obtain preliminary information about some of these dealers by searching for "used books"; alternatively, one can find a number of used-book listing services at `http://www.bookfinder.com/`.

The value of old issues of *Mathematical Reviews* is basically zero within the U.S. Some mathematicians have shipped their copies to China or to Africa, where there is still a need. Direct contact with a visitor to the U.S. is one way of finding out about a particular need. A shipping cost is involved, and sometimes one can find a charity that will pay that cost.

Distance- and Computer-Learning

I basically agree with Steven Krantz's major claim in his opinion column (*Notices*, May 2000), that "we should be hesitant to undermine or discard the traditional [math education] methods" and alert to the danger that distance- and computer-learning may bring to math education. However, I don't think his reasoning is quite convincing.

On the one hand, the major drawback or flaw that Krantz indicates for distance- and computer-learning actually also applies to traditional teaching and learning. In many cases, doesn't traditional math education, which "places students in a classroom" and lets them "learn from a curriculum," also "value form over substance"? Many kids don't understand math or even hate math just because tons of mathematical "substance" was poured directly from the "trained professional or teacher" into their ears, not to their minds, nor through their own active exploration and construction. This situation is true, especially when Krantz's perspective on the nature of the learning process is considered: *a give-and-take human interaction.* Thus, "the important question" is not which approach is more substantial, but rather lies in the point that Krantz himself raises: *whether students are internalizing and retaining the material.*

On the other hand, computer and network are capable of accomplishing many of the tasks that human instructors can. Krantz provides a list of activities that he thinks of as characteristic of a good human teacher (e.g., "shows the students how to read the subject matter," "sets a pace for the students and evaluates their progress," "adjusts the material to the audience," etc.) while suspecting that a machine cannot do these. Actually, most of these are just the fundamental features that an interactive computer- and distance-learning environment could, or at least in principle should, have. If we try to integrate the experiences of experts/good teachers into a well-designed electronic learning system, isn't it more powerful than an unqualified human "professional or teacher"?

In a mercantile society it is no surprise that the design, publication, or adoption of curriculum materials is often connected with commercial benefits, either for traditional textbooks or innovative educational technology. The major fault should not be attributed to commerce or technologies themselves, but rather to ignorance and its resultant superstition or fear that our provosts, deans, principals, as well as faculty and teachers possess. In my view, technology can never replace the role of creative and inspiring teachers and faculty, but it can supplement their works on many occasions and in many approaches. And it will be extremely challenging, especially for the mediocre ones.

—Xuhui Li
University of Texas, Austin

(Received April 3, 2000)

I would like to reply to Steven Krantz's commentary, "Imminent Danger—From a Distance," in the May 2000 *Notices*.

Krantz is obviously very troubled. He decries efforts to develop

computer-aided mathematics instruction as "alarming" and "dangerous." He conjures up visions of invaders from the Internet who "want to substitute the act of 'logging on' for the productive interaction of first-class minds that takes place in the classroom." He despairs dramatically that "What is at stake is the next generation of mathematical scientists."

I believe this is called "yellow journalism".

And the rhetoric is tired. Yet we keep hearing it from people who seem to have little or no engagement with online learning. Unlike those of us who are eager to see what new technologies have to offer and what new strategies might be developed for mathematics instruction, Krantz seems to believe that he has the process of education all figured out. "The vast majority of today's college faculty...were educated with traditional methods," he claims. Indeed.

I don't see much point in responding sentence-by-sentence to Krantz's distorted polemic. His excesses should be apparent enough.

I would like to say, however, that Krantz does not seem to understand the motivations of the vast majority of the mathematical community engaged in a more considered discourse concerning the costs and benefits of classroom technology. We are not out to destroy mathematics to make a buck. We are not looking for a quick fix. We do not take our responsibilities to students lightly. We are not underqualified. And we are not naive.

Krantz may eventually have to capitulate, just as he did when he could not "consciously" choose calculators for his classroom. I plan to *understand* technology and use it towards better ends. That's what I learned in school. The rest of the rampaging horde, I do trust, can think for itself.

—William Mueller
MathSoft, Inc.
Cambridge, MA

(Received April 13, 2000)

The opinion column on distance-learning (*Notices*, May 2000) reminded me of a silly joke that I told an administrator who was a "believer" in distance-learning. I was interviewing for a job at the time (and actually got the job). There is a distance-learning tool that is versatile, highly portable, universally available, reasonably cheap, and of high quality. It has been around for hundreds of years. Almost every version of this tool has been developed by highly trained professionals. All the advantages of self-paced learning and "no missed classes" are incorporated in it. It's called a book. What does this mean? It means that if the concept of distance-learning was a cure-all, then books would have done the job a long time ago.

The problem is (just as with online materials) that the qualities of a teacher that the associate editor mentions cannot be incorporated. So what if the online stuff "talks", moves, and is in color, etc.? It's the same idea, only with more distractors. Can online materials help? Yes, by addressing learning styles that cannot be addressed in books, we will probably be able to reach a few more students. In my opinion that is good. Online adaptive testing is another opportunity. So is compressed video delivery to a classroom that has another teacher to interact with students, especially in areas where certified teachers and classroom experience are at a premium. But each opportunity sees technology as a support, not a replacement.

What of the dangers of bad materials? The danger is probably similar to that encountered when working with a bad book. There are now plenty of texts that have no focus, value form over substance, etc. (consider the comments of the TIMSS study on the U.S. curriculum). I agree that there is a danger in the extensive "sales jobs" that publishers are now trying to do. Maybe the little story above can get the stars (or dollar signs) out of some people's eyes. After that, pick those materials that work for you and move on.

—Bernd S. W. Schroeder
Louisiana Tech University

(Received April 19, 2000)

Facilitating Getting Mathematics Teachers and Researchers Together

In the April 2000 "Commentary", Mark Saul argues the case for the importance of getting mathematics teachers and researchers together "face to face".

The problem is to facilitate this marriage. The first step could be a *virtual* meeting. Under the flagship of mathematics associations, some talented teachers from high schools, colleges, and universities could be selected to have a lecture, tutorial, or seminar videotaped. Some of the better ones would be put on a Web site.

Subsequently, as a second stage, these lectures could be discussed by the two parties in smaller groups face to face.

This project could become an annual event with different participants. As a spinoff, future generations could inherit a library of lectures presented by talented teachers comparable to the collections of records of great concerts or plays.

—Joseph Hammer
Sydney University

(Received May 29, 2000)

The *Notices* invites letters from readers about mathematics and mathematics-related topics. Electronic submissions are best. Acceptable letters are usually limited to something under one printed page, and shorter letters are preferred. Accepted letters undergo light copyediting before publication. See the masthead for electronic and postal addresses for submissions.

A Sideways Look at Hilbert's Twenty-three Problems of 1900

Ivor Grattan-Guinness

David Hilbert, circa 1900.

As the nineteenth century drew to its close, David Hilbert (1862–1943), then regarded as a leading mathematician of his generation, presented a list of twenty-three problems, which he urged upon the attention of his contemporaries. They have entered the folklore of professional mathematicians; even a partial solution of one of them has given its author(s) much prestige. Two compendia have reviewed progress to the date of their publication: [1] in the former Soviet Union, where study of the problems has been a speciality, and [4] in the United States. In addition, individual problems have been examined in various other books and special articles. Now, at the centenary of the lecture, it is opportune to compare the range of Hilbert's problems against the panoply then evident in mathematics.

Circumstances and Publications

First, some details of the preparation and publication of the list are appropriate. The motivation was the Second International Congress of Mathematicians, held in Paris early in August 1900, which Hilbert was invited to address. He seems to have thought of the topic by December 1899, for he sought then the opinion of his close friend Hermann Minkowski (1864–1909) [17, pp. 118–120], and again in March of another ally, Adolf Hurwitz (1859–1919).[1] But apparently he delayed writing the paper until May or June, so that the lecture was left out of the Congress programme. However, by mid-July he must have sent it for publication by the Göttingen Academy of Sciences, of which he was a member, for Minkowski was then reading the proofs [17, pp. 126–130]; very likely no refereeing had occurred.

Hilbert spoke in the Sorbonne on the morning of 8 August 1900, not in a plenary lecture but in the section of the Congress on bibliography and history; he proposed "the future problems of mathematics," working from a French translation of his text that was distributed to the members of the audience. A summary of it soon appeared in the recently founded Swiss journal *L'Enseignement Mathématique* (Hilbert 1900a)[2]; the original seems not to have been published. For reasons of time he described there only ten problems. The full story was soon out with the Göttingen Academy (1900b); next year it was published again, with three additions, in the *Archiv der Mathematik und Physik* (1901a). This second-ranking research journal is a somewhat surprising location: maybe its editors persuaded him to the reprint in order to raise its

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The author thanks particularly Karen Parshall, Helmut Rohlfing, and David Zitarelli for their help in the preparation of this article.

[1] *Hilbert to Hurwitz, 29 March 1900 (Göttingen University Archives, Mathematical Archive 76, letter 275).*

[2] *This notation refers to an item that is cited in the sidebar.*

prestige as they launched a new series of volumes with the new century.

The preamble and ten of the problems in these versions received an anonymous free and condensed translation, which was published in the *Revue Générale des Sciences Pures et Appliquées* (Hilbert 1901b). The *Archiv* version was translated in full into French for the Congress proceedings by the French mathematician and former diplomat Léonce Laugel, who added a few footnotes of his own.[3] His translation appeared both there and as a separate undated pamphlet under the title *Mathematical Problems* (Hilbert 1902a). Then an English translation of the version was prepared for the *Bulletin of the American Mathematical Society* by Mary Newson (1869–1959) (Hilbert 1902b), completing an initiative taken by H. S. White (1861–1943).[4]

All these manifestations were listed in the reviewing journal of the time, the *Jahrbuch über die Fortschritte der Mathematik*, and the Göttingen version was reviewed. The reviewer was Georg Wallenberg (1864–1924), no less but no more; a teacher at the Technical University in Berlin and co-editor of the *Jahrbuch*: he summarised the general preamble that launched the paper and then copied the titles that Hilbert had given to the problems [22]. Sadly he left out the Fifth, Eleventh, and Fourteenth Problems, so that readers of the *Jahrbuch* learnt about Hilbert's twenty problems!

Table 1 shows the twenty-three problems by short description of their subject matter; where possible I have quoted Hilbert. A full survey of the relevant branches of mathematics is far beyond the scope of this article; indeed, it would require a formidable but worthwhile monograph. Instead, I shall point to some general and particular features of the problems, elaborating on the information in the middle and last columns of the table. I shall refer almost entirely to the full version, noting the three additions. For reasons of space, references are confined almost entirely to literature of the time; many articles in [12] partly fill the historical gaps.

Problems: Range and Definition

Range

The few pages of preamble appraised problems in general and the development of mathematical knowledge as Hilbert saw it; near the end he expressed his optimism with a slogan that he would repeat in later life: "*for in mathematics there is no ignorabimus!*" (Hilbert 1902b, p. 7, italics restored). The modernistic flavour of the problems lay not only in their unresolved status but also in the high status given to axiomatisation in solving or even forming several of them.

Several main branches of mathematics were impressively covered or at least exemplified by problems: number theory and higher and abstract algebra (Hilbert's two main research specialities up to that time), most of real- and complex-variable analysis, and the still emerging branch of topology. Geometry was more patchily handled; in particular, the achievements of the Italian geometers largely eluded him. Apparently untalented in languages, he had trouble reading even technical Italian.

Among problems directly inspired by Hilbert's own work, the Fourteenth Problem grew out of his proofs in the early 1890s that systems of algebraic invariants always possess finite bases. However, he forgot to cite Hurwitz's recent contribution [14]; he apologised to his friend in November 1900 and added a paragraph to the *Archiv* version.[5]

Some problems were handled with great perspicuity. In particular, in the Fifth Problem on the theory of Sophus Lie (1842–1899) of continuous groups of transformations, not only did he pose a specific problem invoking the differentiability of the pertaining functions, but also a broader one about weakening that property. The latter is still far from a general answer; indeed, the pertinent articles in [1] and [4] suggest that the distinction between the two problems is not well recognised.

Hilbert grouped together some problems of similar content. In particular, he pointedly placed as the First Problem questions in the set theory of Georg Cantor (1845–1918), which was just then gaining general acceptance among mathematicians after a somewhat difficult development [7]; then as the Second Problem he proposed an issue in the foundations of mathematics that he was soon to enrich as his "proof theory". Some other bunching of problems can be seen in the table. However, it might have been tighter: the gap between the Eleventh and the Seventeenth on quadratic forms is hard to grasp, and maybe also that between the Nineteenth and the Twenty-third on the calculus of variations.

Definition

From now on, my look becomes rather more sideways. To begin with, Hilbert often proposed a list of problem areas rather than individual ones: for example, those on Cantor and on Lie each form pairs. But he seems not to have thought carefully about the notion of problem as such. Without degenerating into language-games philosophy, one can valuably press distinctions between a problem as such and a research programme, a foundational

[3] *In 1901 a booklet containing the conference timetable and related details was published [9]; this information appeared again in the front matter of the proceedings [10].*

[4] *White to Hilbert, 28 April and 12 May 1902 (Göttingen University Archives,* Nachlass *Hilbert, sec. I, letters 432/3–4). I gather that this collection does not contain any manuscript versions of the lecture or full versions.*

[5] *Hilbert to Hurwitz, 21 November 1900 (as in footnote 2, letter 278). The addition is the second paragraph of the Fourteenth Problem.*

Table 1. Hilbert Problems.

Hilbert Problem (*Archiv* Paper)	Hilbert Problem (Lecture)	Apparent Number Of Problems	In Hilbert *Revue* Paper	Problems/Topics
1	1	2	Yes	Set theory: continuum hypothesis; well-ordering principle
2	2	0?1?	Yes	"Consistency of arithmetic axioms"
3		1	No	Equality of volumes of two tetrahedra of equal base area and height
4		1	No	Shortest line between two points
5		2	No	Lie groups and differentiability of its functions
6	3	0?2?	Yes	"Mathematical treatment of the axioms of physics"
7		1 group	Yes	"Irrationality and transcendence of certain numbers" (e.g., $e^{i\pi z}$, α^{β})
8	4	2	Yes	"Prime number problems": Riemann hypothesis; distribution of primes
9		1	No	General reciprocity law in algebraic number theory
10		1	No	"Decidability of solvability of Diophantine equations"
11		1	No	"Quadratic forms with arbitrary algebraic number coefficients"
12	5	2	No	Generalising theory of field extensions to arbitrary rational domains
13	6	1	No	"Impossibility of solving the general quintic"
14		1	No	Invariants and covariants of rational "function systems"
15		0?1?	No	Rigorisation of enumerative geometry
16	7	2	Yes	Topology of curves; maximal number of limit cycles
17		1	No	Reduction of quadratic forms to sums of squares
18		2	Yes	Filling space with congruent polyhedra; functions definable from differential equations
19	8	1	Yes	Analytic solution of problems in the calculus of variations
20		1	No	General solution of Dirichlet's problem
21	9	1	Yes	Monodromy groups over differential equations
22	10	1	Yes	Relationships between automorphic functions
23		1 group	No	Solubility of problems in calculus of variations, with one or several functions and integrals

examination, and an algorithm. For example, the Twenty-third Problem seeks the "Further development [Weiterführung] of the methods of the calculus of variations." But then why not urge the same for every branch of mathematics? (This branch was so selected because he had recently been drawn to it by the Twentieth Problem on proving the Dirichlet principle, a major issue in potential theory; it is overly present in the list as a whole.[6]) The same query could be made also about the Second ("consistency of ... axioms"), the Sixth ("treatment of axioms"), and the Fifteenth ("rigorisation").

Numerical mathematics ought to have gained a problem or two, especially as it contains many in the proper sense of the term. The Thirteenth Problem on solving the general septic equation was laid out in terms of nomography, a graphical method of handling functional relationships for numerical purposes, but it actually concerned the (im)possibility of reducing functions of several variables to functions of functions of fewer variables.

Missing from the list are two of the most spectacular problems of the time. One is Fermat's Last Theorem of number theory: that

$$(1) \qquad \text{if } xyz \neq 0, \text{ then } x^n + y^n = z^n$$

has no solutions in positive integers if $n > 2$. Maybe it could be squeezed in as a Diophantine equation under the Tenth Problem if the variable n is tolerated, but no such mention was made. The other is the three-body problem in dynamics, especially as posed and examined by Henri Poincaré (1854–1912) in 1889–90 and so formally falling under the Sixth on mechanics. Yet in both the lecture and the full versions they were explicitly mentioned as problems in the preamble but omitted from the lists. So are there twenty-five problems in all?

The Place of Applied Mathematics

The three-body problem should have been recalled in the elaboration of the Sixth Problem; but this raises the issue of applied mathematics in general, which needs separate consideration. In his preamble Hilbert stated that "the first and oldest problems in every branch of mathematics spring from experience and are suggested by the world of external phenomena" (Hilbert 1902b, p. 3). Yet applications were poorly treated in the list: while the Twentieth on the Dirichlet problem was relevant, only the Sixth *explicitly* related to applications, and in unsatisfactory ways over and above not being a proper problem anyway. While he stated "physics" in the title of the Sixth Problem, most of the references then given were to mechanics (perhaps prompted by Minkowski, who had studied physics): the difference between physics and mechanics was elided, although it had been a major theme for the whole nineteenth century.

For physics itself, in the second paragraph Hilbert mentioned the role of probability theory—quite rightly in view of the current development of gas theory and statistical mechanics—but he passed over electromagnetism and the interpretation of Maxwell's equations, long a *major* research area in mathematics. In particular, in the spring of 1900 J. J. Larmor (1857–1942) had published a substantial survey of current knowledge in his *Aether and Matter* [16]. His subtitle admirably conveyed the aim: "A development of the dynamical relations of the aether to material systems on the basis of the atomic constitution of matter including a discussion of the influence of the Earth's motion on optical phenomena": that is, physics, but with mathematics *centrally* involved. A variety of problems emerge from the book concerning elastic properties required of the supposed aether, modes of its excitation, means of approximation to the contraction equations, and the mystery of Maxwell's displacement current.

Presumably Hilbert had not read Larmor's new book; but he must have at least seen the recent survey of electromagnetism by his Göttingen colleague Emil Wiechert (1861–1928), for it had been prepared for the unveiling in Göttingen on 17 June 1899 of a statue to Gauss and Wilhelm Weber [23], an occasion for which Hilbert himself had expounded upon the foundations of geometry (Hilbert 1899). But some months later, when thinking out his Paris address, the subject passed him by: in his lecture, he just proposed

> To establish the systems of axioms of the calculus of probabilities, of rational mechanics and of the different branches of physics, then to found upon these axioms the rigorous study of these sciences

with no elaboration at all (1900a, p. 352). Further, both here and in the full version he never mentioned probability theory again, thus omitting most of its uses and problems, which had also been well surveyed recently [6].

Hilbert had recently given his first lecture course in mechanics (Hilbert 1898), introductory but quite wide-ranging, and from 1904 he was to examine several areas of physics in impressive detail, mostly in lecture courses, though with some publications also [5]. But the title just quoted for the Sixth Problem and the elaboration in the full version suggest that in 1900 he was not very familiar with these branches of mathematics.

Understandable Omissions

Some further omissions are worth noting in order to *defend* Hilbert. He stated no problems for three branches of mathematics that have become well

[6] *The text to the Twenty-third Problem received as an addition to the* Archiv *version the paragraph near the end citing [15].*

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1900a. Problèmes mathématiques, *l'Ens. Math.* (1) **2**, 349–355.

1900b. Mathematische Probleme, *Nachrichten Königlichen Gesellschaft Wissenschaften Göttingen, math.-physik. Klasse*, 253–297; also in [1], pp. 22–80.

1901a. Mathematische Probleme, *Arch. Math. Physik* (3) **1**, 44–63, 213–237; also in (Hilbert 1935), pp. 290–329; also in [2], pp. 247–292.

1901b. Problèmes mathématiques, *Revue Gén. Sci. Pures Appl.* **12**, 168–174.

1902a. Sur les problèmes futurs des mathématiques, in [10], pp. 58–114; translation of (Hilbert 1901a); also issued as undated repaginated pamphlet entitled *Problèmes Mathématiques*, 56 pages.

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1902b. Review of (Hilbert 1899), *Bull. Sci. Math.* (2) **26**, 249–272; English translation in *Bull. Amer. Math. Soc.* **10** (1904), 1–23.

1904. Rapport sur les travaux de M. Hilbert, *Obshchestva Fiziko-Matematicheskago Kazan' Universiteta* (2) **14**, 11–48; expanded version of (Hilbert 1902b) for the Lobachevsky prize competition.

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established in mathematics and its higher education but that in 1900 were not on the normal mathematical scene even though the basic notions and theories were in place. These were matrix theory, mathematical statistics (apart from probability theory), and mathematical logic. Their histories are far too convoluted for even a summary account here,[7] but I cite as historical barometer the *Encyklopädie der mathematischen Wissenschaften*, a vast cataloguing of mathematical theories launched in the mid-1890s under the direction of Hilbert's Göttingen colleague Felix Klein (1848–1925) which was to be published until the mid-1930s. Here too there were no articles explicitly on matrix theory and mathematical logic and only a few on specific topics in mathematical statistics. These theories were to gain popularity, especially from the 1920s onwards, and then play roles in the solution of several of Hilbert's problems.

A more unexpected silence surrounds the application of set theory to mathematical analysis in the manner that Maurice Fréchet (1878–1973) was to call in 1906 "functional analysis", where collections of mathematical functions of given kinds were treated as sets in Cantor's sense and properties such as closure were examined. Such tasks were in the mathematical air in the 1890s, especially concerning Fourier series [21]. The historical irony is that between 1903 and 1910 Hilbert himself was to become intensively occupied with this area in connection with integral equations, which linked tightly to functional analysis (hence the notion of "Hilbert space").

Judgements: Hilbert and Poincaré

The importance of Hilbert's lecture was grasped quite soon after the Congress; for example, Laugel's translation of the full version was published in its proceedings with the plenary lectures although it had not been so delivered [10, p. 24]. But the reaction after the lecture was "a rather desultory discussion," to quote from the report on the Congress prepared by Charlotte Angas Scott (1858–1931) for the *Bulletin of the American Mathematical Society*.[8] Two comments were made. Firstly, the Italian mathematician Giuseppe Peano (1858–1932) remarked that the Second Problem on the consistency of arithmetic was already essentially solved by colleagues working on his project of mathematical logic and that the forthcoming Congress lecture by Alessandro Padoa (1868–1937) was pertinent to it [18]. Unfortunately Hilbert did not make amends in the *Archiv* version (presumably lack of Italian again), but in *L'Enseignement Mathématique* Padoa explicitly discussed this problem in one of the early publications on a Hilbert problem [19]. Secondly, the German mathematician Rudolf Mehmke (1857–1944) made a point about numerical methods that bore upon the Thirteenth Problem on resolving the quintic: it led to a new paragraph in the *Archiv* version citing [8], and Laugel elaborated further in a footnote in his translation (Hilbert 1902a, p. 92).

That was all. Maybe Hilbert's manner of delivery was partly to blame: Scott opined that the "presentation of papers is usually shockingly bad," with monotonic utterance exuding boredom; she gave no names, but hinted that eminent ones were not excluded [20, p. 77]. Two weeks after delivering his lecture, Hilbert did not mention it at all when

[7] *Some details and further historical references can be found in [12], respectively articles 6.6–6.8, 10.3–10.15, and 5.1–5.5. Hilbert's own interest in mathematical logic dates from around 1904 and in (infinite) matrix theory in connection with integral equations a little earlier. The theory of determinants was already well known by 1900.*

[8] *[20, p. 68]; see also [10, p. 21]. The five-page report for* L'Enseignement Mathématique *devoted only five lines to the lecture and none to the discussion [11]. However, the* American Mathematical Monthly *[13] recorded a good reception.*

he reported on the Congress to Hurwitz (who had not attended); indeed, he opined that "the visit was not very strong in either the quantitative or in the qualitative regard," and so may have been disappointed in general.

In this letter Hilbert also mentioned that Poincaré "was manifestly present only by duty of necessity,"[9] so maybe he did not hear the lecture. There seems to be no evidence of Poincaré's reaction to the published versions (or that of Larmor, who attended the Congress); but had he given such a survey himself there rather than muse upon "the role of intuition and logic in mathematics" (Poincaré 1902a), it would have been still broader and certainly stronger on applications. Perhaps Poincaré's (apparent) silence *is* the comment: intuition and applications please, dear colleague, not all this purist axiomatics. Never in the remaining dozen years of his life did he explicitly tackle any of the problems or mention any of them in his own survey (1909) of "the future of mathematics" (compare the title of Hilbert's lecture above) at the Third International Congress of Mathematicians in Rome in 1908. However, he praised Hilbert's work on the foundations of geometry at length, especially in (1902a) and (1904).

Hilbert seems to have conceived his lecture as a counter to the rather bland advocacy of the importance of applied mathematics made in (Poincaré 1898) at the First International Congress of Mathematicians in Zürich in 1897, but he surely swung too much the other way. The brilliance with which Hilbert focused on several specific problems (and "problems") has brought some snow-blindness to the estimation by later mathematicians of the whole collection in its historical context. His former graduate student Otto Blumenthal (1876–1944) (the first in a long sequence of students) passed a good sideways judgement many years later: "Quite few [problems] stem from the general situation of mathematics or from the problem-contexts of other researchers" [3, p. 405]. Hilbert had made a personal selection of problems, and moreover seemingly elaborated at speed and only partially grouped. In his closing remarks in the full version he stated that they "are only samples of problems," though he also claimed that they showed "how extensive is the mathematical science of today." The glamour that was to be bestowed on his selection may have distorted priorities somewhat in the development of mathematics during the twentieth century.

[9] *Hilbert to Hurwitz, 25 August 1900 (as in footnote 1, letter 277). The contexts of the translated passages read: "Der Besuch war nicht sehr stark weder in quantitativer noch in qualitativer Hinsicht," and "Poincaré war offenbar nur der Notwendigkeit gehorchend anwesend; bei den Schlussbanquet fehlte er, obwohl er präsidiren sollte" (compare [20, p. 74]). In September 1900 Hilbert reported on the Congress at the annual meeting of the* Deutsche Mathematiker-Vereinigung, *when he was elected chairman for the next twelve months (*Jahresbericht, *7 (1900–01), pp. 4–5, 7: no details are given).*

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Oberwolfach, Yesterday and Today

Allyn Jackson

Of all the world's mathematics institutes, the Mathematisches Forschungsinstitut Oberwolfach is certainly one of the most beloved. Traditionally referred to simply as Oberwolfach, after the tiny hamlet of Oberwolfach-Walke in which it resides, the institute is perched on a hillside in a lovely valley of Germany's Black Forest. This international center has in its more than fifty years of existence served as the site for some 3,000 meetings, drawing mathematicians from all over the world. Founded in the final months of World War II, the institute was originally intended to bolster the Nazi war effort. Instead, it became a meeting place where German mathematicians could heal the severance of international contacts that occurred during the war. In recent years new historical details have come to light that add depth and poignancy to the story of this remarkable institute.

An Institute Is Founded

In 1942, in the midst of World War II, Germany began investing in scientific research as a way to try to ensure a victory, which by then had begun to seem increasingly unlikely. As a result, several *Reichsinstitute* (National Institutes) were founded with the purpose of carrying out scientific and technological research to assist the war effort. Mathematician Wilhelm Süss, rector of Universität Freiburg and president of the Deutsche Mathematiker Vereinigung (DMV, German Mathematical Society), capitalized on this situation to create an institute for mathematical research. Avoiding the possibility of air raids was a prime criterion in deciding the location, and so a former Black Forest hunting lodge, known as the Lorenzenhof, became home for the Reichsinstitut für Mathematik in September 1944.

Who was Wilhelm Süss? Compared to his German contemporaries of the 1930s, which included Richard Courant, Helmut Hasse, Carl Ludwig Siegel, John von Neumann, Hermann Weyl, and others, Süss was not an outstanding mathematician. But through his administrative, organizational, and political skills, Süss had an important influence on mathematics in Germany. Some held exalted opinions of Süss; for example, Alexander Ostrowski wrote in a glowing obituary upon Süss's death in 1958 [2], "Certainly no one since Felix Klein has done so much for German mathematics as Wilhelm Süss." A history of the founding of the institute, written by Süss's wife, Irmgard Süss [3], paints a picture of a man who braved treacherous Nazi politics to create a haven where mathematicians could be protected from the war and continue their research. Volker Remmert, a historian of mathematics at Universität Mainz, noted that a kind of "sainthood" has enveloped memories of Süss. However, the truth about Süss's career is more complex than the idealistic portraits of him would suggest.

Shortly after Matthias Kreck became director of the Oberwolfach institute in 1994, he received a letter from an historian requesting access to the institute archives. Unaware of their existence, Kreck eventually located the archives tucked away in a cellar in one of the institute buildings. There he found not only documents pertaining to the founding of

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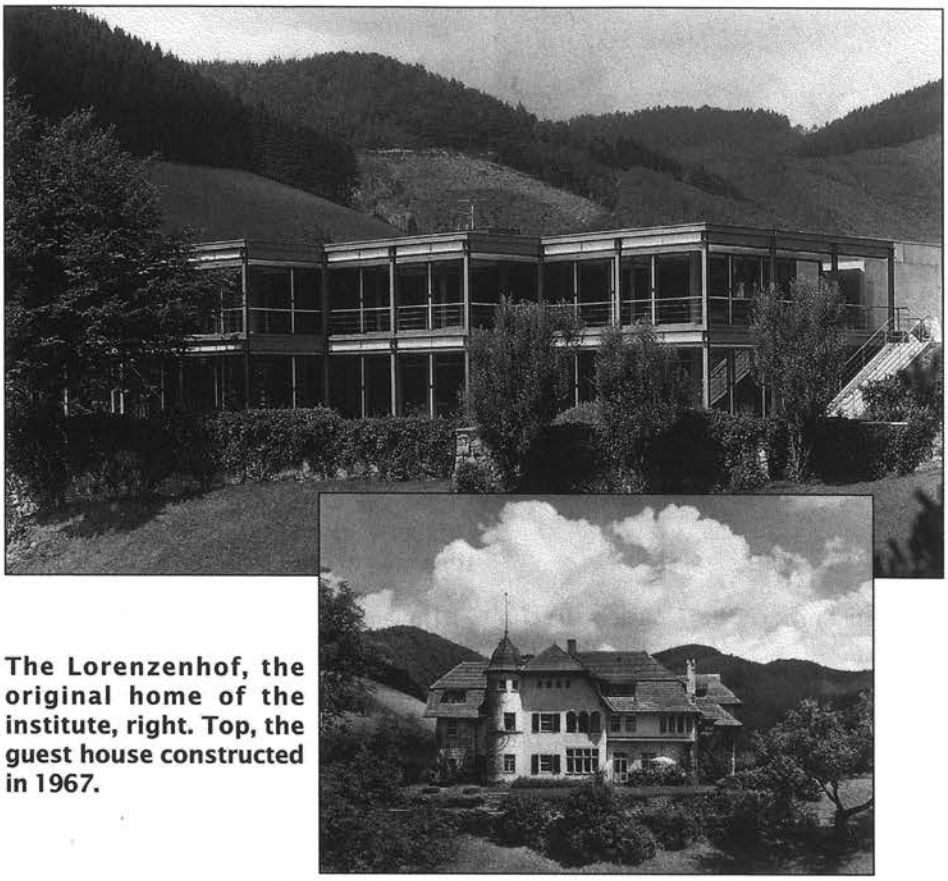
the institute, but also personal papers of Süss and records of the DMV dating from World War II. The material has since been transferred to archives of Universität Freiburg. Remmert is the person most familiar with the archive, and he has written a number of papers based on their content, including one, published just this year, that describes some of Süss's actions during the war [4].



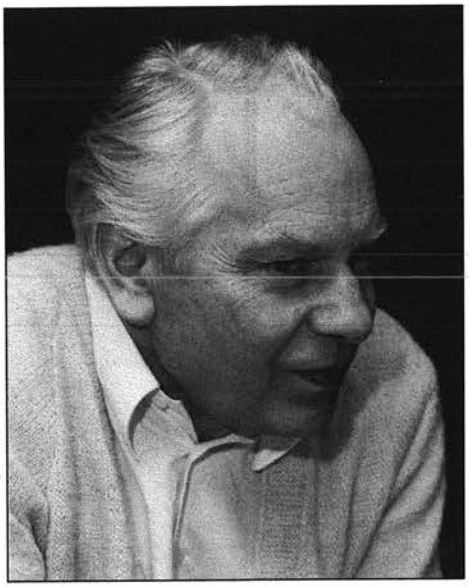
The Lorenzenhof, the original home of the institute, right. Top, the guest house constructed in 1967.

Süss was a geometer who wrote his doctoral thesis in 1920 at Universität Frankfurt, under the direction of Ludwig Bieberbach. The two remained close colleagues after Bieberbach embraced Nazi ideology in the early 1930s. Bieberbach and the mathematician Theodor Vahlen together founded the journal *Deutsche Mathematik*, which published, in addition to bona fide mathematics papers, Nazi propaganda dressed up as research. Bieberbach and Vahlen were at the extreme end of the spectrum in their explicit, outspoken promulgation of Nazi views. Where Süss is to be found in this spectrum is less clear. Remmert's research shows that, as DMV president, Süss took the initiative in expelling Jews from the membership. Did he do this out of anti-Semitism? Or did he hope to prevent Bieberbach's own, more extreme, union of mathematics teachers from gaining ascendency? Or did he simply want to consolidate his political power? The answer remains unclear. Remmert's investigations have uncovered various actions on the part of Süss that seem to align him with Nazi views but for which his motivations are unclear. The complete truth will probably never be known, especially because certain documents are missing from the archive. "It is clear the files have been cleaned," Remmert noted.

With the end of the war just six months away, the Reichsinstitut für Mathematik was established in the Lorenzenhof. Because of the importance the government attached to the institute, Süss was able to bring his family there, as well as mathematicians recalled from military institutions, some of Süss's colleagues from Freiburg, and even one French mathematician who had been kept as a prisoner of war. In this way about twenty people survived the end of the war safe in a mathematics institute. Irmgard Süss's history tells a tale of courage and camaraderie in those final days: the problem of securing food and heating; the preparations for flight in case the Lorenzenhof was attacked; the eventual occupation of the lodge; and, once the war was officially over, the frantic burning of books on National Socialism that had been stored in the house.

Among the mathematicians living there were the complex analyst Heinrich Behnke and the topologists H. Seifert and W. Threlfall. The founding document for the institute, signed by one of the highest Nazi officials, Hermann Göring, shows clearly that the government wanted the institute to focus on research directly related to the war effort. In any case, it appears that the mathematicians who worked there in the first few months, while mathematical work was still possible, did not feel constrained to concentrate on topics having military applications.

After the war, during the "denazification" period, Süss was suspended from Universität Freiburg for two months during the summer of 1945, but afterward resumed his position and remained director of the institute. One reason he was not treated more severely was that few knew about his actions during the war, as he was careful to carry them out quietly and only with the help of trusted colleagues. In addition, gratefulness for the good things he did likely played a role. The institute lost its funding from the national government but was able to keep going with a small amount from the state government of Baden. Süss worked hard to make the institute truly international. Indeed, Oberwolfach played an important role in the rebuilding of mathematics in Germany after the war by serving as a place for meetings between German mathematicians and their colleagues abroad. On



Martin Barner, Oberwolfach director from 1963 to 1994.

the initiative of Behnke and his longtime colleague Henri Cartan in Paris, French and German mathematicians reestablished contact in meetings at Oberwolfach in the early years after the war. Another important figure from that era was the algebraist Reinhold Baer, a Jew who had been expelled from his job at Universität Halle in 1933. He was a professor at the University of Illinois at Urbana-Champaign and then moved back to Germany to take a position at Universität Frankfurt in 1956. Starting in the early 1950s, Baer organized many meetings at Oberwolfach. Sustaining the institute after the war "was really a brilliant thing," Remmert remarked. Under the circumstances of the times,"I doubt that any other mathematician in Germany could have done it." Although Süss did many ethically questionable things during the war, what he did after the war was good for mathematics.

Süss died rather suddenly of liver cancer in 1958 at the age of sixty-three. His close colleague Hellmuth Kneser served as director of the institute for a short period and was succeeded by Theodor Schneider in 1959. That year the Gesellschaft für Mathematische Forschung (Society for Mathematical Research) was founded to provide a permanent legal basis for the Oberwolfach institute, and the society continues in this capacity today. But it was Martin Barner of Universität Freiburg, director from 1963 to 1994, who put the entire enterprise on a secure foundation. Barner "really built up this professional place which we see now," Kreck noted. "He had all the ideas, the vision, of a really big center." During Barner's tenure, the institute obtained funding from the Volkswagen-Stiftung (Volkswagen Foundation) for the construction of a new building to house visitors. Finished in 1967, the building enabled the institute to greatly expand its activities. At that time, the beloved Lorenzenhof still stood on the institute grounds. Unfortunately, in addition to deteriorating badly, the old lodge provided insufficient space for the library and for lectures. It was demolished in the early 1970s and was replaced, again with support of the Volkswagen-Stiftung, by a new building, which now contains the library, lecture rooms, and staff offices. Barner, who is now retired, lives in the Black Forest about an hour's drive from the institute.

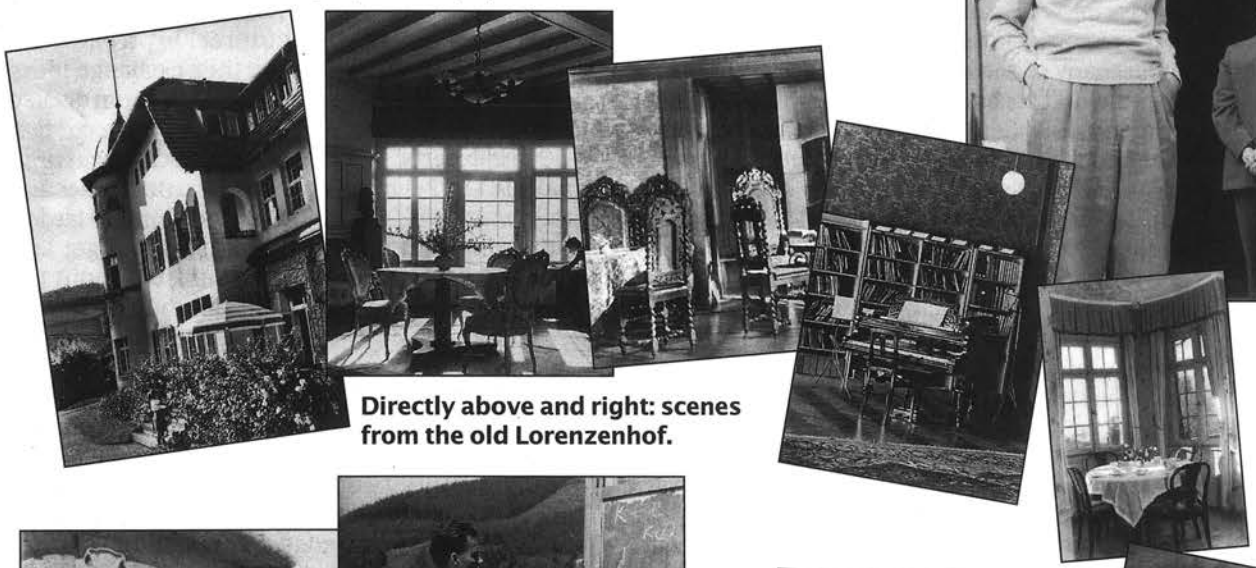
Mathematical Traditions at Oberwolfach

Right after the war there was no formal program of meetings at Oberwolfach. Accommodations were rather rustic: visitors had to bring their own food and collect firewood. As is clear from the institute's photo albums, the atmosphere in the Lorenzenhof was informal, even familial: one photo shows an exuberant Samuel Eilenberg dancing a jig (the photo is unfortunately too blurred to be reproduced). The first organized meetings took place in 1949. One of them, held in August that year, brought together young French and German mathematicians, including two Fields Medalists in the making, René Thom and Jean-Pierre Serre. A highlight was a lecture by Jean Dieudonné about the work of the Bourbaki group, which was very active in France at the time. Some of the early visitors ended up having long associations with the institute. While still in high school around the end of 1944, Kurt Leichtweiss, who was said to be a mathematical prodigy, went to the institute with his father for an examination by the mathematicians there. The youngster followed their encouragement to study mathematics, and in 1949 he spent several weeks at the institute writing his dissertation. From 1966 until 1982 Leichtweiss was a coorganizer of the annual geometry meeting at Oberwolfach. Now retired, he was a professor at Universität Stuttgart, which is one of the universities closest to Oberwolfach.

From 1949 to 1953 three to five meetings were held every year; the number increased to about a dozen per year after Süss secured funding from the federal government. An infusion of funds from the Fritz-Thyssen Foundation in the early 1960s increased the number of meetings to around twenty per year. But it was really the construction of the guesthouse in 1967 that brought the institute into full bloom. The year before the building was finished, eight hundred people attended meetings at Oberwolfach; the next year, the number more than doubled. From that point forward, Oberwolfach became the world's mathematical meeting place par excellence. Today it maintains the pattern that evolved in the 1960s of holding one conference per week almost every week of the year. It has also retained its international profile: nowadays one-third of visitors are from Germany, one-third from the rest of Europe, and one-third from the rest of the world. About a quarter of all visitors come from the United States.

In the world of mathematics institutes the one most similar to Oberwolfach is the Centre International de Reconcontres Mathématiques in Luminy, France; in fact, that center was founded in 1965 as the "Oberwolfach français". These two institutes differ from, for example, the Institut des Hautes Études Scientifiques or the Max-Planck-Institute für Mathematik, where the scientific traditions are shaped strongly by the permanent

Top, left:
Oberwolfach, summer 1949,
left to right: René Thom, Jean Arbault, Jean-Pierre Serre, unidentified, Jean Braconnier, and Georges Reeb. Top, center: Hellmuth Kneser working outdoors, summer 1952. Top right: Institute founder Wilhelm Süss (left) and Georges Reeb, August 1953. Far right: Jean Dieudonné (left) and Jacques Tits, April 1955.



Directly above and right: scenes from the old Lorenzenhof.

Photos directly above, left to right:
Alexander Ostrowski, June 1964; Ferdinand Veldkamp lecturing al fresco, 1962; Paul Erdős at Oberwolfach, 1964; Tonny Springer lecturing outdoors, 1962; and Samuel Eilenberg (left) and Henri Cartan, summer 1964.

faculties' research interests. Oberwolfach, by contrast, has no permanent scientific faculty (apart from the director), and a new batch of mathematicians comes through every week. The topics of the meetings range all over the mathematical map, including the field's borders with other sciences, such as physics, biology, medicine, and astronomy.

Despite this diversity, certain traditions have built up at Oberwolfach over the years. Number theory, for example, has been the topic of meetings held every year or two since the mid-1950s. Helmut Hasse, Peter Roquette, and Theodor Schneider were among the early organizers; today biannual number theory meetings are organized by Christopher Deninger and Peter Schneider of Universität Münster and Anthony Scholl of University of Durham. Gerhard Frey of Universität Essen, who has attended about fifty meetings at Oberwolfach since his first one in 1967, was an organizer of the number theory meetings for several years. At these meetings, as well as at the meetings in arithmetic geometry, he learned about many of the most important developments in the field. For example, at an Oberwolfach meeting in August 1983 Gerd Faltings presented his proof of the Mordell Conjecture, which had been completed only a few months before. Barry Mazur's work in the late 1970s on the strong restrictions on torsion goups of elliptic curves, which was the subject of a one-week meeting at Oberwolfach, "was a great stimulus to me," Frey recalled. This work contributed to the discovery of the so-called Frey curve, which is the linchpin of Kenneth Ribet's work linking Fermat's Last Theorem to the Taniyama-Shimura-Weil Conjecture. Although legend has it that Frey first presented his eponymous curve at Oberwolfach, he said the legend is not quite true. Although he discussed it in an informal evening talk at Oberwolfach in 1984, it was a lecture he gave at Oberwolfach in February 1985 that led to Ribet's learning about the curve.

In addition to the series of meetings on number theory, there have also been long-standing series in other broad areas, such as topology, dynamical systems, geometry, logic, function theory, and stochastics. Such series of meetings serve an important function by providing a consistent forum in which new results are presented. On the other hand, the meetings can grow stale and unexciting, especially if they are always organized by the same people. "When I started here there was a mixture, with rather many series of meetings," Kreck recalled. He has since worked to shift the balance. "Of course, if the world leaders organize meetings here for twenty years, we are happy. But typically we always want to have fresh blood on the organizing team." The only meetings still held every year are the one in stochastics, and the one in Kreck's own area of topology. He explained that the organizing committees of these meetings, by changing their membership regularly, have come up with meetings proposals that compete well against other proposals. Some of the other long-standing meetings, such as that in number theory, are still held but not every year, and they too must regularly bring in new organizers.

While the main business of Oberwolfach is the regular week-long meetings, around forty-five of which are held each year, there are also other activities. One, called the *Arbeitsgemeinschaft* (the literal translation is "working team"), is held twice a year and has roots going back to the late 1950s. The purpose of the Arbeitsgemeinschaft is to bring together people who wish to learn about a particular topic and who are not experts in it. Once the topic is chosen, the leaders of the Arbeitsgemeinschaft choose one or two experts on the topic who map out a plan for a week of lectures to introduce the main ideas. But it is not the experts who deliver the lectures; it is the participants. To take part in the meeting, one must volunteer to speak, and participants typically learn a good deal about an aspect of the topic in order to prepare their lectures. During the meeting they exchange ideas with other participants, who may come from diverse areas of mathematics, and they also have contact with the experts. The Arbeitsgemeinschaft was originally led by Peter Roquette and Martin Kneser and later on by Wulf-Dieter Geyer and Günter Harder; today the leaders are Christopher Deninger and Peter Schneider. What is most unusual about the Arbeitsgemeinschaft is the way in which the topics are chosen. On an evening during the meeting one of the Arbeitsgemeinschaft leaders assembles the group for a program discussion. In the first stage of the discussion people simply throw out suggestions for topics. At a recent discussion Deninger fielded twenty-two suggestions; many were in algebraic number theory and arithmetic geometry, but there was a wide range, from quantum electrodynamics to foliations to operads. The animated reactions ranged from dismissive snorts of laughter to respectful nodding of heads. A system of repeated votes whittles the list down to two: the chosen topic (in this case, "moonshine") and a backup.

Another activity at Oberwolfach is a series of advanced courses, formerly called DMV Seminars and now called Oberwolfach Seminars. These courses, which form the basis for a book series published by Birkhäuser, are designed to introduce young people to a currently active area of research. Since becoming director, Kreck has introduced two new activities at Oberwolfach. The first, supported by the Volkswagen-Stiftung, is called Research in Pairs, or RiP. (Compounding the morbidity of the acronym is the fact that the participants are sometimes referred to as "Rippers".) Under this program, pairs of researchers work together at Oberwolfach for periods ranging from two weeks to three months.

The only stipulation is that they cannot be from the same institution. Kreck has also introduced a new program of "miniworkshops", to start in 2001. The regular meetings, as well as the Arbeitsgemeinschaften, typically have forty or fifty participants; by contrast, the miniworkshops will have only ten or twenty participants who will work together on a particular problem or learn about a new development. Three miniworkshops will be held in parallel during each of three weeks during the year. Kreck said he has the impression that these new activities are not well known, and he would like to encourage people, particularly those from the U.S., to apply to participate in them.

Running the Institute

For the regular one-week meetings at Oberwolfach, participation is by invitation only. However, after the topics of the meetings are made public, it is possible to write to the director to request an invitation. Not all invitees speak at all meetings, and in particular there is an unwritten rule that organizers do not speak except in unusual circumstances. Any person or group can submit a proposal to organize a meeting; for each week of the year, the institute typically has two or three meeting proposals competing for the slot.

Decisions about proposals are made by Oberwolfach's twenty-member scientific board. To keep travel costs down, all the board members are from Europe. Eighteen are from Germany or the German-speaking part of Switzerland, and all are German-speaking. Kreck said that there is no formal rule limiting board membership to German speakers but that this de facto limitation facilitates communication in delicate matters. Batches of proposals are farmed out to the board members according to their areas of expertise. Then, at an intense one-day meeting of the board each October, proposals are selected to fill an entire year; for example, at the board meeting in October 2000 the program for the whole of 2002 will be fixed. This long lead-time means that the institute is sometimes slow in responding to new developments. As Kreck pointed out, "There is a positive effect of having this time lag: we don't jump onto every fashion." However, the institute has responded to the need for flexibility by establishing the miniworkshops, for which proposals need to be received only six months in advance.

When it comes to selecting proposals and setting institute policy, Oberwolfach's scientific board has the final word. However, the director also has considerable influence. For example, Kreck has strongly encouraged organizers to limit the number of talks given during meetings in order to free up time for informal interactions. Tension has sometimes arisen over invitee lists, as organizers eager to invite all their colleagues run afoul of Kreck's insistence that meetings not become too large. Kreck has also instituted a rule that the organizing committee for every meeting must have at least one non-German member; in fact, these committees are not required to have any Germans at all.

Current Oberwolfach director Matthias Kreck.

As with many mathematics institutes, funding for Oberwolfach is somewhat precarious. Kreck said that it costs around 3 million DM (about US$1.5 million) to run the full program of meetings each year. The primary source of funds continues to be the state of Baden-Württemberg, though economic difficulties have reduced the state's contribution by about one-third over the past eight years. It is surprising that Oberwolfach relies mostly on state funding rather than on funding from higher levels of government. For example, the institute receives no funding from the Deutsche Forschungsgemeinschaft (DFG), the major science-funding agency of the German government. The reason, Kreck explained, is that DFG offers only short-term funding rather than the long-term funding the institute needs. The Max-Planck-Gesellschaft (Max Planck Society), another major sponsor of research in Germany, supports many institutes, but these generally have a very differnt character from Oberwolfach. Oberwolfach also does not fit the mold of any of the science programs funded by the European Union.

Funding from private sources has partially made up for the shortfall in recent years. For example, the RiP program is presently supported by the Volkswagen-Stiftung; it will be continued with funding from the state of Baden Württemberg for three more years. A special grant, which ended this year, came from the Möllgaard-Stiftung to support the library. A substantial number of the Japanese visitors to Oberwolfach are funded through a special grant from the Japanese Association of Mathematical Sciences (of which the Fields medalist Heisuke Hironaka is president). In 1992 the Verein zur Förderung des Mathematischen Forschungsinstitutes Oberwolfach (Society of Friends of the Mathematical Institute Oberwolfach) was founded to encourage donations by individuals and corporations. The lack of a tradition of charitable giving in Germany makes this kind of fundraising difficult. Nevertheless, the society has raised funds for the Oberwolfach Prize of 10,000 DM, presented to a young European mathematician every two to three years. A year and a half ago, the society established the Oberwolfach

Foundation with the goal of starting an endowment to help support the institute.

When he became director, Kreck streamlined a complicated system whereby visitors paid for part of their accommodations and were reimbursed for train travel within Germany only. Today visitors receive free housing and meals, and travel expenses are covered only for meeting organizers. The bulk of the yearly budget goes into visitor accommodations, including a ten-person cleaning and kitchen staff. Approximately ten more staff attend to administration, computers, and the library. When money gets tight, Kreck said, he cuts corners by not doing maintenance on the buildings. So far the institute's library, which after forty years' careful tending is perhaps one of the top mathematics libraries in the world, has not suffered major cuts. However, Kreck said that, with the ending of the grant from the Möllgaard-Stiftung and with rises in journal prices, he may have to cut a substantial part of the library's 430 journal subscriptions unless he can find a new source of funds. "This is one of the few libraries that is more or less complete," he noted, "and once we have to cut, it will never again be on this level." The institute has an easier time with monographs than with journals: It has agreements with several of the major mathematics publishers to receive free books in exchange for displaying the books in the library's downstairs lobby.

The excellence of the library is one reason visitors love this institute: Not only is it unnecessary to bring stacks of books and papers to meetings at Oberwolfach, but many find there items unavailable at their home institutions. Another reason visitors love Oberwolfach is that it provides for all basic needs, leaving them able to devote their full attention to mathematics. There are two lecture rooms in the library building plus a seminar room. Most visitors stay in the main guesthouse, which has clean and simple rooms with beds, a desk, and a bathroom. A 1989 addition to the guesthouse includes an additional seminar room plus eight apartments designed for longer stays, which have living rooms and kitchens. There are also five more apartments in a separate building. Breakfast, lunch, and dinner are served family-style in the institute dining room in the main guesthouse. For meeting organizers there are essentially no logistical details to attend to, so they need focus only on assembling the list of participants to invite.

The administration of the institute runs like clockwork, and it can sometimes be just as inflexible. For example, Oberwolfach has settled into a regimented schedule in which meetings must be held Monday through Friday and guests must clear out on Saturday. The schedule sometimes makes meetings difficult for those who travel by plane and need a Saturday-night stay to get a reasonable airfare, or for Germans who teach during the week. When a guest must stay over Saturday, the institute will reserve a room at a nearby hotel or try to provide an additional night's stay. But changing the meeting schedule would mean coming up against long-standing German traditions about workdays: Kreck explained that getting a cleaning and kitchen staff to work on Sunday would be prohibitively expensive and, given the isolated location of the institute, perhaps impossible.

The out-of-the-way location also brings some inconveniences; for example, the nearest cash machine is a one-hour walk from the institute, in the neighboring village of Oberwolfach-Kirche. But most visitors welcome the isolation, which is heightened by the absence of televisions, radios, and telephones in the guestrooms (the apartments, because they are designed for longer stays, have telephones). There is also a sense of relaxed informality at Oberwolfach that is no doubt inspired by the bucolic views of the Black Forest and by the fresh, woodsy air. This sense is deepened by the dining room ritual of randomly mixing up the seating of the visitors for lunch and dinner and by the fact that there are no locks on the doors of the guestrooms. Groups of mathematicians in animated discussion can be found strolling through the woods during the hike that takes place every Wednesday. A bus excursion is a possible substitute in case of wet weather, but usually participants just tote their umbrellas and get happily soaked. Some afternoons soccer games are arranged on an open field next to the sparkling Wolf River. The library building has a music room equipped with a grand piano, violin, cello, and guitar, and often participants organize impromptu concerts during meetings. In the evenings visitors can be found gathered in small groups all over the library or the dining room. Drinks and snacks are available by a convenient honor system whereby one enters on a logsheet what one consumes and puts payment into a cash box. Photocopying and printing are handled in the same, unfussy way.

Amid the serene hills of this Black Forest valley, it is difficult to imagine those final days of the war, when twenty people holed up at the Lorenzenhof, wondering where their next meal would come from and laying plans for escape should an army come through. What is easier to imagine is the inspiration for establishing a mathematics institute here in a place so suited to contemplation. The strange brew of impulses, sinister and idealistic, out of which the institute was born in 1944 today gives visits there an affecting resonance.

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Photographs on page 763 and the cover courtesy of Allyn Jackson. All other photographs courtesy of the Mathematisches Forschungsinstitut Oberwolfach.

About the Cover

This photograph shows one of the buildings of the Mathematisches Forschungsinstitut Oberwolfach, with a view of the Schwarzwald (Black Forest) in the background. This building houses the library, the main seminar rooms, and the administrative offices. On the right in the foreground is a metal sculpture of Boy's surface, a gift to the institute from Daimler-Benz. An article about the sculpture "Die Boysche Fläche in Oberwolfach," by Hermann Karcher and Ulrich Pinkall, appeared in the *DMV-Mitteilungen*, **1** (1997), pages 45-47.

—*A. J.*

Anneli Cahn Lax (1922–1999)

Mark Saul

Anneli Lax

Anneli Lax's life ended on September 25, 1999—a life filled with service and friendship to the mathematical community. Lax was a gifted mathematician, a master of language, a remarkable teacher. Yet the defining characteristic of her life was perhaps not any of these gifts, but rather how she used them. She seemed to have an inner drive to share with others what she could do, and this drive led her from one endeavor to another in the service of mathematics and mathematicians.

Lax the Mathematician

Anneli Cahn was born in Katowice, then a German city, but now part of Poland, on February 23, 1922. Her family fled Hitler's regime in 1935 and settled in New York. She married Peter Lax, a fellow mathematician, in 1948. Their lives together included a shared love for mathematics.

Anneli Lax earned a bachelor's degree from Adelphi University in 1942 and moved on to graduate work at New York University (NYU). She received a Ph.D. in 1955 with a thesis done under the supervision of Richard Courant. The title was "On Cauchy's problem for partial differential equations with multiple characteristics", and it was published in *Communications on Pure and Applied Mathematics* in 1956. She rose through the faculty ranks at NYU to become a professor in 1961; she retired in 1992. (See the sidebar for a synopsis of her mathematics research.)

Lax the Editor

Lax's gift for language showed early in her career. Among other projects, she helped translate into English Courant and Hilbert's book *Mathematical Methods of Physics*. In a 1992 interview in *Focus* she remarked: "Courant often asked me to edit things that other people had written. In fact, he claimed that he hired me because I seemed more literate than most people. In the fifties, publishers didn't have people who could do mathematical copy editing. ...I ended up doing everything. I even made page dummies. That was kind of fun: it was like playing with paper dolls."

Lax's greatest contribution to mathematical literature was triggered by a very different sort of event. The launch of the Soviet satellite *Sputnik* in 1957 was a shock to the American scientific community, a shock felt on every level. Much thought was devoted to the education of a new generation who would accelerate the pace of American scientific productivity. In mathematics education, a major contribution was made by the School Mathematics Study Group, a consortium of mathematicians and educators who scrutinized the

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mathematics curriculum. Their work continues to influence the field.

Out of this endeavor grew the New Mathematical Library. The notion was to make accessible to interested high school students, and to a more general public, deep results in mathematics described by research mathematicians. (This sort of work had long been going on in Eastern Europe.) Lax was asked to take over as general editor for this series, and under her guidance it grew to be the foremost mathematical expository series in the language. Upon her death it was renamed in her honor.

The New Mathematical Library, now published by the Mathematical Association of America, grew to 39 volumes and is still growing. Two generations of mathematicians found early sustenance in its contents, and numerous prominent members of the mathematical community found in it a vehicle to pass their knowledge on to a new public (see sidebar).

Lax was a skilled editor and strove to bring out the best work of the mathematicians who wrote for the series. Perhaps the most interesting of these interactions was one that in fact did not occur at all. In her own words: "The last chapter of *[An Introduction to] Inequalities*, by Beckenbach and Bellman is an interesting story. I wrote the last chapter and inserted it into the manuscript. Each of them thought that the other had written it and never said boo."

Lax the Educator

Lax's interest in communication did not stop with the written word. She became involved in education even before she got her Ph.D. She was always thinking about the lectures she was giving as well as those she was listening to, and was always looking to improve her teaching. As she remarked in her 1992 interview, "I started teaching at NYU in the mid-forties, before I had the degree.... [I]n all of the many years I've taught, I now, in retrospect, think that I didn't really understand teaching until the last ten years or so." Joanne V. Creighton, president of Mount Holyoke College, remarked in a ceremony awarding Lax an honorary degree in 1997 that she "led the way in changing mathematical pedagogy, in exploring the connections of mathematics to the larger curriculum, in understanding the interplay between language and mathematics."

This interplay very early became the focus of Lax's attention. When incoming groups of NYU freshmen found difficulty in learning mathematics, she designed and helped teach a course in mathematics and writing for which students got double credit.

This proved successful, but not successful enough for Lax. She was determined to follow the problem to its roots in the high schools. She teamed up with John Devine, a professor of education with significant experience working with teachers

Photographs courtesy of Peter Lax.

Anneli and Peter Lax.

in inner-city New York schools. Together they got funding from the Ford Foundation to train teachers from these schools in the methods Lax had pioneered at NYU. Devine recalls, "We brought the math teachers and English teachers together for joint sessions after school. This was unheard of. They didn't know each other. Anneli ran these sessions like a mathematical psychoanalyst. She was able to get the English teachers to lose their fear of introducing mathematical terms and concepts and procedures into their English classes. On the mathematics side, she was able to get the math teachers less afraid of word problems."

This work led Lax further into the details of teaching and learning, and she soon found herself tutoring students in these inner-city high schools, using her experience to understand how people outside the mathematical community think about our subject. Devine recalls,

> Anneli would come into the tutoring rooms and work with the kids themselves. This was beautiful to behold. She would sit at a tutoring table with some ninth-grade girl who had poor reading and writing skills. Although she was capable in higher realms of mathematics, Anneli would always begin where the student was. Her interest was in knowing the student's thought processes. She would do everything she could to try to get at the way kids were thinking, not the way she herself was thinking. She would get them talking, and suddenly the kid would be saying, "I went to the store this morning and helped Grandma figure out her food stamp budget." So

Anneli Lax's Research Mathematics

The mid 1950s was a period of intense interest in a basic existence-uniqueness condition for linear partial differential equations (PDEs) known as the "Cauchy problem". Lars Gårding had proved a fundamental result for constant-coefficient linear PDEs, and Jean Leray was just beginning his study of global solutions for linear PDEs with holomorphic coefficients.

The general *Cauchy problem* concerns a linear partial differential operator L of order m in n variables. The equation under study is $L(u) = 0$. Some submanifold S of dimension $n-1$ is given, and initial values of the unknown function and its first $m-1$ outgoing normal derivatives are specified on S. Some hypotheses are imposed on L, S, and the initial values. The question is whether there exists locally a unique solution of the equation on one side of the surface so that the initial conditions are satisfied.

For the situation of interest, Anneli Lax, with Richard Courant, had already proved a theorem that reduced one direction for the question in n variables to the question in 2 variables. It involved a parametrized family of 2-dimensional problems and gave a sufficient condition for the n-dimensional existence-uniqueness in terms of the sufficiency in 2-variables; the sufficiency in 2 variables had already been proved by E. E. Levi in 1909.

Lax's thesis dealt with the necessity in the 2-variable case. Let us state the result precisely when L has constant coefficients. Take the variables to be (x,t), and let $a_{i,j}$ be the coefficient of $\partial^{i+j}u/\partial^i x\partial^j t$. By a linear change of variables if necessary, we may assume that $a_{0,m} \neq 0$. Group the terms according to their order, and define

$$p_k(z) = a_{0,k}z^k + a_{1,k-1}z^{k-1} + \cdots + a_{k,0}.$$

If the roots of $p_m(z)$ are $\lambda_1, \ldots, \lambda_m$, then the top-order terms of L may be written

$$a_{0,m}\left(\frac{\partial}{\partial t} - \lambda_1\frac{\partial}{\partial x}\right)\cdots\left(\frac{\partial}{\partial t} - \lambda_m\frac{\partial}{\partial x}\right).$$

We assume that the λ_i are real but not necessarily distinct.

The lines $x = -\lambda_i t + c$ for each i and c are called *characteristics*. These have long been known to play a special role. This role can already be seen for the special case $(\partial/\partial t - \lambda(\partial/\partial x))u = 0$, whose general solution is $f(x+\lambda t)$ for any function f of one variable. Specifying initial data on a noncharacteristic line determines f everywhere, but specifying data on a characteristic line $x = -\lambda t + c$ determines f only at the one point c.

A curve S in the (x,t) plane is called *noncharacteristic* for L if it is nowhere tangent to a characteristic. The equation $L(u) = 0$ is said to be *properly solvable* relative to S if, for some k, all sets of k times differentiable initial data determine a unique solution of the Cauchy problem in a one-sided neighborhood of S.

It was known that the Cauchy problem is properly solvable for any noncharacteristic curve if the real numbers λ_i are distinct. Lax's theorem allows repetitions among the λ_i:

Theorem. *The Cauchy problem for the constant-coefficient equation $L(u) = 0$ in 2 variables and a noncharacteristic curve is properly solvable if and only if the greatest common divisor of the polynomials*

$$p_m(z), \frac{dp_m(z)}{dz}, \ldots, \frac{d^k p_m(z)}{dz^k}$$

divides $p_{m-k}(z)$ for $k = 1, \ldots, m-1$.

In the previously known case in which the λ_i are distinct, the greatest common divisor in the theorem is 1 and therefore divides all $p_{m-k}(z)$.

Gårding's earlier result gave a different necessary and sufficient condition in the 2-variable constant-coefficient case, but it did not permit verification of the condition by inspection of the coefficients. Lax's thesis went on to consider the 2-variable variable-coefficient case. She proved that a certain condition generalizing the one in the above theorem was necessary and sufficient for proper solvability when the curve is noncharacteristic. The condition is now sometimes called the Levi-Lax condition. L. Svensson extended the theorem to n variables in 1968.

—Anthony W. Knapp

> Anneli would become interested in the food stamp budget. She would get around to the textbook, but only after understanding the kid's view.

Lax the Friend

Anneli Lax's accomplishments in mathematics, in writing, and in teaching are perhaps the easiest to document. Less concrete but perhaps more lasting are her contributions to the support of others in the field. For Anneli Lax was a steadfast and valued friend to many, offering support in countless tangible and intangible ways. One beneficiary of this support, Louise Raphael, writes:

> During my sabbatical year at Courant, I had the deep pleasure of living with the Lax family. Anneli had a genius for friendship. She was most loyal to all of her friends and accepted and loved them as they are.
>
> Anneli was a "mathematical egalitarian". She respected brilliance and could hold her own. She was mathematically

curious and demanded explanation of a theorem in terms she could understand. She encouraged women mathematicians and affected each of us deeply. She was ecstatic for us when our research went well. On the other hand, she never let us forget the need of engaging our students in the mathematical process and curriculum reform. She also made us realize the importance of mathematicians being involved in kindergarten through high school math education, an activity most researchers eschew. She volunteered her services to the New York City public schools, and on occasion she even volunteered my services. ...It was Anneli who gave me the courage to become involved in elementary math education.

It is said that when we give of our possessions we have less, but when we give of our talents we have more. Throughout her life, Anneli Lax gave wholeheartedly of her many talents. We can only hope that Anneli felt rewarded by her own generosity. But we know for sure how much richer we all are for it.

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Forum

Scientific Publishing: A Mathematician's Viewpoint

Joan S. Birman

We are in a time of ferment with regard to the ways in which mathematical research is being communicated throughout the world, and in particular with regard to the nature and cost of scientific journals. This topic has been discussed in articles in the *Notices* by a commercial publisher [1] and by two research librarians [2] and also in numerous letters to the editor. This article examines these and related issues from the point of view of a mathematician who has been actively involved in the journal editorial process.

My main goal is to address the issues raised by the fact that the publishers of some of our best journals (but by no means all of the best ones) have begun to charge such high prices for library subscriptions that to continue with them means to threaten the rest of the collection, but to drop them means to create a big hole in the collection. The situation is puzzling, because the price that publishers charge varies greatly from journal to journal. It is also serious because the most expensive journals include many of the top ones in the field. I want to explore with you the contributing causes, as I see them, and the ways I see for the mathematical community to address them. The principal point I hope to make is that if the people who do the research (the leaders and future leaders in the field) are prepared to act, then the entire system can be changed and the problems solved.

To begin, I will review what we already know: that the essential value in a journal article comes from the excellence of the work of the author and the value added by mathematical colleagues. That is where we *must* begin. The issue of journal subscription prices will be explored next. After that I will describe two ways in which the issue of journal prices has been addressed successfully. The first concerns an example from the neighboring field of theoretical computer science, the *Journal of Logic Programming*. Its entire 50-member editorial board resigned and founded a new journal, *Theory and Practice of Logic Programming* (TPLP), with a new publisher whose prices were 45 percent of those of the old publisher. The second is the story of a new electronic and paper journal, *Geometry and Topology* (G&T), which was started by a group of mathematical colleagues with the express purpose of competing in quality with the best journals in the field at the lowest possible price. After that I will mention a new library initiative called SPARC, which is relevant to both TPLP and G&T. In the last section I will summarize my conclusions.

Acknowledgment: Many people helped me as I was writing this article by answering my questions, supplying me with data, and commenting on earlier drafts. I single out Krzysztof Apt and Colin Rourke for special thanks. Others asked me not to mention names, and I respect that request. I am very appreciative of all of the help I received.

The Articles in a Journal

Let us review what happens from the moment when a mathematician gets the essential idea that will lead to a new paper up to the moment when it is "sent to the publisher" in order to see how value is added at each step by mathematicians.

- Doing the work: Computers have given us new tools, and we can compute examples which were once beyond our reach. Mathematical collaborations between people who are physically far apart has become very easy because of e-mail. But those changes have not made it easier to prove theorems. That is where every paper begins.
- Consulting with colleagues: Most of us test out our ideas with close colleagues as the work is progressing. Thus several experts may have made contributions to the work in question before a manuscript is complete.
- Manuscript preparation: We have learned to "typeset" our own papers, do our own graphics, and in general deliver beautiful manuscripts that are printer-ready when we submit our paper to a journal. Indeed, these days the published version is often precisely the author's TEX manuscript.
- Choosing a journal: Most of the time we want to choose the "best" refereed journal that is likely to accept a paper. Of course the notion of "best" is imprecise and open to interpretation. By and large mathematics is served by a mix of journals which accept papers at many levels, most of them adding to knowledge. Journals have reputations based on the reputations of the members of the editorial board, the quality of the papers they have

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published in previous years, and of course the field in which they specialize. So when the moment comes to choose a journal, others in the mathematical community have already contributed, via their expertise, to the reputation of the journal.

- Refereeing: In mathematics, papers are refereed in a careful and serious way. It is part of the culture and of the scholarly process in our field, and it has served us well in the past because the literature is solid and enduring. Consultations will be made to locate a referee who has the skill and time to do the job. But finding a referee is minor compared to doing the job, which can be hard work. The refereeing process adds value to the paper, not in an easily quantifiable way, but clearly it is there.
- Assembling the collection: This part of the workload falls especially heavily on the shoulders of the editor in chief (EiC) or the managing editor (ME).

The owner of a journal owns the journal title and copyright. The moment when a paper is accepted is also the moment when the author is asked to sign a copyright agreement. Since profits, if any, go to the owner of the journal, I wondered whether dollar costs had been incurred by the owner of the journal at any point up to this moment?

- From conversations with many colleagues, I verified that essentially all the work described above is done pro bono, with the possible exception of the contributions of the journal editors. The EiC of the transactions of a professional society journal told us that he asked for a secretary, and the society offered $12,000 to the department to help pay for one. The director of a major professional society added that his organization also provides credit (very small) to editors for the purchase of its books. Largely, however, he said that editors contribute their work without personal remuneration. He then added that to his knowledge the chief editors of most commercial journals are paid, although the amount is "typically quite modest, compared to the cost of a subscription." But the president of a different professional association told us, "One thing which keeps the current publishing system stable is that the EiCs of commercial journals receive financial support from the publishers, so that they do not have an incentive to argue with the publisher about pricing." Two EiCs denied this vigorously. One said, "The financial rewards never played any role with me; however, I do know EICs who regard the money as important." A second said, "The job is lots of work; however, I would gladly take a lower salary if it would reduce journal prices. The publisher said it would not."
- I asked about the salaries of the EiCs of a sampling of commercial journals. I learned about four journals: three with a single EiC, and the fourth with two MEs. Individual salaries were $6,000, $12,000, $14,000, and $22,500. In one interesting example, discussions between the EiC and the publisher about price quickly led to offers of salary increases (which were declined).

Journal Prices

As it turns out, mathematics journals are not all alike. We distinguish four categories of ownership:

(i) Journals whose ownership is grounded in an essential way in the university system. Examples are *Annals of Mathematics*, which is owned jointly by the Princeton University mathematics department and the Institute for Advanced Study, and *Pacific Journal of Mathematics*, which is owned by a consortium of West Coast U.S. and Pacific Rim mathematics departments.

(ii) Journals owned by one of the learned societies, e.g., the AMS's *Mathematics of Computation* or *Journal of the AMS*.

(iii) Journals owned by a university press, e.g., *Ergodic Theory and Dynamical Systems* (owned by Cambridge University Press) and *Quarterly Journal of Mathematics* (owned by Oxford University Press).

(iv) Journals owned by a commercial publisher, e.g., Springer's *Inventiones Mathematicae*, Elsevier's *Topology*, and Wiley-Interscience's *Communications on Pure and Applied Mathematics*.

Roughly speaking, category (i) is the least oriented toward profit, because it is tied solidly to academia, whereas (iv) is oriented in an essential way toward profit, but in between those two extremes there are gradations. Learned societies are not profit-making, but income from the sale of journals impacts on the overall budget: if income goes down, member dues would probably go up. As for university presses, some seem to operate very much like universities and others very much like commercial publishers. In the survey in [3] of the 148 journals in the collection of the University of California Berkeley Mathematics Library, I counted 17%, 13%, 10%, 60% journals in categories (i), (ii), (iii), (iv), surely making mistakes concerning the distinction between (i) and (iii). My count shows clearly that mathematicians will not be able to do very much about the journal price issue unless they learn how to tackle the problems raised by the instances of very high-priced journals in category (iv).

There has been litigation about the rights of professional societies (who are themselves publishers) to publish comparative price data for journals. As a result, at this writing the only comparative data available to the author are from a private survey conducted by Robion Kirby in 1997 and updated in 2000, giving figures for the journals in the Berkeley Mathematics Library [3]. Kirby gave three numbers: the 1996 (respectively 1999) subscription price to libraries; the number of pages published in the same year; and their ratio, the cost per page. Other relevant information that Kirby did not obtain is the number of libraries subscribing to a given journal. We simply do not know the extent to which price has forced cancellations. Kirby's data showed that in 1999 the price to libraries for a one-year subscription to the journal *Annals of Mathematics* was $220 for 2,290 pages, about $.10/page, whereas the corresponding figure for the Springer-Verlag journal *Inventiones Mathematicae* was $2,838 for 2,881 pages, or just under $1.00/page! Both are top-quality nonspecialized journals. One might think the explanation is that we are comparing categories (i) and (iv), but that fails to explain the many examples in Kirby's list of commercial publishers with well-known names who

appear to be thriving with charges of $.76/page, $.65/page, $.48/page, $.32/page, $.23/page. Market forces, as we normally understand them, do not seem to be working at all.

The chaotic journal price situation had developed in an atmosphere of general panic about the effect of the Internet on journals. Nobody really had a clue as to whether mathematical journals would survive the electronic revolution intact. Some of the commercial publishers began a spiral of steadily increasing prices, and a crisis situation quickly developed in the libraries. The academic community was very hesitant to trash its "best" journals because prices were too high. Instead, many libraries made decisions to cut other journals, and therein lies the problem that is still with us today.

What to do? Kirby's initial suggestion was that mathematicians meet this challenge to our libraries by individually boycotting the most expensive journals, refusing to referee for them, and submitting their own papers elsewhere. He suggested resignations from the editorial boards (EBs) of the most offending journals. I think that more is needed.

A Solution to the Price Problem: Shop for a New Publisher

In November 1999 the complete EB (50 editors total) of the *Journal of Logic Programming* (JLP), published by Elsevier Science, collectively resigned after sixteen months of unsuccessful negotiations about the price of library subscriptions. They founded the new journal TPLP, which will be published by Cambridge University Press. Its subscription price will be 45 percent of that of JLP. How did this come about? I wrote to Krzysztof Apt, president of the Association for Logic Programming (ALP), and received an informative and extremely interesting answer from him, which is the basis for what follows.

The Association for Logic Programming was founded in 1986 in London. Currently it has more than four hundred members worldwide. The journal JLP was founded in 1984 by Alan Robinson (now retired) and was adopted by ALP as its "standard" journal. The publisher, Elsevier, appointed consecutive editors in chief, as proposed by ALP. The contracts were always between Elsevier and the EiC. During the past eight years the EiC was Maurice Bruynooghe, of the University of Louvain, Belgium. The EB of JLP (and now the EB of TPLP) includes among others Alain Colmerauer (University of Marseille), the creator of Prolog, the most known logic programming language; Robert Kowalski (Imperial College, London), the creator of the logic programming paradigm; Jeff Ullman (Stanford), a member of the U.S. National Academy of Engineering and, according to ResearchIndex (`http://citeseer.nj.nec.com/cs`), the most cited computer scientist in the world; and John McCarthy (Stanford), one of the founders of the field of artificial intelligence and winner of the Association for Computing Machinery's Turing award, the most prestigious award given to computer scientists for their research. He is also the winner of the prestigious Kyoto Prize, given to outstanding scientists, and the U.S. National Medal of Science; and is a member of the U.S. National Academy of Sciences.

The price of JLP for libraries in 1984, the year the journal started, was about $.28/page; in 1986 it was about $.26/page (lower); in 1996 it was $.67/page. This is about a 158% increase in ten years. Apparently in this period the Consumer Price Index increased in the U.S. by 44%. In 1999 prices had gone up to about $.88/page. In June 1998 Apt contacted Elsevier, asking to discuss the issue of excessive subscription prices for the libraries. He met with their representatives in Amsterdam in July 1998. They informed him that the price for 1999 was already fixed. Concerning prices for 2000 they promised a reply to Bruynooghe, the EiC. This eventually happened in March 1999. They asked the editors and the Association to form a committee that would discuss the matter.

In his first e-mail to the committee, in the beginning of May 1999, the representative of Elsevier apparently mentioned that the price for 2000 was already fixed and would be 7.5% higher. Further discussions turned out to be fruitless. The committee concluded its work at the end of June 1999. Bruynooghe resigned as the EiC (his resignation being effective at the end of 1999) and declined to name a successor. The Association agreed to name a successor only under condition that Elsevier substantially lowered the prices for the libraries.

In autumn 1999 Apt informed Elsevier that he was in touch with another publisher to launch a cheaper logic programming journal if negotiations failed. This eventually led Elsevier to some concessions. These were, successively: (i) increasing the prices for libraries in 2000 by the inflation rate 2.5% instead of 7.5% that had been announced earlier; (ii) various involved schemes concerning a lower price for electronic access only; (iii) some advantages to the members of the Association; (iv) doubling the size of the journal without increasing the price. But the editors rejected all concessions, demanding a price reduction of at least 40%. The Elsevier representative called several editors, proposing to them the position of EiC. Nobody broke rank.

In November 1999 the EiC organized a vote among all editors concerning the matter. This led to a unanimous decision to leave Elsevier. The editors collectively resigned and moved to found the journal *Theory and Practice of Logic Programming* (TPLP) with Cambridge University Press. The price reduction will be 55%. Jack Minker of the University of Maryland was asked by the editors to become the founding editor in chief of TPLP. Minker agreed, with the understanding that shortly after the first issue of TPLP appears he will resign in the expectation that Bruynooghe would then become EiC of TPLP. Bruynooghe followed the board and terminated his work for Elsevier by the end of 1999. As a sign of good will, he and the editorial board allowed Elsevier to keep their names on the masthead of the JLP throughout 2000, until all papers handled by them have been published.

In February this year the Elsevier representative informed the founding editor, Robinson, that they would like to continue to use his name on the masthead of the JLP beyond 2000. He categorically refused. In March Apt placed an announcement on numerous Internet newsletters explaining the formation of TPLP and requesting that libraries and individuals now support TPLP. He has received several

congratulatory e-mail messages from a number of prestigious libraries.

Apt made specific what I had guessed might be true: "Our move was possible thanks to the leadership of the former editor in chief, Maurice Bruynooghe, who put the interests of the community over his own interests."

A Different Solution to the Price Problem: A New Nonprofit Journal

Most new journals are started when a group of mathematicians senses the need for a new one. The journal *Geometry and Topology* (G&T) was no exception, but this time the felt need was genuinely new: to run a journal of top quality essentially free, using authors' labor for the typesetting and the Internet for distribution of its electronic version.

G&T was started by Colin Rourke, Brian Sanderson, and John Jones of Warwick University, with the help of Kirby. As a member of the initial editorial board, I add that Rourke communicated his enthusiasm to the rest of us, so that we all felt a little bit like pioneers with a mission. It was very exciting! Members of the EB of G&T currently include three Fields medalists (Michael Freedman, Simon Donaldson, and Vaughan Jones) and a long list of other very distinguished mathematicians. Since one of the missions was to establish very high standards, the ground rules called for extensive discussions among members of the editorial board, with all correspondence carried out by e-mail. As it has turned out, the collegiate e-mail discussions have been both broadly based and at an extremely high level. This rather prosaic use of the e-world is perhaps the most innovative aspect of the journal. The electronic version of G&T is published in PostScript and PDF. One may look at it by going to `http://www.maths.warwick.ac.uk/gt/`. Hardcopy is printed by International Press, which also fills orders and mails the journal.

Knowing that I was planning to write this article, Rourke offered to tell me about his experience with the costs, both in dollars and in time, to get G&T up and running:

> There were no secretarial or setting-up costs. Computer costs for running a journal the size of G&T are negligible, given the fact that universities are already networked and provide good computing facilities for their staff. I estimate that the size of the Warwick Maths computing system is about four orders of magnitude greater than that needed to run G&T. But then this is the whole point: journals are firmly based in the academic world and all piggy-back to a great extent on that world.
>
> Academic time costs to set things up: I would guess 500 hours, with ten weeks of really hard work. It was done in bits over a long period, so it is difficult to be accurate—I could be off by a factor of 2 either way. If we were setting up again now, it would be much less—we've been on a steep learning curve. Brian has done the Web site and PERL scripts (see below), and I've done all the TEX stuff: designing formats, writing macro files, etc. Most of this is replicable, and we could very quickly set up another similar journal or help others to do so.
>
> Academic time costs for day-to-day running: A great deal of this is automated. We get authors to submit their papers by a WWW submission form. This comes to us as an e-mail message, which we process by a PERL script. This little program moves files to the correct places and generates e-mail messages to the author and the responsible editor (we can edit these messages as they fly past!) and updates the journal main-log. If all goes well, this takes about 10 minutes total. Then there is sending out reminders to responsible editors, circulating discussions around the EB, sending out rejection/acceptance letters to authors, etc., which probably take around 15 minutes total per paper—some more, some less! We have templates for all standard letters. Once a paper is accepted, there is the preparation of the TEX file for publications. If a paper is in good format, it can take very little time to prepare; on the other hand, one of the excellent submissions we received was in dreadful shape. Averaging, I'd guess one hour of my time (I do most of this bit by bit) per 10 pages. We could cut this a lot by (a) leaning more heavily on authors or (b) accepting a greater variation in appearance between different papers. We could cut the preparation time to zero by doing what some of the e-print servers do, which is to accept anything that TEX will accept. Finally, publication is also automated with another PERL program, which moves files around and announces publication to the EB. So an outside estimate of the total bill (in academic time) is two hours per paper plus one hour per 10 published pages. This is all very difficult to translate into cash. Using graduate student labor for some of the more routine work makes sense. One good TEXie ought to be able to do all this for several journals the size of G&T.
>
> Archiving costs: The printed version of G&T provides the same level of permanence as for print-only journals, but there should also be a permanent electronic archive. For our needs LANL [4] (also known as "xxx" or "the arXiv") seems to be a natural choice, and G&T is now setting in place mechanisms to use it. LANL is supported by U.S. government funds and seems to be a secure place for the archiving of journals if anything should go wrong at Warwick. At the very least LANL seems as secure in its future as the commercial publishers. (We all know many examples of former commercial giants who have disappeared from the scene.)

Printing costs and return from sales: The only place where G&T incurs dollar costs is in the printing of hard copies. In order to print efficiently we need to print approximately 200 copies. If we sell at \$.10 per page (a target cost to keep costs to libraries to the minimum), then after adding handling and postage this grosses up to around \$.13 per page. We break even at 80 sales. If we sell all 200, we generate \$12 per page profit, more than enough to pay for the formatting, with an efficient setup.

The Libraries and SPARC

When a new mathematics journal is launched, it must face the problem of how to get into mathematics libraries. I discussed this matter with Barbara List, the director of the Columbia University Science-Engineering libraries, and she told me about SPARC, the Scholarly Publishing & Academic Resources Coalition, whose Web site is `http://www.arl.org/sparc/`. SPARC is a consortium of 182 major North American and international research libraries (including Columbia), with new ones signing up every month. Founded in 1997 by a group of members of the Association of Research Libraries, an institutional professional society, its goal was to address library problems caused by rising journal prices.

Here is one of the things SPARC does. When a new journal appears that might be a high-quality, low-cost alternative to a well-known high-priced journal (e.g., G&T vs. Springer-Verlag's *Topology*), consultations are initiated with members in the discipline, and a judgment is made as to the viability of the new journal. If SPARC signs a contract to *partner* with the new journal, the advertising and publicity needed to get it into member libraries will be handled by SPARC, whose members have agreed to promote the new journal among faculty members and to commit funds from their annual budgets to buy partner journals that fit their collections. This and other SPARC activities are supported by member dues.

An example of a SPARC partner is the journal *Evolutionary Ecology Research*, which had a history very much like that of TPLP. With the SPARC "seal of approval" and member support, it achieved break-even at the end of its first year. For comparison's sake, I was told by librarians that an excellent new journal typically needs five years from launch to become self-supporting. Today SPARC has eleven partners, the newest being G&T , whose SPARC subscriptions have begun to come in. Discussions are under way between SPARC and TPLP.

Summary and Conclusions

We are currently witnessing what must be properly identified: a battle for the ownership, transfer, and dissemination of scientific information. The issue is extremely serious, and it reaches across many disciplines. Yet we have seen by examples that we are not powerless to fight it:

1. Individuals who are in a leadership position can put community interests ahead of their own interests and work seriously with their colleagues on editorial boards and with the publishers to lower prices. If that fails, it is time to go shopping for a new publisher. That is what a market economy means, and there is nothing shameful in shopping for the best buy. To fail to do that is to put our literature and our libraries at risk.

2. Every new journal in mathematics begins with a group of mathematicians who sense a need and decide to work together to get it going. Interested mathematicians, perhaps a subset of those who are already on the editorial board of an overpriced journal if the full board cannot agree, can get together and start a new journal with the express purpose of competing with the old one. SPARC is there to support exactly such an enterprise. Electronics has made it much easier than it was fifteen years ago. Yes, it is a very big commitment of time and energy, but it has been done over and over in the past. The only new feature is that these days mathematicians can go shopping for the publisher, whereas in the past the publishers went shopping for the mathematicians. Yes, any such mass movement would lead to new forms of resistance from old-style publishers, but I expect that it would also lead to opportunities for new-style publishers who see a chance for a profitable business in the inexpensive assembly and distribution of mathematics journals.

3. Library committees can also make a difference. If they simply have the courage to end subscriptions to the very expensive (and often excellent) journals, these journals will die. If they simultaneously vote to support new journals with high-quality editorial boards and low prices, these new journals will have a chance to live and grow.

4. Authors can help too by considering journal price along with other factors when deciding on a journal in which to publish.

5. The issue of copyright has not been addressed in this article because it has been discussed extensively elsewhere in the *Notices*, but it is relevant to our discussions. With respect to copyright the AMS Consent to Publish form (which is a proper subset of its Consent to Publish *and* Copyright Agreement) is particularly author-friendly. "Copyright" transfers ownership to the publisher, whereas "Consent to Publish" allows the author to retain ownership of his/her work. Authors are advised to read copyright agreements carefully and to tell the publisher if they wish to give consent while retaining copyright. This matter appears to be more negotiable than most mathematicians think it is.

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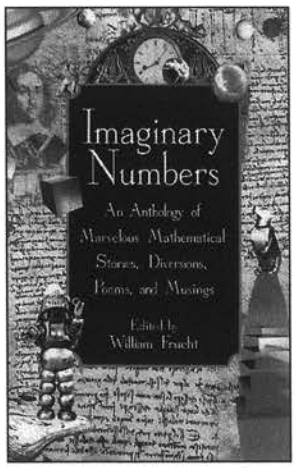
Imaginary Numbers: An Anthology of Marvelous Mathematical Stories, Diversions, Poems, and Musings

Reviewed by Alex Kasman

Imaginary Numbers: An Anthology of Marvelous Mathematical Stories, Diversions, Poems, and Musings
William Frucht, editor
John Wiley & Sons
ISBN 0-471-33244-5
1999, $27.95 cloth

In 1958 a collection of short stories and book excerpts was published under the name *Fantasia Mathematica*. What tied these previously published works of fiction together was that they all had something to do with mathematics. The editor of that book, Clifton Fadiman, later remarked, "I had been storing away these wisps of mathematical thistledown in the untidy nest of my files, with hardly any expectation that others might take pleasure in them. But, to my surprise, and I believe also to the publisher's, the little book assembled entirely as a labor of love attracted not a vast audience, of course, but at least an inappropriately large one, when one considers the esoteric nature of the subject." Fadiman edited another collection that appeared in 1962 as *Mathematical Magpie*. Then in 1987 author and self-proclaimed "world-class mathematician" Rudy Rucker edited a collection of mathematically oriented science fiction stories called *Mathenauts*. For many years these three volumes remained the only published collections of mathematical fiction.

Who would have thought that there were so many mathematical stories published? In fact, there are many more. When I reviewed the novel *Cryptonomicon* for the *Notices* (December 1999, pages 1407–1410), I included a request for more examples of "mathematical fiction". Since the review appeared I have received several new suggestions each week, and the list (`http://math.cofc.edu/faculty/kasman/MATHFICT/`) has grown larger in a few months than I ever thought it would become. Many of the works on this list, like the movie *Pi*, were so successful that it is hard to imagine that anyone with an interest in mathematics would not have noticed them. Others are so rare, like the books *The Sinister Researches of C. P. Ransom* and *The Curve of the Snowflake*, that it is difficult now to find any trace of them. Since many of the mathematical stories, books, and movies on the list appeared for the first time only after the publication of *Mathenauts*, it might seem that it is about time for someone to attempt a new collection—and someone has.



Imaginary Numbers: An Anthology of Marvelous Mathematical Stories, Diversions, Poems, and Musings, edited by William Frucht, was published by John Wiley & Sons in the fall of 1999. As Frucht explains in the acknowledgments, he successfully arranged for a small reissue of Fadiman's two volumes, which was to be followed by a new collection edited by Martin Gardner. When this plan did not seem to be working out, Frucht himself collected the thirty-one works that make up this book.

Among my favorite entries in the book is the short story "A New Golden Age" by Rudy Rucker (which also appeared in *Mathenauts*). Only this

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story, of all the stories in these collections, leaves me with the impression that it was written with professional mathematicians as its intended audience. (In fact, Fadiman explicitly insists that his collections are *not* for mathematicians at all.) In this story, and in our world as well, mathematicians lament the fact that legislators cannot sufficiently appreciate mathematics and that this adversely affects the funding of their science. To address this problem, one of the mathematicians in the story creates a device called the Moddler. It can be used to experience the thoughts of great mathematicians while considering their greatest theorems, giving the user the momentary feeling of understanding and appreciating the results. An attempt to read the original papers after using the Moddler confirms that it does not actually give one any *real* understanding of the concepts. Still, the mathematicians find that they love using it to get some appreciation of results that were always beyond them. Finally, the legislators are convinced to try the Moddler, but the consequences are not exactly what the mathematicians had wished. I think the moral of the story is that perhaps we should be *glad* that legislators do not appreciate mathematics, because if they did, we might find we do not agree with their taste.

Another interesting story is "The Extraordinary Hotel, or the Thousand and First Journey of Ion the Quiet" by Stanislaw Lem. Here the famous Polish author toys with the counterintuitive nature of the countably infinite by postulating the existence of an intergalactic hotel with rooms indexed by the positive integers. For instance, the narrator of the story arrives at the hotel to find that there are no vacancies. However, as a favor the management makes room for him by simply asking each of the other guests to move to the next room. It goes on from there, discussing ideas that we have all encountered before, but probably not in such an entertaining context.[1]

Connie Willis's short story "Schwarzschild Radius" is based on events in the life of Karl Schwarzschild, who gave the first exact solutions to the equations of general relativity. The historical aspects of the story here are enhanced by cleverly self-referential fictional details. Told in flashback form, the events are recalled by a soldier who happened to intercept a letter from Einstein to Lieutenant Schwarzschild at the front line during World War I. As the story develops, haunting analogies are made between the situation of the soldiers in the trenches and the scientific theories being discussed. For example, the discussion of the red shift of light from distant stars is echoed in the soldier's treatment with an eye ointment that adds a red tint to everything he sees. The inability of information to leave from within the Schwarzschild radius of a black hole seems somehow to explain the fact that the soldiers' families are not receiving the letters and requests they write from the front line. In the end we are left with the impression that even the disease that eventually claims Schwarzschild's life was a consequence of the singular solutions he found to Einstein's equations.

Let me briefly mention some other works appearing in *Imaginary Numbers*. "The Church of the Fourth Dimension" describes Martin Gardner's (fictional) visit to an unusual church where he considers theology in dimension $n > 3$ and learns some topological magic tricks. The excerpt from Edwin Abbott's classic *Flatland* is an unusual choice, as this passage seems to have more to do with the sociology of the famous two-dimensional world than with its mathematical elements. A chapter from A. K. Dewdney's *Flatland*-inspired novel *Planiverse* describes a one-dimensional ocean surface in a two-dimensional virtual universe. Though interesting, this story left me wishing that the author had included *more* mathematics, since the two-dimensional air turbulence in the boat sails and the uniformly shallow one-dimensional sea he describes would have been ideal starting points for a discussion of Kelvin-Helmholz instabilities and KdV solitons! "A Serpent with Corners" is an elementary word problem disguised as a story by Lewis Carroll.

One of the few entries in the book to be accompanied by any comments from the editor is the short excerpt from Alan Lightman's book *Einstein's Dreams*. This passage, describing Einstein's dreams of a universe in which entropy decreases as time passes, is preceded by historical notes that may be of use to some readers and that help to "set the mood" even for those who already know the background. Generally, the editor's comments are helpful and appropriate. In fact, the book would have benefited from more. For instance, the book includes the dialogue "Prelude..." by Douglas Hofstadter from his Pulitzer Prize-winning *Gödel, Escher, Bach*. Rereading this excerpt merely served to remind me what an intricate and amazing work of art that book was, for it truly fulfills its promise of interweaving the spirit of the mathematics, art, and music of these three people. Yet I am afraid that in isolation the excerpt might just seem like nonsense. Some comments regarding the goals of Hofstadter's book and its connection to this excerpt would be helpful. Otherwise, how is the reader unfamiliar with Gödel's work to know that the discussion of Fermat's Last Theorem is not merely a joke but a clever foreshadowing of the sort of

[1] *Or perhaps you have. George Gamow in "One, Two, Three...Infinity" attributes the hotel analogy to David Hilbert, and Allyn Jackson points out to me that the article "Hilbert's Hotel", by Ian Stewart* (New Scientist, *19/26 December 1998 to 2 January 1999, pages 59–61) also presents this idea in the form of a story.*

logical paradox that underlies Gödel's proof? (Let me explain. In this dialogue a character devises a formal logical calculus to attempt to prove Fermat's Last Theorem. In this notation the proof of the theorem happens to take exactly the form $x^n + y^n = z^n$, thus demonstrating that proving Fermat's Last Theorem is equivalent to finding a counterexample to it, which he does.) Comments from the editor might also enhance the poem "Ten Weary, Footsore Travelers" (a puzzle that asks the reader to find the mathematical error it contains), which is unattributed and appears without any indication of its source.

Two of the other poems included in this anthology are mathematics jokes in verse: "A Positive Reminder" by J. A. Lindon considers the formal consequences of building a wooden cube with edge length -1, and "Parallelism" by Piet Hein questions the reality of the "mathematical fiction" that is projective geometry. The serious poem "The Definition of Love" by Andrew Marvell applies the same idea, that parallel lines can never meet, to the realm of human emotion. Though these poems seem appropriate for a collection of this nature, I am uncertain about the reason for including Roald Hoffman's poem "Why Does Disorder Increase in the Same Direction of Time As That in Which the Universe Expands?" Though the title is intriguing and bears a footnote attributing it to an article by Stephen Hawking, the title seems to have nothing to do with the rest of the poem. In fact, this brings us to the most serious criticism of the book.

Unfortunately, I do not feel that this book lives up to the subtitle *An Anthology of Marvelous Mathematical Stories, Diversions, Poems, and Musings.* I do not mean to say that the works in the collection are not marvelous. It is in its claim that these stories and poems are *mathematical* that I am afraid the title is misleading. A few of the works in this book, most of which I have mentioned above, have quite explicit connections to mathematics. Furthermore, several of the stories and poems do achieve for me the *feeling* of mathematics even if there is no specific reference to mathematical ideas (and so they are in this way like Rucker's Moddler). For example, Tommaso Landolfi's "Giovanni and His Wife" is really a story about music, not about mathematics at all, but it does for music something akin to what non-Euclidean geometries did for mathematics. However, there does not appear to be *any* mathematics at all in many of the remaining works. Perhaps I am guilty of not practicing what I preach, since I surely tell my students that there is interesting mathematics everywhere, but in comparison to the other three collections this one is by far the least mathematical.

The apparent absence of mathematics in these works may, to some extent, represent a "generation gap". Today computers are such a standard part of everyday life and typical science fiction stories that I cannot see referring to a story as mathematical simply because of its connection to computers. Of course, I am aware that historically computer science grew out of mathematics, but it seems too much of a stretch to present the groundbreaking "cyberpunk" story "Burning Chrome" by William Gibson in this collection as a mathematical story. Similarly, the poems authored by the computer program Racter which appear here may be interesting from a philosophical point of view, but they do not seem to be especially mathematical.

Even if we consider computer science to be part of mathematics, there still remain many non-mathematical works in this collection. Some stories appear here apparently because they incorporate the "many world" interpretation of quantum mechanics (a standard science fiction plot device and not an especially mathematical one) or because they include the word "improbability" (for I can see no other justification for the inclusion of "The Private War of Private Jacob"). The surrealistic fantasy "Gonna Roll the Bones" by Friz Lieber is a good example here, since Frucht explains its connection to mathematics in the preface. In this story we meet a gambler who has an unrealistically strong ability to control small objects that he throws (allowing him, for instance, to achieve any desired outcome from a roll of dice). Frucht explains that this story appears in this collection because gambling with dice "is one of the wellsprings of probability theory" and because the gambler's incredible skill at throwing is a "playful anticipation" of what chaos theorists would later call "sensitive dependence". I agree that because of these things one can discuss the story from a mathematical perspective, but the story itself does not seem mathematical.

Many works of mathematically oriented fiction have been published since 1987, and I was disappointed that so few of them are represented here. Frucht seems to have predicted this reaction, asking readers who "find this anthology frustratingly incomplete" to send him suggestions by e-mail. Perhaps it is already time for another such collection. Those who enjoy leisure-time reading with a mathematical slant may appreciate this book, but they should be aware that this editor seems to have put greater emphasis on finding things that he considers "marvelous" than things that are "mathematical".

Acknowledgments

I am grateful for many helpful suggestions from Allyn Jackson and the referee. I also thank Jody Trout for sending me information about the collection *Mathenauts.*

AMERICAN MATHEMATICAL SOCIETY

Electronic Research Announcements OF THE AMERICAN MATHEMATICAL SOCIETY

Volume 6, 2000 (Most Recent Articles)

The American Mathematical Society's electronic-only journal, *Electronic Research Announcements of the AMS* (ERA-AMS), is available on the World Wide Web at www.ams.org/era.

ERA-AMS publishes high-quality research announcements of significant advances in all branches of mathematics. Authors may submit manuscripts to any editor. All papers are reviewed, and the entire Editorial Board must approve the acceptance of any paper. Papers are posted as soon as they are accepted and processed by the AMS.

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AMS
AMERICAN MATHEMATICAL SOCIETY

Mathematics People

National Academy of Sciences Elections

The National Academy of Sciences (NAS) has announced the election of sixty new members and fifteen foreign associates. Following are the names and affiliations of the mathematicians who are among the newly elected members: MARSHA J. BERGER, Courant Institute of Mathematical Sciences, New York University; FRANCIS A. DAHLEN JR., Princeton University; ARTHUR M. JAFFE, Harvard University; THOMAS KAILATH, Stanford University; SIMON A. LEVIN, Princeton University; GEORGE C. PAPANICOLAOU, Stanford University; KENNETH A. RIBET, University of California, Berkeley; and GRACE WAHBA, University of Wisconsin, Madison. SIMON K. DONALDSON of Imperial College, University of London, was elected as a foreign associate.

—From NAS announcement

Académie des Sciences Elections

The Académie des Sciences de Paris has announced the election of three mathematical scientists to membership. They are: PIERRE AUGER, Université Claude Bernard Lyon 1; GÉRARD BRICOGNE, Université Paris-Sud, Orsay; and THIBAULT D'AMOUR, Institut des Hautes Études Scientifiques.

—From an Académie des Sciences announcement

McFadden Receives Nemmers Prize in Economics

Northwestern University has awarded its 2000–2001 Nemmers Prize in Economics to DANIEL L. MCFADDEN, the E. Morris Cox Professor of Economics at the University of California, Berkeley. The prize carries a $100,000 stipend.

The Nemmers Prizes are awarded every other year to scholars who display "outstanding achievement in their discipline as demonstrated by major contributions to new knowledge or the development of significant new modes of analysis." In connection with the prize, McFadden will spend a period of residence at Northwestern.

McFadden has made pioneering contributions in econometrics and has been highly influential in theoretical and applied economics. His 1973 article "Conditional Logit Analysis of Qualitative Choice Behavior" is recognized as one of the most important milestones in the development of microeconometrics, the field that deals with the analysis of economic data using models of consumer and firm behavior. Through this and many subsequent articles and books, McFadden founded modern econometric research on the analysis of discrete choice. The models and methods that he developed have become standard tools used to interpret the decisions made by consumers, firms, and governments in a wide variety of contexts.

Among McFadden's other major methodological innovations are the proposed novel estimation methods that use simulation techniques to approximate the values of functions that are otherwise too difficult to calculate. Early in his career he performed important research on the theoretical and econometric analysis of production decisions by firms. McFadden has throughout his career complemented his methodological research with important contributions to many fields of applied economics. He is widely respected for his research on travel demand forecasting, consumer utilization of energy-consuming appliances, the economics of aging, and the use of contingent valuation methods to value public goods.

McFadden has held permanent faculty positions at the University of Pittsburgh, the Massachusetts Institute of Technology, and the University of California at Berkeley. He currently is director of the Econometrics Laboratory at Berkeley.

He is a member of the American Academy of Arts and Sciences and the National Academy of Sciences. He received the John Bates Clark Medal of the American Economics Association and the Frisch Medal of the Econometric Society. In 1985 McFadden served as president of the Econometric Society.

The Nemmers Prizes, initiated in 1994, were made possible through bequests from the late Erwin E. Nemmers, a former member of the Northwestern University faculty, and his brother, the late Frederic E. Nemmers, both of Milwaukee, Wisconsin.

—From Northwestern University news release

2000 Prize for Achievement in Information-Based Complexity

SERGEI PEREVERZEV of the Institute of Mathematics, Ukrainian Academy of Science, has been awarded the Prize for Achievement in Information-Based Complexity for 2000. He was cited for "numerous outstanding contributions to information-based complexity."

The award, consisting of $3,000 and a plaque, will be presented at the Workshop on Algorithms and Complexity for Continuous Problems at Schloss Dagstuhl, Germany, in September 2000.

—Joseph F. Traub, Columbia University

PECASE Awards Announced

Sixty young researchers have been chosen to receive the 1999 Presidential Early Career Awards for Scientists and Engineers (PECASE). This award is the highest honor bestowed by the U.S. government on outstanding young scientists, mathematicians, and engineers who are in the early stages of establishing their independent research careers.

The recipients were selected from nominations made by nine participating federal agencies. Each recipient receives a five-year grant of up to $500,000 to further his or her research and educational efforts.

KEN ONO of Pennsylvania State University was one of twenty recipients nominated by the National Science Foundation. He was honored for outstanding contributions to number theory and for his ability to foster mathematical abilities in students at different levels.

—Elaine Kehoe

1999 and 2000 CAREER Awards Made

A number of mathematicians have been honored by the National Science Foundation (NSF) in fiscal years 1999 and 2000 with Faculty Early Career Development (CAREER) awards. The NSF established the awards to support promising scientists, mathematicians, and engineers who are committed to the integration of research and education. The grants run from four to five years and range from $200,000 to $500,000 each.

The CAREER grant awardees for 1999 and the titles of their grant projects are: LIMING GE, University of New Hampshire: Operator algebras and applications; MICHAEL HOLST, University of California, San Diego: Adaptive multilevel finite element methods with applications to biomolecules and gravitation; LUDMIL KATZARKOV, University of California, Irvine: Nonabelian Hodge theory and monodromy actions; KEN ONO, Pennsylvania State University, University Park: Topics in number theory; and GUENTHER WALTHER, Stanford University: Statistics for flow cytometry and freshman seminars.

The CAREER grant awardees for 2000 are: SARA BILLEY, Massachusetts Institute of Technology: Combinatorial structures in algebra and geometry; BENSON FARB, University of Chicago: Topics at the intersection of geometry, topology, and group theory; LAURENT JAY, University of Iowa: Development, analysis, implementation, and application of innovative structure-preserving integrators for constrained systems in mechanics; and CHRISTOPH THIELE, University of California, Los Angeles: Time-frequency analysis of multilinear operators and more general nonlinear operators.

—From NSF announcement

Deaths

RICHARD F. ARENS, professor emeritus, University of California, Los Angeles, died on May 3, 2000. Born on April 24, 1919, he was a member of the Society for 57 years.

HERTA T. FREITAG, professor emeritus, Hollins University, Roanoke, VA, died on January 25, 2000. Born on December 6, 1908, she was a member of the Society for 51 years.

L. M. LE CAM, professor emeritus, University of California, Berkeley, died on April 25, 2000. Born on November 18, 1924, he was a member of the Society for 49 years.

LUCILLE MAIER, retired, from Tonawanda, NY, died on November 20, 1999. Born on March 6, 1920, she was a member of the Society for 54 years.

HENRY B. MANN, professor emeritus, University of Arizona, Tucson, died on February 1, 2000. Born on October 27, 1905, he was a member of the Society for 58 years. He received the AMS Cole Prize in 1946.

GEORGE S. MCCARTY, University of California, Irvine, died on March 19, 2000. Born on October 21, 1926, he was a member of the Society for 40 years.

ROSE MARY MILLER, retired, from Barnet, VT, died on March 13, 2000. Born on November 23, 1911, she was a member of the Society for 52 years.

EARLE F. MYERS, professor emeritus, University of Pittsburgh, died on January 21, 2000. Born on November 3, 1915, he was a member of the Society for 46 years.

THEODORE P. PALMER, professor emeritus, Rose-Hulman Institute of Technology, Terre Haute, IN, died on April 17, 2000. Born on November 19, 1906, he was a member of the Society for 69 years.

MARCEL K. SUCHESTON, a graduate assistant at Texas A&M University, College Station, died on April 24, 2000. Born on May 17, 1970, he was a member of the Society for 6 years.

ABRAHAM H. TAUB, professor emeritus, University of California, Berkeley, died on August 9, 1999. Born on February 1, 1911, he was a member of the Society for 62 years.

Mathematics Opportunities

Deadlines and Target Dates at the DMS

The Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) has a number of programs in support of mathematical sciences research and education. Listed below are the names of programs having deadlines or target dates coming up in the next several months.

July 17, 2000 (proposal deadline): Grants for Vertical Integration of Research and Education in the Mathematical Sciences (VIGRE)

September 15, 2000 (deadline): Research Experiences for Undergraduates Sites (send inquiries to: reu.dms@nsf.gov)

October 3, 2000 (target date): Algebra and Number Theory

October 3, 2000 (target date): Analysis

October 3, 2000 (target date): Foundations

October 16, 2000 (deadline): Mathematical Sciences Postdoctoral Research Fellowships (send inquiries to: msprf@nsf.gov)

November 7, 2000 (target date): Applied Mathematics (excluding Mathematical Biology)

November 7, 2000 (target date): Statistics and Probability

November 7, 2000 (target date): Geometric Analysis

November 7, 2000 (target date): Topology

November 13, 2000 (deadline): University-Industry Cooperative Research Programs in the Mathematical Sciences

December 5, 2000 (target date): Computational Mathematics

December 5, 2000 (target date): Mathematical Biology

December 8, 2000 (deadline): Interdisciplinary Grants in the Mathematical Sciences

Proposals for conferences, workshops, and special years that are submitted to the Statistics and Probability program or to the Topology and Foundations program can be sent at any time. However, proposals for these activities that are submitted to all other DMS programs (Analysis, Algebra and Number Theory, Applied Mathematics, Computational Mathematics, and Geometric Analysis) must be submitted according to the target dates for those programs. Proposals for supplements for Research Experiences for Undergraduates may be submitted at any time.

For further information consult the DMS Web site at http://www.nsf.gov/mps/dms/. The mailing address is Division of Mathematical Sciences, National Science Foundation, Room 1025, 4201 Wilson Boulevard, Arlington, VA 22230. The telephone number is 703-306-1870.

—From a DMS announcement

Funding Opportunities at NIH

The National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health seeks to forge interdisciplinary partnerships between biomedical researchers and mathematical scientists and engineers.

Areas of interest include but are not limited to: population dynamics, developmental patterning, cell mechanics, metabolic flux, signal transduction circuitry, organ system networks, and cell-cell communication.

For more information about new funding opportunities that include grants for research, training, and workshops, please visit the NIGMS Web site at http://www.nigms.nih.gov/funding/complex_systems.html. Or contact: James C. Cassatt, Director, Division of Cell Biology and Biophysics, NIGMS/NIH, Building 45, Room 2AS19, 45 Center Drive MSC 6200, Bethesda, MD 20892-6200; telephone 301-594-0828; fax 301-480-2004; e-mail: cassattj@nigms.nih.gov.

—NIGMS announcement

Travel/Host Grants for Research

The Office for Central Europe and Eurasia of the National Research Council (NRC) awards grants to American scientists to host or visit their colleagues from Central and Eastern Europe and the newly independent states. This program is designed primarily to prepare these new partnerships for competition in programs of the National Science Foundation (NSF).

Only fields funded by NSF are eligible. Each individual visit proposed must be at least two weeks (10–14 days) in length. Grants will be in the range of $2,500 to $10,000. All applicants must be U.S. citizens or permanent residents, must be affiliated with a U.S. university or other nonprofit research institution, and must have earned a Ph.D. or have equivalent research experience. Foreign counterparts must be citizens of and permanently employed at an institution in a Central or Eastern European country or a newly independent state and must hold a Ph.D. (kandidat) degree or have research training and experience equivalent to a doctoral degree. American applicants who have received their doctoral degrees within the past six years will receive special consideration.

Deadlines for applications to be postmarked are **August 28, 2000**, and **January 8, 2001**. Application forms and instructions are available at `http://www.nationalacademies.org/oia/`, or contact: Office of International Affairs, National Research Council, 2101 Constitution Avenue, NW, Washington, DC 20418; telephone 202-334-2644; fax 202-334-2614; e-mail: `ocee@nas.edu`.

—From an NRC announcement

Call for Nominations for 2002 Parzen Prize

Nominations are sought for the Emanuel and Carol Parzen Prize for statistical innovation for 2002. The Parzen Prize is awarded in even-numbered years by the Department of Statistics at Texas A&M University to North American statisticians who have made outstanding and influential contributions to the development of applicable and innovative statistical methods. The prize consists of a $1,000 honorarium and travel to College Station, Texas, to present a lecture at the prize ceremony.

The deadline for nominations is **October 1, 2001**. Nominations may be submitted to J. H. Matis, Department of Statistics, Texas A&M University, College Station, TX 77873-3143.

—Department of Statistics, Texas A&M University

Inside the AMS

Joint Testimony by Society Presidents

On April 12, 2000, AMS president Felix E. Browder, together with three other scientific organization officials, gave testimony before the subcommittee of the House Appropriations Committee that oversees the budget of the National Science Foundation (NSF). The testimony discussed the fiscal year 2001 appropriation for the NSF and called for increased funding for the NSF across all disciplines.

The testimony was presented before the House Subcommittee on Veterans Affairs, Housing and Urban Development, and Independent Agencies. Joining Browder in the presentation were Daryle Busch, president of the American Chemical Society; David G. Kaufman, president of the Federation of American Societies for Experimental Biology, and Robert C. Richardson, chair of the Physics Policy Committee of the American Physical Society.

Busch introduced the group to the committee and emphasized the importance of science to economic growth. Kaufman highlighted the interdependence of the sciences and mathematics, citing magnetic resonance imaging as an example of a development that depended on advances in a variety of areas. Richardson stressed the need for an appropriate balance between funding for focused research initiatives and funding for core research.

Browder's portion of the testimony, which concluded the presentation, was as follows.

"[A]s my colleagues have stressed, our nation benefits tremendously from research supported by the National Science Foundation. Fundamental knowledge gained from this research often forms the basis for the development of new technologies: in medicine, the environment, telecommunications, defense and agriculture, to name just a few areas. I will cite a few specific examples.

"Let us look at medicine first. The NSF currently supports researchers who are developing methods that will facilitate real-time magnetic resonance imaging (MRI) data processing so that three-dimensional brain images can be produced in minutes. Currently, because of the massive amounts of data generated from MRI brain scans, hours, even days, are needed to process the data.

"Another NSF-supported research group has developed a method to detect precancerous cells. This method, based on fluorescence spectroscopy, applied in clinical trials, has demonstrated significantly improved efficacy in detection of early-stage cervical cancer, as compared to existing technologies.

"In the environmental arena, discovering cheaper and more benign solvents to replace toxic volatile organic solvents for polymer synthesis is a critical problem. NSF-supported research has led to an environmentally benign method of polymer synthesis using liquid carbon dioxide. Several chemical companies are supporting the development of products for commercial use based on this research.

"As a mathematician, I would be remiss if I didn't point out that scientific discoveries often depend on complex mathematical modeling and computational algorithms. NSF supports research in mathematics that is related to many scientific problem areas. For example, enormous data sets are being generated in all scientific areas and must be displayed and analyzed. This poses difficult mathematical problems since all data sets do not have similar characteristics, nor are they always used in the same way. Data sets needing real-time analysis, as in the control of aircraft, pose even more difficult mathematical challenges.

"These are just a few of the areas where NSF-supported research is making significant contributions to society. Let me conclude with just a few other observations about the nature of NSF's operation.

"The NSF is widely regarded as a sound steward of the taxpayer's investment. The NSF is one of the most efficient of all federal agencies by almost any measure. It spends only about 5 percent of its budget on administration and management. Moreover, NSF awards funds to researchers only after a rigorous merit-review process using expert peers. Although NSF funds about 20,000 grants in any given year, it is forced to turn down approximately two-thirds of all new proposals each year.

"Not only will increased funding allow NSF to fund more outstanding proposals, it will allow NSF to increase the size and duration of its grants—a long-standing goal of the foundation—without limiting the number of new awards. Reducing the time researchers spend writing proposals will free up more time for research and increase

the overall return per dollar invested. Longer grants should also encourage more high-risk, and potentially high-payoff, research.

"Mr. Chairman, it's hard to overstate how central NSF is to basic scientific and engineering discoveries. NSF provides the cornerstone of new knowledge across scientific disciplines and, as such, plays a key role in maintaining the nation's scientific and economic leadership. Put most simply, NSF is a true investment in our nation's future."

—Allyn Jackson

AMS Participates in Project on Professional Master's Degrees

As mathematics becomes increasingly important in a wide variety of professions, many mathematics departments have launched professional master's degree programs. The AMS and the Mathematicians and Education Reform (MER) Forum, in cooperation with the Society for Industrial and Applied Mathematics (SIAM), have for the past two years collaborated on a project designed to promote the development of these programs. With funding from the National Science Foundation (NSF), two workshops were held and a survey was conducted. Information from the survey will soon be available on the Web.

The purpose of professional master's degrees in mathematics is to provide mathematical education deeper than that at the bachelor's level, together with preparation for a profession in which mathematical training is an asset. These are stand-alone degrees in the sense that they are not intended as steppingstones to the Ph.D. Indeed, some who already have mathematics doctorates have enrolled in professional master's programs as a way of gaining the specific background they needed to enter certain professions.

There is a wide range in the character of professional master's programs, from those with a strong academic flavor to those emphasizing practicalities of career preparation. Some are interdisciplinary programs, in which the degrees are given jointly by a mathematics department and a department in another field. Among the areas of emphasis are actuarial mathematics, applied mathematics, bioinformatics, financial mathematics, industrial mathematics, scientific computing, and teaching. Internships are often part of these programs, and sometimes professionals from outside academia are brought in to teach courses.

The first workshop on professional master's degree programs was held in November 1998 at the Courant Institute of Mathematical Sciences, New York University. With twenty-six universities represented among the sixty-five participants, the workshop included a panel of finance professionals, as well as discussions with graduates of financial mathematics programs. The second workshop, held a year later at Arizona State University, drew seventy-five participants from thirty-three institutions. That workshop included a panel of professionals from the high technology and pharmaceutical industries.

As part of the project, the AMS solicited information about existing professional master's degree programs from all U.S. mathematics departments that grant graduate degrees. In addition to contact information, departments with professional master's degree programs were asked to provide such information as the date when the program started, the number of graduates, and the degree requirements. The AMS plans to make this information accessible by the end of August 2000 through the AMS Web page, `http://www.ams.org/education/`.

—Allyn Jackson

AMS Science and Technology Town Meeting in Cambridge

The AMS held a Science and Technology Town Meeting in Cambridge, Massachusetts, on April 24, 2000, with Congressman Michael Capuano, representing Massachusetts's eighth congressional district. This is the fourth town meeting that the AMS has organized over the past two years. These meetings provide forums for discussions between mathematicians, scientists, engineers, and members of Congress.

Congressman Capuano responded candidly to questions from an audience of around seventy-five constituents, explaining how he must balance the many issues and needs of his district. Science is very seldom a high priority for him, even though his district has one of the highest concentrations of scientists in the country. However, Capuano thoroughly enjoyed the give-and-take with this group of science constituents and—with continued followup by the group—science should be able to move up in his consciousness.

The town meeting was organized locally by Arthur Jaffe of Harvard University and Dan Stroock and Jerry Friedman of the Massachusetts Institute of Technology, with support from the AMS Washington Office. The AMS Washington Office enlisted the help of several other scientific societies, including the American Physical Society and the American Chemical Society, in publicizing the town meeting and cosponsoring the event.

The AMS Washington Office hopes to facilitate the organization of several science and technology town meetings later this year. These meetings provide an advantageous and relatively easy way to begin to develop relationships with members of Congress, and I encourage those interested in hosting similar events on their campuses to contact me by e-mail at `smr@ams.org` or by telephone at 202-588-1100.

—Samuel M. Rankin III
AMS Washington Office

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, book reviews and other communications, and "Forum" pieces. 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.sunysb.edu` in the case of the editor and `notices@ams.org` in the case of the managing editor. The fax numbers are 631-751-5730 for the editor and 401-331-3842 for the managing editor. Postal addresses may be found in the masthead.

Upcoming Deadlines

July 17, 2000: Full proposal for NSF VIGRE grants. See `http://www.nsf.gov/pubs/2000/nsf0040/nsf0040.html`, or contact the Division of Mathematical Sciences, Room 1025, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; telephone: 703-306-1870.

July 19, 2000: Preproposals for NSF IGERT program. See `http://www.nsf.gov/cgi-bin/getpub?nsf0078/`, or contact NSF 00-78 - IGERT Program, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; telephone: 703-306-1870.

July 27, 2000: Proposals for NSF CAREER program. See `http://www.nsf.gov/cgi-bin/getpub?nsf0089/`.

July 31, 2000: Nominations for the Monroe Martin Prize. Contact J. A. Yorke, Director, Institute for Physical Sciences and Technology, University of Maryland, College Park, MD 20742.

August 1, 2000: Applications for Fulbright Scholarship Program lecturing and research grants. Contact the Council for International Exchange of Scholars (CIES), 3007 Tilden Street, NW, Suite 5L, Washington, DC 20008-3009; telephone: 202-686-7877; World Wide Web: `http://www.iie.org/cies/compo.htm`.

August 15, 2000: Third competition for NRC Research Associateships. See `http://www.national-academies.org/rap/`, or contact the

Where To Find It

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

AMS e-mail Addresses—*November 1999, p. 1269*

AMS Ethical Guidelines—*June 1995, p. 694*

AMS Officers 1999 and 2000 (Council, Executive Committee, Publications Committees, Board of Trustees)—*May 2000, p. 591*

AMS Officers and Committee Members—*November 1999, p. 1271*

AMS Bylaws—*November 1999, p. 1252*

Board on Mathematical Sciences and Staff—*April 2000, p. 494*

Information for *Notices* Authors—*June/July 2000, p. 686*

Mathematical Sciences Education Board and Staff—*April 2000, p. 494*

Mathematics Research Institutes Contact Information—*August 2000, p. 786*

National Science Board—*January 2000, p. 71*

New Journals for 1999—*June/July 2000, p. 688*

NSF Mathematical and Physical Sciences Advisory Committee—*March 2000, p. 381*

Program Officers for Federal Funding Agencies (DoD, DoE; NSF)—*October 1999, p. 1075; November 1999, p. 1247*

National Research Council, Associateship Programs (TJ 2114/D3), 2101 Constitution Avenue, NW, Washington, DC 20418; telephone: 202-334-2760; fax: 202-334-2759; e-mail: rap@nas.edu.

August 28, 2000: Applications for NRC travel/host grants for research. See "Mathematics Opportunities" in this issue.

September 1, 2000: Applications for the AWM 2001 Workshop for Women Graduate Students and Postdocs. Workshop Selection Committee, Association for Women in Mathematics, 4114 Computer & Space Sciences Building, University of Maryland, College Park, MD 20742-2461; telephone: 301-405-7892; e-mail: awm@math.umd.edu. The AWM Web site is at http://www.awm-math.org/.

September 15, 2000: Nominations for Sloan Research Fellowships. Contact Sloan Research Fellowships, Alfred P. Sloan Foundation, 630 Fifth Avenue, Suite 2550, New York, New York 10111, or see: http://www.sloan.org/.

October 1, 2000: Nominations for the AWM Louise Hay Award and Alice T. Schafer Prize. Contact Hay Award Selection Committee, Association for Women in Mathematics, 4114 Computer & Space Sciences Building, University of Maryland, College Park, MD 20742-2461; telephone: 301-405-7892; e-mail: awm@math.umd.edu.

October 1, 2000: Applications for NSF/AWM Travel Grants for Women. See http://www.awm-math.org/travelgrants.html, or contact Association for Women in Mathematics, 4114 Computer & Space Sciences Building, University of Maryland, College Park, MD 20742-2461; telephone: 301-405-7892; e-mail: awm@math.umd.edu.

October 16, 2000: Applications for NSF Mathematical Sciences Postdoctoral Research Fellowships. See http://www.fastlane.nsf.gov/, or contact Division of Mathematical Sciences, Room 1025, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; telephone 703-306-1870; e-mail: msprf@nsf.gov.

November 1, 2000: Applications for Fulbright Scholar Program international education and academic administrator seminars. Contact the Council for International Exchange of Scholars (CIES), 3007 Tilden Street, NW, Suite 5L, Washington, DC 20008-3009; telephone: 202-686-7877; World Wide Web: http://www.iie.org/cies/compo.htm.

January 8, 2001: Applications for NRC travel/host grants. See "Mathematics Opportunities" in this issue.

January 16, 2001: Proposals for NSF institute competition. See http://www.nsf.gov/cgi-bin/getpub?nsf0086/, or contact Division of Mathematical Sciences, Room 1025, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; telephone: 703-306-1870.

January 26, 2001: Full proposals for NSF IGERT program. See http://www.nsf.gov/cgi-bin/getpub?nsf0078/, or contact NSF 00-78 - IGERT Program, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; telephone: 703-306- 1870.

October 1, 2001: Nominations for the Emanuel and Carol Parzen Prize. See "Mathematics Opportunities" in this issue.

Contact Information for Mathematics Institutes

American Institute of Mathematics
360 Portage Avenue
Palo Alto, CA 94306
Telephone: 650-845-2072, 650-845-2065
Fax: 650-845-2074
e-mail: conrey@aimath.org
World Wide Web: http://www.aimath.org/

Stefan Banach International Mathematical Center
ul Mokotowska 25, P. O. Box 137
00-950 Warszawa, Poland
Telephone: (+48-22) 628-01-92
Fax: (+48-22) 622-57-50
e-mail: banach@impan.gov.pl
World Wide Web: http://www.impan.gov.pl/BC/

Center for Discrete Mathematics and Theoretical Computer Science (DIMACS)
CoRE Building, 4th Floor
Rutgers University
96 Frelinghuysen Road
Piscataway, NJ 08854-8018
Telephone: 732-445-5930
Fax: 732-445-5932
e-mail: center-admin@dimacs.rutgers.edu
World Wide Web: http://dimacs.rutgers.edu/

Centre International de Rencontres Mathématiques (CIRM)
Case 916, 163, avenue de Luminy
13288 Marseille Cedex 09, France
Telephone: +33 4 91 83 30 00
Fax: +33 4 91 83 30 05
e-mail: labesse@cirm.univ-mrs.fr
World Wide Web: http://cirm.univ-mrs.fr/

Centre de Recerca Matemática (CRM)
Institut d'Estudis Catalans
Apartat 50
E-08193 Bellaterra, Spain
Telephone: +34 93 581 1081
Fax: +34 93 581 2202
e-mail: crm@crm.es
World Wide Web: http://crm.es/

Centre de Recherches Mathématiques (CRM)
Université de Montréal
C.P. 6128, Succ. Centre-ville
Montréal, Quebec, Canada H3C 3J7
Telephone: 514-343-7501
Fax: 514-343-2254
e-mail: activites@crm.umontreal.ca
World Wide Web: http://www.crm.umontreal.ca/

Centre for Mathematical Physics and Stochastics (MaPhySto)
Department of Mathematical Sciences
University of Aarhus
Ny Munkegade
DK-8000 Aarhus C, Denmark
Telephone: (+45) 8942 3532
Fax: (+45) 8613 1769
e-mail: maphysto@maphysto.dk
World Wide Web: http://www.maphysto.dk/

Centro de Investigacion en Matemáticas (CIMAT)
A. P. 402, Guanajuato, Gto.
C.P. 36000, Mexico
Telephone: +52-473-271-55
Fax: +52-473-257-49
e-mail: cimat@cimat.mx

World Wide Web:
http://www.cimat.mx/

Chennai Mathematical Institute
92 G. N. Chetty Road
Chennai 600 017, India
Telephone: +91-44-8284232
Fax: +91-44-8250573
e-mail: office@smi.ernet.in
World Wide Web:
http://www.smi.ernet.in/

The Fields Institute for Research in Mathematical Sciences
222 College Street, 2nd Floor
Toronto, Ontario, Canada M5T 3J1
Telephone: 416-348-9710
Fax: 416-348-9714
e-mail: geninfo@fields.utoronto.ca
World Wide Web:
http://www.fields.utoronto.ca/

Forschungsinstitut für Mathematik (FIM)
Eidgenössische Technische Hochschule Zentrum
Ramistrasse 101
8092 Zürich, Switzerland
Telephone: +41-1-632-3475
Fax: +41-1-632-1614
e-mail: Marcela.Kraemer@math.ethz.ch
World Wide Web:
http://www.fim.math.ethz.ch/

Institut des Hautes Études Scientifiques (IHÉS)
Le Bois-Marie
35, route de Chartres
F-91440 Bures-sur-Yvette, France
Telephone: +33 1 60 92 66 00
Fax: +33 1 60 92 66 69
World Wide Web:
http://www.ihes.fr/

Institute for Advanced Study (IAS)
School of Mathematics
Olden Lane
Princeton, NJ 08540
Telephone: 609-734-8100
Fax: 609-951-4459
e-mail: math@math.ias.edu
World Wide Web:
http://www.math.ias.edu/

Institute for Mathematics and its Applications (IMA)
University of Minnesota
400 Lind Hall
207 Church Street, SE
Minneapolis, MN 55455-0436
Telephone: 612-624-6066
Fax: 612-626-7370
e-mail: staff@ima.umn.edu
World Wide Web:
http://www.ima.umn.edu/

Institut Mittag-Leffler
Auravägen 17
S-182 62 Djursholm, Sweden
Telephone: +46 622 05 61
e-mail: widman@ml.kva.se
World Wide Web:
http://www.ml.kva.se/

Institute for Pure and Applied Mathematics (IPAM)
Mathematics Department
University of California, Los Angeles
6363 Math Sciences
405 Hilgard Avenue, Box 951555
Los Angeles, CA 90095-1555
Telephone: 310-825-4701
Fax: 310-206-6673
e-mail: ipam@math.ucla.edu
World Wide Web:
http://www.ipam.org/

International Center for Theoretical Physics (ICTP)
Strada Costiera 11, P.O. Box 586
34100 Trieste, Italy
Telephone: +39 040 2240111
Fax: +39 040 224163
e-mail: sci_info@ictp.trieste.it
World Wide Web:
http://www.ictp.trieste.it/

International Centre for Mathematical Sciences (ICMS)
14 India Street
Edinburgh EH3 6EZ, Scotland
Telephone: +44 (0)131 220 1777
Fax: +44 (0)131 220 1053
e-mail: icms@math.ed.ac.uk
World Wide Web:
http://www.ma.hw.ac.uk/icms/

Isaac Newton Institute for Mathematical Sciences
20 Clarkson Road
Cambridge CB3 0EH, England
Telephone: +44 (0)1223-335999
Fax: +44 (0)1223-330508
e-mail: inewton@newton.cam.ac.uk
World Wide Web:
http://www.newton.cam.ac.uk/

Istituto de Matemática Pura e Aplicada (IMPA)
Estrada Dona Castorina, 110
Jardim Botânico
Rio de Janeiro, RJ, Brazil
Telephone: +55 21-529 5000
Fax: +55 21-512 4115/512 4112
World Wide Web:
http://www.impa.br/

Istituto Nazionale di Alta Matematica "F. Severi" (INDAM)
Citta Universitaria
P. le Aldo Moro 5
00185 Rome, Italy
Telephone: +39 6490320
Fax: +39 64462293
e-mail: indam@mat.uniroma1.it
World Wide Web:
http://indam.mat.uniroma1.it/

Korea Institute for Advanced Study (KIAS)
207-43 Cheongryangri-dong
Dongdaemun-gu
Seoul 130-012, Korea
Telephone: +82-2-958-3701
Fax: +82-2-958-3770
World Wide Web:
http://www.kias.re.kr/

Mathematical Research Centre (MCAA)
The University of Aarhus
Department of Mathematical Sciences
Ny Munkegade
8000 Aarhus C, Denmark
Telephone: +45 8942 3188
Fax: +45 8613 1769
e-mail: mcaa@imf.au.dk
World Wide Web:
http://www.imf.au.dk/ResearchC/MCAA/index.html

Mathematical Sciences Research Institute (MSRI)
1000 Centennial Drive, #5070
Berkeley, CA 94720-5070
Telephone: 510-642-0143
Fax: 510-642-8609
e-mail: inquiries@msri.org
World Wide Web:
http://www.msri.org/

Mathematisches Forschungsinstitut Oberwolfach
Lorenzenhof
D-77709 Oberwolfach-Walke, Germany
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Fax: +49 7834 979 55
e-mail: admin@mfo.de
World Wide Web:
http://www.mfo.de/

Max-Planck-Institut für Mathematik
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Fax: +49 228 402277
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World Wide Web:
http://www.mpim-bonn.mpg.de/

Max-Planck-Institut für Mathematik in den Naturwissenschaften
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Pacific Institute for the Mathematical Sciences
1933 West Mall
University of British Columbia
Vancouver, BC, Canada V6T 1Z2
Telephone: 604-822-3922
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World Wide Web:
http://www.pims.math.ca/

Research Institute for Mathematical Sciences (RIMS)
Kyoto University
Kyoto, 606-8502, Japan
Fax: +81 75 753 7276
World Wide Web:
http://www.kurims.kyoto-u.ac.jp/

Steklov Institute of Mathematics
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Fax: (+7 095) 938-1466
World Wide Web:
http://www.ras.ru/local.docs/mian/mian.html

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Fax: 7 (812) 310-53-77
e-mail: admin@pdmi.ras.ru
World Wide Web:
http://www.pdmi.ras.ru/

Tata Institute of Fundamental Research
School of Mathematics
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http://www.math.tifr.res.in/

Book List

*The **Book List** highlights books that have mathematical themes and hold appeal for a wide audience, including mathematicians, students, and a significant portion of 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 the managing editor, e-mail:* notices@ams.org.

The Advent of the Algorithm: The Idea That Rules the World, by David Berlinski. Harcourt, March 2000. ISBN 0-151-00338-6.

The Arithmetic of Life, by George Shaffner. Ballantine Books, August 1999. ISBN 0-345-42631-2.

The Bride of Science, by Benjamin Woolley. MacMillan, August 1999. ISBN 0-333-72436-4.

* *Chance Rules: An Informal Guide to Probability, Risk, and Statistics*, by Brian S. Everitt. Springer, August 1999. ISBN 0-387-98768-1.

The Code Book: The Evolution of Secrecy from Mary, Queen of Scots to Quantum Cryptography, by Simon Singh. Doubleday, October 1999. ISBN 0-385-49531-5. (Reviewed March 2000.)

Complexity and Information, by J. F. Traub and Arthur G. Werschulz. Cambridge University Press, December 1998. ISBN 0-521-48005-1 (hardcover), 0-521-48506-1 (paperback).

The Eightfold Way: The Beauty of Klein's Quartic Curve, edited by Silvio Levy. Cambridge University Press, March 1999. ISBN 0-521-66066-1.

The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory, by Brian Greene. W. W. Norton & Company, February 1999. ISBN 0-393-04688-5.

Euclid: The Creation of Mathematics, by Benno Artmann. Springer, June 1999. ISBN 0-387-98423-2.

* *Excursions into Mathematics: Millennium Edition*, by Anatole Beck, Michael N. Cleicher, and Donald W. Crowe. A K Peters, 2000. ISBN 1-568-81115-2.

Fermat's Last Theorem for Amateurs, by Paulo Ribenboim. Springer, February 1999. ISBN 0-387-98508-5. (Reviewed April 2000.)

Five More Golden Rules: Knots, Codes, Chaos and Other Great Theories of 20th Century Mathematics, by John L. Casti. John Wiley & Sons, February 2000. ISBN 0-471-32233-4.

Fragile Dominion: Complexity and the Commons, by Simon Levin. Perseus Books, June 1999. ISBN 0-738-20111-1. (Reviewed May 2000.)

* *The Game's Afoot! Game Theory in Myth and Paradox*, by Alexander Mehlmann. AMS, 2000. ISBN 0-8218-2121-0.

A History of Algorithms: From the Pebble to the Microchip, edited by Jean-Luc Chabert. Springer, September 1999. ISBN 3-540-63369-3.

A History of the Circle: Mathematical Reasoning and the Physical Universe, by Ernest Zebrowski Jr. Rutgers University Press, August 1999. ISBN 0-813-52677-9.

Imaginary Numbers: An Anthology of Marvelous Mathematical Stories, Diversions, Poems, and Musings, edited by William Frucht. John Wiley & Sons, October 1999. ISBN 0-471-33244-5. (Reviewed in this issue.)

The Importance of Being Fuzzy and Other Insights from the Border between Math and Computers, by Arturo Sangalli. Princeton University Press, December 1998. ISBN 0-691-00144-8.

Infosense: Turning Data and Information into Knowledge, by Keith Devlin. W. H. Freeman, June 1999. ISBN 0-716-73484-2.

John von Neumann: The Scientific Genius Who Pioneered the Modern Computer, Game Theory, Nuclear Deterrence, and Much More, by Norman Macrae. AMS, October 1999. ISBN 0-821-82064-8.

The Kingdom of Infinite Number: A Field Guide, by Bryan Bunch. W. H. Freeman, January 2000. ISBN 0-716-73388-9.

A Mathematical Mystery Tour: Discovering the Truth and Beauty of the Cosmos, by A. K. Dewdney. John Wiley & Sons, March 1999. ISBN 0-471-23847-3. (Reviewed February 2000.)

Mathematical Sorcery: Revealing the Secrets of Numbers, by Calvin C. Clawson. Plenum Press, May 1999. ISBN 0-306-46003-3.

Mathematics and Mathematicians: Mathematics in Sweden before 1950, by Lars Gårding. AMS/London Mathematical Society, 1998. ISBN 0-821-80612-2.

Mathematics Success and Failure among African American Youth: The Roles of Sociohistorical Context, Community Forces, School Influence, and Individual Agency, by Danny B. Martin. Lawrence Erlbaum Associates, December 1999. ISBN 0-805-83042-1.

The Nature of Mathematical Modeling, by Neil Gershenfeld. Cambridge University Press, February 1999. ISBN 0-521-57095-6.

Noeuds: Genèse d'une théorie mathématique (Knots: Genesis of a Mathematical Theory), by Alexei Sossinsky (in French). Seuil, 1999. ISBN 2-020-32089-4. (Reviewed June/July 2000.)

The Nothing That Is: A Natural History of Zero, by Robert Kaplan. Oxford University Press, October 1999. ISBN 0-195-12842-7.

Number: From Ahmes to Cantor, by Midhat Gazalé. Princeton University Press, March 2000. ISBN 0-691-00515-X.

Philosophy of Mathematics: An Introduction to a World of Proofs and Pictures, by James Robert Brown. Routledge, August 1999. ISBN 0-415-12274-0.

Pioneers of Representation Theory: Frobenius, Burnside, Schur, and Brauer, by Charles W. Curtis. AMS/London Mathematical Society, October 1999. ISBN 0-821-89002-6.

Proofs and Contradictions: The Story of the Alternating Sign Matrix Conjecture, by David M. Bressoud. MAA Spectrum Series, published jointly with Cambridge University Press, August 1999. ISBN 0-521-66646-5.

* *Riemann, Topology, and Physics*, by Michael Monastyrsky. Translated by Roger Cooke, James King, and Victoria King. Birkhäuser, second edition, May 1999. ISBN 3-7643-3789-3.

Shadows of the Circle: Conic Sections, Optimal Figures and Non-Euclidean Geometry, by Vagn Lundsgaard Hansen. World Scientific Publishing Company, November 1998. ISBN 9-810-23418-X.

Slicing Pizzas, Racing Turtles, and Further Adventures in Applied Mathematics, by Robert B. Banks. Princeton University Press, September 1999. ISBN 0-691-05947-0.

Small Worlds: The Dynamics of Networks between Order and Randomness, by Duncan J. Watts. Princeton University Press, November 1999. ISBN 0-691-00541-9.

Squaring the Circle: The War between Hobbes and Wallis, by Douglas M. Jesseph. University of Chicago Press, December 1999. ISBN 0-226-39899-4 (cloth), 0-226-39900-1 (paper).

Statistics on the Table: The History of Statistical Concepts and Methods, by Stephen M. Stigler. Harvard University Press, November 1999. ISBN 0-674-83601-4.

Stephen Smale: The Mathematician Who Broke the Dimension Barrier, by Steve Batterson. AMS, February 2000. ISBN 0-821-82045-1.

Turing and the Computer (The Big Idea), by Paul Strathern. Anchor Books, April 1999. ISBN 0-385-49243-X.

The Universal History of Numbers: From Prehistory to the Invention of the Computer, by Georges Ifrah (translated by David Bellos, Sophie Wood, and Ian Monk). John Wiley & Sons, December 1999. ISBN 0-471-37568-3.

Uncle Petros and Goldbach's Conjecture by Apolstolos Doxiadis. Bloomsbury USA, February 2000. ISBN 1-582-34067-6.

The Unknowable, by Gregory Chaitin. Springer, August 1999. ISBN 9-814-02172-5.

What Are the Odds? Chance in Everyday Life, by Michael Orkin. W. H. Freeman, December 1999. ISBN 0-716-73560-1.

What Counts: How Every Brain Is Hardwired for Math, by Brian Butterworth. Free Press, August 1999. ISBN 0-684-85417-1.

What Is Random? Discovering Chance and Order in Mathematics and the World, by Edward J. Beltrami. Springer, August 1999. ISBN 0-387-98737-1.

The Wild Numbers, by Philibert Schogt. Four Walls Eight Windows, April 2000. ISBN 1-568-68166-1.

Zero: The Biography of a Dangerous Idea, by Charles Seife. Viking Press, February 2000. ISBN 0-670-88457-X.

**Added to the "Book List" since the list's last appearance.*

Visiting Mathematicians

American and Canadian Mathematicians Visiting Abroad

Name and Home Country	Host Institution	Field of Special Interest	Period of Visit
Friedman, Sy David (U.S.A.)	Institut für Logistik, Austria	Mathematical Logic	9/00- 5/01
Morgan, John (U.S.A.)	IHÉS, Bures-sur-Yvette, France	Topology	9/00- 6/01

Visiting Foreign Mathematicians

Aastveit, Are Halvor (Norway)	University of Wisconsin, Madison	Longitudinal Data Analysis, Linear Linear Models	8/00- 7/01
Abdalla Behiry, Salah Eldin (Egypt)	University of Central Florida	Wavelets and Spectral Theory	5/00- 9/00
Allili, Madjid (Algeria)	Georgia Institute of Technology	Computational and Topological Methods in Dynamical Systems	6/00- 5/01
Arnaudon, Marc (France)	University of Connecticut	Mathematics	9/00-10/00
Azimi, Parviz (Iran)	University of Denver	Theory of Banach Spaces	9/00- 8/01
Bauer, Ingrid (Germany)	Florida State University	Algebraic Geometry	12/00- 5/01
Beresovsky, Faina (Russia)	Georgia Institute of Technology	Mathematical Biology	8/00- 5/01
Bertola, Marco (Italy)	Concordia University, Montréal	Axiomatic Quantum Field Theory	5/00- 4/01
Blanc, David (Israel)	Northwestern University	Algebraic Topology	9/00- 6/01
Brenti, Francesco (Italy)	Massachusetts Institute of Technology	Combinatorics	10/00- 5/01
Cagliero, Leandro (Argentina)	Massachusetts Institute of Technology	Lie Theory	9/00- 1/01
Calin, Ovidiu (Romania)	University of Notre Dame	Partial Differential Equations	8/00- 5/01
Cao, Xifang (People's Republic of China)	Concordia University, Montréal	Soliton Theory and Differential Geometry	6/00- 5/01
Catanese, Fabrizio (Germany)	Florida State University	Geometry	12/00- 5/01
Charatonik, Wlodimierz (Poland)	University of Missouri, Rolla	Topological Dynamics	8/00- 6/01
Coates, John (England)	Columbia University	Number Theory	1/01- 5/01
Damanik, David (Germany)	University of California, Irvine	Mathematical Physics	10/00- 6/02
De Medeiros, Nivaldo Nunes, Jr. (Brazil)	Massachusetts Institute of Technology	Algebraic Geometry	9/00- 5/01
Denzler, Jochen (Germany)	University of Notre Dame	Partial Differential Equations	8/00- 5/01
Dette, Holger (Germany)	SUNY at Stony Brook	Statistics Approximation	9/00
Fashe, Lei (China)	University of Connecticut	Mathematics	9/00- 2/01
Flores, Gilberto (Mexico)	Georgia Institute of Technology	Traveling Waves, Ordinary and Partial Differential Equations	8/00-12/00
Franjou, Vincent (France)	Northwestern University	Algebraic Topology	9/00- 3/01
Froncek, Dalibor (Czech Republic)	University of Vermont	Graph Theory	1/00- 5/01
Gal, Sorin (Romania)	University of Memphis	Approximation Theory	8/00-12/00
Gay, Cyprien (France)	Massachusetts Institute of Technology	Fluids, Computational Mathematics	9/00- 8/01
Georgy, Nicolas (Switzerland)	Georgia Institute of Technology	Analysis	1/00-12/00
Ghouali, Amine (Algeria)	Université Laval	Applied Mathematics	3/00- 3/01
Gyula, Katona (Hungary)	University of Memphis	Combinatorics	1/01- 5/01
Imre, Patyi (Hungary)	University of California, Irvine	Analysis	10/00- 6/02
Jeschke, Sabina (Germany)	Georgia Institute of Technology	Functional Analysis, Numerical Mathematics, Mathematical Physics	8/00-12/00

The list of visiting mathematicians includes both foreign mathematicians visiting in the United States and Canada, and Americans and Canadians visiting abroad. Note that there are two separate lists.

Name and Home Country	Host Institution	Field of Special Interest	Period of Visit
Jiang, Qingtang (Singapore)	West Virginia University	Harmonic Analysis and Wavelet Analysis and Its Applications	8/00- 5/01
Jorn, Hongsuk (Korea)	University of Wisconsin, Madison	Spatial Statistics/Markov Chain Monte Carlo	8/00- 7/01
Kang, Chang Wook (Korea)	University of South Carolina	Statistics	1/00-12/00
Karev, Georgy (Russia)	Georgia Institute of Technology	Mathematical Biology	8/00- 5/01
Karoński, Michal (Poland)	Emory University	Random Structures and Algorithms	1/01- 5/01
Ko, Seok-ku (Korea)	University of Connecticut	Mathematics	1/00-12/00
Kokotov, Alexey (Russia)	Concordia University, Montréal	Analysis on Manifolds with Singularities, Partial Differential Equations	9/00-12/00
Ku, Albert (Hong Kong)	University of California, Irvine	Geometric Analysis	10/00- 6/02
Lalande, Franck (France)	Carleton University, Ottawa	Galois Theory	8/00-08/01
LeDrappier, François (France)	Northwestern University	Dynamics	9/00- 3/01
Lee, Jen-Young (Korea)	University of New Mexico	Statistics	6/00- 6/01
Li, Wei-Ping (Hong Kong)	Massachusetts Institute of Technology	Differential Geometry	9/00-12/00
Llibresalo, Jaume (Spain)	Northwestern University	Celestial Mechanics	3/01- 6/01
Loehl, Martin (Czech Republic)	Georgia Institute of Technology	Discrete Mathematics, Combinatorial Optimization	8/00- 5/01
Lubotsky, Alex (Israel)	Columbia University	Group Theory	10/00-12/00
Łuczak, Tomasz (Poland)	Emory University	Random Graphs	9/00-12/00
Macias, Sergio (Mexico)	West Virginia University	Continuum Theory and Hyperspaces of a Continuum	8/00- 5/01
Mastylo, Mieczyslaw (Poland)	University of Memphis	Analysis	1/01- 5/01
Mehdi, Salah (France)	Massachusetts Institute of Technology	Lie Theory	9/00- 1/01
Mesfioui, M'hamed (Belgium)	Université Laval	Statistics	8/99- 8/01
Neusel, Mara (Germany)	University of Notre Dame	Algebra	8/00- 5/01
Onn, Chan (Singapore)	Massachusetts Institute of Technology	Combinatorics	9/00- 6/01
Paulauskas, Vygantas (Lithuania)	Georgia Institute of Technology	Probability and Statistics	8/00- 5/01
Pawlikowski, Janusz (Poland)	West Virginia University	Set Theory	8/99- 5/01
Perdomo, Oscar (Colombia)	University of California, Irvine	Differential Geometry	10/00- 6/02
Peresetsky, Anatoly (Russia)	Georgia Institute of Technology	Mathematical Statistics, Econometrics	8/00- 5/01
Pitteloud, Philippe (Switzerland)	Massachusetts Institute of Technology	Combinatorics	8/00- 7/01
Rabi, Reuben (India)	Massachusetts Institute of Technology	Algebraic Geometry	9/00- 1/01
Raeburn, Iain (Australia)	Dartmouth College	Operator Algebras	9/00-12/00
	University of Denver		1/01- 3/01
Roman, Luis (Venezuela)	University of California, Irvine	Probability	10/00- 6/02
Rothmaler, Phillip (Germany)	Wesleyan University	Model Theory and Algebra	1/00- 6/01
Ryáček, Zdenek (Czech Republic)	University of Memphis	Graph Theory	8/00-12/01
Saichev, Alexander (Russia)	Case Western Reserve University	Random Dynamical Systems	7/00- 9/00
Schroer, Stefan (Germany)	Massachusetts Institute of Technology	Differential Geometry	9/00- 5/01
Sharifi, Hamid (France)	Université Laval	Applied Mathematics	3/00- 3/01
Shin, Chang Eon (Korea)	University of Central Florida	Sampling Theory and Differential Equations	2/00- 1/01
Skhiri, Haikel (France)	Université Laval	Analysis	1/00-12/00
Skjelnes, Roy (Sweden)	Massachusetts Institute of Technology	Algebraic Geometry	8/00- 8/01
Solomon, Andrew (Australia)	Simon Fraser University	Symbolic Computation	5/00- 4/01
Stokolos, Alexander (Ukraine)	University of Missouri, Kansas City	Fourier Analysis	4/99- 6/01
Tabak, Esteban (Argentina)	Massachusetts Institute of Technology	Fluid Dynamics	9/00- 5/01
Vavilov, Nikolai (Russia)	Northwestern University	Algebraic Groups	9/00- 3/01
Wang, Feng-Yu (China)	University of Connecticut	Mathematics	10/00-12/00
Wang, Qiying (China)	Carleton University, Ottawa	Probability Theory, Limit Theorems	11/00-11/01
Xiao, Jie (China)	Concordia University, Montréal	Function Spaces and Composition Operators	7/00- 5/01
Zhang, Weiping (People's Republic of China)	Massachusetts Institute of Technology		1/01- 5/01
Zhu, Chaofeng (People's Republic of China)	Massachusetts Institute of Technology	Differential Geometry	9/00- 6/01

From the AMS Secretary

Each spring the AMS executive director presents to the Council a general report about the state of the Society. The report typically covers such topics as Society finances, meetings, the publication program, and special and ongoing projects. What follows is a slightly edited version of the text of the report presented by Executive Director John H. Ewing on April 15, 2000, at the Council meeting in Washington, DC.

A Report to the Council

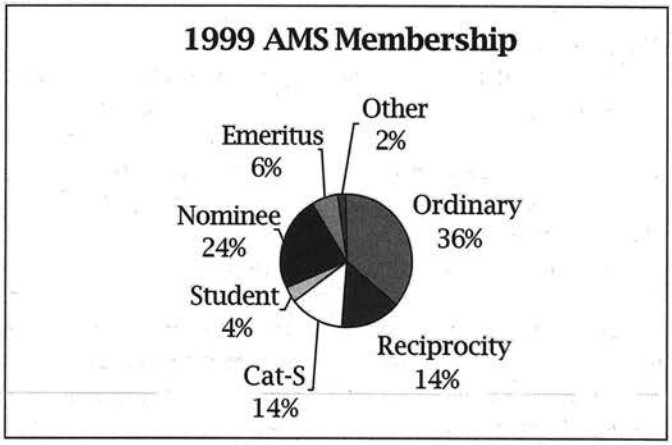
John H. Ewing

Introduction

Traditionally each spring the executive director reports to the Council on the Society; reports can be pretty dull. "The best way to become boring," wrote Voltaire, "is to say everything," and I tried to heed Voltaire's advice in recent years by choosing a particular perspective for each report—the transition in our publication program, a renewed commitment to outreach, the business side of the Society. This year's report will once again look at the Society from a different perspective, concentrating on a face of the AMS that we often take for granted.

Overview of Society

The American Mathematical Society has two distinct personalities. On the one hand, the AMS is a publisher, publishing books, journals, databases, and, increasingly, electronic products. The business of publishing mathematics is merely one way to promote mathematics, of course, but the publishing business of the Society is much more than a way to serve members: The Society's publication program is a major enterprise that competes effectively with other scientific publishers, influences mathematical publishing around the world, and generates revenue for the rest of the Society's operations. Of the $20.5 million in revenue last year, 76% came from publishing. (By comparison, only 7% came from individual dues and only 3.5% from meetings.) Of the 230 budgeted employees of the AMS, more than 175 are directly involved in publishing, and many of the rest provide publication support (for example, the Fiscal Department).

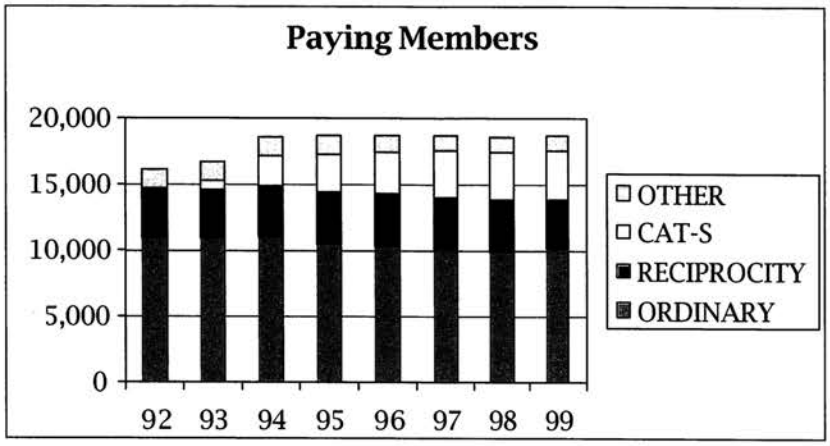


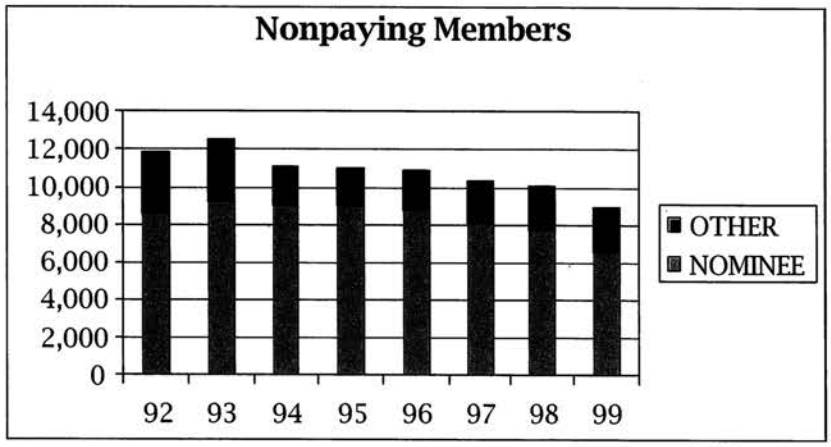
On the other hand, the AMS is a professional society with nearly 28,000 members, and about one-third of those members live outside the United States, drawn from all over the world. Nearly 7,500 members are students; another 3,800 belong through reciprocity agreements with other mathematical societies; another 3,700 are Category-S, a special arrangement that allows mathematicians in currency-weak countries to join the Society (and receive most member benefits) for only nominal dues. While the Society provides services for its members and for mathematicians more generally, it does not serve them as a trade organization or a union. Rather, it primarily serves mathematicians by promoting mathematics—all mathematics, but especially research and scholarship.

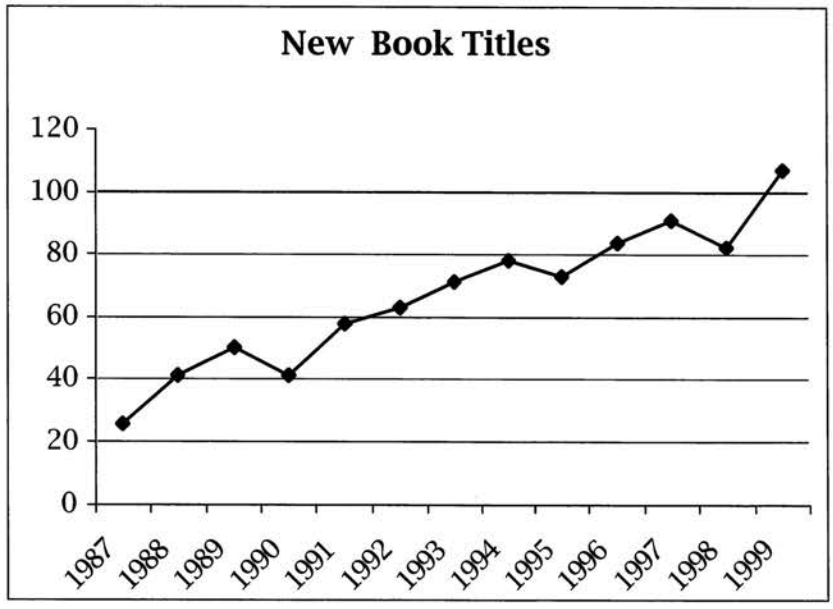
Because most of the Society's staff are in its publication program, it is natural that annual reports concentrate on

that face of the Society. That's especially true nowadays, because scholarly publishing is changing rapidly, and the AMS has been actively engaged in almost every aspect of electronic publication. It is exciting to report on innovations and progress in a rapidly changing field, and people are intrigued by that excitement. But the professional society face of the AMS is crucially important too; it's what defines us as an organization. This year's report will emphasize that face, where the innovations are exciting as well.

I will begin with a brief overview of the publication program and then devote the remaining space to a report on the AMS as a professional society.







Publisher

The American Mathematical Society publishes journals, books, and a very important database. It has people who work on every aspect of publishing—acquisitions, editing, printing, distribution, promotion, marketing, and electronic development. One entire office (Ann Arbor, MI) is devoted to assembling the Math Reviews database; another office (in Pawtucket, RI) is devoted to distribution and printing. Our two large presses each produced more than 2.5 million impressions last year—that's more than 300,000 individual books and journal issues.

In 1999 our own nine journals published nearly 15,000 pages, including over 1,000 articles. (There were even more pages and articles published in translation journals.) Every one of those pages was published in electronic form, and most were also published on paper as well. Our journal articles are now posted when ready; their references are fully linked to Math Reviews; a new interface makes them more usable than ever. Journal subscriptions reach mathematicians around the world, and the electronic versions of journals reach more and more people each year.

We published 107 new book titles last year (a record number), and we now carry over 2,500 titles in print. Book sales increase each year, and again the Web has made a difference: By the end of last year, we had sold over 20,000 books through our own bookstore since its inception. Interest has increased in almost every area—graduate texts, the new undergraduate series, popular biography, and Chelsea classics. Authors find the AMS a better place to publish, which is the key to a successful book program.

MathSciNet is upgraded each year with a new version in September. Users continue to be enthusiastic about Math Reviews on the Web (although, surprisingly, most subscribers continue to want the paper edition as well.) All reviews back to 1940 have been keyboarded in standard TEX (at a total cost of over $800,000), providing data that can be carried forward in years to come. Features such as browsing and special searching have been added. A new tool for verifying references and adding links (MR-Lookup) has been added. More than 100,000 items in Math Reviews now have links to original articles.

One of the most important changes for Math Reviews, however, is its pricing. By participating in consortia, universities and colleges that previously found it impossible to subscribe to MathSciNet can now do so at minimal cost. The number of consortia continues to grow rapidly, including entire countries and states, expanding the number of institutions around the world with access to Math Reviews.

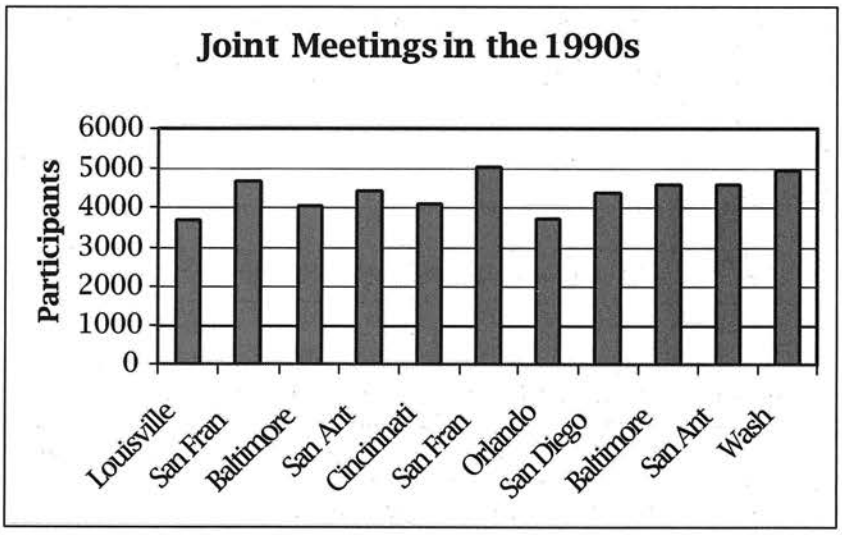
This brief summary of the AMS publishing program captures only a small piece of a large business. Publishing has always been an important part of the AMS, and today that is more true than ever. But behind that publication program is an organization that serves the mathematics community in many ways, and publication is only one of them.

Professional Society

Since its founding in 1888, the Society has been a membership organization, holding meetings and providing small services to mathematicians. In one sense a professional society doesn't merely serve the community of scholars; it creates that community. When occasionally mathematicians ask me why they ought to become members of the Society, the best answer I can think of is this: Each member of the Society contributes to programs such as those below, creating a community of mathematicians around the world. We all benefit from that community, and we all have a responsibility to support it.

What does a professional society do? From the beginning meetings have been among the most important services of the AMS, and they continue to be important today. But the Society also conducts surveys and runs employment services, hosts workshops, and carries out special projects. The AMS has also devoted much energy in recent years in Washington, representing mathematics alongside all the other sciences. And the AMS has tried to promote mathematics to various audiences—scientists, government officials, and the general public—in an ongoing program of public awareness.

Here is a sample of some of these activities from the past year.

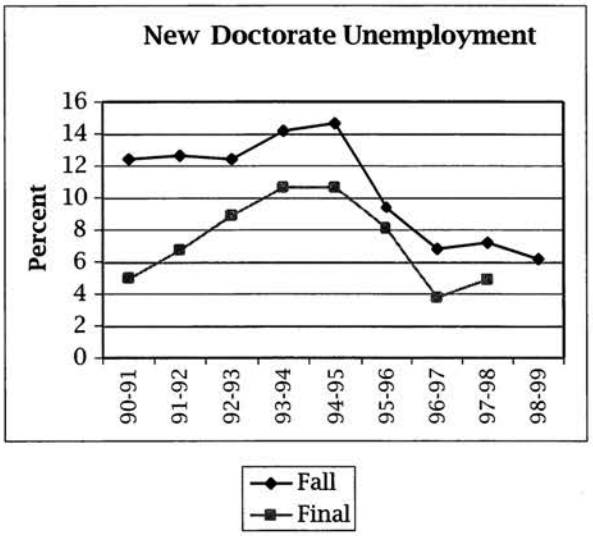


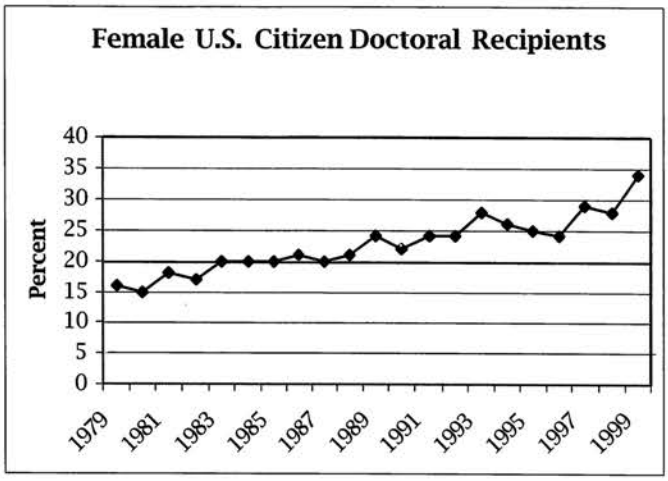
Meetings

- The Joint Meeting held in Washington this past January was joint with the Mathematical Association of America (MAA) and the Society for Industrial and Applied Mathematics (SIAM). It had nearly 5,000 attendees (close to a record), and both the program and the setting drew praise from most of those people.
- The AMS will hold a special summer meeting, Mathematical Challenges of the 21st Century, in August of 2000. The meeting at UCLA will extend over six days, include plenary lectures by thirty of the world's outstanding mathematicians, and draw many young mathematicians to meet them. This last point is made possible by a travel grant from the National Science Foundation that provides travel support to approximately 150 young mathematicians for the conference. Over 500 applications were received for those awards.
- There were eight sectional meetings of the AMS in 1999, and attendance at these meetings continues to increase each year. International meetings were held jointly with the Australian Mathematical Society (in Australia) and the Mexican Mathematical Society (in the United States). During this year there will be international meetings held in Denmark and Hong Kong.
- Summer research conferences, joint with SIAM and the Institute for Mathematical Statistics (IMS), have been held for a number of years. These will continue in the future, funded by a new grant from the NSF this past year. The slightly new format provides for more flexibility, and during the most recent competition there were a record number of proposals submitted—a healthy sign that summer research conferences remain appealing and relevant.

Young Mathematicians

- Each year the AMS runs an employment register at the annual meeting. The old format was greatly expanded recently, allowing both mathematicians and departments to use the register in a variety of ways. This past January there were 343 mathematicians and 152 employers—healthy numbers and a healthy ratio.
- In addition to the employment register, the Society provides a job seekers service each spring, giving young mathematicians an opportunity to let potential employers know they are still on the market (once the recruitment process is well under way).
- This year the Society has started a new program, aimed at our youngest mathematicians. Programs for talented high school students in mathematics have existed for many years. These young scholars programs are carried out each summer in a few universities throughout the country, run by dedicated people who have changed the lives of many of today's mathematicians. And yet the programs continue to struggle. The Society has started a program of small competitive grants to selected programs, and it seeks a permanent way to fund that effort.





Survey Work

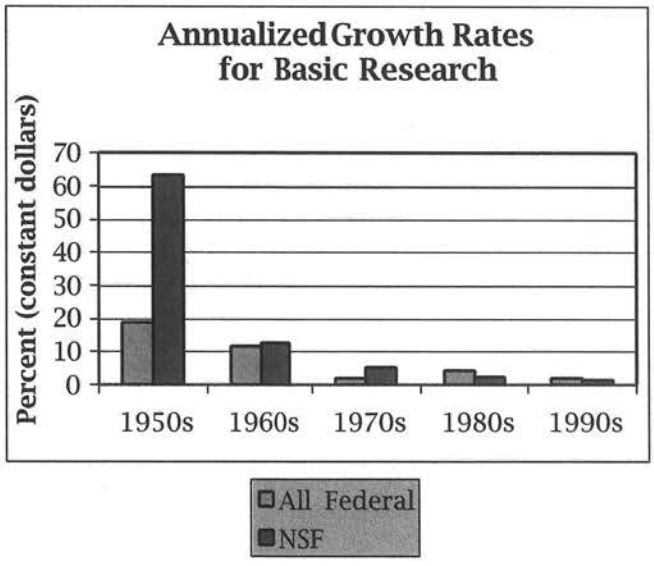
- Each year the AMS conducts an annual employment survey of young mathematicians, joint with the MAA, the American Statistical Society (ASA), and the Institute for Mathematical Statistics (IMS). That survey provides the mathematics community with information that is more complete than that available in almost any other discipline.
- Every five years the staff at the AMS supports a comprehensive survey under the aegis of the Conference Board for Mathematical Sciences. That survey investigates everything from course enrollments to faculty aging, and it provides comprehensive data going back to the 1960s. The survey is funded by the National Science Foundation but administered by the Society.
- On a limited basis the Society now provides comparative salary data for our institutional members. These individualized studies can provide crucial information to a chair in understanding how the salary structure of a department compares to a small group of similar departments across the nation.

Special Projects

- After a number of years of work, the Task Force on Excellence completed its work in 1999. The book that was published (*Towards Excellence*) was printed, distributed, and reprinted. That book advocates thoughtful self-examination by mathematics departments and provides some useful advice and examples. The work of the Task Force was capped by a "leadership conference" involving approximately seventy-five leaders from mathematics departments around the country.
- Following the work of the Task Force on Excellence, the Society put in place several new programs. There is now an annual workshop for chairs of departments held immediately before the Joint Meetings; that workshop concentrates on specific issues and problems that face chairs day-to-day in running a department. The AMS also will continue to hold focus groups for chairs at its meetings, bringing together leaders of departments across the country to share both successes and failures. Finally, the AMS has made a commitment to expand data collection and survey work so that department chairs have more information in the future.
- The Society runs a variety of other special workshops and programs, sometimes funded by agencies or private organizations. The nonacademic employment project (joint with SIAM and the MAA) is nearing completion. A Preparing Future Faculty project (joint with the MAA) is currently under way, providing grants to four doctoral departments that will serve as models. The second of two workshops on professional master's degree programs (joint with the Mathematics and Education Reform network and SIAM) was held last year. A conference for faculty who run Research Experiences for Undergraduates (REU) programs was run by the Society in October of 1999. The aim of that conference was to share common experiences and to collect material to promote such programs in the future.

Government Relations

- Reaching out to Congress and other parts of the government is an ongoing activity for our Washington office. Each spring there are two days set aside for large



Compiled by Sam Rankin 1999.

numbers of scientists to make congressional visits. But throughout the year there is an ongoing effort to set up visits between mathematicians and members of Congress. Working with congressional staff on a daily basis is equally important.

- There are special events to further this process. Each year the AMS sponsors a Congressional Luncheon to which members of Congress (and their staffs) come to hear about a small piece of mathematics. In 1999 DeWitt Sumners talked about mathematical biology; the year before, Carl Pomerance talked about encryption.
- We have held several town meetings for congressional representatives in recent years. Most recently there was a meeting for Congressman Rush Holt at Princeton and another for Congressman Michael Capuano in Cambridge. Scientists and mathematicians come to such meetings to exchange views with the congressmen, and this helps to build connections with key people in Congress.
- The most important Washington activity is the most subtle—networking with other science and technology groups. Being a part of the enormous scientific establishment in Washington makes mathematics more visible; it gives mathematicians a voice and some presence when decisions are being made. Going to meetings, participating in initiatives, holding receptions—these all sound like simple, social activities. But they are essential to working in Washington.

Public Awareness

- Public awareness includes making mathematicians themselves aware of interesting mathematics. The *Notices* has done a spectacular job in carrying that out in recent years. The rejuvenated *Bulletin* is beginning to do the same.
- At a high level (for scientists and the scientifically minded), *What's Happening* is a series of books that explains some of the exciting new areas and developments in mathematics in recent years.
- Our special public awareness section of e-MATH (*What's New in Mathematics*) has some first-rate material for general audiences. Unfortunately, it's hard to attract large audiences to that material in spite of its quality.
- The Society also puts out news releases regularly, contacts newspapers and other media for our national meetings, and cultivates key science reporters throughout the country.
- For the long term, the Society is trying to build a group of people who are both mathematically and media trained. Each year, we participate in the media fellows program of the American Association for the Advancement of Science, sponsoring one or two young mathematics graduate students who spend a summer working at a newspaper, magazine, or station. Over time, these people either become mathematicians with media experience or they become media people with some mathematical training. We win in either case.

This is a sample of recent activity, and it may not include some services considered most useful by some members. The *Combined Membership List* is used by almost all mathematicians. The *Professional Directory* is used by most departments. Our series of "how to" books on teaching or chairing or simply entering the profession are widely read and admired. e-MATH provides information and reporting used constantly by the community. These are all services that many people take for granted as part of the Society's ongoing activity.

Which is the most important face of the AMS? What are the most important services? Which parts should members value most? Of course, none of these questions makes sense. A professional society thrives on its many faces, and all faces are necessary for its health. That is a maxim that is forgotten by passionate constituencies from time to time; it is a maxim worth remembering.

Preliminary List of Candidates for 2000 AMS Election

Vice President

Ingrid Daubechies
M. Susan Montgomery

Trustee

John B. Conway
Douglas A. Lind

Member at Large of the Council

Walter L. Craig
Keith J. Devlin
Irene Fonseca
Joel Hass
William James Lewis
Paul S. Muhly
Alexander J. Nagel
Irena Peeva
Louise A. Raphael
Hema Srinivasan

Nominating Committee

Jonathan Alperin
Irwin Kra
Cora Sadosky
Audrey A. Terras
Thomas W. Tucker
Steven H. Weintraub

Editorial Boards Committee

Paul R. Blanchard
Tony F. Chan
Jane Gilman
Paul R. Goodey

Call for Nominations

Levi L. Conant Prize

Albert Leon Whiteman Memorial Prize

The selection committees for these prizes request nominations for consideration for the 2001 awards, which will be presented at the Joint Mathematics Meetings in New Orleans, LA, in January 2001. These newly established prizes will be presented for the first time at this event.

The Levi L. Conant Prize is to be awarded annually for the best expository paper published in either the Notices or the Bulletin of the American Mathematical Society during the preceding five years.

The Alfred Leon Whiteman Memorial Prize is to be awarded every four years for notable exposition and exceptional scholarship in the history of mathematics.

Nominations should be submitted to the Secretary, Robert J. Daverman, American Mathematical Society, 312D Ayres Hall, University of Tennessee, Knoxville, TN 37996-1330, and should include supporting material. Include a short description of the work that is the basis of the nomination, with complete bibliographic citations. A brief curriculum vitae should be included for all nominees. The nominations will be forwarded by the secretary to the appropriate prize selection committee which, as in the past, will make the final decisions on the awarding of the prizes.

Deadline for Nominations is September 15, 2000.

Call for Nominations

Ruth Lyttle Satter Prize

The selection committee for this prize requests nominations for consideration for the 2001 award, which will be presented at the Joint Mathematics Meetings in New Orleans, LA, in January 2001. Information about this prize may be found in the November 1999 *Notices*, p. 1262. (Also available at http://www.ams.org/ams/prizes.html.)

The Ruth Lyttle Satter Prize is presented every two years in recognition of an outstanding contribution to mathematics research by a woman during the previous five years.

Nominations should be submitted to the Secretary, Robert J. Daverman, American Mathematical Society, 312D Ayres Hall, University of Tennessee, Knoxville, TN 37996-1330, and should include supporting material. Include a short description of the work that is the basis of the nomination, with complete bibliographic citations. A brief curriculum vitae should be included for all nominees. The nominations will be forwarded by the secretary to the prize selection committee which, as in the past, will make the final decision on the awarding of the prize.

Deadline for Nominations is September 15, 2000.

Mathematics Calendar

The most comprehensive and up-to-date Mathematics Calendar information is available on e-MATH at `http://www.ams.org/mathcal/`.

August 2000

*21-30 **Conference and Ukrainian-U.S. Workshop "Dynamical Systems and Ergodic Theory"**, Katsiveli, Crimea, Ukraine.
Organizers: Institute of Mathematics and Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine together with Institut de Mathématiques de Luminy and Université de Tours, France, and will be partially sponsored by the INTAS OPEN-97 grant 1843 and INTAS Monitoring Conference Grants, Centre National de la Recherche Scientifique (CNRS, France), Ministry of Sciences and Technologies of Ukraine, Center for Dynamical Systems at Penn State University (U.S.), European Science Foundation - PRODYN, European Mathematical Society, CRDF Ukrainian - U.S. Scientific Workshop Grants (a joint program with the National Science Foundation (U.S.)).
Dedicated: To the memory of Vladimir Mikhailovich Alexeyev (1932-1980).
Minicourses: V. Bergelson (Ohio State Univ.), Anatole Katok (Pennsylvania State Univ.), P. Le Calvez (Univ. Paris 13, France), J.-P. Thouvenot (Univ. Paris 6, France), S. van Strien (Univ. of Warwick, UK), B. Weiss (Hebrew Univ. of Jerusalem, Israel).
Program: The program of the meeting will include: short speeches/recollections of Anatole Katok, Alexander Sharkovsky and Anatole Stepin, minicourses, 50-minute lectures, and 30-minute talks.
Information: S. Kolyada, Dept. of Dynamical Systems Theory, Inst. of Math., National Acad. of Sciences of Ukraine, Tereshchenkivs'ka, 3, 252601, Kiev, Ukraine; phone: (+380)-44-2243036; fax: (+380)-44-2352010; e-mail: `kats2000@imath.kiev.ua`; Web site: `http://www.imath.kiev.ua/~skolyada/kats2000.html`.

September 2000

*1-4 **Constantin Caratheodory in His...Origins**, Vissa Orestiada, Greece.
Invited Lecturers: R. Bulirsch, Technische Univ. München, Germany; H. M. Srivastava, Univ. of Victoria, Canada; O. Smolyanov, Moscow Univ., Russia; E. Wegert, TU Bergakademie Freiberg, Germany.
Information: T. Vougiouklis, Democritus Univ. of Thrace, 68 100 N. Chili, Alexandroupolis, Greece; tel. +30-551-39348; e-mail: `vougiouklis@xanthi.cc.duth.gr` and `vougiou@edu.duth.gr`; fax: +30-551-40040 and +30-551-39348.

*3-11 **Fifth International Workshop on Complex Structures and Vector Fields**, St. Constantine resort (near Varna), Bulgaria.
Organizing Committee: S. Dimiev (chairman, Sofia, Bulgaria), S. Manoff (Sofia, Bulgaria), K. Sekigawa (Niigata, Japan), H. Hashimoto (Saitama, Japan).
Program: 45-minute plenary lectures delivered by invited speakers and 30-minute communications are planned. The following seminars are also planned: (1) Seminar on Complex Analysis and Potential Theory, (2) Seminar on Differential Geometry, (3) Seminar on Mathematical Physics.
Information: Fifth International Workshop on Complex Structures and Vector Fields, Institute of Mathematics of the Bulgarian Academy of Sciences, Acad. G. Bonchev str. Bl. 8, 1113 Sofia, Bulgaria; S. Dimiev, e-mail: `sdimiev@math.bas.bg`; S. Manoff, e-mail: `smanov@inrne.bas.bg`.

*10-16 **Finiteness Conditions in Group Theory, dedicated to the memory of Richard E. Phillips**, Crotone, Italy.
Program: The aim of this school is to give an overview of some of the latest developments in some areas of group theory in which finiteness conditions play a prominent role. There will be five series of lectures given by J. I. Hall (Michigan State Univ.-East Lansing): Locally finite simple groups; F. Leinen (Univ. of Newcastle-

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This section contains announcements of meetings and conferences of interest to some segment of the mathematical public, including ad hoc, local, or regional meetings, and meetings and symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. A complete list of meetings of the Society can be found on the last page of each issue.
An announcement will be published in the *Notices* if it contains a call for papers and specifies the place, date, subject (when applicable), and the speakers; a second announcement will be published only if there are changes or necessary additional information. Once an announcement has appeared, the event will be briefly noted in every third issue until it has been held and a reference will be given in parentheses to the month, year, and page of the issue in which the complete information appeared. Asterisks (*) mark those announcements containing new or revised information.
In general, announcements of meetings and conferences held in North America carry only the date, title of meeting, place of meeting, names of speakers (or sometimes a general statement on the program), deadlines for abstracts or contributed papers, and source of further information. Meetings held outside the North American area may carry more detailed information. In any case, if there is any application deadline with respect to participation in the meeting, this fact should be noted. All communications on meetings and conferences in the mathematical sciences should be sent to the Editor of the *Notices* in care of the American Mathematical Society in Providence or electronically to `notices@ams.org` or `mathcal@ams.org`.
In order to allow participants to arrange their travel plans, organizers of meetings are urged to submit information for these listings early enough to allow them to appear in more than one issue of the *Notices* prior to the meeting in question. To achieve this, listings should be received in Providence **six 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, 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 e-MATH on the World Wide Web. To access e-MATH, use the URL: `http://e-math.ams.org/` (or `http://www.ams.org/`). (For those with VT100-type terminals or for those without WWW browsing software, connect to e-MATH via Telnet (`telnet e-math.ams.org`; login and password `e-math`) and use the Lynx option from the main menu.)

Newcastle, UK): Finitary groups; D. J. S. Robinson (Univ. of Illinois - Urbana): Soluble groups of finite rank; P. Shumyatsky (Univ. of Brasilia - Brasilia, Brazil): Periodic residually finite groups; and M. J. Tomkinson (Univ. of Glasgow - Glasgow, UK): FC-groups.
Accommodations: Accommodations are limited. For this reason people interested in attending the school should contact the organizers as soon as possible at the following address: infinite@matna2.dma.unina.it. The cost of full-board accommodation is 70.000 Italian lire per day/per person. Further information will soon be available at the school's home page, whose URL is http://www.science.unitn.it/~puglisi/index.html.

*21-24 **First SIAM Conference on Computational Science and Engineering**, Washington, DC.
Information: SIAM Conference Coordinator, 3600 University City Science Center, Philadelphia, PA 19104-2688; phone 215-382-9800; fax: 215-386-7999; e-mail: meetings@siam.org.

*23-24 **Mathematical Finance Day '2000 and Practitioners' Workshop on Computational Finance**, Boston University Law Auditorium.
Program: Mathematical Finance Day (Sept. 24) will be preceded by a Practitioners' Workshop on Computational Finance on Sept. 23, 2000.
Speakers: For Mathematical Finance Day '2000: M. Avellaneda, J. Cvitanic, D. Kramkov, G. Papanicolaou, W. Schachermayer, N. Touzi, H. Wang; For the Practitioners' Workshop on Computational Finance: A. Lewis, R. R. Reitano.
Information: Boston University Law Auditorium is located at 765 Commonwealth Avenue, Boston, MA 02215. For further information see the Web site http://www.bu.edu/mfd/.

*24-27 **DIMACS Workshop on Sublinear Algorithms**, Nassau Inn, Princeton, New Jersey.
Sponsor: Dimacs Center.
Organizers: S. Goldwasser, MIT; P. Raghavan, Verity; R. Rubinfeld, NEC Research Institute; M. Strauss, AT&T Labs - Research.
Short Description: Recent advances in computing power and the trend toward interconnecting computers has resulted in an increase in the size of data sets that are considered useful; therefore, this demands that we revisit traditional notions of efficient algorithms. This workshop will bring together researchers from several communities, including: combinatorial property testing, streaming algorithms, randomized algorithms and learning theory. By bringing researchers together that have had experience with massive data sets that occur in diverse domains such as the Web and databases, we hope to advance participants' research by establishing common issues.
Local Arrangements: S. Barbu, Princeton Univ., barbu@cs.princeton.edu, 609-609-1771.
Information: M. Strauss, AT&T Labs - Research, mstrauss@research.att.com; or http://dimacs.rutgers.edu/Workshops/index.html.

*29-October 2 **IX Oporto Meeting on Geometry, Topology, and Physics**, Universidade do Porto, Portugal.
Description: The aim of the Oporto meetings is to bring together mathematicians and physicists interested in the interrelation between geometry, topology, and physics and to provide them with a pleasant and informal environment for scientific interchange. The meeting will consist largely of short courses of approximately three lectures each given by the main speakers, supplemented by a limited number of seminars. The talks are at the advanced graduate or postdoctoral level and should be of interest to all researchers wishing to learn about recent developments in the overlap between geometry, topology, and physics.
Main Speakers: M. A. Akivis, V. V. Goldberg, J. Landsberg, D. Salamon, S. Salamon, R. W. Sharpe. (Professors Akivis and Goldberg will be giving a joint course of four lectures in total.)
Information and registration: See the Conference Web page http://fisica.ist.utl.pt/~jmourao/om/omix/om00b.html. Deadline for registration: July 30, 2000.

October 2000

*1-5 **International Conference on Numerical Algorithms, dedicated to Claude Brezinski on the occasion of his 60th birthday**, Marrakesh, Morocco.
Program: An international conference to celebrate the 60th birthday of Claude Brezinski and the 10th anniversary of the journal *Numerical Algorithms* that he founded in 1991 and where contributed papers will be published. The themes of the conference will cover all aspects of numerical analysis, in particular those that are related to numerical algorithms.
Information and Registration: A Web site containing all the information about this conference can be found at http://www-lmpa.univ-littoral.fr/~na2001/. If interested in participating, please respond to this address: na2001@lmpa.univ-littoral.fr.

*3-5 **International Symposium on Applications of Computer Algebra (ISACA'2000)**, Goa, India.
Information and Registration: Contact R. Akerkar, Convener, ISACA'2000, Technomathematics Research Foundation, Kolhapur 416001, India; e-mail: tmrf@pn3.vsnl.net.in. and URL: http://tmrf.homepage.com/isaca.html.

*3-8 **Swedish-Russian Conference on Combinatorics and Dynamics**, Royal Institute of Technology (KTH), Stockholm, Sweden.
Main Speakers: D. Anosov (Steklov Institute, Moscow) (to be confirmed), O. Häggström (Chalmers and Göteborg University), S. Janson (Uppsala University), K. Johansson (KTH, Stockholm), V. Kaimanovich (CNRS, France), S. Kerov (Steklov Institute, St.-Petersburg), A. Vershik (Steklov Institute, St.-Petersburg).
Focus: The conference is aimed mainly at young mathematicians from Sweden and Russia, but participants from other countries are also welcome. The emphasis will be on the interaction of combinatorics and dynamics and their relation to probability and mathematical physics. The lectures given by the main speakers will be complemented with shorter talks by younger participants and an open problems session.
Information: Further information can be found on the conference WWW page: http://www.math.kth.se/~stas/sto2000/. For questions about attendance and financial support (provided by the NFR), please contact the organizers: T. Smirnova-Nagnibeda, KTH, e-mail: tatiana@math.kth.se; S. Smirnov, KTH, e-mail: stas@math.kth.se, fax: 46-8-7231788.

*7-9 **Midwest Several Complex Variables Meeting**, Purdue University, West Lafayette, Indiana.
Preliminary List of Speakers: S. Baouendi (Univ. of California, San Diego), J. Duval (Univ. Paul Sabatier, Toulouse), J. E. Fornaess (Univ. Michigan, Ann Arbor), B. Hall (Notre Dame Univ.), T. Ohsawa (Nagoya Univ.), Y. T. Siu (Harvard Univ.)
Organizers: L. Lempert, S. Kee Yeung.
Information: The meeting is partially supported by the Institute for Mathematics and its Applications and by Purdue University. There is no registration fee, and there will be money to support graduate students/junior researchers. For information, e-mail: lempert@math.purdue.edu.

*12-14 **SIAM Northwest Regional Mathematics in Industry Workshop**, University of Washington, Seattle, Washington.
Organizer: A. Greenbaum, Univ. of Washington.
Information: SIAM Conference Coordinator, 3600 University City Science Center, Philadelphia, PA 19104-2688; phone: 215-382-9800; fax: 215-386-7999; e-mail: meetings@siam.org.

*20-21 **20th Annual Southeastern-Atlantic Regional Conference on Differential Equations**, Virginia Tech, Blacksburg, Virginia.
Forum: The conference is an annual meeting which was envisioned by members of the Department of Mathematics at Virginia Tech and which began in 1981. Since then its location has rotated among the institutions in the Southeastern-Atlantic region.
Scope: The primary purpose of the conference is to provide an exchange of ideas and discussions about research and education

among established and new researchers and advanced graduate students in the field of differential equations, i.e., ordinary and partial differential equations and functional differential equations, and numerical techniques and their applications to biology, engineering, and physics.
Topics: The conference will consist of a series of three plenary one-hour lectures and sessions for contributed papers. Topics presented during these conferences have been diverse and have included ordinary and partial differential equations, integral and functional equations, numerical methods, and applications to the sciences and engineering.
Invited Speakers: J. Bona (Univ. of Texas, Austin), E. Carlen (Georgia Tech), J. Glimm (SUNY at Stony Brook).
Contributed Talks: There will be sessions of contributed talks. Deadline for submission of abstracts for contributed talks is September 29, 2000.
Financial Assistance: Contingent on NSF funding, some financial assistance may be available to offset travel and housing expenses for graduate students and recent Ph.D. recipients. Requests postmarked by September 18, 2000, are guaranteed consideration. Eligible persons who belong to currently underrepresented groups are especially encouraged to apply to the conference for financial assistance.
Information: Updated information can be obtained at the conference Web site: `http://www.icam.vt.edu/SEARCDE_2000/` or by contacting: J. Borggaard, SEARCDE Coordinator, Dept. of Mathematics, Virginia Tech, Blacksburg, VA 24060; phone 540-231-3453; fax 540-231-7079; e-mail: `jborggaard@vt.edu`.

*22 **Computational Information Retrieval Workshop**, North Carolina State University, Raleigh, North Carolina.
Organizer: M. W. Berry, Univ. of Tennesse, Knoxville.
Information: SIAM Conference Coordinator, 3600 University City Science Center, Philadelphia, PA 19104-2688; phone: 215-382-9800; fax: 215-386-7999; e-mail: `meetings@siam.org`.

*23-26 **Sixth SIAM Conference on Applied Linear Algebra**, North Carolina State University, Raleigh, North Carolina.
Sponsor: SIAM Activity Group on Linear Algebra.
Organizers: C. Meyer and I. Ipsen, North Carolina State Univ.
Information: SIAM Conference Coordinator, 3600 University City Science Center, Philadelphia, PA 19104-2688; phone: 215-382-9800; fax: 215-386-7999; e-mail: `meetings@siam.org`.

*26-28 **The First Sino-Japan Optimization Meeting (SJOM2000)**, Hong Kong.
Information: See `http://www.polyu.edu.hk/~ama/events/conference/AMA-SJOM2000/fsjom2000.htm`.

*27-November 1 **Yosemite Symposium on Advanced Multiscale and Multiresolution Methods**, Yosemite National Park, California.
Sponsors: NSF, NASA, IBM, and SGI.
Topic: Many computationally challenging problems ubiquitous in science and engineering exhibit multiscale phenomena so that the prospect of numerically computing or even representing all scales of action is either very expensive or completely intractable. The Yosemite symposium is devoted to these problems with a focus on exciting new developments in this area.
Program: The three-day event will consist of several in-depth invited lectures from leading specialists, a small number of tutorial lectures, and contributed talks chosen from abstract submission.
Information: Complete instructions for abstract submission and student registration/travel support can be found at the Web site `http://raphael.mit.edu/yosemite/`. Or contact P. M. Lee, MIT 33-305, 77 Massachusetts Ave., Cambridge, MA 02139; `pmlee@mit.edu`.

November 2000

*27-December 3 **Workshop on Whitham Equations and Their Applications in Mathematics and Physics**, International School for Advanced Studies (SISSA), Trieste, Italy.
Program: The workshop's aim is to foster the interaction between mathematicians and physicists dealing with various applications of nonlinear semiclassical approximations.
Workshop Topics: Whitham equations (1) in the theory of dispersive waves: variational principles and Hamiltonian formalism; (2) and differential and algebraic geometry; (3) in plasma physics; (4) in fiber optics; (5) in string theory.
Speakers: J. Bronski (Univ. Illinois at Urbana), L. Friedland (Hebrew Univ., Jerusalem), T. Grava (Univ. Maryland at College Park and Imperial College, London), R. Grimshaw (Loughborough Univ.), Y. Kodama (Ohio State Univ.), K. McLaughlin (Univ. Arizona, Tucson), A. Maltsev (SISSA, Trieste, and Univ. Maryland at College Park), P. Miller (Monash Univ.), A. Shagalov (Institute of Metal Physics at Ekaterinburg), N. Mazur* (Physics of Earth Inst., Moscow), F.-R. Tian (Ohio State Univ.), S. Venakides* (Duke Univ.), A. Zabrodin (ITEP, Moscow), K. Zybin (Lebedev Inst., Moscow). (*=to be confirmed)
Information: B. Dubrovin, Secretariat of Whitham2000, SISSA, Via Beirut 2-4, I-34013 Trieste, Italy; e-mail: `whitham2000@fm.sissa.it`. Deadline for applications: May 15, 2000.

December 2000

*4-8 **25th Australasian Conference on Combinatorial Mathematics and Combinatorial Computing**, University of Canterbury, Christchurch, New Zealand.
Organizers: C. Semple, `c.semple@math.canterbury.ac.nz`; M. Steel, `m.steel@math.canterbury.ac.nz`.
Information: The conference home page is `http://www.math.canterbury.ac.nz/accmcc.shtml`.

January 2001

*22-25 **First International Conference on Industrial and Applied Mathematics**, Amritsar, India.
Sponsors: Indian Society of Industrial and Applied Mathematics and Guru Nanak Dev University.
Speakers: Several distinguished mathematicians from the USA, Germany, France, and Canada have consented to participate.
Information: P. Manchanda (chairperson), Department of Mathematics, Guru Nanak Dev University, Amritsar, India; tel: 0091-183-422748 (res.); 0091-183-258802-09, ext. 3299 (off.); fax: 0091-183-258820; e-mail: `kmanch@jla.vsnl.net.in`.

March 2001

*9-11 **The Third International Meeting of Origami Science, Math, and Education**, Asilomar, Monterey, California.
Information: In 1989 and 1994 the first two meetings devoted to origami research and applications in math and science were held in Italy and Japan respectively. OrigamiUSA, a national not-for-profit organization devoted to paperfolding, is proud to sponsor the third such meeting.
Call for Papers: Deadline is September 1, 2000. Please send abstracts, 10-20 lines long, and any other supporting material to T. C. Hull, Dept. of Math., Merrimack College, North Andover, MA 01845; or e-mail: `thull@merrimack.edu`. Details on registration can be found on `http://web.merrimack.edu/~thull/osm/osm.html`.

June 2001

*8-10 **Joint Meeting of the Belgian and German Mathematical Societies 2001 BMS-DMV Meeting**, University of Liege, Belgium.
Program: The aim is to set up a conference with six plenary talks of 50 minutes and 10-12 Special Sessions. The following three speakers have already agreed to deliver plenary talks: I. Daubechies (Princeton, NJ, USA), C. Deninger (Münster, Germany), and P. Deuflhard (Berlin, Germany). The following six Special Sessions (and organizers) have already been fixed: Arithmetic Geometry (G. Cornelissen, A. Huber, K. Künnemann, W. Veys); Functional Analysis and Functional Analytic Methods in Partial Differential Equations (K. D. Bierstedt, P. Laubin, R. Meise, J. Schmets); Global

MATHEMATICS CALENDAR

Analysis (J. Brüning, L. Lemaire); Optimization (M. Goemans, M. Grötschel, Ph. Toint, J. Zowe); Ordinary Differential Equations and Dynamic Systems (F. Dumortier, B. Fiedler, J. Mawhin, J. Scheurle); Representation Theory (D. Happel, C. Ringel, F. Van Oystaeyen, A. Verschoren).
Information: Information on the meeting can be found on the Web home page `http://math-www.uni-paderborn.de/Liege2001/`.

Everybody interested in participating in the meeting is kindly asked to preregister by sending an e-mail to `bmsdmv@upb.de`, mentioning their name, institution, e-mail address, and 2001 BMS-DMV Meeting. All mathematicians who have preregistered this way for the meeting will automatically receive the second announcement of the meeting in October 2000.

*25-29 **Harmonic Morphisms and Harmonic Maps**, Centre International de Rencontres Mathématiques, Luminy, Marseille, France.
Description: The second international conference primarily dedicated to harmonic morphisms will be held at the Centre International de Rencontres Mathématiques in Luminy, France. Though centered on harmonic morphisms, neighbouring themes in harmonic maps will also be represented with lectures from leading experts. Since 1979 the harmonic morphism bibliography has grown to more than 170 publications, and the prominence of the subject continues to grow, providing rich interactions between harmonic maps, minimal surface theory, low dimensional topology, probability theory, and theoretical physics.
Organizing Committee: M. Ville (École Polytechnique), E. Loubeau (Brest), S. Montaldo (Cagliari).
Scientific Committee: J. Eells (Cambridge), L. Lemaire (Brussels), J. C. Wood (Leeds).
Information: For more on the CIRM see: `http://www.cirm.univ-mrs.fr/indexE.html`.

The southeastern city of Marseille is the second largest in France; further information on Marseille can be found at: `http://www.marseille.enprovence.com/musee/anglais/lieux.html`.

If you wish to attend the conference, please contact M. Ville at `ville@math.polytechnique.fr`. Web site: `http://beltrami.unica.it/harmor/`.

July 2001

*1-5 **Warthog Delta'01 Conference on Undergraduate Teaching of Mathematics—Third Southern Hemisphere Symposium on Undergraduate Mathematics Teaching**, Kruger Park, South Africa.
Organizers: Jointly organized by SAMERN, the African Mathematical Union, and the International DELTA Committee.
Keynote Speakers: A. Schoenfeld, M. Kawski.
Theme: Gearing for Flexibility.
Information: Web site: `http://science.up.ac.za/delta01/`.

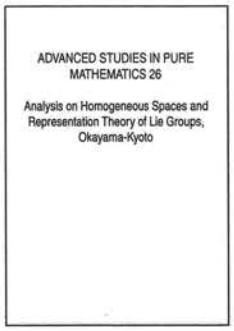
*22-25 **International Symposium on Symbolic and Algebraic Computation (ISSAC 2001)**, University of Western Ontario, London, Ontario, Canada.
Description: ISSAC is the yearly premier international symposium in symbolic and algebraic computation. It provides an opportunity to learn of new developments and to present original research results in all areas of symbolic mathematical computation. Recent advances are communicated through its refereed conference proceedings (available at the conference), prestigious invited talks, tutorials, and other activities.
Conference Committee: General Chair: E. Kaltofen (North Carolina State Univ.); Program Committee Chair: G. Villard (IMAG, Grenoble, France); Local Arrangements Chair: G. Reid (Univ. of Western Ontario, London, Ontario, Canada).
Information: Please see the conference Web page: `http://www.orcca.on.ca/issac2001/`. Conference e-mail: `issac2001@orcca.on.ca`.

New Publications Offered by the AMS

New Series from the AMS!

The AMS is pleased to announce a new series entitled, Courant Lecture Notes. This series features books in mathematics and theoretical computer science written by the faculty and visitors of the Courant Institute of Mathematical Sciences at New York University (New York City). Most of the books originate from graduate courses and minicourses offered at the institute. See page 806.

Algebra and Algebraic Geometry



Analysis on Homogeneous Spaces and Representation Theory of Lie Groups, Okayama-Kyoto

Toshiyuki Kobayashi, *University of Tokyo, Japan*, **Masaki Kashiwara**, *RIMS*, **Toshihiko Matsuki** and **Kyo Nishiyama**, *Kyoto University, Japan*, and **Toshio Oshima**, *University of Tokyo, Japan*, Editors

A publication of the Mathematical Society of Japan.

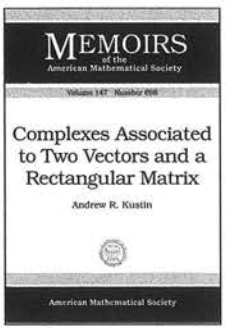
This volume is an outgrowth of the activities of the RIMS Research Project, which presented symposia offering both individual lectures on specialized topics and expository courses on current research. The subjects therein reflect very active areas in the representation theory of Lie groups. Also included are various topical interactions with geometry of homogeneous spaces, automorphic forms, quantum groups, special functions, discrete groups, differential equations, etc. Comprising results from some of today's most active areas of research, this volume will serve as an excellent up-to-date guide to the representation theory of Lie groups.

Published for the Mathematical Society of Japan by Kinokuniya, Tokyo, and distributed worldwide, except in Japan, by the AMS.

Contents: J. Adams, Characters of non-linear groups; **E. Balslev** and **A. Venkov**, Selberg's eigenvalue conjecture and the Siegel zeros for Hecke L-series; **Y. Benoist**, Propriétés asymptotiques des groupes linéaires (II); **T. Hayata**, **H. Koseki**, and **T. Oda**, Matrix coefficients of the principal P_j-series and the middle discrete series of $SU(2,2)$; **R. Howe**, K-type structure in the principal series of GL_3, I; **T. Kobayashi**, Discretely decomposable restrictions of unitary representations of reductive Lie groups—examples and conjectures; **B. Kostant**, On $\wedge \mathfrak{g}$ for a semisimple Lie algebra $\mathfrak{g}$, as an equivariant module over the symmetric algebra $S(\mathfrak{g})$; **O. Mathieu**, Tilting modules and their applications; **E.-C. Tan**, On the theta lift for the trivial representation; **T. Tanisaki**, Hypergeometric systems and Radon transforms for Hermitian symmetric spaces; **G. Tomanov**, Orbits on homogeneous spaces of arithmetic origin and approximations; **D. A. Vogan, Jr.**, A Langlands classification for unitary representations; **M. Wakimoto**, Modular transformation of twisted characters of admissible representations and fusion algebras associated to non-symmetric transformation matrices; Symposia.

Advanced Studies in Pure Mathematics, Volume 26

April 2000, 359 pages, Hardcover, ISBN 4-314-10138-5, 2000 *Mathematics Subject Classification*: 22Exx; 11Fxx, 17Bxx, 20Gxx, 43-XX, 53Cxx, **Individual member $58**, List $96, Institutional member $77, Order code ASPM/26N



Complexes Associated to Two Vectors and a Rectangular Matrix

Andrew R. Kustin, *University of South Carolina, Columbia*

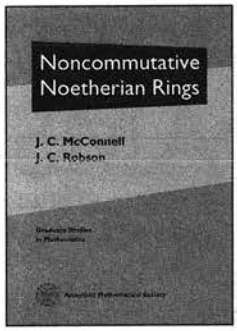
Contents: Preliminary results; The complex $\mathbb{I}^{(z)}$; Properties of the complexes $\mathbb{I}^{(z)}$; The complex $\mathbb{M}^{(z)}$; The functor $\mathcal{M}(p,q,r)$; Binomial coefficients; The proof of Theorems 4.5 and 4.8; Exactness; The case $g = f - 1$; References.

Memoirs of the American Mathematical Society, Volume 147, Number 698

September 2000, 81 pages, Softcover, ISBN 0-8218-2073-7, LC 00-034996, 2000 *Mathematics Subject Classification*: 13D25, **Individual member $25**, List $42, Institutional member $34, Order code MEMO/147/698N

Advance Notice

Recommended Text



Noncommutative Noetherian Rings

J. C. McConnell and **J. C. Robson**, *University of Leeds, England*

From reviews of the first edition ...

A model of mathematical writing, as perfectly written a mathematics book as I have seen ... It can be profitably read by non-experts ... an almost perfectly conceived account of major developments and general methods ... will remain a basic reference for many years ...

—Bulletin of the AMS

Very thorough and illuminating ... A veritable tour de force, encompassing a wide range of topics in some depth ... very easy to find information in this book ... full of illuminating examples which throw a light on [the theory].

—Proceedings of the Edinburgh Mathematical Society

Self-contained, comprehensive ... The creation of this valuable resource is a service to mathematics ...

—Mathematical Reviews

An intrinsically interesting branch of algebra ... Until ... this book there has been no attempt to provide an overview of, and a general reference for, the most important developments in the theory. The ... authors set out to fill this gap and have succeeded admirably ... easy to read and use ... well written ... An essential possession for any serious worker in the area.

—Zentralblatt für Mathematik

An account of noncommutative Noetherian rings, giving the theory as far as it exists but with constant emphasis on constructions and examples. [This is] a daunting task but the authors have succeeded well ... highly readable ... well indexed ... will rapidly become the standard text in the field and will stimulate further progress.

—Bulletin of the LMS

An abundance of well-organized material ... a must for those in the area.

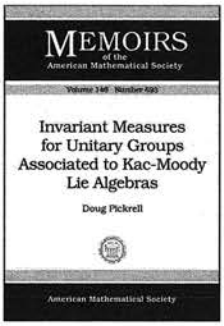
—International Mathematical News

This is a reprinted edition of a work that was considered the definitive account in the subject area upon its initial publication by J. Wiley & Sons in 1987. It presents, within a wider context, a comprehensive account of noncommutative Noetherian rings. The author covers the major developments from the 1950s, stemming from Goldie's theorem and onward, including applications to group rings, enveloping algebras of Lie algebras, PI rings, differential operators, and localization theory. The book is not restricted to Noetherian rings, but discusses wider classes of rings where the methods apply more generally. In the current edition, some errors were corrected, a number of arguments have been expanded, and the references were brought up to date. This reprinted edition will continue to be a valuable and stimulating work for readers interested in ring theory and its applications to other areas of mathematics.

Contents: Preliminaries; *Basic theory:* Some Noetherian rings; Quotient rings and Goldie's theorem; Structure of semiprime Goldie rings; Semiprime ideals in Noetherian rings; Some Dedekind-like rings; *Dimensions:* Krull dimension; Global dimension; Gelfand-Kirillov dimension; *Extensions:* The Null-stellensatz; Prime ideals in extension rings; Stability; K_0 and extension rings; *Examples:* Polynomial identity rings; Enveloping algebras of Lie algebras; Rings of differential operators on algebraic varieties; References; Index of notation; Index.

Graduate Studies in Mathematics

January 2001, approximately 616 pages, Hardcover, ISBN 0-8218-2169-5, LC 00-034990, **All AMS members $58**, List $72, Order code GSM-MCCONNELLN



Invariant Measures for Unitary Groups Associated to Kac-Moody Lie Algebras

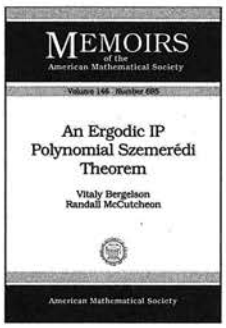
Doug Pickrell, *University Arizona, Tucson*

Contents: General introduction; *Part I. General Theory:* The formal completions of $G(A)$ and $G(A)/B$; Measures on the formal flag space; *Part II. Infinite Classical Groups:* Introduction for Part II; Measures on the formal flag space; The case $\mathfrak{g} = sl(\infty, \mathbb{C})$; The case $\mathfrak{g} = sl(2\infty, \mathbb{C})$; The cases $\mathfrak{g} = o(2\infty, \mathbb{C}), o(2\infty + 1, \mathbb{C}), sp(\infty,)$; *Part III. Loop Groups:* Introduction for Part III; Extensions of loop groups; Completions of loop groups; Existence of the measures $\nu_{\beta,k}, \beta > 0$; Existence of invariant measures; *Part IV. Diffeomorphisms of S^1:* Introduction for Part IV; Completions and classical analysis; The extension $\hat{\mathcal{D}}$ and determinant formulas; The measures $\nu_{\beta,c,h}, \beta > 0, c, h \geq 0$; On existence of invariant measures; Concluding comments; acknowledgements; References.

Memoirs of the American Mathematical Society, Volume 146, Number 693

July 2000, 125 pages, Softcover, ISBN 0-8218-2068-0, LC 00-036256, 2000 *Mathematics Subject Classification*: 58D20, 22E65, 22E67, **Individual member $26**, List $44, Institutional member $35, Order code MEMO/146/693N

Analysis



An Ergodic IP Polynomial Szemerédi Theorem

Vitaly Bergelson, *Ohio State University, Columbus*, and **Randall McCutcheon**, *University of Maryland, College Park*

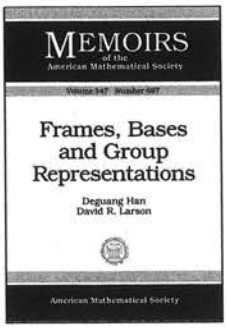
This item will also be of interest to those working in discrete mathematics and combinatorics.

Contents: Introduction; Formulation of main theorem; Preliminaries; Primitive extensions; Relative polynomial mixing;

Completion of the proof; Measure-theoretic applications; Combinatorial applications; For future investigation; Appendix: Multiparameter weakly mixing PET; References; Index of notation; Index.

Memoirs of the American Mathematical Society, Volume 146, Number 695

July 2000, 106 pages, Softcover, ISBN 0-8218-2657-3, LC 00-036258, 2000 *Mathematics Subject Classification*: 28D05; 05A17, 05D10, 11B05, 11B83, **Individual member $26**, List $43, Institutional member $34, Order code MEMO/146/695N



Frames, Bases and Group Representations

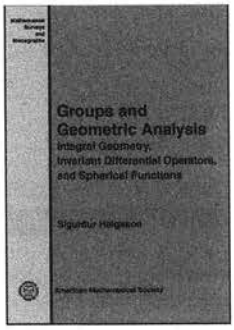
Deguang Han, *McMaster University, Hamilton, ON, Canada*, and **David R. Larson**, *Texas A & M University, College Station*

Contents: Introduction; Basic theory for frames; Complementary frames and disjointness; Frame vectors for unitary systems; Gabor type unitary systems; Frame wavelets, super-wavelets and frame sets; Frame representations for groups; Concluding remarks; Bibliography.

Memoirs of the American Mathematical Society, Volume 147, Number 697

September 2000, 94 pages, Softcover, ISBN 0-8218-2067-2, LC 00-034995, 2000 *Mathematics Subject Classification*: 46N99, 47N40, 47N99, 42C99; 47-XX, 47C05, 46B28, **Individual member $25**, List $42, Institutional member $34, Order code MEMO/147/697N

Recommended Text



Groups and Geometric Analysis

Integral Geometry, Invariant Differential Operators, and Spherical Functions

Sigurdur Helgason, *Massachusetts Institute of Technology, Cambridge*

From reviews for the original edition ...

The book is excellent both as a text and as a reference work; it will clearly become another instant classic.

—American Scientist

This volume makes an excellent companion to the author's Differential Geometry, Lie Groups, and Symmetric Spaces, *putting to work many of the abstract concepts developed in the earlier volume. The introductory material and large number of exercises (with answers!) will make the book quite appropriate for students. Researchers will find numerous useful references on geometric analysis, along with proofs, connections with other parts of mathematics, and valuable historical remarks.*

This book, like the author's previous work on differential geometry, will no doubt inspire considerable further research and become the standard text on the subjects it covers.

—Mathematical Reviews

Few treatises today can lay claim to being "aere perennius", but all of Helgason's books certainly do with a vengeance ... [He] sets a model of style and clarity that has not been matched since Enriques's Geometria proiettiva. *This is the kind of mathematics that will live forever.*

—Bulletin of Mathematical Books

A most valuable contribution to Lie theory and to the interplay between geometry and analysis. It is remarkable that the beautiful theory in Chapter IV can be presented in a textbook form with complete proofs.

—Bulletin of the London Mathematical Society

The diversity of subjects treated is great. Nevertheless the author has managed to achieve coherence of presentation by clearly putting forward a few main themes and basic problems. The first third of the book is suitable as a text for beginning graduate students; the book is also an excellent source of reference for experts. No doubt it will become a new standard in the field.

—CWI Quarterly

This volume, the second of Helgason's impressive three books on Lie groups and the geometry and analysis of symmetric spaces, is an introduction to group-theoretic methods in analysis on spaces with a group action.

The first chapter deals with the three two-dimensional spaces of constant curvature, requiring only elementary methods and no Lie theory. It is remarkably accessible and would be suitable for a first-year graduate course. The remainder of the book covers more advanced topics, including the work of Harish-Chandra and others, but especially that of Helgason himself. Indeed, the exposition can be seen as an account of the author's tremendous contributions to the subject.

Chapter I deals with modern integral geometry and Radon transforms. The second chapter examines the interconnection between Lie groups and differential operators. Chapter IV develops the theory of spherical functions on semisimple Lie groups with a certain degree of completeness, including a study of Harish-Chandra's c-function. The treatment of analysis on compact symmetric spaces (Chapter V) includes some finite-dimensional representation theory for compact Lie groups and Fourier analysis on compact groups. Each chapter ends with exercises (with solutions given at the end of the book!) and historical notes.

This book, which is new to the AMS publishing program, is an excellent example of the author's well-known clear and careful writing style. It has become the standard text for the study of spherical functions and invariant differential operators on symmetric spaces.

Sigurdur Helgason was awarded the Steele Prize for *Groups and Geometric Analysis* and the companion volume, *Differential Geometry, Lie Groups and Symmetric Spaces.*

This item will also be of interest to those working in geometry and topology and algebra and algebraic geometry.

Contents: Geometric Fourier analysis on spaces of constant curvature; Integral geometry and Radon transforms; Invariant differential operators; Invariants and harmonic polynomials;

Spherical functions and spherical transforms; Analysis on compact symmetric spaces; Appendix; Some details; Bibliography; Symbols frequently used; Index; Errata.

Mathematical Surveys and Monographs

September 2000, approximately 572 pages, Hardcover, ISBN 0-8218-2673-5, LC 00-034997, 2000 *Mathematics Subject Classification*: 22E30, 22-02, 43A85, 53-02, 53C65, 22E46, 53C35, 58C35, 43A77, 43A90, 35C15, 44A12, 51M10, 58J70, **All AMS members $45**, List $56, Order code SURV-HELGASON2N

Back in Print from the AMS

A Classic

Lectures on the Calculus of Variations and Optimal Control Theory

L. C. Young

A considerable number of heretofore unpublished results developed by the author are found ... The book is an important contribution to the calculus of variations and optimal control theory. It is most appropriate that the theory of generalized curves should be presented ... by its founder. The book is well written with an unusual and lively style. It is filled with historical remarks and with comments which enlarge one's outlook on the role of mathematics and mathematicians in our society ... This book should be mastered by anyone who wishes to become an expert in this field.

—***Mathematical Reviews***

This book is divided into two parts. The first addresses the simpler variational problems in parametric and nonparametric form. The second covers extensions to optimal control theory.

The author opens with the study of three classical problems whose solutions led to the theory of calculus of variations. They are the problem of geodesics, the brachistochrone, and the minimal surface of revolution. He gives a detailed discussion of the Hamilton-Jacobi theory, both in the parametric and nonparametric forms. This leads to the development of sufficiency theories describing properties of minimizing extremal arcs.

Next, the author addresses existence theorems. He first develops Hilbert's basic existence theorem for parametric problems and studies some of its consequences. Finally, he develops the theory of generalized curves and "automatic" existence theorems.

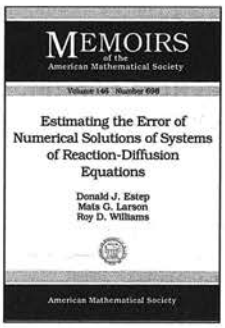
In the second part of the book, the author discusses optimal control problems. He notes that originally these problems were formulated as problems of Lagrange and Mayer in terms of differential constraints. In the control formulation, these constraints are expressed in a more convenient form in terms of control functions. After pointing out the new phenomenon that may arise, namely, the lack of controllability, the author develops the maximum principle and illustrates this principle by standard examples that show the switching phenomena that may occur. He extends the theory of geodesic coverings to optimal control problems. Finally, he extends the problem to generalized optimal control problems and obtains the corresponding existence theorems.

Contents: *Volume I. Lectures on the Calculus of Variations:* Generalities and typical problems; The method of geodesic coverings; Duality and local embedding; Embedding in the large; Hamiltonians in the large, convexity, inequalities and functional analysis; Existence theory and its consequences; Generalized curves and flows; Appendix I: Some further basic notions of convexity and integration; Appendix II: The variational significance and structure of generalized flows; *Volume II. Optimal Control Theory:* The nature of control problems; Naive optimal control theory; The application of standard variational methods to optimal control; Generalized optimal control; References; Index.

AMS Chelsea Publishing

August 2000, 337 pages, Hardcover, ISBN 0-8218-2690-5, LC 79-57387, 2000 *Mathematics Subject Classification*: 49-02, **All AMS members $31**, List $34, Order code CHEL/304.HN

Differential Equations



Estimating the Error of Numerical Solutions of Systems of Reaction-Diffusion Equations

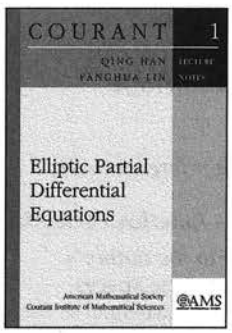
Donald J Estep, *Georgia Institute of Technology, Atlanta*, **Mats G. Larson**, *Chalmers University of Technology, Goteborg, Sweden*, and **Roy D. Williams**, *California Institute of Technology, Pasadena*

Contents: Introduction; A framework for a posteriori error estimation; The size of the residual errors and stability factors; Computational error estimation; Preservation of invariant rectangles under discretization; Details of the analysis in Chapter 2; Details of the analysis in Chapter 3; Details of the analysis in Chapter 5; Bibliography.

Memoirs of the American Mathematical Society, Volume 146, Number 696

July 2000, 109 pages, Softcover, ISBN 0-8218-2072-9, LC 00-036259, 2000 *Mathematics Subject Classification*: 65M12, 65M15, 35K57; 65M20, 65M60, 35B35, 35B50, 35B65, **Individual member $26**, List $43, Institutional member $34, Order code MEMO/146/696N

Independent Study



Elliptic Partial Differential Equations

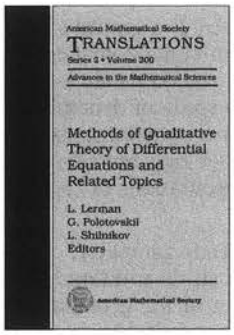
Qing Han, *University of Notre Dame, IN*, and **Fanghua Lin**, *New York University, Courant Institute, NY*

This volume is based on PDE courses given by the authors at the Courant Institute and at the University of Notre Dame (IN). Presented are basic methods for obtaining various a priori estimates for second-order equations of elliptic type with particular emphasis on maximal principles, Harnack inequalities, and their applications. The equations considered

in the book are linear; however, the presented methods also apply to nonlinear problems.

Contents: Harmonic functions; Maximum principles; Weak solutions, part I; Weak solutions, part II; Viscosity solutions; Bibliography.

August 2000, 123 pages, Softcover, ISBN 0-8218-2691-3, 2000 *Mathematics Subject Classification*: 35-XX, **All AMS members $16**, List $20, Order code CLN/1N



Methods of Qualitative Theory of Differential Equations and Related Topics

L. Lerman, *Research Institute for Applied Mathematics and Cybernetics, Nizhni Novgorod, Russia*, **G. Polotovskiĭ**, *Nizhni Novgorod State University, Russia*, and **L. Shilnikov**, *Research Institute for Applied Mathematics and Cybernetics, Nizhni Novgorod, Russia*, Editors

Dedicated to the memory of Professor E. A. Leontovich-Andronova, this book was composed by former students and colleagues who wished to mark her contributions to the theory of dynamical systems. A detailed introduction by Leontovich-Andronova's close colleague, L. Shilnikov, presents biographical data and describes her main contribution to the theory of bifurcations and dynamical systems.

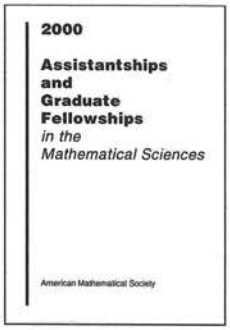
The main part of the volume is composed of research papers presenting the interests of Leontovich-Andronova, her students and her colleagues. Included are articles on traveling waves in coupled circle maps, bifurcations near a homoclinic orbit, polynomial quadratic systems on the plane, foliations on surfaces, homoclinic bifurcations in concrete systems, topology of plane controllability regions, separatrix cycle with two saddle-foci, dynamics of 4-dimensional symplectic maps, torus maps from strong resonances, structure of 3 degree-of-freedom integrable Hamiltonian systems, splitting separatrices in complex differential equations, Shilnikov's bifurcation for C^1-smooth systems and "blue sky catastrophe" for periodic orbits.

Contents: L. P. Shilnikov, Evgeniya Aleksandrovna Leontovich-Andronova (1905–1996); **V. Afraimovich** and **M. Courbage**, On the abundance of traveling waves in coupled expanding circle maps; **S. A. Alekseeva** and **L. P. Shilnikov**, On cusp-bifurcations of periodic orbits in systems with a saddle-focus homoclinic curve; **S. Aranson**, **V. Medvedev**, and **E. Zhuzhoma**, Collapse and continuity of geodesic frameworks of surface foliations; **V. N. Belykh**, Homoclinic and heteroclinic linkages in concrete systems: Nonlocal analysis and model maps; **A. A. Binstein** and **G. M. Polotovskiĭ**, On the mutual arrangement of a conic and a quintic in the real projective plane; **N. N. Butenina**, The structure of the boundary curve for planar controllability domains; **V. V. Bykov**, Orbit structure in a neighborhood of a separatrix cycle containing two saddle-foci; **N. Gavrilov** and **A. Shilnikov**, Example of a blue sky catastrophe; **S. V. Gonchenko**, Dynamics and moduli of Ω-conjugacy of 4D-diffeomorphisms with a structurally unstable homoclinic orbit to a saddle-focus fixed point; **V. Z. Grines** and **R. V. Plykin**, Topological classification of amply situated attractors of A-diffeomorphisms of surfaces; **M. V. Shashkov** and **D. V. Turaev**, A proof of Shilnikov's theorem for C^1-smooth dynamical systems; **L. P. Shilnikov** and **D. V. Turaev**, A new simple bifurcation of a periodic orbit of "blue sky catastrophe" type; **V. P. Tareev**, On the splitting of the complex loop of a separatrix.

American Mathematical Society Translations—Series 2 (*Advances in the Mathematical Sciences*), Volume 200

August 2000, 196 pages, Hardcover, ISBN 0-8218-2663-8, LC 91-640741, 2000 *Mathematics Subject Classification*: 34Cxx, 37Cxx; 14H99, **Individual member $53**, List $89, Institutional member $71, Order code TRANS2/200N

General and Interdisciplinary



Assistantships and Graduate Fellowships, 2000

Review of the previous annual edition:

This directory is a tool for undergraduate mathematics majors seeking information about graduate programs in mathematics. Although most of the information can be gleaned from the Internet, the usefulness of this directory for the prospective graduate student is the consistent format for comparing different mathematics graduate programs without the hype. Published annually, the information is up-to-date, which is more than can be said of some Websites. Support for graduate students in mathematics is a high priority of the American Mathematical Society, which also provides information for fellowships and grants they offer as well as support from other societies and foundations. The book is highly recommended for academic and public libraries.

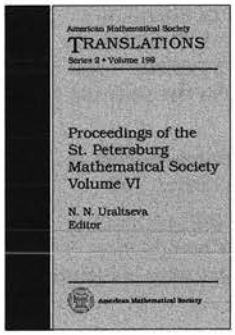
—American Reference Books Annual

This publication is an indispensable source of information for students seeking support for graduate study in the mathematical sciences. Providing data from a broad range of academic institutions, it is also a valuable resource for mathematical sciences departments and faculty.

Assistantships and Graduate Fellowships brings together a wealth of information about resources available for graduate study in mathematical sciences departments in the U.S. and Canada. Information on the number of faculty, graduate students, and degrees awarded (bachelor's, master's, and doctoral) is listed for each department when available. Stipend amounts and the number of awards available are given, as well as information about foreign language requirements. Numerous display advertisements from mathematical sciences departments throughout the country provide additional information.

Also listed are sources of support for graduate study and travel, summer internships, and graduate study in the U.S. for foreign nationals. Finally, a list of reference publications for fellowship information makes *Assistantships and Graduate Fellowships* a centralized and comprehensive resource.

October 2000, approximately 169 pages, Softcover, ISBN 0-8218-2638-7, 2000 *Mathematics Subject Classification*: 00-XX, **Individual member $12**, List $20, Order code ASST/2000N



Proceedings of the St. Petersburg Mathematical Society Volume VI

N. N. Uraltseva, *St. Petersburg State University, Russia*, Editor

This collection presents new results in algebra, functional analysis, and mathematical physics. In particular, evolution and spectral problems related to small motions of viscoelastic fluid are considered. Specific areas covered in the book include functional equations and functional operator equations from the point of view of the C^*-algebraic approach, the existence of an isomorphism between certain ideals regarded as Galois modules, spectral problems in singularly perturbed domains, scattering theory, the existence of bounded solutions to the equation $\operatorname{div} u = f$ in a plane domain, and a compactification of a locally compact group. Also given is an historic overview of the mathematical seminars held at St. Petersburg State University. The results, ideas, and methods given in the book will be of interest to a broad range of specialists.

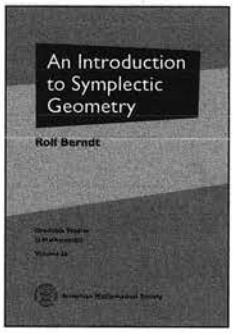
Contents: T. Ya. Azizov, N. D. Kopachevskii, and **L. D. Orlova**, Evolution and spectral problems related to small motions of viscoelastic fluid; **A. B. Antonevich** and **A. V. Lebedev**, Functional equations and functional operator equations. A C^*-algebraic approach; **M. V. Bondarko** and **S. V. Vostokov**, Isomorphism of ideals regarded as Galois modules of complete discrete valuation fields with residue field of positive characteristic; **I. V. Kamotskii** and **S. A. Nazarov**, Spectral problems in singularly perturbed domains and selfadjoint extensions of differential operators; **V. A. Sloushch**, Discrete spectrum in gaps of the spectrum under strong perturbations of fixed sign; **N. D. Filonov**, On bounded solutions to the equation $\operatorname{div} u = f$ in a plane domain; **B. Ya. Shteinberg**, Compactification of a locally compact group and the Noethericity of convolution operators with coefficients on quotient groups; **N. S. Ermolaeva**, Prehistory of seminars at the St. Petersburg/Petrograd/Leningrad University.

American Mathematical Society Translations—Series 2, Volume 199

July 2000, 238 pages, Hardcover, ISBN 0-8218-2112-1, 2000 *Mathematics Subject Classification*: 01Axx, 11Sxx, 22Dxx, 34Kxx, 35Pxx, 35Qxx, 47Lxx, 47Axx, 47Gxx, **Individual member $59**, List $99, Institutional member $79, Order code TRANS2/199N

Geometry and Topology

Recommended Text



An Introduction to Symplectic Geometry

Rolf Berndt, *University of Hamburg, Germany*

Symplectic geometry is a central topic of current research in mathematics. Indeed, symplectic methods are key ingredients in the study of dynamical systems, differential equations, algebraic geometry, topology, mathematical physics and representations of Lie groups.

This book is a true introduction to symplectic geometry, assuming only a general background in analysis and familiarity with linear algebra. It starts with the basics of the geometry of symplectic vector spaces. Then, symplectic manifolds are defined and explored. In addition to the essential classic results, such as Darboux's theorem, more recent results and ideas are also included here, such as symplectic capacity and pseudoholomorphic curves. These ideas have revolutionized the subject. The main examples of symplectic manifolds are given, including the cotangent bundle, Kähler manifolds, and coadjoint orbits. Further principal ideas are carefully examined, such as Hamiltonian vector fields, the Poisson bracket, and connections with contact manifolds.

Berndt describes some of the close connections between symplectic geometry and mathematical physics in the last two chapters of the book. In particular, the moment map is defined and explored, both mathematically and in its relation to physics. He also introduces symplectic reduction, which is an important tool for reducing the number of variables in a physical system and for constructing new symplectic manifolds from old. The final chapter is on quantization, which uses symplectic methods to take classical mechanics to quantum mechanics. This section includes a discussion of the Heisenberg group and the Weil (or metaplectic) representation of the symplectic group.

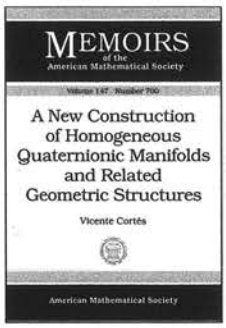
Several appendices provide background material on vector bundles, on cohomology, and on Lie groups and Lie algebras and their representations.

Berndt's presentation of symplectic geometry is a clear and concise introduction to the major methods and applications of the subject, and requires only a minimum of prerequisites. This book would be an excellent text for a graduate course or as a source for anyone who wishes to learn about symplectic geometry.

Contents: Some aspects of theoretical mechanics; Symplectic algebra; Symplectic manifolds; Hamiltonian vectorfields and the Poisson bracket; The moment map; Quantization; Differentiable manifolds and vector bundles; Lie groups and Lie algebras; A little cohomology theory; Representations of groups; Bibliography; Index; Symbols.

Graduate Studies in Mathematics, Volume 26

September 2000, approximately 224 pages, Hardcover, ISBN 0-8218-2056-7, LC 00-033139, 2000 *Mathematics Subject Classification*: 53C15, 53Dxx, 20G20, 81S10, **All AMS members $29**, List $36, Order code GSM/26N



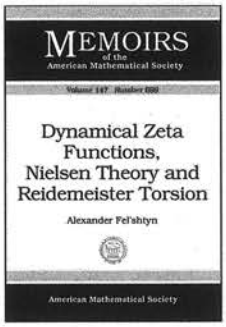
A New Construction of Homogeneous Quaternionic Manifolds and Related Geometric Structures

Vicente Cortés, *University of Bonn, Germany*

Contents: Introduction; Extended Poincaré algebras; The homogeneous quaternionic manifold (M, Q) associated to an extended Poincaré algebra; Bundles associated to the quaternionic manifold (M, Q); Homogeneous quaternionic supermanifolds associated to superextended Poincaré algebras; Appendix. Supergeometry; Bibliography.

Memoirs of the American Mathematical Society, Volume 147, Number 700

September 2000, 63 pages, Softcover, ISBN 0-8218-2111-3, LC 00-034993, 2000 *Mathematics Subject Classification*: 53C30; 53C25, **Individual member $23**, List $38, Institutional member $30, Order code MEMO/147/700N



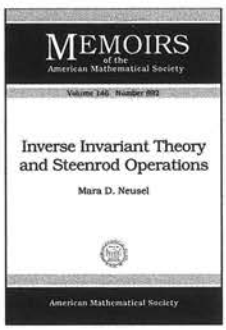
Dynamical Zeta Functions, Nielsen Theory and Reidemeister Torsion

Alexander Fel'shtyn, *University of Greifswald, Germany*

Contents: Introduction; Nielsen fixed point theory; The Reidemeister zeta function; The Nielsen zeta function; Reidemeister and Nielsen zeta functions modulo normal subgroup, minimal dynamical zeta functions; Congruences for Reidemeister and Nielsen numbers; The Reidemeister torsion.

Memoirs of the American Mathematical Society, Volume 147, Number 699

September 2000, 146 pages, Softcover, ISBN 0-8218-2090-7, LC 00-034994, 2000 *Mathematics Subject Classification*: 58-XX; 55M20, 57Q10, **Individual member $28**, List $47, Institutional member $38, Order code MEMO/147/699N



Inverse Invariant Theory and Steenrod Operations

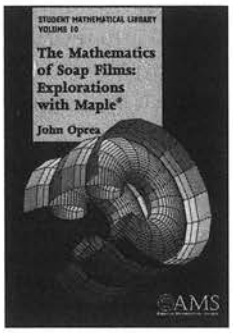
Mara D. Neusel, *Yale University, New Haven, CT*

Contents: Introduction; The Δ-theorem; Some field theory over the Steenrod Algebra; The integral closure theorem and the unstable part; The inseparable closure; The embedding theorem I; Noetherianess, the embedding theorem II and Turkish delights; The Galois embedding theorem, the little imbedding theorem and a bit more; The big imbedding theorem, Thom classes, Turkish delights II and reverse Landweber-Stong conjecture; Technical stuff; References.

Memoirs of the American Mathematical Society, Volume 146, Number 692

July 2000, 157 pages, Softcover, ISBN 0-8218-2091-5, LC 00-036255, 2000 *Mathematics Subject Classification*: 13A50, 55S10; 55-XX, 13-XX, **Individual member $28**, List $47, Institutional member $38, Order code MEMO/146/692N

Recommended Text



The Mathematics of Soap Films: Explorations with Maple®

John Oprea, *Cleveland State University, OH*

Nature tries to minimize the surface area of a soap film through the action of surface tension. The process can be understood mathematically by using differential geometry, complex analysis, and the calculus of variations. This book employs ingredients from each of these subjects to tell the mathematical story of soap films.

The text is fully self-contained, bringing together a mixture of types of mathematics along with a bit of the physics that underlies the subject. The development is primarily from first principles, requiring no advanced background material from either mathematics or physics.

Through the Maple® applications, the reader is given tools for creating the shapes that are being studied. Thus, you can "see" a fluid rising up an inclined plane, create minimal surfaces from complex variables data, and investigate the "true" shape of a balloon. Oprea also includes descriptions of experiments and photographs that let you see real soap films on wire frames.

The theory of minimal surfaces is a beautiful subject, which naturally introduces the reader to fascinating, yet accessible, topics in mathematics. Oprea's presentation is rich with examples, explanations, and applications. It would make an excellent text for a senior seminar or for independent study by upper-division mathematics or science majors.

This item will also be of interest to those working in analysis.

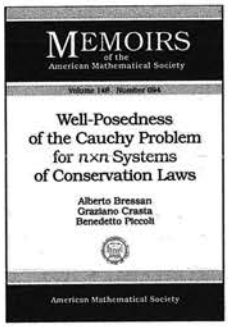
® Waterloo Maple, Inc., Ontario, Canada.

Contents: Surface tension; A quick trip through differential geometry and complex variables; The mathematics of soap films; The calculus of variations and shape; Maple, soap films and minimal surfaces; Bibliography; Index.

Student Mathematical Library, Volume 10

September 2000, approximately 277 pages, Softcover, ISBN 0-8218-2118-0, LC 00-041614, 2000 *Mathematics Subject Classification*: 49-01, 49-04, 49Q05, 53-01, 53-04, 53A10, **All AMS members $23**, List $29, Order code STML/10N

Mathematical Physics



Well-Posedness of the Cauchy Problem for $n \times n$ Systems of Conservation Laws

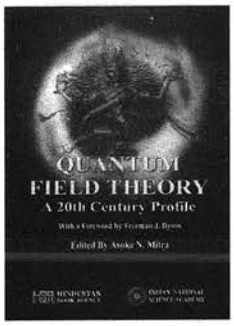
Alberto Bressan, *School International Superior di Studi Avanzati, Trieste, Italy*, **Graziano Crasta**, *University of Modena, Italy*, and **Benedetto Piccoli**, *University of Salerno, Italy*

This item will also be of interest to those working in differential equations.

Contents: Introduction; Outline of the proof; Construction of local semigroups; Restarting procedures; Proof of Proposition 2.4; Proof of Proposition 2.5; Proof of Proposition 2.7; Proof of Proposition 2.10; Proof of Proposition 2.15; Completion of the proof; Appendix; Bibliography.

Memoirs of the American Mathematical Society, Volume 146, Number 694

July 2000, 134 pages, Softcover, ISBN 0-8218-2066-4, LC 00-036257, 2000 *Mathematics Subject Classification*: 35L65, **Individual member $28**, List $46, Institutional member $37, Order code MEMO/146/694N



Quantum Field Theory

A Twentieth Century Profile

Asoke N. Mitra, Editor

A publication of the Hindustan Book Agency.

"After serving his apprenticeship as a field theorist at Cornell University ... Dr. Mitra sacrificed his chance of a brilliant research career in America in order to serve his country and his people. I deeply respect that choice, and I rejoice that his sacrifice was not made in vain. After a fruitful career as a pioneer and teacher of modern science in India, he now stands at the center of the vibrant scientific community that he helped to create. This volume is, among other things, a monument to his vision."

—*From the* **Foreword** *by Freeman Dyson*

Quantum Field Theory (QFT) may be the single most important concept in physics to be discovered in the twentieth century. This volume reflects the multidimensional impact of QFT on the evolution of physics in the last century. Dr. Asoke Mitra, editor for the volume and former student and colleague of Freeman Dyson, gathers here a selection of articles in the areas where the impact of QFT has been especially pronounced: from particle physics to string theory and extending to facets of astrophysics and the physics of condensed matter.

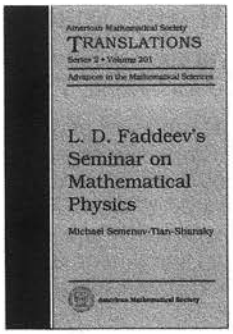
The wide range of topics covered makes this volume more than just an introductory text on QFT. Contributors include V. Gribov, M. Moshinsky, K. Nishijima, J. Schwarz, D. Shirkov, E. Witten and many more renowned experts in their respective fields. This book makes an excellent reference work for a broad spectrum of readers, from postdocs in key areas of QFT to specialists in currently evolving areas.

Published jointly by the Hindustan Book Agency (India) and the Indian National Science Academy. Distributed worldwide except in India by the American Mathematical Society.

Contents: *Editor's Summary:* **A. N. Mitra**, Dimensions of field theory—from particles to strings; *Part A: Basic Structure of QFT:* **D. V. Shirkov**, Evolution of the Bogoliubov renormalization group; **S. Szpigel** and **R. J. Perry**, The similarity renormalization group; **V. Novikov**, Quantum field theory and the standard model—bird's eye view; **P. K. Kabir**, Broken reflection symmetries; **D. Boyanovsky** and **H. J. de Vega**, Dynamics of symmetry breaking out of equilibrium—from condensed matter to QCD and the early universe; **V. N. Gribov**, Orsay lectures on confinement; **K. Nishijima** and **M. Chaichian**, An essay on color confinement; *Part B: Topological Aspects of QFT:* **R. Kaul**, Topological quantum field theories—a meeting ground for physicists and mathematicians; **E. Witten**, Quantum field theory and the Jones polynomial; **H. Banerjee**, Chiral anomalies in field theories; **W.-M. Zhang**, Coherent states in field theory; **N. Mukunda**, Pancharatnam, Bargmann and Berry phases—a retrospective; **J. Schechter** and **H. Weigel**, The Skyrme model for baryons; *Part C: Formal Methods in QFT:* **R. Ramanathan**, Euclidean methods in quantum field theory; **A. Das**, Topics in finite temperature field theory; **B. M. Sodermark**, Integrable models and the Toda lattice hierarchy; **P. P. Srivastava**, Perspectives of light-front quantized field theory—some new results; **D. S. Kulshreshtha**, Gauge symmetry in chiral electrodynamics; **L. Lusanna**, Towards a unified description of the four interactions in terms of Dirac-Bergmann observables; *Part D: Extension of QFT Frontiers:* **R. N. Mohapatra**, Supersymmetry and particle physics; **N. Sakai**, Supersymmetry in field theory; **W. Nahm**, Conformal field theory: A bridge over troubled waters; **J. H. Schwarz**, Superstring theory—an overview; **J. Maharana**, Recent developments in string theory; **L. Bonora**, Yang-Mills theory and matrix string theory; *Part E: QFT in* 2 + 1 *Dimensions:* **A. Khare**, Fractional statistics and Chern-Simons field theory in 2 + 1 dimensions; **R. Rajaraman**, Chern Simons field and composite bosons in the quantum hall system; *Part F: Methods of Strong Interactions in QFT:* **O. Pene**, Hadrons from QCD—achievements and prospects; **L. S. Kisslinger**, QCD sum rules in hadronic and nuclear physics; **V. A. Karmanov**, Light-front dynamics; **A. N. Mitra**, 3D-4D interlinkage of B-S amplitudes—unified view of $Q\overline{Q}$ and QQQ dynamics; **M. Moshinsky**, The harmonic oscillator in quantum theory—a powerful bridge in physics; *Conclusion:* **D. Home**, Modern perspectives on foundations of quantum mechanics.

Hindustan Book Agency

March 2000, 900 pages, Hardcover, ISBN 81-85931-25-9, 2000 *Mathematics Subject Classification*: 81-XX, **All AMS members $71**, List $89, Order code HIN/4N



L. D. Faddeev's Seminar on Mathematical Physics

Michael Semenov-Tian-Shansky, *Steklov Mathematical Institute, St. Petersburg, Russia*, Editor

Professor L. D. Faddeev's seminar at Steklov Mathematical Institute (St. Petersburg, Russia) has a long history of over 30 years of intensive work which shaped modern mathematical physics. This collection, honoring Professor Faddeev's 65th anniversary, has been prepared by his students and colleagues.

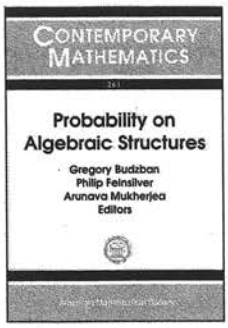
Topics covered in the volume include classical and quantum integrable systems (both analytic and algebraic aspects), quantum groups and generalizations, quantum field theory, and deformation quantization. Included is a history of the seminar highlighting important developments, such as the invention of the quantum inverse scattering method and of quantum groups. The book will serve nicely as a comprehensive, up-to-date resource on the topic.

Contents: **M. Semenov-Tian-Shansky**, Some personal historic notes on our seminar; **E. Meinrenken** and **A. Alekseev**, An elementary derivation of certain classical dynamical r-matrices; **I. Ya. Aref'eva** and **O. A. Rytchkov**, Incidence matrix description of intersection p-brane solutions; **A. I. Bobenko** and **Yu. B. Suris**, A discrete time Lagrange top and discrete elastic curves; **A. M. Budylin** and **V. S. Buslaev**, The Gelfand-Levitan-Marchenko equation and the long-time asymptotics of the solutions of the nonlinear Schrödinger equation; **R. M. Kashaev** and **A. Yu. Volkov**, From the tetrahedron equation to universal R-matrices; **A. N. Kirillov**, On some quadratic algebras; **V. Korepin** and **N. Slavnov**, Quantum inverse scattering method and correlation functions; **A. Losev**, **N. Nekrasov**, and **S. Shatashvili**, Testing Seiberg-Witten solution; **J. M. Maillet** and **J. S. de Santos**, Drinfeld twists and algebraic Bethe Ansatz; **V. B. Matveev**, Darboux transformations, covariance theorems and integrable systems; **A. L. Pirozerski** and **M. A. Semenov-Tian-Shansky**, Generalized q-deformed Gelfand-Dickey structures on the group of q-pseudodifference operators; **A. K. Pogrebkov**, On time evolutions associated with the nonstationary Schrödinger equation; **N. Reshetikhin** and **L. A. Takhtajan**, Deformation quantization of Kähler manifolds; **E. K. Sklyanin**, Canonicity of Bäcklund transformation: r-matrix approach. I; **F. A. Smirnov**, Quasi-classical study of form factors in finite volume; **V. Tarasov**, Completeness of the hypergeometric solutions of the qKZ equation at level zero.

American Mathematical Society Translations—Series 2 (*Advances in the Mathematical Sciences*), Volume 201

August 2000, approximately 319 pages, Hardcover, ISBN 0-8218-2133-4, LC 91-640741, 2000 *Mathematics Subject Classification*: 00B30, 37K10, 17B37, 53D55, 35Q99; 81T15, 81T30, 81R50, **Individual member $65**, List $109, Institutional member $87, Order code TRANS2/201N

Probability



Probability on Algebraic Structures

Gregory Budzban and **Philip Feinsilver**, *Southern Illinois University, Carbondale*, and **Arunava Mukherjea**, *University of South Florida, Tampa*, Editors

This volume presents results from an AMS Special Session held on the topic in Gainesville (FL). Papers included are written by an international group of well-known specialists who offer an important cross-section of current work in the field. In addition there are two expository papers that provide an avenue for non-specialists to comprehend problems in this area.

The breadth of research in this area is evident by the variety of articles presented in the volume. Results concern probability on Lie groups and general locally compact groups. Generalizations of groups appear as hypergroups, abstract semigroups, and semigroups of matrices. Work on symmetric cones is included. Lastly, there are a number of articles on the current progress in constructing stochastic processes on quantum groups.

This item will also be of interest to those working in algebra and algebraic geometry.

Contents: *Lie groups, topological groups:* **S. G. Dani** and **R. Shah**, Contractible measures in Levy's measures on Lie groups; **P. Feinsilver** and **R. Schott**, Lie response to signals with noise; **W. Jaworski**, On shifted convolution powers and concentration functions in locally compact groups; **M. McCrudden** and **S. Walker**, Embedding infinitely divisible probabilities on subsemigroups of Lie groups; **D. Neuenschwander**, s-stable semigroups on simply connected step 2-nilpotent Lie groups; *Hypergroups:* **H. Heyer**, The covariance distribution of a generalized random field over a commutative hypergroup; **C. Rentzsch** and **M. Voit**, Lévy processes on commutative hypergroups; *Symmetric cones, Wishart distributions:* **G. Letac**, Symmetric cones as Gelfand pairs: Probabilistic applications; **G. Letac** and **H. Massam**, Representations of the Wishart distributions; *Quantum groups, quantum probability:* **L. Accardi**, Quantum probability: An historical survey; **U. Franz**, Lévy processes on quantum groups; **V. K. Dobrev**, **H.-D. Doebner**, **U. Franz**, and **R. Schott**, Lévy processes on $U_q(\mathfrak{g})$ as infinitely divisible representations; *Semigroups, matrices, applications:* **G. Budzban** and **A. Mukherjea**, A semigroup approach to the road coloring problem; **G. Högnäs**, On some one-dimensional stochastic population models; **Z. J. Jurek**, Three algebraic problems in probability theory; **A. Mukherjea**, Products of i.i.d. $d \times d$ real matrices: Convergence in direction.

Contemporary Mathematics, Volume 261

June 2000, 238 pages, Softcover, ISBN 0-8218-2027-3, LC 00-034992, 2000 *Mathematics Subject Classification*: 60B15; 43A05, 81R20, **Individual member $35**, List $59, Institutional member $47, Order code CONM/261N

Previously Announced Publications

New and Noteworthy

Mathematics: Frontiers and Perspectives

V. Arnold, *University of Paris IX, France*, and *Steklov Mathematical Steklov Mathematical Institute, Moscow*, Russia, **M. Atiyah**, *University of Edinburgh, Scotland*, **P. Lax**, *New York University-Courant Institute, NY*, and **B. Mazur**, *Harvard University, Cambridge, MA*, Editors

"The twentieth century has transformed mathematics from a cottage industry run by a few semi-amateurs into a worldwide industry run by an army of professionals ..."

—*from the* **Preface** *by M. Atiyah*

This remarkable book is a celebration of the state of mathematics at the end of the millennium. Produced under the auspices of the International Mathematical Union (IMU), the volume was born as part of the activities observing the World Mathematical Year 2000.

The volume consists of 30 articles written by some of the most influential mathematicians of our time. Authors of 15 contributions were recognized in various years by the IMU as recipients of the Fields Medal, from K. F. Roth (Fields Medalist, 1958) to W. T. Gowers (Fields Medalist, 1998). The articles offer valuable reflections about the amazing mathematical progress we have witnessed in this century and insightful speculations about the possible development of mathematics over the next century.

Some articles formulate important problems, challenging future mathematicians. Others pay explicit homage to the famous set of Hilbert Problems posed one hundred years ago, giving enlightening commentary. Yet other papers offer a deeply personal perspective, allowing singular insight into the minds and hearts of people doing mathematics today.

Mathematics: Frontiers and Perspectives is a unique volume that pertains to a broad mathematical audience of various backgrounds and levels of interest. It offers readers true and unequaled insight into the wonderful world of mathematics at this important juncture: the turn of the millennium.

The work is one of those rare volumes that can be browsed, and if you do simply browse through it, you get a wonderful sense of mathematics today. Yet it also can be intensely studied on a detailed technical level for gaining insight into some of the great problems on which mathematicians are currently working.

Individual members of mathematical societies of the IMU member countries can purchase this volume at the AMS member price when buying directly from the AMS.

Contributors include: A. Baker, G. Wüstholz, J. Bourgain, S.-S. Chern, A. Connes, S. K. Donaldson, W. T. Gowers, V. F. R. Jones, D. Kazhdan, F. Kirwan, P.-L. Lions, A. J. Majda, Yu. I. Manin, G. Margulis, D. McDuff, S. Mori, D. Mumford, R. Penrose, K. F. Roth, D. Ruelle, P. Sarnak, S. Smale, R. P. Stanley, C. Vafa, A. Wiles, E. Witten, S.-T. Yau, V. I. Arnold, P. D. Lax, and B. Mazur.

August 2000, 459 pages, Softcover, ISBN 0-8218-2697-2, LC 99-047980, 2000 *Mathematics Subject Classification*: 00B10; 00B15, **All AMS members $31**, List $39, Order code MFP.SRT008

The Backward Shift on the Hardy Space

Joseph A. Cima, *University of North Carolina, Chapel Hill*, and **William T. Ross**, *University of Richmond, VA*

Shift operators on Hilbert spaces of analytic functions play an important role in the study of bounded linear operators on Hilbert spaces since they often serve as models for various classes of linear operators. For example, "parts" of direct sums of the backward shift operator on the classical Hardy space H^2 model certain types of contraction operators and potentially have connections to understanding the invariant subspaces of a general linear operator.

This book is a thorough treatment of the characterization of the backward shift invariant subspaces of the well-known Hardy spaces H^p. The characterization of the backward shift invariant subspaces of H^p for $1 < p < \infty$ was done in a 1970 paper of R. Douglas, H. S. Shapiro, and A. Shields, and the case $0 < p \leq 1$ was done in a 1979 paper of A. B. Aleksandrov which is not well known in the West. This material is pulled together in this single volume and includes all the necessary background material needed to understand (especially for the $0 < p < 1$ case) the proofs of these results.

Several proofs of the Douglas-Shapiro-Shields result are provided so readers can get acquainted with different operator theory and theory techniques: applications of these proofs are also provided for understanding the backward shift operator on various other spaces of analytic functions. The results are thoroughly examined. Other features of the volume include a description of applications to the spectral properties of the backward shift operator and a treatment of some general real-variable techniques that are not taught in standard graduate seminars. The book includes references to works by Duren, Garnett, and Stein for proofs and a bibliography for further exploration in the areas of operator theory and functional analysis.

Mathematical Surveys and Monographs, Volume 79

July 2000, 199 pages, Hardcover, ISBN 0-8218-2083-4, LC 00-028032, 2000 *Mathematics Subject Classification*: 47B38; 46E10, 46E15, **Individual member $29**, List $49, Institutional member $39, Order code SURV/79RT008

Some Current Topics on Nonlinear Conservation Laws

Lectures at the Morningside Center of Mathematics, 1

Ling Hsiao, *Institute of Mathematics, Academia Sinica, Beijing, People's Republic of China*, and **Zhouping Xin**, *New York University, Courant Institute, NY*, Editors

This volume resulted from a year-long program at the Morningside Center of Mathematics at the Academia Sinica in Beijing. It presents an overview of nonlinear conversation laws and introduces developments in this expanding field. Xin's introductory overview of the subject is followed by lecture notes of leading experts who have made fundamental contributions to this field of research. A. Bressan's theory of L^1-well-posedness for entropy weak solutions to systems of nonlinear hyperbolic conversation laws in the class of viscosity solutions is one of the most important results in the past two decades; G. Chen discusses weak convergence methods and various applications to many problems; P. Degond details mathematical modelling of semi-conductor devices; B. Perthame describes the theory of asymptotic equivalence

between conservation laws and singular kinetic equations; Z. Xin outlines the recent development of the vanishing viscosity problem and nonlinear stability of elementary wave—a major focus of research in the last decade; and the volume concludes with Y. Zheng's lecture on incompressible fluid dynamics.

This collection of lectures represents previously unpublished expository and research results of experts in nonlinear conservation laws and is an excellent reference for researchers and advanced graduate students in the areas of nonlinear partial differential equations and nonlinear analysis.

Titles in this series are co-published with International Press, Cambridge, MA.

Contributors include: A. Bressan, G.-Q. Chen, P. Degond, B. Perthame, Z. Xin, and Y. Zheng.

AMS/IP Studies in Advanced Mathematics, Volume 15

May 2000, 226 pages, Softcover, ISBN 0-8218-1965-8, LC 00-025164, 2000 *Mathematics Subject Classification*: 35-02, 35L65, 35L67; 35L60, 35L80, 76N10, 76P05, 46N20, 35Q30, **All AMS members $34**, List $42, Order code AMSIP/15RT008

Recommended Text

Number Theory

Algebraic Numbers and Functions

Helmut Koch, *Humboldt-University, Berlin, Germany*

Algebraic number theory is one of the most refined creations in mathematics. It has been developed by some of the leading mathematicians of this and previous centuries. The primary goal of this book is to present the essential elements of algebraic number theory, including the theory of normal extensions up through a glimpse of class field theory. Following the example set for us by Kronecker, Weber, Hilbert and Artin, algebraic functions are handled here on an equal footing with algebraic numbers. This is done on the one hand to demonstrate the analogy between number fields and function fields, which is especially clear in the case where the ground field is a finite field. On the other hand, in this way one obtains an introduction to the theory of 'higher congruences' as an important element of "arithmetic geometry".

Early chapters discuss topics in elementary number theory, such as Minkowski's geometry of numbers, public-key cryptography and a short proof of the Prime Number Theorem, following Newman and Zagier. Next, some of the tools of algebraic number theory are introduced, such as ideals, discriminants and valuations. These results are then applied to obtain results about function fields, including a proof of the Riemann-Roch Theorem and, as an application of cyclotomic fields, a proof of the first case of Fermat's Last Theorem. There are a detailed exposition of the theory of Hecke L-series, following Tate, and explicit applications to number theory, such as the Generalized Riemann Hypothesis. Chapter 9 brings together the earlier material through the study of quadratic number fields. Finally, Chapter 10 gives an introduction to class field theory.

The book attempts as much as possible to give simple proofs. It can be used by a beginner in algebraic number theory who wishes to see some of the true power and depth of the subject. The book is suitable for two one-semester courses, with the first four chapters serving to develop the basic material. Chapters 6 through 9 could be used on their own as a second semester course.

Graduate Studies in Mathematics, Volume 24

June 2000, 368 pages, Hardcover, ISBN 0-8218-2054-0, LC 00-022320, 2000 *Mathematics Subject Classification*: 11Rxx, 11Sxx, 11Mxx, **All AMS members $47**, List $59, Order code GSM/24RT008

Differential Equations and Mathematical Physics

Rudi Weikard and **Gilbert Weinstein**, *University of Alabama, Birmingham*, Editors

This volume contains the proceedings of the 1999 International Conference on Differential Equations and Mathematical Physics. The contributions selected for this volume represent some of the most important presentations by scholars from around the world on developments in this area of research. The papers cover topics in the general area of linear and nonlinear differential equations and their relation to mathematical physics, such as multiparticle Schrödinger operators, stability of matter, relativity theory, fluid dynamics, spectral and scattering theory including inverse problems.

This item will also be of interest to those working in mathematical physics.

Titles in this series are co-published with International Press, Cambridge, MA.

Contributors include: A. A. Balinsky, W. D. Evans, R. Bartnik, R. D. Benguria, M. C. Depassier, B. K. Berger, M. Sh. Birman, T. A. Suslina, T. Bodineau, B. Helffer, R. Brummelhuis, M. B. Ruskai, E. Werner, D. Chae, O. Yu. Imanuvilov, M. Christ, A. Kiselev, Y. Last, D. Christodoulou, L. Erdős, J. P. Solovej, R. Froese, I. Herbst, F. Gesztesy, H. Holden, M. Griesemer, G. A. Hagedorn, A. Joye, R. Hempel, K. Lienau, A. M. Hinz, P. D. Hislop, T. Hupfer, H. Leschke, S. Warzel, W. Karwowski, V. Koshmanenko, Y. V. Kurylev, M. Lassas, Y. Li, E. H. Lieb, M. Loss, J. Yngvason, M. Ohmiya, Y. Pinchover, T. C. Sideris, H. Siedentop, J. A. Smoller, J. B. Temple, S. B. Sontz, G. Teschl, V. Tkachenko, M. M. Tom, C. Tretter, J. A. Viaclovsky, R. Weder, and G. Wolanski.

AMS/IP Studies in Advanced Mathematics, Volume 16

June 2000, 461 pages, Softcover, ISBN 0-8218-2157-1, LC 00-025797, 2000 *Mathematics Subject Classification*: 34-06, 35-06, **All AMS members $47**, List $59, Order code AMSIP/16RT008

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Differential Geometry, edited by Robert E. Greene and S. T. Yau, 1993, 655 pp.
PSPUM/54.2WS008 $96 **$20**

Differential Geometry, edited by Robert E. Greene and S. T. Yau, 1993, 710 pp.
PSPUM/54.3WS008 $103 **$20**

Algebraic Groups and Their Generalizations, edited by William J. Haboush and Brian J. Parshall, 1994, 383 pp.
PSPUM/56.1WS008 $68 **$15**

Algebraic Groups and Their Generalizations, edited by William J. Haboush and Brian J. Parshall, 1994, 415 pp.
PSPUM/56.2WS008 $72 **$15**

Stochastic Analysis, edited by Michael C. Cranston and Mark A. Pinsky, 1995, 621 pp.
PSPUM/57WS008 $129 **$20**

***K*-Theory and Algebraic Geometry: Connections with Quadratic Forms and Division Algebras**, edited by Bill Jacob and Alex Rosenberg, 1995, 293 pp.
PSPUM/58.1WS008 $69 **$15**

***K*-Theory and Algebraic Geometry: Connections with Quadratic Forms and Division Algebras**, edited by Bill Jacob and Alex Rosenberg, 1995, 444 pp.
PSPUM/58.2WS008 $89 **$20**

Selected Tables in Mathematical Statistics

Selected Tables in Mathematical Statistics, Volume 10, by B. K. Shah and Robert E. Odeh, 1986, 347 pp.
TABLES/10WS008 $50 **$15**

Selected Translations in Mathematical Statistics and Probability

Eleven Papers from the Fourth Prague Conference on Information Theory Statistical Decision Functions and Random Processes, by I. I. Gruško, A. A. Juškevič, A. M. Kagan, Ju. F. Kičatov, V. F. Krapivin, Ju. V. Linnik, N. S. Raĭbman, T. A. Sarymsakov, V. V. Sazonov, A. N. Širjaev, V. N. Sudakov, and O. V. Viskov, 1970, 221 pp.
STAPRO/8WS008 $42 **$10**

Twenty-Nine Papers on Statistics and Probability, by A. Aksomaĭtis, A. Aleškjavičene, G. Aleškevičius, A. Békéssy, Ju. K. Beljaev, N. N. Čencov, I. D. Čerkasov, V. F. Gapoškin, È. Gečiauskas, A. A. Gol′dberg, D. V. Gusak, J. Hájek, W. K. Hayman, A. M. Jaglom, I. N. Kovalenko, I. V. Ostrovskiĭ, V. V. Petrov, N. I. Portenko, G. I. Prizva, B. A. Rogozin, M. F. Romanov, J. Sapagovas, S. N. Simonova, A. V. Skorohod, N. P. Slobodenjuk, Yang Tsung-p′an, and V. M. Zolatarev, 1971, 315 pp.
STAPRO/9WS008 $51 **$15**

Twenty-Two Papers on Statistics and Probability, by A. Aleškjavičene, I. I. Banis, A. Bikjalis, N. A. Bodin, N. G. Gamkrelidze, B. Grigelionis, S. V. Grigor′ev, Hoang Hyu N′y, G. Jasjunas, F. M. Kagan, V. F. Kolčin, V. I. Ladohin, T. I. Miskaja, A. V. Nagaev, A. S. Pabedinskaĭte, V. Pipiras, J. Sapagovas, A. N. Šerstnev, V. A. Statuljavičjus, P. Survila, A. A. Tempel′man, I. N. Volodin, and V. A. Zalgaller, 1973, 279 pp.
STAPRO/11WS008 $45 **$10**

Twenty Papers on Statistics and Probability, by Ch′en Hsi-ju, Chen Jia-ding, Chu Ch′en-shi, I. I. Gihman, B. V. Gnedenko, S. Ilovec, I. L. Ivanova, R. N. Mirošin, H. Mortimer, T. Nemetz, Pan Jie-jian, Pan Yi-min, L. V. Prohorov, V. N. Tutubalin, G. Varga, L. Vilkauskas, Wu Li-de, Yang Ch′ao-ch′un, and V. M. Zolotarev, 1973, 312 pp.
STAPRO/12WS008 $62 **$15**

Twenty Papers on Statistics and Probability, by M. Arató, A. Ja. Beleckiĭ, A. Bikjalis, E. F. Car′kov, I. D. Čerkasov, Ju. M. Ermol′ev, J. Gergely, B. Grigelionis, Z. S. Halil′, M. D. Judin, N. P. Kandelaki, Ja. P. Lumel′skiĭ, V. Paulauskas, E. Pleszcyńska, A. G. Postnikov, A. Rényi, L. I. Saulis, A. Slušnis, J. Štěpán, A. D. Tuniev, and N. N. Vahanija, 1973, 298 pp.
STAPRO/13WS008 $75 **$15**

Eighteen Papers on Statistics and Probability, by G. P. Čistjakov, Endre Csáki, I. I. Ežov, P. M. Flekser, A. E. Fryntov, B. N. Ginzburg, A. A. Gol′dberg, B. I. Grigelionis, A. I. Il′inskiĭ, V. S. Koroljuk, L. S. Kudina, L. Z. Livšic, L. D. Mešalkin, A. D. Milka, I. V. Ostrovskiĭ, B. A. Rogozin, I. N. Volodin, and V. M. Zolotarev, 1981, 317 pp.
STAPRO/15WS008 $79 **$15**

SIAM–AMS Proceedings

Nonlinear Programming, edited by R. W. Cottle and C. E. Lemke, 1976, 200 pp.
SIAMS/9WS008 $27 **$10**

Fracture Mechanics, edited by Robert Burridge, 1979, 169 pp.
SIAMS/12WS008 $30 **$10**

Translations of Mathematical Monographs

The Linearization Method in Hydrodynamical Stability Theory, by V. I. Yudovich, 1989, 170 pp.
MMONO/74WS008 $85 **$20**

Introduction to Algebraic Curves, by Phillip A. Griffiths, 1989, 221 pp.
MMONO/76WS008 $39 **$10**

Ideals of Identities of Associative Algebras, by Aleksandr Robertovich Kemer, 1991, 81 pp.
MMONO/87WS008 $78 **$15**

Fewnomials, by A. G. Khovanskiĭ, 1991, 139 pp.
MMONO/88WS008 $100 **$20**

Conformal Mappings and Boundary Value Problems, by Guo-Chun Wen, 1992, 303 pp.
MMONO/106WS008 $99 **$20**

Nonlinear Semigroups, by Isao Miyadera, 1992, 230 pp.
MMONO/109WS008 $99 **$20**

Theory of Entire and Meromorphic Functions—Deficient and Asymptotic Values and Singular Directions, by Zhang Guan-Hou, 1993, 375 pp.
MMONO/122WS008 $182 **$20**

An Introduction to Sato's Hyperfunctions, by Mitsuo Morimoto, 1993, 273 pp.
MMONO/129WS008 $49 **$10**

Nonlinear Nonlocal Equations in the Theory of Waves, by P. I. Naumkin and I. A. Shishmarev, 1994, 289 pp.
MMONO/133WS008 $149 **$20**

Linear Infinite-Particle Operators, by V. A. Malyshev and R. A. Minlos, 1995, 298 pp.
MMONO/143WS008 $125 **$20**

Nontraditional Methods in Mathematical Hydrodynamics, by O. V. Troshkin, 1995, 197 pp.
MMONO/144WS008 $39 **$10**

Modular Forms and Hecke Operators, by A. N. Andrianov and V. G. Zhuravlev, 1995, 334 pp.
MMONO/145WS008 $95 **$20**

Mixed Problem for Partial Differential Equations with Quasihomogeneous Principal Part, by S. G. Gindikin and L. R. Volevich, 1995, 233 pp.
MMONO/147WS008 $99 **$20**

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WS008

Classified Advertisements

Positions available, items for sale, services available, and more

CANADA

The University of British Columbia Department of Mathematics

The mathematics department at the University of British Columbia is seeking candidates for at least one tenure-track assistant professorship, subject to funding, with a starting date of July 1, 2001. Exceptional candidates at the associate professor or professor level may be considered. Applicants must have a superb research record in one of the following areas: algebraic geometry, differential geometry, geometric topology or number theory. The successful applicant is expected to interact with related groups in the mathematics department and have demonstrated interest and ability in teaching. The salary will be commensurate with experience and research record. Applicants should send a current CV, including a list of publications, statement of research and teaching interests, and a list of four referees to:

Professor George Bluman, Head
Department of Mathematics
University of British Columbia
#121 - 1984 Mathematics Road
Vancouver, B.C., Canada V6T 1Z2

Assistant professorship candidates should arrange for three letters of recommendation to be sent directly to the same address.

Applications must be received before October 15, 2000.

In accordance with Canadian immigration requirements, this advertisement is directed to Canadian citizens and permanent residents. The University of British Columbia hires on the basis of merit and is committed to employment equity. We encourage all qualified persons to apply.

The University of British Columbia Department of Mathematics

The mathematics department at the University of British Columbia is seeking candidates for at least one tenure-track assistant professorship, subject to funding, with a starting date of July 1, 2001. Exceptional candidates at the associate professor or professor level may be considered. Applicants must have a superb research record in one of the following areas: financial mathematics, mathematical biology (analysis of complex biological systems, including functional genomics), partial differential equations or probability. The successful applicant is expected to interact with related groups in the mathematics department and have demonstrated interest and ability in teaching. The salary will be commensurate with experience and research record. Applicants should send a current CV, including a list of publications, statement of research and teaching interests, and a list of four referees to:

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The University of Western Ontario Department of Mathematics

The Department of Mathematics is seeking to nominate a candidate for an NSERC University Faculty Award in the fall 2000 competition.

The University Faculty Award was created by NSERC to encourage Canadian universities to appoint very promising women researchers to tenure-track positions in science and engineering. Further information on the program can be found at the following Web page: `http://www.nserc.ca/programs/schol4_e.htm`.

The nominee from our department will have an outstanding record of research and publication in a field related to one of the existing areas of strengths of the department; these include homotopy theory, algebraic K-theory, number theory, noncommutative algebra, cyclic homology, algebraic groups, complex analysis, and analytic geometry. The candidate will also have a commitment to and aptitude for teaching undergraduate and graduate students and will be expected to supervise graduate theses.

Suggested uses for classified advertising are positions available, books or lecture notes for sale, books being sought, exchange or rental of houses, and typing services.

The 2000 rate is $100 per inch or fraction thereof on a single column (one-inch minimum), calculated from top of headline. Any fractional text of 1/2 inch or more will be charged at the next inch rate. No discounts for multiple ads or the same ad in consecutive issues. For an additional $10 charge, announcements can be placed anonymously. Correspondence will be forwarded.

Advertisements in the "Positions Available" classified section will be set with a minimum one-line headline, consisting of the institution name above body copy, unless additional headline copy is specified by the advertiser. Headlines will be centered in boldface at no extra charge. Ads will appear in the language in which they are submitted.

There are no member discounts for classified ads. Dictation over the telephone will not be accepted for classified advertising.

Upcoming deadlines for classified advertising are as follows: September issue–June 20, 2000; October issue–July 19, 2000; November issue–August 23, 2000; December issue–September 29, 2000; January 2001 issue–October 25, 2000; February 2001 issue–November 29, 2000.

U.S. laws prohibit discrimination in employment on the basis of color, age, sex, race, religion, or national origin. "Positions Available" advertisements from institutions outside the U.S. cannot be published unless they are accompanied by a statement that the institution does not discriminate on these grounds whether or not it is subject to U.S. laws. Details and specific wording may be found on page 1373 (vol. 44).

Situations wanted advertisements from involuntarily unemployed mathematicians are accepted under certain conditions for free publication. Call toll-free 800-321-4AMS (321-4267) in the U.S. and Canada or 401-455-4084 worldwide for further information.

Submission: Promotions Department, AMS, P. O. Box 6248, Providence, Rhode Island 02940; or via fax: 401-331-3842; or send e-mail to `classads@ams.org`. AMS location for express delivery packages is 201 Charles Street, Providence, Rhode Island 02904. Advertisers will be billed upon publication.

The appointment is scheduled to begin on July 1, 2001.

Those interested in being nominated for this award should send a curriculum vitae and the names of at least three referees to:

Prof. J. F. Jardine, Chair
Department of Mathematics
University of Western Ontario
London, Ontario N6A 5B7, Canada

We also welcome e-mail inquiries and submissions, to be sent to the address `math-pos@julian.uwo.ca`.

Application materials should arrive no later than August 15, 2000. This position is subject to budgetary approval and to the success of the application to NSERC.

In accordance with Canadian immigration requirements, this advertisement is directed to Canadian citizens and permanent residents of Canada. The University of Western Ontario is committed to employment equity, welcomes diversity in the workplace, and encourages applications from all qualified individuals, including women, members of visible minorities, aboriginal persons, and persons with disabilities.

PUBLICATIONS WANTED

MATHEMATICS BOOKS PURCHASED

Pure & appl. adv. & research level, any age, usable cond. Reprints OK. One box to whole libraries sought. Contact: Collier Brown or Kirsten Berg @ **Powell's Technical Bks.**, Portland, OR. Call 800-225-6911, fax 503-228-0505, or e-mail `kirsten@technical.powells.com`.

FOR SALE

Gian-Carlo Rota's personal library is for sale. Approximately 7,000 mathematics, 1,000 philosophy.

Also, sold separately, his papers, class notes & preparations, file cabinet contents.

Contact James Cormier, 617-492-4888.

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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 e-MATH. See `http://www.ams.org/meetings/`. Programs and abstracts will continue to be displayed on e-MATH in the Meetings and Conferences section until about three weeks after the meeting is over. Final programs for Sectional Meetings will be archived on e-MATH in an electronic issue of the *Notices* as noted below for each meeting.

Los Angeles, California

University of California, Los Angeles

August 6–12, 2000

Meeting #956

Associate secretary: Robert J. Daverman
Announcement issue of *Notices*: May 2000
Program first available on e-MATH: May 24, 2000
Program issue of electronic *Notices*: October 2000
Issue of *Abstracts*: Volume 21, Issue 3

Deadlines

For organizers: None
For consideration of contributed papers in Special Sessions: None
For abstracts: Expired

Invited Addresses

James G. Arthur, University of Toronto, *The principle of functoriality.*

Alexander A. Beilinson, University of Chicago, *On the geometric Langlands conjecture.*

Michael V. Berry, University of Bristol, *Wave asymptotics and borderland physics.*

Haim Brezis, University of Paris VI and Rutgers University, *The interplay between analysis and topology in some nonlinear PDEs.*

Alain Connes, IHÉS and Collège de France, *Noncommutative geometry.*

David L. Donoho, Stanford University, *High-dimensional data analysis: The blessings and curses of dimensionality.*

Charles L. Fefferman, Princeton University, *Unsolved problems of fluid mechanics.*

Michael H. Freedman, Microsoft Research, *The physics of computation.*

Ronald L. Graham, University of California, San Diego, *Mathematics in the 21st century: Problems and prospects* (AMS-MAA Presidents' Lecture).

Helmut H. W. Hofer, Courant Institute, New York University, *Dynamical systems at the interface of symplectic geometry and three-dimensional topology.*

Richard M. Karp, International Computing Science Institute, *Algorithmic challenges from genomics and molecular biology.*

Sergiu Klainerman, Princeton University, *On the analysis of geometric evolution equations.*

Maxim Kontsevich, Institut des Hautes Études Scientifiques, *Operads of little discs in algebra and topology.*

Peter D. Lax, Courant Institute, New York University, *Mathematics and computing.*

Simon A. Levin, Princeton University, *Ecosystems as complex adaptive systems.*

László Lovász, Microsoft Research, *Classical mathematics and new challenges.*

David Mumford, Brown University, *Modeling perception and inference in intelligent systems.*

Peter Sarnak, Princeton University, *Some problems in number theory and related analysis.*

Saharon Shelah, The Hebrew University and Rutgers University, *Logical dreams.*

Peter W. Shor, AT&T Labs, *Quantum computation.*

Yakov G. Sinai, Princeton University, *From renormalization in dynamics to renormalization in probability and statistical physics.*

Richard P. Stanley, Massachusetts Institute of Technology, *Recent progress in algebraic combinatorics.*

Dennis P. Sullivan, The CUNY Graduate School, *String topology.*

Clifford Taubes, Harvard University, *Bliss and ignorance in 4-dimensions.*

Jean E. Taylor, Rutgers University, *Mathematics and materials science.*

William P. Thurston, University of California, Davis, *Three-dimensional topology and geometry.*

Karen Uhlenbeck, University of Texas at Austin, *Geometric partial differential equations: From Hilbert's Twenty-third Problem to nonlinear waves.*

S. R. S. Varadhan, Courant Institute, New York University, *Stochastic analysis and applications.*

Edward Witten, Institute for Advanced Study, *Mathematical impact of quantum fields and strings.*

Shing-Tung Yau, Harvard University, *Geometry and its relation to physics.*

Don B. Zagier, Max-Planck-Institut für Mathematik, *Number theory: Modular forms.*

Registration at the Meeting

Participants who registered in advance by June 8 and who so elected will have their badges and final programs mailed to them before the meeting. All other registrants will receive the final program at the meeting. Those who registered in advance but did not receive badges and programs in the mail may pick up pertinent materials at the outside ticket booth at Royce Hall on Sunday afternoon between 2:00 p.m. and 5:00 p.m.; otherwise, all badge and program pickup and new registrations will take place at the meeting registration desk in Room 132 in Royce Hall on Monday and Tuesday, 8:00 a.m. to 4:30 p.m.; Wednesday through Friday, 8:00 a.m. to 3:00 p.m.; and on Saturday from 8:00 a.m. to noon.

Mathematical Challenges On-site Registration Fees

Member of AMS, CMS, MAA, SIAM	$202
Temporarily Employed	127
Emeritus Member of AMS, MAA: Graduate Student, Unemployed, Librarian, High School Teacher, Developing Countries Special Rate	45
Undergraduate Student	26
Nonmember	312
High School Student	5
One-Day Member of AMS, CMS, MAA, SIAM	111
One-Day Nonmember	172
Special: 3-day Member Registration	132
3-day Nonmember Registration	204
Nonmathematican Guest	5

Accommodations

Participants who did not reserve a room during advance registration but who need accommodations should see the options for hotels and campus residence halls available to them on pages 612 and 613 in the May issue of the *Notices*. Participants interested in campus residences should inquire at the check-in desk in the Sunset Village lobby. The number of rooms in all facilities is limited; we regret that none may be available after the stated deadlines.

Toronto, Ontario, Canada

University of Toronto

September 23–24, 2000

Meeting #957

Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: August 2000
Program first available on e-MATH: August 10, 2000
Program issue of electronic *Notices*: November 2000
Issue of *Abstracts*: Volume 21, Issue 3

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: July 14, 2000

Invited Addresses

John H. Conway, Princeton University, *Title to be announced* (Erdős Memorial Lecture).

George Elliott, University of Toronto, *Title to be announced.*

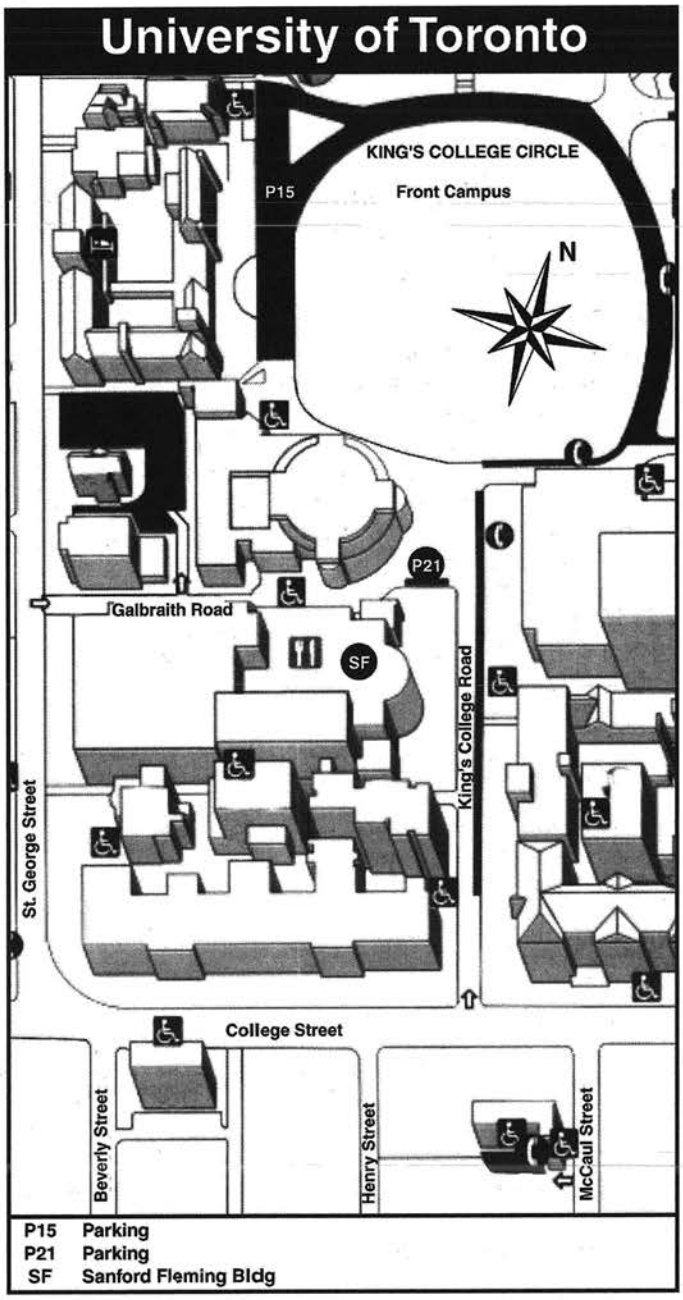
Benson Farb, University of Chicago, *Title to be announced.*

Boris Tsyagan, Pennsylvania State University, *Title to be announced.*

Special Sessions

Analytic Number Theory (Code: AMS SS N1), **John Friedlander**, University of Toronto, and **Steve Gonek**, University of Rochester.

Applied Categorical Structures (Code: AMS SS J1), **Joan Wick Pelletier** and **Walter Tholen**, York University.



Commutative Algebra and Algebraic Geometry (Code: AMS SS A1), **Anthony Geramita**, Queens University, and **William Traves**, United States Naval Academy.

Computational Wavelet Analysis (Code: AMS SS H1), **Sebastian Ferrando** and **Larry Kolasa**, Ryerson Polytechnic University.

Discrete and Applied Geometry (Code: AMS SS L1), **Asia Ivic Weiss** and **Walter Whiteley**, York University.

Ergodic Theory and Dynamical Systems (Code: AMS SS B1), **Andres del Junco**, University of Toronto, and **Blair Madore**, SUNY, Potsdam.

Functional Differential Equations and Applications (Code: AMS SS D1), **Anatoli F. Ivanov**, Pennsylvania State University, and **Jianhong Wu**, York University.

Hamiltonian Systems (Code: AMS SS M1), **Lisa Jeffrey**, **Velimir Jurdjevic**, and **Boris Khesin**, University of Toronto.

Innovative Programs and Projects That Work in Undergraduate Mathematics (Code: AMS SS R1), **Bathi Kasturiarachi**, Kent State University.

Modern Schubert Calculus (Code: AMS SS K1), **Nantel Bergeron**, York University, and **Frank Sottile**, University of Wisconsin.

Nonabsolute Integration (Code: AMS SS C1), **Patrick Muldowney**, University of Ulster, and **Erik Talvila**, University of Illinois, Urbana.

Noncommutative Geometry (Code: AMS SS Q1), **Ryszard Nest**, University of Copenhagen, and **Victor Nistor** and **Boris Tsygan**, Pennsylvania State University.

Nonlinear Functional Analysis (Code: AMS SS P1), **Sankatha Singh** and **Bruce Watson**, Memorial University of Newfoundland.

Operator Algebras and Operator Theory (Code: AMS SS T1), **Man-Duen Choi** and **George Elliott**, University of Toronto.

Probability (Code: AMS SS S1), **Neal Madras**, **George L. O'Brien**, **Thomas Salisbury**, and **Donna Salopek**, York University.

Pseudo-differential Operators, Wavelet Transforms and Related Topics (Code: AMS SS F1), **M. W. Wong**, York University.

Representation Theory of Infinite Dimensional Lie Algebras (Code: AMS SS E1), **Yun Gao**, York University.

Set Theory and Set-Theoretic Topology (Code: AMS SS G1), **Franklin D. Tall**, University of Toronto.

Accommodations

Participants should make their own arrangements directly with the hotel of their choice and request the American Mathematical Society rate. The AMS is not responsible for rate changes or for the quality of the accommodations.

Courtyard by Marriott, Downtown Toronto, 475 Younge Street, Toronto, Ontario, Canada; 416-924-0611; $182 (CAD) single or double (approx. US$122). Deadline for reservations is August 1, 2000.

Days Inn-Toronto Downtown, 30 Carlton Street, Toronto, Ontario, Canada; 416-977-6655 or 800-325-2525; $139 (CAD) single or double (approx. US$93). Deadline for reservations is August 23, 2000.

Food Service

There are a number of restaurants adjacent to the campus. A list of restaurants will be available at the registration desk.

Local Information

Please visit the Web site maintained by the University of Toronto at `http://www.utoronto.ca/` or visit `http://www.torinfo.com/`.

Other Activities

AMS Book Sale: Examine the newest titles from the AMS! Most books will be available at a special 50% discount offered only at meetings. Complimentary coffee will be served, courtesy of AMS Membership Services. The book exhibit will be located in Room 1013 in the Sandford Fleming Building and is adjacent to the atrium area.

Parking

Parking is available on a cash basis in marked lots adjacent to the Sandford Fleming Building.

Registration and Meeting Information

The registration desk will be located in the atrium of the Sandford Fleming Building and will be open from 8:00 a.m. to 4:30 p.m. on Saturday, and from 8:00 a.m. to noon on Sunday. Talks will take place in the Sandford Fleming Building.

Registration fees (payable on-site only): $40/AMS and CMS members; $60/nonmembers; $15/emeritus members, students, or unemployed mathematicians. Fees are payable by cash (US$), check, VISA, MasterCard, Discover, or American Express.

Travel

By Air: The Lester B. Pearson International Airport serves most major airlines. The following specially negotiated rates on **USAirways** are available exclusively to mathematicians and their families for the period September 19–September 27, 2000. Restrictions may apply and seats are limited. Receive a 5% discount off First or Envoy Class and any published USAirways promotional round-trip fare. By purchasing your ticket 60 days or more prior to departure, you can receive an additional 5% bonus discount. Or you may receive a 10% discount off unrestricted coach fares with 7-day advance purchase. For reservations call (or have your travel agent call) USAirways Group and Meeting Reservation Office toll-free at 877-874-7687 between 8:00 a.m. and 9:30 p.m. Eastern Time. Refer to **Gold File number 18611161.**

For more specific travel information please visit `http://www.utoronto.ca/toronto.htm`.

Weather

The climate is mild at this time of year, with an average daytime temperature between 60° and 70°F.

San Francisco, California

San Francisco State University

October 21–22, 2000

Meeting #958

Western Section
Associate secretary: Bernard Russo
Announcement issue of *Notices*: August 2000
Program first available on e-MATH: September 11, 2000
Program issue of electronic *Notices*: December 2000
Issue of *Abstracts*: Volume 21, Issue 4

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: August 29, 2000

Invited Addresses

Steven N. Evans, University of California, Berkeley, *Title to be announced.*

Lisa J. Fauci, Tulane University, *Title to be announced.*

Kristin Lauter, Microsoft Corporation, *Title to be announced.*

Thomas Wolff, California Institute of Technology, *Title to be announced.*

Special Sessions

Abstract Wavelet Theory (Code: AMS SS J1), **Lawrence W. Baggett**, University of Colorado, and **Kathy D. Merrill**, The Colorado College.

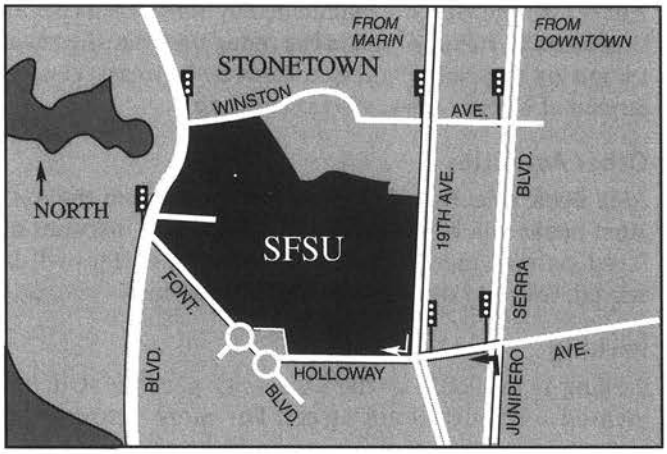
Algebraic and Geometric Combinatorics (Code: AMS SS A1), **Jesus De Loera**, University of California, Davis, and **Frank Sottile**, University of Wisconsin.

Banach Algebras (Code: AMS SS K1), **Suren Grigoryan**, Kazan State University, and **Thomas Tonev**, University of Montana, Missoula.

Diagrammatic Morphisms in Algebra, Category Theory, and Topology (Code: AMS SS F1), **David Radford**, University of Illinois at Chicago, **Fernando Souza**, Los Alamos National Laboratory and University of Illinois at Chicago, and **David Yetter**, Kansas State University.

Geometric and Symbolic Dynamical Systems (Code: AMS SS D1), **Arek Goetz**, San Francisco State University, and **Luca Zamboni**, University of North Texas.

Harmonic Analysis (Code: AMS SS C1), **Christoph Thiele**, University of California, Los Angeles, and **Thomas Wolff**, California Institute of Technology.



San Francisco State University

History of Mathematics (Code: AMS SS B1), **Shawnee McMurran**, University of Redlands, and **James J. Tattersall**, Providence College.

Holomorphic Spaces (Code: AMS SS E1), **Sheldon Axler** and **Alex Schuster**, San Francisco State University.

Periodic and/or Multiple Solutions of Differential and Difference Equations (Code: AMS SS L1), **Jorge Aarao** and **Mario Martelli**, Claremont McKenna College, and **Adolfo Rumbos**, Pomona College.

Quantum Algebra (Code: AMS SS H1), **Nicolai Reshetikhin**, University of California, Berkeley.

Singularities and Algebraic Geometry (Code: AMS SS G1), **Caroline Melles**, United States Naval Academy, and **Ruth Michler**, University of North Texas.

Topics in Probability, with Emphasis on Markov Chains and Random Matrices (Code: AMS SS M1), **Steve Evans**, University of California, Berkeley, **Amir Dembo**, Stanford University, and **Yuval Peres**, University of California, Berkeley.

Accommodations

Participants should make their own arrangements directly with a hotel of their choice. Special rates have been negotiated at the hotel listed below. Rates quoted do not include sales tax. The AMS is not responsible for rate changes or for the quality of the accommodations. When making a reservation, participants should state that they are with the American Mathematical Society group.

Days Inn, 2600 Sloat Blvd., San Francisco, CA; 415-665-9000; rates start at $87.75 single and $97.75 double. Rates include a special discount of 15%. Reservations are on a space-available basis only, and participants must make reservations directly with this hotel using the phone number listed in this announcement.

Food Service

A list of restaurants will be available at the registration desk.

Local Information

Please visit the Web site maintained by San Francisco State University at `http://www.sfsu.edu/` and the site maintained by the San Francisco Convention and Visitors Bureau at `http://www.sfvisitor.org/`.

Other Activities

AMS Book Sale: Examine the newest titles from the AMS! Most books will be available at a special 50% discount offered only at meetings. Complimentary coffee will be served, courtesy of AMS Membership Services.

Parking

Parking is available in the University parking structure located on South State Street. For more information regarding parking please visit `http://www.sfsu.edu/~parking/text/tocampus.html`.

Registration and Meeting Information

The registration desk will be located on the third (main) floor of Thornton Hall and will be open from 7:30 a.m. to 4:30 p.m. on Saturday and from 8:00 a.m. to noon on Sunday. Talks will take place in the Science Building and Thornton Hall.

Registration fees (payable on-site only): $40/AMS and CMS members; $60/nonmembers; $15/emeritus members, students, or unemployed mathematicians. Fees are payable by cash, check, VISA, MasterCard, Discover, or American Express.

Travel

By Air: The San Francisco International Airport (SFO) is served by all major airlines. The following specially negotiated rates on **USAirways** are available exclusively to mathematicians and their families for the period October 18–October 25, 2000. Discounts apply only to travel within the continental U.S. Other restrictions may apply and seats are limited. Receive a 5% discount off First or Envoy Class and any published USAirways promotional round-trip fare. By purchasing your ticket 60 days or more prior to departure, you can receive an additional 5% bonus discount. Or you may receive a 10% discount off unrestricted coach fares with 7-day advance purchase. For reservations call (or have your travel agent call) USAirways Group and Meeting Reservation Office toll-free at 877-874-7687 between 8:00 a.m. and 9:30 p.m. Eastern Time. Refer to **Gold File number 18611161.**

Shuttles from the airport to the campus are available and cost $12 to $15. Taxi service is approximately $40 one way. If driving from the airport, go north on Highway 101 to I-380 North to I-280 North. From 280 North follow the signs for 19th Avenue and SFSU. As the freeway ends, remain in the right lanes of traffic and exit onto Juniper Serra Blvd. From Juniper Serra turn left on Holloway Avenue, then turn right onto Font Blvd., then right onto Lake Merced Blvd., and then right onto South State Street Drive. The University parking structure is on South State Street Drive.

Driving to the campus: From the north: Take Highway 101 South across the Golden Gate Bridge. Take 19th Avenue/Highway 1 exit. Follow 19th Avenue to campus at Holloway Avenue.

From the south: Take I-280 North; exit at 19th Avenue. Take Junipero Serra Blvd. to Holloway Avenue; turn left on Holloway Avenue to campus at 19th Avenue.

To get directly to the parking garage from 19th and Holloway, continue down Holloway to Font Blvd. Take a right on Font Blvd. until you come to Lake Merced Blvd. Take a right onto Lake Merced, and then take another immediate right onto State Drive. The public parking garage is straight ahead.

From the east: Take I-80 West across the Bay Bridge to Highway 101 South. Take 101 South to I-280 toward Daly City. Take the Mission St./Daly City exit, bearing right onto Sagamore Street to Brotherhood Way to Junipero Serra Blvd. North. Take Junipero Serra Blvd. to Holloway Avenue; turn left on Holloway Avenue to campus at 19th Avenue. To get directly to the parking garage, stay on

Brotherhood Way and turn right onto Lake Merced Blvd. Two stoplights up is the entrance to the public parking garage (turn right).

Weather

The weather in October is variable, with temperatures from 70° to 85°F. The weather can turn cold, overcast, and windy due to the close proximity of the SFSU campus to the ocean.

New York, New York

Columbia University

November 4–5, 2000

Meeting #959

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: September 2000
Program first available on e-MATH: September 28, 2000
Program issue of electronic *Notices*: December 2000
Issue of *Abstracts*: Volume 21, Issue 4

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: July 18, 2000
For abstracts: September 12, 2000

Invited Addresses

Paula Cohen, Université des Sciences et Technologies de Lille, France, *Title to be announced.*

Brian Greene, Columbia University, *Title to be announced.*

Sergey Novikov, University of Maryland, College Park, and Landau Institute for Theoretical Physics, *Title to be announced.*

Alexander I. Suciu, Northeastern University, *Title to be announced.*

Special Sessions

Algebraic Geometry (Code: AMS SS H1), **Sorin Popescu** and **Lev A. Borisov**, Columbia University.

Arithmetic Geometry and Modular Forms (Code: AMS SS D1), **Dorian Goldfeld**, Columbia University, and **Paula Cohen**, Université des Sciences et Technologies de Lille.

Arrangements of Hyperplanes (Code: AMS SS C1), **Michael J. Falk**, Northern Arizona University, and **Alexander I. Suciu**, Northeastern University.

Combinatorial Group Theory (Code: AMS SS A1), **Gilbert Baumslag, Sean T. Cleary, Alexei Myasnikov**, and **Vladimir Shplirain**, City College (CUNY).

Commutative Algebra (Code: AMS SS F1), **Irena Peeva**, Cornell University, and **Luchezar Avramov**, Purdue University.

Differential Algebra and Related Topics (Code: AMS SS E1), **Li Guo** and **William Keigher**, Rutgers University at Newark, and **William Sit**, City College (CUNY).

Nonlinear Partial Differential Equations (Code: AMS SS J1), **Zheng-Chao Han**, Rutgers University, and **A. Shadi Tahvildar-Zadeh**, Princeton University.

Riemannian Manifolds and Their Limit Spaces (Code: AMS SS K1), **Xiaochun Rong**, Rutgers University, and **Christina Sormani**, Lehman College, CUNY.

Symbolic Computation and Kleinian Groups (Code: AMS SS G1), **Jane P. Gilman**, Rutgers University, and **Mika K. Seppala**, Florida State University.

The Topology of 3-Manifolds (Code: AMS SS B1), **Joan S. Birman** and **Brian S. Magnum**, Columbia University, and **Walter D. Neumann**, University of Melbourne.

Birmingham, Alabama

University of Alabama at Birmingham

November 10–12, 2000

Meeting #960

Southeastern Section
Associate secretary: John L. Bryant
Announcement issue of *Notices*: September 2000
Program first available on e-MATH: October 5, 2000
Program issue of electronic *Notices*: January 2001
Issue of *Abstracts*: Volume 21, Issue 4

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: July 25, 2000
For abstracts: September 19, 2000

Invited Addresses

Nick Alikakos, University of Tennessee and University of Athens, *Title to be announced.*

Ivan Cherednik, University of North Carolina at Chapel Hill, *Title to be announced.*

Vladimir Temlyakov, University of South Carolina, *Greedy algorithms in nonlinear approximation.*

Xin Zhou, Duke University, *Title to be announced.*

Special Sessions

Analytical Problems in Mathematical Physics (Code: AMS SS E1), **Roger T. Lewis**, University of Alabama at Birmingham, **Michael P. Loss**, Georgia Institute of Technology, and **Marcel Griesemer**, University of Alabama at Birmingham.

Billiards and Related Topics (Code: AMS SS C1), **Nikolai I. Chernov** and **Nandor Simanyi**, University of Alabama at Birmingham.

Differential Operators and Function Spaces (Code: AMS SS P1), **R. C. Brown**, University of Alabama at Tuscaloosa, and **D. B. Hinton**, University of Tennessee, Knoxville.

Dynamics and Low-Dimensional Topology (Code: AMS SS G1), **Alexander M. Blokh**, **Lex G. Oversteegen**, and **John C. Mayer**, University of Alabama at Birmingham.

Integrable Systems and Riemann-Hilbert Problems (Code: AMS SS N1), **Xin Zhou**, Duke University, and **Kenneth McLaughlin**, University of Arizona.

Inverse Problems (Code: AMS SS A1), **Ian Walker Knowles** and **Rudi Weikard**, University of Alabama at Birmingham.

Nonlinear Differential Equations and Applications (Code: AMS SS H1), **James R. Ward Jr.**, University of Alabama at Birmingham, and **Wenzhang Huang**, University of Alabama at Huntsville.

Nonlinear Methods in Approximation (Code: AMS SS K1), **Vladimir N. Temlyakov**, University of South Carolina.

Nonlinear Partial Differential Equations and Applications (Code: AMS SS J1), **Dehua Wang**, University of Pittsburgh, and **Yanni Zeng**, University of Alabama at Birmingham.

Operator Algebras and Their Representations (Code: AMS SS F1), **Alan Hopenwasser**, University of Alabama, and **Justin R. Peters**, Iowa State University.

Operators and Function Theory on Holomorphic Space (Code: AMS SS M1), **James L. Wang** and **Zhijian Wu**, University of Alabama.

Relations between Spectral Theory and Analytic Number Theory (Code: AMS SS B1), **Robert M. Kauffman**, University of Alabama at Birmingham, and **Martin N. Huxley**, Cardiff University, Wales.

Spectral and Transport Problems in Solid State Physics (Code: AMS SS D1), **Peter D. Hislop**, University of Kentucky, and **Yulia Karpeshina** and **Gunter H. Stolz**, University of Alabama at Birmingham.

Wavelets, Frames, Sampling, and Time-Frequency Representations (Code: AMS SS L1), **Akram Aldroubi**, Vanderbilt University.

Hong Kong, People's Republic of China

Hong Kong Baptist University

December 13–16, 2000

Meeting #961

First Joint International Meeting between the AMS and the Hong Kong Mathematical Society.
Associate secretary: Bernard Russo
Announcement issue of *Notices*: August 2000
Program first available on e-MATH: Not applicable
Program issue of electronic *Notices*: Not applicable
Issue of *Abstracts*: None

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: July 15, 2000
For abstracts: September 1, 2000

Invited Addresses

Jianshu Li, Hong Kong University of Science and Technology, *Title to be announced.*

Thomas Liggett, University of California, Los Angeles, *Title to be announced.*

Ngai Ming Mok, University of Hong Kong, *Title to be announced.*

Gilles Pisier, University of Paris VI and Texas A&M University, *Title to be announced.*

Michael Shub, IBM, *Title to be announced.*

Gang Tian, Massachusetts Institute of Technology, *Title to be announced.*

Special Sessions

Combinatorial and Computational Methods in Commutative Algebra and Algebraic Geometry, **Vladimir Shpilrain**, CUNY, City College, and **Jie-Tai Yu**, University of Hong Kong.

Combinatorics and Graph Theory, **Beifang Chen**, Hong Kong University of Science and Technology, **Jeong Han Kim**, Microsoft, USA, and **Che Bor Lam**, Hong Kong Baptist University.

Geometric Analysis, **Peter Li**, University of California, Irvine, and **Luen Fai Tam** and **Tom Wan**, Chinese University of Hong Kong.

Integrable Systems, **Jishan Hu**, Hong Kong University of Science and Technology, **Wen Xiu Ma**, City University of Hong Kong, **Peter Olver**, University of Minnesota, and **Min Yan**, Hong Kong University of Science and Technology.

Iterative Methods in Scientific Computation, **Michael Ng**, University of Hong Kong, and **Robert Plemmons**, Wake Forest University.

Low Dimensional Topology, **Iain Aitchison** and **Hyam Rubinstein**, University of Melbourne.

Mathematics of Learning Theory, **Felipe Cucker** and **Stephen Smale**, City University of Hong Kong.

Mathematics of Optimization, **Kung Fu Ng**, Chinese University of Hong Kong, and **Jong-shi Pang**, Johns Hopkins University.

Nonlinear Elliptic and Parabolic Partial Differential Equations, **Kai Seng Chou**, Chinese University of Hong Kong, **Yanyan Li**, Rutgers University, and **Juncheng Wei**, Chinese University of Hong Kong.

Nonlinear Waves, **Zhouping Xin**, Courant Institute and Chinese University of Hong Kong, and **Xiaoping Wang**, Hong Kong University of Science and Technology.

Numerical Methods for Partial Differential Equations, **Susanne Brenner**, University of South Carolina, and **Jun Zou**, Chinese University of Hong Kong.

Optimization and Applications, **Kok Lay Teo** and **X. Q. Yang**, Hong Kong Polytechnic University.

Representation Theory, **Jian Shu Li** and **Jinsong Huang**, Hong Kong University of Science and Technology.

Theoretical and Numerical Aspects of Nonlinear Conservation Laws, **Tao Tang**, Hong Kong Baptist University, and **Zhouping Xin**, Courant Institute and Chinese University of Hong Kong.

Value Distribution Theory and Complex Dynamics, **Chung Chun Yang**, Hong Kong University of Science and Technology, and **William Cherry**, University of North Texas.

Contributed Papers

There is a contributed paper session organized by Joseph H. W. Lee. The abstract deadline for this session is August 1, 2000. All questions regarding submission of abstracts for this session should be directed to majlee@polyu.edu.hk.

Conference Web Site

The information in this announcement is taken from the Web site maintained by the local organizers. See http://www.math.hkbu.edu.hk/hkms/ams-hkms2000.html for additional program details and links to sites for hotels, campus, and other local information.

The e-mail address for conference information is amshkms@math.ust.hk.

Abstracts

The deadline for abstracts for Special Sessions is September 1, 2000. All questions regarding abstracts for these sessions should be directed to amshkms@math.ust.hk.

Accommodations

The conference organizers have negotiated a special rate with the Royal Plaza Hotel. The price per room per night is HK$550 (approximately US$71). It is about five minutes by train to the Kowloon Tong Station and another five-minute walk to the Lam Woo Conference Centre.

Registration and Meeting Information

The meeting will be held at the Lam Woo Conference Centre of Hong Kong Baptist University.

Social Activities

A local tour will be arranged on Friday afternoon, December 15, 2000. A banquet will be arranged for Friday evening after the local tour.

Travel and Local Information

Local Travel: Hong Kong has an excellent public transportation system consisting of trains, buses, and taxis. Generally, frequency of service is every few minutes. The Lam Woo Conference Centre of the Hong Kong Baptist University is a short walk from the Kowloon Tong underground subway (MTR) and railway (KCR) interchange.

International Travel & Visas: Visitors to Hong Kong from some countries require visas. If you are in doubt, please contact the Chinese consulate nearest you. Some participants may wish to visit the Chinese mainland before or after the conference. All foreigners visiting the Chinese mainland require a visa, which may be obtained from the Chinese consulate. However, for short trips you may obtain a tourist visa in Hong Kong within a matter of a few days.

About Hong Kong: Hong Kong (http://www.info.gov.hk/, http://www.hkta.org/) is a metropolis influenced by both Eastern and Western cultures and home to almost 7 million people. The native tongue of most residents is Cantonese, but those speaking English and Mandarin can get around easily. The local currency has an exchange rate of HK$7.75 = US$1.

New Orleans, Louisiana

New Orleans Marriott and Sheraton New Orleans Hotel

January 10–13, 2001

Meeting #962

Joint Mathematics Meetings, including the 107th Annual Meeting of the AMS, 84th 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).
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: October 2000
Program first available on e-MATH: November 1, 2000
Program issue of electronic *Notices*: January 2001
Issue of *Abstracts*: Volume 22, Issue 1

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: August 8, 2000
For abstracts: October 3, 2000
For summaries of papers to MAA organizers: September 15, 2000

Joint Invited Addresses

Barry Mazur, Harvard University, *Title to be announced* (AMS-MAA).

Jeffrey R. Weeks, Canton, NY, *Measuring the universe* (AMS-MAA).

Joint Special Sessions

History of Mathematics (Code: AMS SS K1), **Karen H. Parshall**, University of Virginia, and **David E. Zitarelli**, Temple University.

Mathematics and Education Reform (Code: AMS SS X1), **Naomi Fisher**, University of Illinois at Chicago, **William H. Barker**, Bowdoin College, **Jerry L. Bona**, University of Texas

at Austin, and **Kenneth C. Millett**, University of California, Santa Barbara.

AMS Invited Addresses

Bonnie Berger, Massachusetts Institute of Technology, *Title to be announced.*

Igor B. Frenkel, Yale University, *Title to be announced.*

Ronald L. Graham, University of California, San Diego, *Title to be announced* (AMS Josiah Willard Gibbs Lecture).

Mark L. Green, University of California, Los Angeles, *Title to be announced.*

Michael J. Hopkins, Massachusetts Institute of Technology, *Title to be announced.*

János Kollár, Princeton University, *Title to be announced* (AMS Colloquium Lecture).

AMS Special Sessions

Analysis on Infinite Dimensional Spaces (in honor of Leonard Gross) (Code: AMS SS N1), **Hui-Hsiung Kuo** and **Ambar N. Sengupta**, Louisiana State University.

Analytic Number Theory (Code: AMS SS P1), **Dorian Goldfeld**, Columbia University.

Asymptotic Behavior of Difference Equations with Applications (Code: AMS SS F1), **Vlajko L. Kocic**, Xavier University, **Abdul-Aziz Yakubu**, Howard University, and **Gerasimos Ladas**, University of Rhode Island.

Braid Groups and Configuration Spaces (Code: AMS SS L1), **Daniel C. Cohen** and **Neal W. Stoltzfus**, Louisiana State University.

Commutative Rings and Monoids (Code: AMS SS G1), **Scott T. Chapman**, Trinity University, and **Evan G. Houston**, University of North Carolina at Charlotte.

Computational Algebraic Geometry for Curves and Surfaces (Code: AMS SS B1), **Mika K. Seppala**, Florida State University, and **Emil J. Volcheck**, National Security Agency.

Discovery Learning: The Moore Method in American Mathematics (Code: AMS SS D1), **John W. Neuberger**, University of North Texas, and **Judy A. Kennedy**, University of Delaware.

Discrete Geometry (Code: AMS SS Y1), **Andras Bezdek**, Auburn University.

Function Theory, Differential Equations and Functional Equations (Code: AMS SS H1), **Gary G. Gundersen**, University of New Orleans, **Ilpo Laine**, University of Joensuu, and **Enid M. Steinbart**, University of New Orleans.

Geometric Group Theory (Code: AMS SS A1), **Stephen G. Brick** and **Igor Mineyev**, University of South Alabama, and **Jon M. Corson**, University of Alabama.

Geometry and Topology of Low Dimensional Manifolds (Code: AMS SS M1), **Slawomir Kwasik** and **Terry Lawson**, Tulane University.

Graduate and Postdoctoral Education in Arithmetical Algebraic Geometry: The Arizona Winter School (Code: AMS SS V1), **Douglas L. Ulmer** and **William G. McCallum**, University of Arizona.

Group Cohomology and Applications to Homotopy Theory and Representation Theory (Code: AMS SS J1), **Alejandro Adem**, University of Wisconsin, Madison, and **Jon F. Carlson**, University of Georgia.

Integral Transforms (Code: AMS SS T1), **Gestur Olafsson**, Louisiana State University, **Gunter Lumer**, University of Mons-Hainaut, and **Frank Neubrander**, Louisiana State University.

Integrals and Series throughout Mathematics (Code: AMS SS E1), **Victor H. Moll**, Tulane University, and **George Boros**, University of New Orleans.

Interaction of Inverse Problems and Image Analysis (Code: AMS SS Z1), **M. Zuhair Nashed**, University of Delaware, and **Otmar Scherzer**, Ludwig-Maximilians-Universität München.

Model Theory (Code: AMS SS AA1), **Steven A. Buechler** and **Sergei Starchenko**, University of Notre Dame.

Nonlinear Evolution Equations and Applications (Code: AMS SS W1), **Ralph A. Saxton**, University of New Orleans, **David H. Wagner**, University of Houston, and **Katarzyna Saxton**, Loyola University.

Operator Theory on Function Spaces (Code: AMS SS Q1), **Zhijian Wu**, University of Alabama, and **Dechao Zheng**, Vanderbilt University.

PDE Models in Population Biology and Epidemiology (Code: AMS SS U1), **J. M. Cushing**, University of Arizona, **Eric T. Funasaki**, Georgia Southern University, **Shandelle M. Henson**, College of William and Mary, and **Anna Maria Spagnuolo**, Texas A&M University.

Partial Differential Equations and Geometric Implications (Code: AMS SS R1), **Vladimir E. Shklover**, Northwestern University.

Representation Theory of Finite and Algebraic Groups (Code: AMS SS C1), **Zongzhu Lin**, Kansas State University, **Daniel K. Nakano**, Utah State University, and **Cornelius Pillen**, University of South Alabama.

Stochastic Analysis and Applications (Code: AMS SS S1), **Padmanabhan Sundar** and **Guillermo S. Ferreyra**, Louisiana State University.

Columbia, South Carolina

University of South Carolina

March 16–18, 2001

Meeting #963

Southeastern Section
Associate secretary: John L. Bryant
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: August 16, 2000
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Lawrence, Kansas

University of Kansas

March 30–31, 2001

Meeting #964

Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: August 30, 2000
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Special Sessions

Algebraic Geometry (Code: AMS SS C1), **B. P. Purnaprajna**, University of Kansas.

Commutative Algebra (Code: AMS SS A1), **Craig Huneke** and **Daniel Katz**, University of Kansas.

Number Theory (Code: AMS SS D1), **Ken Ono**, University of Wisconsin at Madison, **Cristian Popescu**, University of Texas at Austin, and **Tonghai Yang**, Harvard University.

Progress in Numerical Linear Algebra (Code: AMS SS E1), **Ralph Byers**, University of Kansas.

Set Theoretic Topology and Boolean Algebra (Code: AMS SS B1), **William Fleissner**, University of Kansas.

Las Vegas, Nevada

University of Nevada

April 21–22, 2001

Meeting #965

Western Section
Associate secretary: Bernard Russo
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: September 21, 2000
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Special Sessions

Finite Element Analysis and Applications (Code: AMS SS B1), **Jichun Li**, University of Texas and University of Nevada, and **Michael Marcozzi**, **George Miel**, and **Darrell W. Pepper**, University of Nevada.

Geometric and Computational Group Theory (Code: AMS SS A1), **Eric M. Freden**, Southern Utah University, and **Eric L. Swenson**, Brigham Young University.

Hoboken, New Jersey

Stevens Institute of Technology

April 28–29, 2001

Meeting #966

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: September 28, 2000
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Invited Addresses

Alexander Barvinok, University of Michigan, Ann Arbor, *Title to be announced.*

Robert Calderbank, AT&T Laboratories Research, *Title to be announced.*

Alexei Miasnikov, City College, New York, *Title to be announced.*

Frank Sottile, University of Massachusetts at Amherst, *Title to be announced.*

Special Sessions

Analytic Number Theory (Code: AMS SS A1), **Milos A. Dostal**, Stevens Institute of Technology, and **Werner G. Nowak**, Vienna, Austria.

Computational Algebraic Geometry and Its Applications (Code: AMS SS B1), **Serkan Hosten**, San Francisco State University, and **Frank Sottile**, University of Massachusetts at Amherst.

Lyon, France

July 17–20, 2001

First Joint International Meeting between the AMS and the Société Mathématique de France.
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: To be announced
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Columbus, Ohio

Ohio State University

September 21–23, 2001

Meeting #968

Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: February 21, 2001
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Chattanooga, Tennessee

University of Tennessee, Chattanooga

October 5–6, 2001

Meeting #969

Southeastern Section
Associate secretary: John L. Bryant
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: March 5, 2001
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Williamstown, Massachusetts

Williams College

October 13–14, 2001

Meeting #970

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: March 13, 2001
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Invited Addresses

Yisong Yang, Polytechnic University, *Title to be announced.*

Special Sessions

History of Mathematics (Code: AMS SS A1), **Glen R. Van Brummelen**, Bennington College, **Della D. Fenster**, Richmond University, and **James J. Tattersall**, Providence College.

Number Theory, Holomorphic Dynamics, and Algebraic Dynamics (Code: AMS SS B1), **Robert L. Benedetto**, University of Rochester, **John W. Milnor**, IMS and SUNY Stony Brook, and **Kevin M. Pilgrim**, University of Missouri at Rolla.

San Diego, California

San Diego Convention Center

January 6–9, 2002

Joint Mathematics Meetings, including the 108th Annual Meeting of the AMS, 85th 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).
Associate secretary: John L. Bryant
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: April 4, 2001
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced
For summaries of papers to MAA organizers: To be announced

Montréal, Québec Canada

Centre de Recherches Mathématiques, Université de Montréal

May 3–5, 2002

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: October 3, 2001
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Pisa, Italy

June 12–16, 2002

First Joint International Meeting between the AMS and the Unione Matematica Italiana.
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: To be announced
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Boston, Massachusetts

Northeastern University

October 5–6, 2002

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: To be announced
Program first available on e-MATH: To be announced
Program issue of electronic *Notices*: To be announced
Issue of *Abstracts*: To be announced

Deadlines

For organizers: March 6, 2002
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Presenters of Papers

Los Angeles, California; August 6–12, 2000

Numbers following the name indicate the speaker's position on the program.

◇ *AMS-MAA Invited Lecturer,* • *AMS Invited Lecturer,* ▸ *Graduate Student*

Program of the Sessions

Los Angeles, California, August 6–12, 2000

Sunday, August 6

Meeting Registration

2:00 PM – 5:00 PM **Outside Ticket Booth, Royce Hall**

For pickup of advance registration packets only.

AMS-MAA Presidents' Lecture

4:00 PM – 5:00 PM **Auditorium, Royce Hall**

(1) *Mathematics in the 21st century: Problems and prospects.*
Ronald L. Graham, University of California at San Diego

Opening Ceremonies and Reception

5:15 PM – 8:00 PM **Auditorium, Royce Hall**

Monday, August 7

Meeting Registration

8:00 AM – 4:30 PM **Room 132, Royce Hall**

Book Sales and Exhibits

8:00 AM – 4:30 PM **West Lobby, Royce Hall**

Invited Address

8:30 AM – 9:30 AM **Auditorium, Royce Hall**

(2) *Unsolved problems of fluid mechanics.*
Charles L. Fefferman, Princeton University

Invited Address

10:00 AM – 11:00 AM **Auditorium, Royce Hall**

(3) *Modeling perception and inference in intelligent systems.*
David Mumford, Brown University

Session on Optimization

11:15 AM – 11:55 AM **Room 160, Royce Hall**

11:15AM ▶ (4) *Extremum criteria in Neoclassical Analysis.* Preliminary report.
Mark S. Burgin, University of California, Los Angeles, CA 90095 (956-49-96)

11:30AM (5) *Substationarity of the non-Lipschitz energy for an eigenvalue problem in Hemivariational Inequalities.* Preliminary report.
Marian Bocea, Carnegie Mellon University (956-49-134)

11:45AM (6) *A study in the space of functions of bounded variation of a denoising-deblurring variational problem.*
Luminita A Vese, University of California, Los Angeles (956-49-144)

Session on Number Theory, I

11:15 AM – 11:55 AM **Room 162, Royce Hall**

11:15AM ▶ (7) *Finite order elements of Hecke groups.* Preliminary report.
Abdul Hassen, Rowan University (956-11-36)

11:30AM (8) *Results Concerning Cyclotomic Swan Subgroups.*
Daniel R Replogle, College of Saint Elizabeth (956-11-51)

11:45AM (9) *Local L-factors for the symplectic group of order four.*
Ramin Takloo-Bighash, Johns Hopkins University (956-11-103)

The time limit for each contributed paper in the sessions is ten minutes. In the Special Sessions the time limit varies from session to session and within sessions. To maintain the schedule, time limits will be strictly enforced.
For papers with more than one author, an asterisk follows the name of the author who plans to present the paper at the meeting.
Papers flagged with a solid triangle (▶) have been designated by the author as being of possible interest to undergraduate students.
Abstracts of papers presented in the sessions at this meeting will be found in Volume 21, Issue 3 of *Abstracts of papers presented to the American Mathematical Society*, ordered according to the numbers in parentheses following the listings. The middle two digits, e.g., 897-**20**-1136, refer to the Mathematical Reviews subject classification assigned by the individual author. Groups of papers for each subject are listed chronologically in the *Abstracts*. The last one to four digits, e.g., 897-20-**1136**, refer to the receipt number of the abstract; abstracts are further sorted by the receipt number within each classification.

Session on Geometry

12:45 PM – 1:40 PM **Room 164, Royce Hall**

12:45PM (10) *The Duistermaat-Heckman integration formula on generalized flag manifolds via a Morse theoretic approach.*
Andreas T Arvanitoyeorgos, The American College of Greece (956-53-90)

1:00PM (11) *Tubes and the geometry of Kahler manifold.*
Christina C Beneki, University of Patras (956-53-93)

1:15PM (12) *Exotic Spaces in Quantum Gravity.*
Kristin Schleich* and **Donald M Witt**, University of British Columbia (956-53-124)

1:30PM ► (13) *Closing some gaps in the basic development of hyperbolic geometry.*
Dieter Ruoff, University of Regina, Regina, Canada (956-51-49)

Session on Mathematics Education

12:45 PM – 1:40 PM **Room 160, Royce Hall**

12:45PM ► (14) *On mathematical learning: Application to learning generally.* Preliminary report.
Danielle Mihram, University of Southern California, and **G. Arthur Mihram***, Princeton, NJ (956-97-120)

1:00PM ► (15) *Keeping mathematics unified in the 21st century.*
M. Anne Dow, Maharishi University of Management (956-97-140)

1:15PM ► (16) *Some Activities Connecting Geometry, Probability, and Regression.* Preliminary report.
Gie-Whan D Kim*, Southern Oregon University, and **Sungsook Kim**, PaiChai University (956-97-115)

1:30PM ► (17) *Use of Worksheets to Facilitate Understanding.* Preliminary report.
Carol E Fan, Loyola Marymount University (956-97-80)

Session on Associative Rings and Algebras

12:45 PM – 1:40 PM **Room 162, Royce Hall**

12:45PM (18) *On the structure of certain rings with conditions on potent and noncentral elements.*
Hazar M Abu-Khuzam, Beirut Lebanon (956-16-64)

1:00PM (19) *Determinants and inversion of Gram matrices and expansions of the energy operator in the Fock representation of the multiparametric CCR-algebras.* Preliminary report.
Dragutin Svrtan*, University of Zagreb, Bijenicka c.30 ,10000Zagreb, Croatia, and **Stjepan Meljanac**, Rudjer Boskovic Institute (956-16-146)

1:15PM ► (20) *Index of Lie algebras and associative algebras.* Preliminary report.
Vladimir Dergachev, University of Pennsylvania (956-16-127)

1:30PM (21) *The algebra of multiple zeta values.* Preliminary report.
Michael E Hoffman, U. S. Naval Academy (956-16-119)

Invited Address

2:00 PM – 3:00 PM **Auditorium, Royce Hall**

(22) *Geometry and its relation to physics.*
Shing-Tung Yau, Harvard University

Invited Address

3:15 PM – 4:15 PM **Auditorium, Royce Hall**

(23) *Recent progress in algebraic combinatorics.*
Richard P. Stanley, Massachusetts Institute of Technology

Invited Address

4:30 PM – 5:30 PM **Auditorium, Royce Hall**

(24) *Geometric partial differential equations: From Hilbert's Twenty-third Problem to nonlinear waves.*
Karen Uhlenbeck, University of Texas at Austin

UCLA Department of Mathematics Reception

5:30 PM – 7:30 PM **UCLA Department of Mathematics Building**

AWM Special Presentation

8:00 PM – 9:00 PM **Grand Horizon Ballroom, Covel Commons at Sunset Village**

Demographic trends and challenges for mathematics.
Presenter: **Carolyn R. Mahoney**, California State University, San Marcos

AWM Reception

9:00 PM – 10:30 PM **Grand Horizon Ballroom Terrace, Covel Commons at Sunset Village**

Tuesday, August 8

Meeting Registration

8:00 AM – 4:30 PM **Room 132, Royce Hall**

Book Sales and Exhibits

8:00 AM – 4:30 PM **West Lobby, Royce Hall**

Invited Address

8:30 AM – 9:30 AM **Auditorium, Royce Hall**

(25) *Bliss and ignorance in 4-dimensions.*
Clifford Taubes, Harvard University

Invited Address

10:00 AM – 11:00 AM **Auditorium, Royce Hall**

(26) *High-dimensional data analysis: The blessings and curses of dimensionality.*
David L. Donoho, Stanford University

Session on Mechanics of Solids

11:15 AM – 11:55 AM **Room 164, Royce Hall**

11:15AM ► (27) *A Circular Inclusion with Homogeneously Imperfect Interface in Anti-plane Shear Elasticity.*
Peter Schiavone, University of Alberta, Edmonton, Canada (956-74-53)

11:30AM (28) *Aerodynamics of a moving curveball in Navier-Stokes flow.*
Joey Huang, Oak Ridge National Laboratory (956-76-32)

11:45AM (29) *A scaling analysis of turbulent flows driven by Rayleigh-Taylor and Richtmyer-Meshkov instabilities.*
Ye Zhou, Univ. of California, LLNL (956-76-122)

Session on Low-Dimensional Topology

11:15 AM - 11:55 AM **Room 160, Royce Hall**

11:15AM ► (30) *Three weight systems arising from intersection graphs.*
Blake Mellor, Honors College, Florida Atlantic University (956-57-60)

11:30AM (31) *Solving oriented tangle equations involving 2-bridge knots and links.*
Isabel K Darcy, University of Texas at Dallas (956-57-123)

11:45AM (32) *Convergence and Collapse of Three Manifolds in General Relativity.*
Arthur E Fischer*, University of California, Santa Cruz, and **Vincent Moncrief**, Yale University (956-83-116)

Session on Probability Theory and Stochastic Processes

12:45 PM - 1:40 PM **Room 160, Royce Hall**

12:45PM (33) *Extreme value theory in reinsurance.* Preliminary report.
Nicholas E. Frangos*, Athens University of Economics and Hofstra University, and **John Stamoulis**, Athens University of Economics (956-60-111)

1:00PM (34) *Asymptotic Theory of Noncentered Mixing Stochastic Differential Equations.* Preliminary report.
Jeong-Hoon Kim, Yonsei University (956-60-104)

1:15PM (35) *On the pointwise central limit theorem for strongly mixing and associated random variables.* Preliminary report.
Khurelbaatar Gonchigdanzan, University of Cincinnati (956-60-34)

1:30PM (36) *When does a stochastic process have sample paths in a given RKHS?* Preliminary report.
Jay H. Beder*, University of Wisconsin - Milwaukee, and **Milan N. Lukić**, Viterbo College (956-60-108)

Session on Number Theory, II

12:45 PM - 1:40 PM **Room 162, Royce Hall**

12:45PM (37) *The system of diophantine equations* $XYZW = X + Y + Z + W = 1$ *over finite fields.*
T. Venkatesh, Karnataka University (956-11-38)

1:00PM (38) *Restricted divisor sums and the class number* $h(-p)$ *of binary quadratic fields.*
Kevin A Broughan, University of Waikato (956-11-126)

1:15PM ► (39) *How the Langlands Program is Prefigured and Mirrored in the "Onsager Program" of Mathematical Statistical Mechanics.* Preliminary report.
Martin H Krieger, University of Southern California (956-11-68)

1:30PM (40) *Covering collections and a challenge problem of Serre.*
E. Victor Flynn, University of Liverpool, and **Joseph L Wetherell***, University of Southern California (956-11-142)

Invited Address

2:00 PM - 3:00 PM **Auditorium, Royce Hall**

(41) *The interplay between analysis and topology in some nonlinear PDEs.*
Haim Brezis, University of Paris VI and Rutgers University

Invited Address

3:15 PM - 4:15 PM **Auditorium, Royce Hall**

(42) *The physics of computation.*
Michael H. Freedman, Microsoft Research

Invited Address

4:30 PM - 5:30 PM **Auditorium, Royce Hall**

(43) *Quantum computation.*
Peter W. Shor, AT&T Labs

Southern California Barbecue

6:00 PM - 9:30 PM **Courtside Lawn, Covel Commons at Sunset Village**

Wednesday, August 9

Meeting Registration

8:00 AM - 3:00 PM **Room 132, Royce Hall**

Book Sales and Exhibits

8:00 AM - 3:00 PM **West Lobby, Royce Hall**

Invited Address

8:30 AM - 9:30 AM **Auditorium, Royce Hall**

(44) *On the analysis of geometric evolution equations.*
Sergiu Klainerman, Princeton University

Invited Address

10:00 AM - 11:00 AM **Auditorium, Royce Hall**

(45) *From renormalization in dynamics to renormalization in probability and statistical physics.*
Yakov G. Sinai, Princeton University

Session on Quantum Theory, I

11:15 AM - 11:55 AM **Room 162, Royce Hall**

11:15AM (46) *Nonlinear Maxwell Theory and Electrons in Two Dimensions.*
Artur Sowa, Yale University (956-81-33)

11:30AM (47) *Fractality and Fractional Quantum Mechanics.*
Nick Laskin, Carleton University (956-81-117)

11:45AM (48) *Log dimensional properties spectral measures.* Preliminary report.
Michael D Landrigan, UC Irvine (956-81-145)

Session on Applications to Natural Sciences

11:15 AM - 11:55 AM **Room 164, Royce Hall**

11:15AM ► (49) *The Topology of Brain Systems.* Preliminary report.
William C Hoffman, Institute for Topological Psychology (956-92-61)

11:30AM *Wavelet Analysis of Image Registration.*
► (50) **Ivo D Dinov***, Department of Neurology, UCLA, **Michael S Mega**, Alzheimer's Disease Center, UCLA, and **Arthur W Toga**, Department of Neurology, UCLA (956-92-74)

11:45AM *Computational grand challanges associated with*
(51) *combinatorial models of intra-cellular signaling transduction networks.*
Joseph S Oliveira, Pacific Northwest National Laboratory (956-92-143)

Session on Algebraic Geometry

11:15 AM – 11:55 AM **Room 160, Royce Hall**

11:15AM *The chiral ring of Calabi-Yau hypersurfaces in toric*
(52) *varieties.*
Anvar R Mavlyutov, University of Massachusetts at Amherst and Clay Mathematics Institute (956-14-139)

11:30AM *Some new analysis on the K-trivial extremal*
(53) *contractions of smooth threefolds.* Preliminary report.
Csilla Tamás, Purdue University (956-14-129)

11:45AM *Jacobian Conjectures: Injectivity and Dynamical*
(54) *Systems.*
Marc A Chamberland, Grinnell College (956-14-91)

Session on Partial Differential Equations, I

12:45 PM – 1:40 PM **Room 160, Royce Hall**

12:45PM *On some quasilinear singular Schrödinger*
(55) *equations.*
Horst R Lange, University of Cologne, Germany (956-35-78)

1:00PM *Singular limit of some degenerate parabolic*
(56) *equations.*
Kin Ming Hui, Institute of Mathematics, Academia Sinica, Taipei, Taiwan (956-35-45)

1:15PM *Dirichlet and Neumann problems with singular*
(57) *boundary.* Preliminary report.
Alberto S Dubson, I.A.M. Buenos Aires, Argentina (956-35-148)

1:30PM *Free Boundary Problems for the Unsteady Transonic*
(58) *Small Disturbance Equation: Transonic Regular Reflection.*
Suncica Canic, **Barbara L Kefitz** and **Eun Heui Kim***, University of Houston (956-35-65)

Session on Geometry and Global Analysis

12:45 PM – 1:40 PM **Room 162, Royce Hall**

12:45PM *Shape invariants of nonsmooth surfaces.*
► (59) **George I Kamberov**, Stevens Inst of Technology (956-53-147)

1:00PM *A global construction of the CP^2 quantum*
(60) *cohomology Frobenius manifold.* Preliminary report.
Jan Segert, University of Missouri (956-53-39)

1:15PM *Random Riemann surfaces.* Preliminary report.
► (61) **Robert Brooks**, Technion - Israel Institute of Technology, and **Eran Makover***, Dartmouth College (956-58-137)

1:30PM *A new proof of the Smale Conjecture.*
(62) **Kristin A Schleich** and **Donald M Witt***, University of British Columbia (956-58-131)

Invited Address

2:00 PM – 3:00 PM **Auditorium, Royce Hall**

(63) *Algorithmic challenges from genomics and molecular biology.*
Richard M. Karp, International Computing Science Institute

Invited Address

3:15 PM – 4:15 PM **Auditorium, Royce Hall**

(64) *Mathematics and materials science.*
Jean E. Taylor, Rutgers University

Invited Address

4:30 PM – 5:30 PM **Auditorium, Royce Hall**

(65) *String topology.*
Dennis P. Sullivan, The CUNY Graduate School

Thursday, August 10

Meeting Registration

8:00 AM – 3:00 PM **Room 132, Royce Hall**

Book Sales and Exhibits

8:00 AM – 3:00 PM **West Lobby, Royce Hall**

Invited Address

8:30 AM – 9:30 AM **Auditorium, Royce Hall**

(66) *The principle of functoriality.*
James G. Arthur, University of Toronto

Invited Address

10:00 AM – 11:00 AM **Auditorium, Royce Hall**

(67) *The mathematical impact of quantum fields and strings.*
Edward Witten, Institute for Advanced Study

Session on Quantum Theory, II

11:15 AM – 11:55 AM **Room 160, Royce Hall**

11:15AM *XIII Hilbert Problem and Quantum Mechanics.*
(68) **Ladislav G Andrey**, Academy of Sciences, Prague (956-81-97)

11:30AM *Deformation quantization and Poisson sigma*
(69) *models.*
Alberto S Cattaneo*, Zurich University, Switzerland, and **Giovanni Felder**, ETH Zurich, Switzerland (956-81-110)

11:45AM *String theory and quantum computation: A link?*
(70) Preliminary report.
Karl-Georg Schlesinger, University of Wuppertal (956-81-79)

Session on Logic and Foundations

11:15 AM – 11:40 AM **Room 162, Royce Hall**

11:15AM *The Aset Theory and Its Implications to the*
► (71) *Foundations of Mathematics.* Preliminary report.
Andrew C Angus, Absolute Math Foundation (956-03-52)

11:30AM *Forcing for* hd *and* hL.
(72) **Andrzej Roslanowski***, University of Nebraska at Omaha, and **Saharon Shelah**, Hebrew University of Jerusalem (956-03-109)

Session on Computer Science

11:15 AM - 11:40 AM **Room 164, Royce Hall**

11:15AM (73) *Applying molecular computation to construct unbreakable cryptosystems.* Preliminary report.
Ponnammal Natarajan* and **Anbarasu Sivalingam**, Anna University, India (956-68-83)

11:30AM (74) *Evidential paradigm: A current state.* Preliminary report.
Alexander V. Lyaletski*, Cybernetics Department, Taras Shevchenko University of Kyiv, and **Marina K. Morokhovets**, Digital Automata Theory Department, Glushkov Institute of Cybernetics (956-68-132)

Session on Partial Differential Equations, II

12:30 PM - 1:40 PM **Room 160, Royce Hall**

12:30PM (75) *Three Symmetric Positive Solutions for Lidstone Problems By a Generalization of the Leggett-Williams Theorem.*
Richard I Avery, Dakota State University, **John M Davis***, Baylor University, and **Johnny Henderson**, Auburn University (956-34-112)

12:45PM (76) *Canonical Dual Transformation Method for Solving Fully Nonlinear PDEs with Applications in Nonconvex Hamilton Systems.*
David Y Gao, Virginia Tech (956-35-54)

1:00PM (77) *Animal coat patterns and the Turing instability.* Preliminary report.
Evelyn Sander*, George Mason University, and **Thomas Wanner**, University of Maryland, Baltimore County (956-35-94)

1:15PM (78) *Critical exponent for a nonlinear wave equation with damping.*
Grozdena Todorova*, University of Minnesota, and **Borislav Yordanov**, University of Wisconsin - Milwaukee (956-35-102)

1:30PM (79) *On the L^1-Well-posedness of Systems of Conservation Laws Near Solutions Containing Two Large Shocks.*
Marta Lewicka, SISSA, Italy, and **Konstantina Trivisa***, Northwestern University (956-35-114)

Session on Complex Variables

12:30 PM - 1:40 PM **Room 162, Royce Hall**

12:30PM (80) *Quasiconformal Mappings in Loewner Space.*
Ai-Nong Fang* and **Zemin Wu**, Shanghai Jiao Tong University (956-30-98)

12:45PM (81) *Jørgensen groups of parabolic type.* Preliminary report.
Sato Hiroki, Shizuoka University, Japan (956-30-89)

1:00PM (82) *Symplectic and Szegö Forms on the Moduli Space of Connections on Rank Two Bundles.* Preliminary report.
David J Pinchbeck, Saint Joseph's College (956-30-113)

1:15PM ▷ (83) *An inequality for the norm of a polynomial factor.*
Igor E Pritsker, Oklahoma State University (956-30-72)

1:30PM (84) *Circle Packings and Earthquakes.*
G. Brock Williams, Texas Tech University (956-30-118)

Session on Fluid Mechanics

12:45 PM - 1:40 PM **Room 164, Royce Hall**

12:45PM (85) *Affine Kac-Moody superalgebras: Involutive automorphisms and Iwasawa decompositions.*
Dayanand Parashar, University of Delhi (956-22-48)

1:00PM (86) *Equivariant semi-algebraic embeddings.*
Dae Heui Park* and **Dong Youp Suh**, Korea Advanced Inst. of Science and Tech. (956-22-133)

1:15PM (87) *An NP-complete Algebraic Question (The Finite Algebra Membership Problem for Varieties).*
Zoltan Szekely, Gallaudet University (956-06-106)

1:30PM (88) *A Group Theoretic Approach to Filter Banks, Preliminary report.* Preliminary report.
Hamid R Behamrd, Western Oregon University (956-94-76)

Invited Address

2:00 PM - 3:00 PM **Auditorium, Royce Hall**

(89) *Mathematics and computing.*
Peter D. Lax, Courant Institute, New York University

Invited Address

3:15 PM - 4:15 PM **Auditorium, Royce Hall**

(90) *Logical dreams.*
Saharon Shelah, The Hebrew University and Rutgers University

Invited Address

4:30 PM - 5:30 PM **Auditorium, Royce Hall**

(91) *Three-dimensional topology and geometry.*
William P. Thurston, University of California - Davis

Hollywood Bowl Concert

6:30 PM - 10:30 PM **Hollywood Bowl**

"Thunder and Lightning" featuring the music of Beethoven and Tchaikovsky.

Friday, August 11

Meeting Registration

8:00 AM - 3:00 PM **Room 132, Royce Hall**

Book Sales and Exhibits

8:00 AM - 3:00 PM **West Lobby, Royce Hall**

Invited Address

8:30 AM - 9:30 AM **Auditorium, Royce Hall**

(92) *On the Geometric Langlands Conjecture.*
Alexander A. Beilinson, University of Chicago

Invited Address

10:00 AM - 11:00 AM **Auditorium, Royce Hall**

(93) *Dynamical systems at the interface of symplectic geometry and three-dimensional topology.*
Helmut H. W. Hofer, New York University - Courant Institute

Session on Groups and Modules

11:15 AM – 11:55 AM **Room 160, Royce Hall**

11:15AM (94) *Cotensor products of modules.*
Lowell Abrams* and **Charles Weibel**, Rutgers University (956-18-85)

11:30AM ▶ (95) *On an Equivalence of Fuzzy Subgroups.* Preliminary report.
Venkateswaran Murali*, Rhodes University, and **Babington B Makamba**, Fort Hare University (956-20-84)

11:45AM (96) *Integrability of infinite dimensional Lie algebras: New result - challenge and perspective.*
Thierry P Robart, Howard University (956-20-95)

Session on Statistics, Approximations and Sequences

11:15 AM – 11:55 AM **Room 162, Royce Hall**

11:15AM (97) *Consistency and limiting distribution of M-estimators in two-phase linear regression models.*
Hira L Koul, Michigan State University, **Lianfen Qian***, Florida Atlantic University, and **Donatas Surgailis**, Institute of Mathematics & Informatics (956-62-121)

11:30AM (98) *Isotonic Good Approximation in $L_p[0,1]$.*
Salem A. Sahab, Abdul-Aziz University (956-41-46)

11:45AM (99) *Four Dimensional Characterization of Rates of Convergence for Double Sequences.* Preliminary report.
Richard F Patterson, University of North Florida (956-40-57)

Session on Combinatorics

11:15 AM – 11:40 AM **Room 164, Royce Hall**

11:15AM (100) *Conjugacy graphs.*
Harold Bowman and **Michelle Schultz***, University of Nevada Las Vegas (956-05-135)

11:30AM ▶ (101) *Homogeneous weights and finite Frobenius rings.* Preliminary report.
Stefan E Schmidt, MIT (956-05-136)

Session on Numerical Analysis

12:30 PM – 1:40 PM **Room 162, Royce Hall**

12:30PM (102) *Embedded Additive Runge-Kutta Methods.*
Ali M.S. Sayfy, American University of Sharjah (956-65-69)

12:45PM (103) *Numerical validation of linear and nonlinear complimentarity problems.*
Goetz E Alefeld*, Institut fuer Angewandte Mathematik, Universitaet Karlsruhe, **Florian Potra**, University of Maryland, and **Xiaojun Chen**, Shimane University, Matsue, Japan (956-65-130)

1:00PM (104) *A scalable parallel algorithm for solving time dependent PDEs.*
Wilson Rivera, Jianping Zhu* and **David Huddleston**, Mississippi State University (956-65-141)

1:15PM ▶ (105) *Approximate Solution of the ODE for a Model Neuron Preliminary report.* Preliminary report.
Stanley R Lenihan, Del Norte Research & Development (956-65-55)

1:30PM ▶ (106) *A Boundary Condition Capturing Method for Poisson's Equation on Irregular Domains.*
Xu-Dong Liu*, UCSB, **Ronald Fedkiw** and **Myungjoo Kang**, UCLA (956-65-125)

Session on Integration, Integral Equations and Functional Analysis

12:45 PM – 1:40 PM **Room 160, Royce Hall**

12:30PM (107) *$L^{\varphi}(\mu)$-Averaging Domains.* Preliminary report.
Shusen Ding, Seattle University (956-28-92)

12:45PM (108) *Anisotropic Hardy Spaces.*
Marcin Bownik, Washington University (956-42-107)

1:00PM (109) *The Special Class of Volterra Integral Equations of The First Kind: Theory, Numerical Methods and Applications.*
Anatoly S. Apartsyn, Eugenia V. Markova, Malent'ev Institute of Energy Systems of Russian Academy of Sciences, Irkutsk, Russia, and **Denis N. Sidorov***, Malent'ev Institute of Energy Systems of Russian Academy of Sciences, Irkutsk, Russia (956-45-50)

1:15PM (110) *Generalized Shifts On Banach Spaces.* Preliminary report.
Rajagopalan Minakshisundarm, Tennessee State University, and **Kondagunta Sundaresan***, Cleveland State University (956-46-105)

1:30PM (111) *C*-algebras of higher dimensional shifts.* Preliminary report.
Valentin Deaconu, University of Nevada, Reno (956-46-138)

Invited Address

2:00 PM – 3:00 PM **Auditorium, Royce Hall**

(112) *Some problems in number theory and related analysis.*
Peter Sarnak, Princeton University

Invited Address

3:15 PM – 4:15 PM **Auditorium, Royce Hall**

(113) *Stochastic analysis and applications.*
S. R. S. Varadhan, Courant Institute, New York University

Invited Address

4:30 PM – 5:30 PM **Auditorium, Royce Hall**

(114) *Classical mathematics and new challenges.*
László Lovász, Microsoft Research

Saturday, August 12

Meeting Registration

8:00 AM – NOON **Room 132, Royce Hall**

Book Sales and Exhibits

8:00 AM – NOON **West Lobby, Royce Hall**

Invited Address

8:30 AM – 9:30 AM **Auditorium, Royce Hall**

(115) *Wave asymptotics and borderland physics.*
Michael V. Berry, University of Bristol

Invited Address

10:00 AM - 11:00 AM **Auditorium, Royce Hall**

(116) *Ecosystems as complex adaptive systems.*
Simon A. Levin, Princeton University

Invited Address

2:00 PM - 3:00 PM **Auditorium, Royce Hall**

(117) *Number theory: modular forms.*
Don B. Zagier, Max-Planck Institut fũr Mathematik

Invited Address

3:15 PM - 4:15 PM **Auditorium, Royce Hall**

(118) *Operads of little discs in algebra and topology.*
Maxim Kontsevich, Institut des Hautes Etudes Scientifiques

Invited Address

4:30 PM - 5:30 PM **Auditorium, Royce Hall**

(119) *Noncommutative geometry.*
Alain Connes, IHES and College de France

Millennium Banquet

6:30 PM - 10:00 PM **Grand Horizon Ballroom, Covel Commons at Sunset Village**

Robert J. Daverman
Associate Secretary
Knoxville, Tennessee

Meetings and Conferences of the AMS

Associate Secretaries of the AMS

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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 is available on the World Wide Web at www.ams.org/meetings/.**

Meetings:

Important Information regarding AMS Meetings

Potential organizers, speakers, and hosts should refer to page 106 in the January 2000 issue of the *Notices* for general information regarding participation in AMS meetings and conferences.

Abstracts

Several options are available for speakers submitting abstracts, including an easy-to-use interactive Web form. No knowledge of LaTeX is necessary to submit an electronic form, although those who use LaTeX or AMS-LaTeX may submit abstracts with such coding. To see descriptions of the forms available, visit http://www.ams.org/abstracts/instructions.html, or send mail to abs-submit@ams.org, typing help as the subject line; descriptions and instructions on how to get the template of your choice will be e-mailed to you.

Completed abstracts should be sent to abs-submit@ams.org, typing submission as the subject line. Questions about abstracts may be sent to abs-info@ams.org.

Paper abstract forms may be sent to Meetings & Conferences Department, AMS, P.O. Box 6887, Providence, RI 02940. There is a $20 processing fee for each paper abstract. There is no charge for electronic abstracts. Note that all abstract deadlines are strictly enforced. Close attention should be paid to specified deadlines in this issue. Unfortunately, late abstracts cannot be accommodated.

Conferences: (See http://www.ams.org/meetings/ for the most up-to-date information on these conferences.)

June 11–July 20, 2000: Joint Summer Research Conferences in the Mathematical Sciences, Mount Holyoke College, South Hadley, MA. (See pages 1325–30, November 1999 issue, for details.)

January 8-9, 2001: Short Course on *Mathematical Biology*, New Orleans, LA. (See the October 2000 issue for details.)

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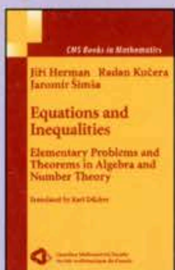
Elementary Problems and Theorems in Algebra and Number Theory



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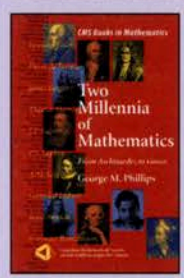
GEORGE M. PHILLIPS, University of St. Andrews, Scotland

TWO MILLENIA OF MATHEMATICS

From Archimedes to Gauss



This book is an interesting collection of intercollected topics in areas of mathematics, ranging over two millenia from the work of Archimedes, who died in the year 212 BC, to the "Werke" of Gauss, who was born in 1777. The book is intended for those who love mathematics, including undergraduate students of mathematics, more advanced students, and the vast unseen host of amateur mathematicians.

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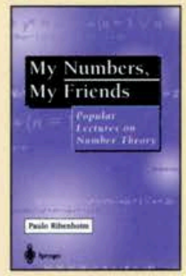
PAULO RIBENBOIM, Queen's University, Kingston, ON, Canada

MY NUMBERS, MY FRIENDS

Popular Lectures on Number Theory



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