Calendar of AMS Meetings and Conferences

This calendar lists all meetings and conferences approved prior to the date this issue went to press. The summer and annual meetings are joint meetings with the Mathematical Association of America. Abstracts of papers presented at a meeting of the Society are published in the journal Abstracts of papers presented to the American Mathematical Society in the issue corresponding to that of the Notices which contains the program of the meeting, as far as is possible. Instructions for submission of abstracts can be found in the January 1993 issue of the Notices on page 46. Abstracts of papers to be presented at the meeting must be received at the headquarters of the Society in Providence, Rhode Island, on or before the deadline given below for the meeting. Note that the deadline for abstracts for consideration for presentation at special sessions is usually three weeks earlier than that specified below.

Meetings

<table>
<thead>
<tr>
<th>Meeting #</th>
<th>Date</th>
<th>Place</th>
<th>Abstract Deadline</th>
<th>Program Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>893</td>
<td>June 16-18, 1994</td>
<td>Eugene, Oregon</td>
<td>Expired</td>
<td>May-June</td>
</tr>
<tr>
<td>894</td>
<td>August 15-17, 1994</td>
<td>Minneapolis, Minnesota</td>
<td>May 17</td>
<td>July-August</td>
</tr>
<tr>
<td>895</td>
<td>October 29-31, 1994</td>
<td>Stillwater, Oklahoma</td>
<td>August 3</td>
<td>October</td>
</tr>
<tr>
<td>896</td>
<td>November 11-13, 1994</td>
<td>San Francisco, California</td>
<td>August 3</td>
<td>October</td>
</tr>
<tr>
<td>897</td>
<td>January 4-7, 1995</td>
<td>Hartford, Connecticut</td>
<td>October 3</td>
<td>December</td>
</tr>
<tr>
<td>898</td>
<td>March 4-5, 1995</td>
<td>Orlando, Florida</td>
<td></td>
<td></td>
</tr>
<tr>
<td>899</td>
<td>March 17-18, 1995</td>
<td>Chicago, Illinois</td>
<td></td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>March 24-25, 1995</td>
<td>Burlington, Vermont</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>August 6-8, 1995</td>
<td>Boston, Massachusetts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>October 7-8, 1995</td>
<td>Kent, Ohio</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>November 3-4, 1995</td>
<td>Greensboro, North Carolina</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>November 17-18, 1995</td>
<td>Orlando, Florida</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>January 10-13, 1996</td>
<td>Iowa City, Iowa</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>March 22-23, 1996</td>
<td>Baton Rouge, Louisiana</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>April 19-21, 1996</td>
<td>Columbia, Missouri</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>November 1-3, 1996</td>
<td>San Diego, California</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>January 8-11, 1997</td>
<td>Baltimore, Maryland</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>January 7-10, 1998</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Please refer to page 354 for listing of special sessions.
† Please refer to the Table of Contents for further information.

Conferences

June 11-July 14, 1994: Joint Summer Research Conferences in the Mathematical Sciences, Mt. Holyoke College, South Hadley, Massachusetts.

Other Events Cosponsored by the Society

May 5-8, 1994: MER Network Workshop, University of Texas at Austin, Austin, Texas.

Deadlines

<table>
<thead>
<tr>
<th>Classified Ads*</th>
<th>News Items</th>
<th>Meeting Announcements**</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 20, 1994</td>
<td>June 8, 1994</td>
<td>June 8, 1994</td>
</tr>
<tr>
<td>August 29, 1994</td>
<td>August 24, 1994</td>
<td>August 24, 1994</td>
</tr>
<tr>
<td>October 3, 1994</td>
<td>September 21, 1994</td>
<td>September 21, 1994</td>
</tr>
</tbody>
</table>

* Please contact AMS Advertising Department for an Advertising Rate Card for display advertising deadlines.
** For material to appear in the Mathematical Sciences Meetings and Conferences section.
ARTICLES

277 AMS Celebrates 100th Annual Meeting
January 1994 marked the 100th Annual Meeting of the AMS. Allyn Jackson describes part of the celebration of this auspicious event.

283 Employment Issues Discussed at the Cincinnati Meeting
Edward F. Aboufadel
At the Joint Meetings in Cincinnati, a panel on employment helped to define some of the crucial issues and make suggestions for the future.

286 Are Women Getting All the Jobs?
Allyn Jackson reports on a panel at the Joint Meetings in Cincinnati which discussed whether women doctorates have an edge in today's tight job market.

288 Ethical Guidelines Drafted by AMS Council
The ad hoc Committee on Professional Responsibility has drafted a set of ethical guidelines, printed here by vote of the Council.

290 Mathematics and National Goals
Science Policy Panel in Cincinnati Discusses COSEPUP Report on Federal Funding of Science
Thought-provoking views on science policy issues were presented during a panel at the Joint Meetings in Cincinnati. This article presents summaries of the panelists' remarks.

296 Science in the National Interest John S. Bradley
Organized by the Office of Science and Technology Policy, a recent forum produced lively discussion of federal priorities in funding science.

298 Annual AMS-MAA Survey: Doctoral Degrees Conferred 1992-1993 (Supplementary List)

FEATURE COLUMNS

299 Computers and Mathematics Keith Devlin
Three software reviews comprise this month's column. John Crow presents the second installment of his two-part comparative review of Maple and Macsyma. Mario Vassallo reports on his experiences with Spreadsheets and Mathematics. Gustaf Gripenberg takes a look at MAX.

307 Inside the AMS
Plans for enhancing the Notices are discussed by Hugo Rossi, who becomes Editor in January 1995. Following, are listed the names of recipients of AMS-ISU Aid Fund grants made in the second round of awards.
From the Executive Director...

EMPLOYMENT OF YOUNG MATHEMATICIANS

We as a community should be more actively engaged in addressing the problems young mathematicians currently face in seeking employment. These problems are not unique to mathematics, and many of the causes of the problems are largely beyond the control of the mathematical community; however, there remains nagging anxiety that if various segments of our community could each do their part, then collectively we could improve the current situation and place ourselves in a position where we will not be so vulnerable in the future.

In late spring 1990, there was anecdotal evidence of an unexpectedly large number of new Ph.D.s without employment. The Society immediately made available an electronic information network on employment opportunities and organized a survey to assess the situation. These actions eventually led to what is now an electronic version of Employment Information in the Mathematical Sciences on e-MATH and the creation of an AMS Task Force on Employment. We found that the situation really was much worse than usual and very much worse than expected. The task force report, "Employment and the U.S. Mathematics Doctorate," provides recommendations to the mathematics community and to the AMS. In brief, the task force recommended that the community broaden doctoral programs in mathematics to recognize the value and opportunities of nonacademic employment and further, that the Society advocate a larger pool of postdoctoral positions to enable continued development of young mathematicians and better fits with employment opportunities. The recommendations to the AMS included a number of items, such as improving electronic employment services, expanding the Employment Register activities, increasing the number of employers (especially nonacademic employers) participating in the Register, improving the matching algorithm of the Register, and so on.

How are we doing on the recommendations of the task force? In some sense, our record is good: we have done something toward nearly every recommendation of the task force. On the other hand, the fact remains that we have not, as a broad community, addressed the employment of young mathematicians with vigor and imagination.

While many may be frustrated that we have not done enough, I believe that the Society is building the momentum for some significant actions (and results). The AMS has a working subcommittee of its Committee on the Profession with the single charge of addressing issues related to employment of young mathematicians. The possible areas where actions can be taken have been defined as: data collection, employment services, education and preparation, and postdoctoral experiences. For example, in the area of employment services, there are several short-term actions that, if incorporated into the culture of the community, could be helpful. These include the AMS function as an "electronic clearing house" for improving the match between employment opportunities and new Ph.D.s, development of materials on vita preparation and interviewing skills, directory of nonacademic employment opportunities and contacts, etc. Broadening the education and preparation of Ph.D.s for career paths that include nonacademic employment and development of teaching skills that meet the needs of the community are longer-term changes. However, as a community, we must find ways to get on with this. Greatly enlarging the opportunities for postdoctoral experiences does not create new jobs, but there is good evidence that postdoctoral experiences provide young mathematicians with the chance to develop and therefore possibly find job opportunities and job fits that would otherwise not have been available. A broad postdoctoral program with opportunities in disciplinary research, industrial research, interdisciplinary research, and even in educational research and practice provides multiple career path options and helps to connect young mathematicians to these options.

There is much more to be said on this subject, for the problems and remedies are complex. But the Society is on the right path to begin to take effective actions that can make a difference. Furthermore, we, as a community, can take actions that will help—let's get on with these actions.

William Jaco
Appreciation for fSU Aid Fund
On behalf of the Board of the Moscow Mathematical Society I want to express my deep gratitude to the American colleagues for the establishment of the American Mathematical Society’s fSU Aid Fund. The research grants from this Fund give an essential support to many mathematicians (among which there are MMS’s members) and allow them to continue their professional work in this difficult time. We are extremely grateful to all contributors to the Fund, particularly, to the Soros Foundation. We greatly appreciate Professor MacPherson’s generous activity in this field. We believe in further cooperation of our two mathematical communities in various directions.

S. P. Novikov, President
Moscow Mathematical Society
(Received February 1, 1994)

Teaching, Research, and Talent
Gail S. Young states (Letters to the Editor, December 1993) that he sees “nothing wrong in a person who is so low in that peculiar ability required for mathematical research but who loves the subject and will continue learning, giving his or her life to teaching”. I read into this statement that teaching is for those mathematicians who aren’t talented enough to do research. I know that he doesn’t really feel this way, but I know that many people do.

Why does giving one’s life to teaching have to be equated with a lack of ability? Doesn’t education deserve the efforts of our “talented” mathematicians?

Howard Iseri
Mansfield University
(Received December 14, 1993)

Observations on Job Searches
Having been through several job interviews for positions in academia, I have made an observation that your readers may find valuable. Sometimes, new tenure-track positions are intended for faculty members who have been working on a temporary basis at the same institution where the opening is made available. Such candidates are most times given preference to outside applicants.

I have realized that hiring committees are readily willing to inform an applicant if they have such internal candidates. An applicant may use this information to decide whether she is really interested to have her case further considered by that institution or would rather pursue other possibilities.

Julio Kuplinsky
Ramsey, NJ
(Received December 14, 1993)

Dropped Minus Sign
As a member of the Fibonacci Association, I have the duty of drawing to your attention that the right-hand side of identity 4 in D. Zeilberger’s article, page 979 of the October 1993 issue of the Notices, is incorrect. It should read $(-1)^n$.

Piero Filipponi
Fondazione Ugo Bordoni
(Received December 3, 1993)

Science Funding Semantics
Recently, there has been much concern expressed over the changes in federal research funding priorities but few proposals for countering the shift in politicians’ agenda. I would like to make a modest linguistic suggestion.

As mathematicians, we are used to precise, but arbitrary, definitions. When I talk of a ring, everyone understands exactly what I mean, yet the name for the object is unimportant. A ring by any other name would be as interesting. However, when words move out into the political arena, they gain many more connotative meanings. I fear that we as research mathematicians are losing a semantic battle with the forces of short-termism, for who can really be surprised at the decisions of Congress when faced with a choice between “strategic” and “curiosity-driven” research? Should we expend our nation’s resources on solving national problems, or satisfying our curiosity?

Research that contributes to solving current national problems is important, but it is hardly strategic, it is tactical. Funding tactical research is akin to drilling new wells in a producing oil field. For a time the oil will flow faster and we shall become richer. Then the field will dry up.

A long-range plan requires a strategy, and strategic research. Funding strategic research is like drilling exploratory wells. Most will come up dry. A few will define large new fields. Drilling exploratory wells builds our “proven reserves” of mathematics, a critical national resource. A nation without reserves cannot maintain competitiveness for long.

How much of our resources should we direct to tactical research, and how much to strategic research, is a valid policy question, and one which I hope could be debated vigorously by both mathematicians and politicians. It is also a question in which the semantics are a little fairer.

Duncan J. Melville
St. Lawrence University
(Received November 23, 1993)
Search for an Executive Director for the American Mathematical Society

Position:
The Trustees of the American Mathematical Society seek to find a suitable person to serve as the Executive Director of the Society when that position is vacated by the current incumbent, Dr. William Jaco, at some time in the first half of 1995. The precise starting date of employment is somewhat flexible, but would not be later than July 1, 1995.

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

The American Mathematical Society is the oldest scientific organization of mathematicians in the U.S. The Society’s activities are mainly directed towards the promotion and dissemination of mathematical research and scholarship, broadly defined; the improvement of mathematical education at all levels; increasing the appreciation and awareness by the general public of the role played by mathematics in our society; and advancing the professional status of mathematicians. These aims are pursued mainly through an active program of publications, meetings, and conferences. The Society is a major publisher of mathematical books and journals, including Mathematical Reviews; organizer of numerous meetings and conferences each year; and is a leading provider of electronic information in the mathematical sciences. The Society has recently opened a Washington office to improve interaction with federal agencies.

The annual budget of the Society for the current year is $21 million. The major part of the budget is related to publications. Almost all operations (including the printing) of the publications program are done in-house by the Society. Most phases of the office operations and the publications program are computerized. There is a staff of over 250 in the four offices. The directors of five divisions report directly to the Executive Director.

The Executive Director serves at the pleasure of the Trustees. The terms of appointment, salary and benefits will be consistent with the nature and responsibilities of the position and will be determined by mutual agreement between the Trustees and the prospective appointee.

Qualifications:
Candidates for the office of Executive Director should have a Ph.D. (or equivalent) in mathematics, published research beyond the Ph.D., and significant administrative experience. Excellent communication skills are essential, and an interest in mathematical publication, fiscal management, and the utilization of modern technologies for these activities would be highly desirable.

Applications:
A search committee (chaired by Ramesh Gangolli) has been formed to seek and review applications. Persons who wish to be considered for the position or who wish to make a nomination of another individual should write, with appropriate supporting information, to:

Ramesh Gangolli
Department of Mathematics, GN-50
University of Washington
Seattle, WA 98195

The closing date for applications is May 31, 1994.
The 100th Annual Meeting of the AMS was celebrated at the Joint Mathematics Meetings in Cincinnati in January 1994. A Special Committee on 100 Years of Annual Meetings organized the festivities. The members of the committee were: Richard A. Askey, University of Wisconsin; Paul T. Bateman, University of Illinois at Urbana-Champaign; Bettye Anne Case, Florida State University (chair); W. Wistar Comfort, Wesleyan University; Robert J. Daverman, University of Tennessee; Robert M. Fossum, University of Illinois at Urbana-Champaign; Everett Pitcher, Lehigh University; and Janice B. Walker, Xavier University.

The celebration included an exhibit of books on the history of mathematics, a display of photographs and mementos from AMS meetings past, celebration ceremonies, a panel on the future of AMS meetings, and a celebratory banquet. The highlight was a Special Session called "Meetings of Mathematicians". In addition to Bateman and Pitcher, the Special Session Speakers were: W. L. Duren, Jr., University of Virginia; Wilfred Kaplan, University of Michigan; Irwin Kra, State University of New York at Stony Brook; Lee Lorch, York University; Saunders Mac Lane, University of Chicago; Rogers J. Newman, Southern University; Karen Parshall, University of Virginia; G. Bailey Price, University of Kansas; Paul K. Rees, Louisiana State University; Kenneth A. Ross, University of Oregon; Alice T. Schafer, Marymount University; Dirk J. Struik, Massachusetts Institute of Technology; and Beauregard Stubblefield, Houston, Texas.

The AMS Council argued about federal science policy. Job seekers adjusted ties and smoothed skirts before interviews at the Employment Register. Mathematical talks included a delightful parallel between group theory and Dickens's A Tale of Two Cities by Georgia Benkart of the University of Wisconsin at Madison, a fascinating look at the uses of mathematics in ecology by Robert May of the University of Oxford, and a compelling analysis of the complexities of student learning by Stephen Monk of the University of Washington. At the AMS Business Meeting, the eloquence of Saunders Mac Lane of the University of Chicago commanded respect, if not much support, in favor of rescinding the AMS "strategic plan", which sets forth its goals and objectives for the coming three to five years. And 4,000 cups of coffee were consumed.

In other words, the Joint Mathematics Meetings in Cincinnati in January were fairly typical. But in at least one way they were not: The Cincinnati meeting marked the 100th Annual Meeting of the AMS. Round numbers like that always provide a good reason for reminiscing and celebrating. A Special Session on "Meetings of Mathematicians" provided a forum for a host of venerable members of the Society to look back on some of the meetings they had attended and personalities they had encountered over the years.

Scheduling, Abstracts, and Food
Several of the Special Session speakers looked back on how AMS meetings have changed over the years. Everett Pitcher of Lehigh University, who served as secretary of the AMS for twenty-one years, got the proceedings started with a look at the history of the AMS and its meetings. In 1889, the year after the founding of the New York Mathematical Society (as it was then called), there were sixteen members. Eighteen ninety-four saw the first Annual Meeting, which featured the Retiring Presidential Address of J. Emory McClintock, an actuary at...
a New York insurance company, and the presentation of two papers. In the early days, the meetings were usually held in New York, many times in conjunction with the meeting of the mathematics section of the American Association for the Advancement of Science. Pitcher said he remembered that around 1916 or 1917, he and his mother would take his father to the train station in Cleveland a few days after Christmas, and his father would board the train for New York to attend the AMS Annual Meeting. When he returned, the younger Pitcher would get his father’s name tag as a souvenir.

One big change over the years has been the size and complexity of the meetings. Pitcher noted that for many years the AMS could organize meetings entirely without scheduling conflicts, so that it was easier to attend a wide variety of talks and sessions. And yet even then there were complaints that the schedule was too crowded and that there was not enough time for discussion. Paul T. Bateman of the University of Illinois, who served for seventeen years as associate secretary for the Central Section of the AMS, remarked that there are now many more constraints on choosing meeting sites. Universities, rather than subsidizing the meetings, now want to make money on them, he said. In addition, the choice of sites is much more influenced by what could cynically be labeled as “political correctness”. Said Bateman, “Holding a meeting at a site does imply a certain stamp of approval.” He said it is fair to take into account treatment of women and minorities, the status of the Equal Rights Amendment in the local legislature, the existence of local loyalty oaths, the behavior of the local police, the extent of censorship of the arts, even the availability of gambling—all of which have over the years influenced the choice of meeting sites.

Such considerations continue to this day. Last year, after hearing protests from many members, the AMS and MAA decided to move the 1995 Joint Meetings from Denver because of an amendment to the Colorado constitution prohibiting laws or policies that entitle individuals to protection against discrimination on the basis of sexual orientation. Near the end of last year, when it was too late to consider moving the Joint Meetings from Cincinnati, that city also passed a similar ordinance. The mayor of Cincinnati met with the AMS Council and the MAA Board of Governors to assure them that homosexuals would be safe in Cincinnati and to urge them not to boycott the city in the future.

Bateman said that one of his biggest tasks as associate secretary was screening abstracts. The AMS has always had a “free speech” policy concerning contributed papers, so just about anything that looked like mathematics went through. Whether the result is trivial, inconsequential, or already known does not matter, and he said he quickly learned that it was pointless to try to convince authors that their abstracts might be lacking. Mainly, he said, he was on the lookout for nationalistic, racial, religious, or personal attacks. Kenneth A. Ross of the University of Oregon, who served as AMS associate secretary for ten years, said that his rule was, “If it looked like mathematics, it stayed.” Sometimes he would even see things in his own field that he knew were clearly wrong, but he only turned down things that were “really outrageous.” Once he got embroiled in a disagreement with the author of an abstract who felt that his free speech rights were being violated when Ross refused to accept his abstract. This disagreement was the occasion for discussions between the man’s lawyer and a lawyer for the AMS. But the matter did not pose any serious worries to Ross, though the author of the abstract did cause some inconvenience. Early one Sunday morning he called Ross’s wife and berated him to her, saying that Ross “wasn’t fit to shine the shoes of Einstein.”

One thing that seems to have remained a constant at the meetings over the years is food quality. Lee Lorch of York University recalled that when he was a graduate student, he attended an AMS meeting at Columbia University. Unable to afford a luncheon held at the faculty club during the meeting, he went to a cafeteria instead. Afterward he passed by the faculty club, and “who comes down the steps, cheerful as usual, but one Professor D. J. Struik,” Lorch recalled, “I asked the usual stupid question ‘How was the lunch?’ A happy smile lit up Struik’s face. ‘Oh, it was far better than I expected. The food was mediocre.’ ”

The 1893 Columbian World Fair
Among the most influential meetings in the history of mathematics in the U.S. was the Chicago Mathematical Congress of 1893, organized in conjunction with the Columbian World Fair, held that year in Chicago. During the Special Session in Cincinnati, talks by G. Baley Price of the University of Kansas and by Karen Parshall of the University of Virginia presented a fascinating look at the inner workings of this historic meeting.*

“A dirty, uncouth, uncultured metropolis” was how Chicago appeared to many more urbane Easterners at the time, said Parshall. However, “the founding of the University of Chicago in 1892 had marked the culmination of a whole series of cultural achievements that had altered the face of Chicago,” and it was able to beat out New York City as the site of the fair. However, Parshall noted, the organizers faced problems that threatened to turn it into “a giant fiasco”. In addition to financial troubles, the site chosen for the fair was a marshland. This required a “Herculean landscaping effort” in which more than a million cubic yards of earth were moved. But in the end, beautiful grounds were created for the fair, with a wooded island, a system of lagoons, and ornate buildings.

Price pointed out that this spectacular event comprised 200 buildings, 633 acres, and 48 exhibits from different states and countries. He quoted a novelist of that era who wrote back to his parents who lived on the family farm, “Sell the cookstove if necessary, and come.” Calling it one of the “epochal events of the time”, Price said that “no world’s fair before or since has captured the national imagination quite as completely.” It is difficult to understand today the influence of such an event, but Price compared it to the moon launch or the U.S. bicentennial. The fair drew 27 million people, close to half the population of the country.

*The Emergence of the American Mathematical Research Community, 1876-1900, by Parshall and David E. Rowe, describes many of these developments. The book will be published by the AMS later this year.
the U.S. population at the time. The fair organizers wanted something to rival the Eiffel Tower, which had been built for the 1889 world fair in Paris. What they came up with was the world’s first ferris wheel—and an enormous one at that. Price said its thirty-six gondolas could carry a total of 2,100 people 260 feet into the air.

Although the ferris wheel was probably the star attraction, the fair organizers also took care to assemble activities in scholarly and cultural areas. E. H. Moore, Oskar Bolza, and Heinrich Maschke of the University of Chicago, together with Henry S. White of Northwestern University, were charged with organizing activities in mathematics and astronomy. They invited as a keynote speaker Felix Klein of the University of Göttingen, who, according to Parshall, saw the exposition as a way to demonstrate Germany’s domination of mathematics and to solidify his own reputation. Klein solicited contributions from the leading German mathematicians of the day and also presented a sweeping survey, flavored with his own philosophical views, of the mathematics of the time. Many of the great European mathematicians of the time—such as David Hilbert, Hermann Minkowski, and Charles Hermite—submitted articles to be read in absentia at the congress.

"Strikingly modern and readable, the papers and lectures presented in Chicago seemed crafted to be accessible to the widest possible audience," Parshall noted. The topics represented the forefront of mathematics of that era: elliptic and abelian integrals and functions, invariant theory, finite groups, hypercomplex number systems, and Lie theory. "Instead of plunging into various possible thickets of technicalities, the writers and speakers consciously motivated their presentations with historical remarks and emphasized the broader context that informed the developments in these fields."

The American contributions were more modest, said Parshall, but there was foreshadowing of great things to come. For example, Frank Nelson Cole of the University of Michigan presented “the first clear statement on American shores of the problem of determining and classifying finite simple groups.” E. H. Moore’s lecture on doubly infinite systems of simple groups, which Parshall called “unquestionably the most important mathematical research to issue from the Chicago Congress,” picked up where Cole had left off. Moore’s contribution “marks an early milestone in what would later become an American specialty, the classification of finite simple groups,” said Parshall. The Congress showed that many American mathematicians had understood and assimilated much of the mathematics of their day, but it was clear that few were ready to move forward the frontiers of research. Nevertheless, noted Parshall, the Chicago Congress sent out a clear signal that “mathematics could flourish in the hinterlands of the U.S.”

Neither the fair organizers nor the U.S. government had made any provision for publishing the proceedings of the scholarly activities of the fair. According to Price, the mathematicians appealed to the New York Mathematical Society to publish the mathematical papers presented at the Congress. With $600 from the Society and $400 from individual mathematicians, the proceedings were published in 1894 by MacMillan. Price noted that the title page of the proceedings reads, “Papers published by the American Mathematical Society, Volume 1”, for by that time the Society had changed its name. Before the Chicago Mathematical Congress, the New York Mathematical Society was “a local organization with small monthly meetings in New York,” said Price, and the Congress “soon changed the character of the organization.”

The timing of the Chicago Congress—coming on the heels of the founding of the University of Chicago and just before the New York Mathematical Society went national—helped buoy its success, said Parshall. “In a symbolic sense,” she noted, “the events surrounding Klein’s visit to the U.S., and particularly the Chicago Mathematical Congress, represented the ‘passing of the mathematical torch’—at least insofar as the training of America’s leading mathematicians was concerned—from Göttingen to Chicago, and the hearkening of a new era in American mathematics.”

Mathematical Portraits

Some of the speakers in the Special Session provided fascinating reminiscences about mathematicians they had known. The highlight was the talk by Dirk J. Struik of the Massachusetts Institute of Technology, who kept the audience enthralled from start to finish. Introducing Struik, Paul Bateman joked that although he sometimes thought of himself as an “old duffer”, Struik had twenty-five years on him. Struik, who at the age of ninety-nine is the oldest member of the AMS, protested with mock indignation, “I’m not an old duffer.” And he wasn’t. He drew incisive portraits that were both witty and poignant.

Dirk J. Struik

Struik went to Göttingen in 1925 and studied with David Hilbert, who according to Struik “was one of the few people left who was in command of the whole of mathematics.” The mathematics department was only a few
Tullio Levi-Civita belonged to the Italian school of mathematics that followed the traditions of theoretical mathematics having connections to applications, especially to mechanics. Levi-Civita's specialties were on the one hand theoretical—he worked on tensors and differential geometry—and on the other more applied—he also worked in relativity, the three-body problem, and other problems in applied mathematics. “innocent-looking” formidable at times.

“Don’t you think Professor Wiener takes mathematics a little too cockeyed.” Struik, recalling that Heisenberg, after a session with Wiener, conceded he could be hard to take. Wiener was always “buttonholing everyone and explaining to them his latest theory,” whether wonderful or cockeyed. “This can sometimes be a little fatiguing,” Struik noted, recalling that Heisenberg, after a session with Wiener, said, “Don’t you think Professor Wiener takes mathematics a little too seriously?”

According to Struik, Paul Ehrenfest, like Wiener, had his ups and downs. But, said Struik, Ehrenfest was a “marvelous teacher” who was in contact with all of the mathematical physics of his time. Einstein was a close friend of Ehrenfest, and it was through Ehrenfest that Struik met Einstein. “Now, why did people like Ehrenfest so much?” asked Struik. It was not so much because of his original ideas, though he had made excellent contributions to the theory of adiabatic invariants, which played a role in quantum mechanics. It was mostly because Ehrenfest was a “conscience of all physicists,” said Struik. “He could tell a theoretical physicist or a mathematical physicist what his theories meant. He could tell Einstein what his theories meant. And Einstein appreciated that!”

Political and Social Issues

Some of the Special Session speakers touched on aspects of the history of AMS meetings that were influenced by the political or social climate of the time. Paul K. Rees of Louisiana State University (who has been an AMS member for seventy years, making him the member of longest standing) recalled the difficulties that arose when the black mathematician Wade Ellis of the University of New Mexico was invited to speak at a meeting of the Texas section of the AMS. C. V. Newsom, who was chair at New Mexico at the time, confided in Reese his worries. “Paul, what are we going to do?” Rees recalled Newsom saying. “Texas doesn’t allow this. But still, I can’t bring this man from New Mexico to Texas and listen to him talk and tell him he has to go find another place to eat.” This is what Rees told Newsom: “You sit on one side, put someone from New Mexico on the other, and I’ll sit across the table from him. And let’s see what happens.” As it turned out, nothing happened, and Ellis became the first black mathematician to eat at a dinner for the Texas section.
the open participation of all members in the affairs of the organizations, without regard to race, creed, or color. In the end, the AMS and MAA adopted a statement saying that the organizations were against discrimination at meetings, which Lorch called a step in the right direction, but a “gingerly” one.

In 1968 Chicago was the scene of the famous riot at the Democratic National Convention, in which the police used tear gas and brutality against Vietnam War protesters. The following year in New Orleans saw one of the most tempestuous AMS Business Meetings, where about 400 attendees passed a motion to move the 1970 AMS Annual Meeting from Chicago to another city. Later, the Council gave its final okay to the move. The Mathematics Action Group was formed around this time to address concerns about the Vietnam War and about the lack of democracy and the racism and sexism within the AMS. Out of this stormy time also came two other organizations, the Association for Women in Mathematics and the National Association of Mathematicians, an organization that works on behalf of black mathematicians. Lorch says that these organizations not only helped their own constituencies but also helped to open up the AMS and MAA to make them more responsive to all members. Much has improved, said Lorch, but he cautioned against complacency. “Unless we are willing to face this [history], in these days of backlash, we’ll be living it again.”

Rogers Newman of Southern University described some of the organizations, such as Beta Kappa Chi and the National Institute of Science, that have over the years provided a forum for black scientists and mathematicians to communicate their work and share ideas. The National Institute of Science, which was founded at a time when blacks were excluded from membership in most scientific societies, provided a model for the establishment of the National Association of Mathematicians. Newman also noted that in recent years participation of African-Americans in the AMS and the MAA has increased; for example, James Donaldson of Howard University was recently elected as a vice-president of the MAA. Progress is being made, he noted, but there is still much to be done.

Alice T. Schafer of Marymount University reflected on the history of women’s participation in the AMS. It was at her first AMS meeting that Schafer met a woman with a doctorate in mathematics. Schafer was intending to submit her thesis research for a ten-minute talk at the meeting; and when she told this to her thesis advisor, she was given to understand that “women never give ten-minute talks.” The Association for Women in Mathematics, of which Schafer served as president in its early years, was begun during an AMS meeting in Atlantic City in 1971 by a group of women who were dissatisfied with the number of women speakers and the number of women on AMS committees. In 1973 the AMS established a committee on women, with Cathleen S. Morawetz of the Courant Institute as chair. This committee published a directory of women mathematicians to provide an “existence proof” that there were qualified women mathematicians who could be invited to give talks or serve on committees. Schafer noted that there have been improvements in recent years, with more women being invited to speak and more women holding high AMS offices. (Morawetz is currently president-elect of the Society.)

Alice T. Schafer and Everett Pitcher

Other Perspectives
Some of the speakers brought a different perspective to the topic of AMS meetings. Irwin Kra of the State University of New York at Stony Brook described the extended “Ahlfors-Bers” family, a large group of mathematicians having ties to Lars Ahlfors and Lipman Bers. Since around 1969, the group has met approximately every four years at mathematical conferences on Riemann surfaces and related subjects. Each of these meetings was characterized by a particular mathematical development of the time, some of which Kra described.

Other speakers recalled some of the people they met during their careers. Beauregard Stubblefield, who is now retired, described his years in Ann Arbor in the 1940s. There he worked as a watchmaker for a decade before enrolling as a graduate student in mathematics at the University of Michigan, where he received his doctorate under Gail S. Young. Stubblefield attended his first AMS meeting and presented his solution to a problem posed by R. H. Bing. Two years later, when Stubblefield generalized some of the ideas and presented them at another meeting, Bing raised an objection that he said invalidated the result. Evidently Bing had not paid attention at Stubblefield’s talk two years earlier, during which Stubblefield had taken care of exactly that objection.

Wilfred Kaplan of the University of Michigan described an extraordinary year he spent in Europe during 1936-1937, when he was a graduate student. He met and studied with some of the major mathematicians of the time: Hopf, Pancherel, and Nevanlinna in Switzerland; Levi-Civita in Italy; Alexandroff, Pontryagin, and Kolmogorov in Moscow; Eilenberg, Kurtowski, and Borsuk in Poland; and Cartan, Denjoy, Borel, Chazy, Hadamard, and Lebesgue in Paris. They were all very kind to the young Kaplan. “Looking back, I think how naive I was to just pick out the leading lights of European mathematics, and say, ‘Will you give me some time?’ ” he remarked. “And they said, ‘Of course!’ ”
Looking to the Future
A historical look at AMS affairs would hardly be complete without Saunders Mac Lane of the University of Chicago, who served as president of both the AMS and MAA and continues to take an interest in important issues facing mathematicians. Mac Lane recalled that the first AMS meeting he attended was in Cambridge, Massachusetts, in December 1933. Like many others at the meeting he said, “I was a young man looking for a job.” His only prospect was teaching at a prep school. At the time he had a research fellowship at Yale University, where he was supposed to be working on algebra because the algebraist Oystein Ore controlled the research fellowships. However, Mac Lane preferred to work in logic. At the meeting he presented a ten-minute talk in what was known as the “general session”. Such luminaries as Norbert Wiener, G. D. Birkhoff, William Casper Graustein, and M. H. Stone were sitting in the front row. Mac Lane, who spoke about his thesis work in logic, was enthusiastic about speaking before such well-known mathematicians and perhaps increasing his chances at getting a job. However, Ore was also sitting in the front row and afterward got up to denounce Mac Lane, saying that logic was not really a part of mathematics. However, said Mac Lane, “maybe I was lucky that Oystein Ore had taken those ten minutes to call everybody’s attention to that nonsense better.” Two months later, he was offered a Benjamin Peirce Lectureship at Harvard University.

Both Mac Lane and W. L. Duren, Jr., of the University of Virginia touched on the difficult employment problems facing young mathematicians. Mac Lane said that he believes the employment problems of today are far worse than those his generation faced. Duren noted that changes in graduate education could help to alleviate some job seeking woes, and he also proposed more far-reaching ideas. Pointing to the fiscal problems most colleges and universities face today, he described an alternate way of organizing collegiate and university education that would retain the best aspects of graduate study while providing improved undergraduate instruction.

During his talk Saunders Mac Lane also presented some suggestions to improve AMS meetings. Special Sessions are very effective, he noted, but he said there ought to be more general talks about broad trends in mathematics, about where the main streams of mathematics run today. Other topics he would like to see explored: Who sets fashions in mathematics? Is it set by big shots or by progress? Which is more useful, speculation and conjecture or traditional mathematical proof? (In other words, as Mac Lane put it, “Did Edward Witten deserve a Fields Medal?” “Was Grothendieck a genius, or a guru, or both?”) Is technology transfer the business of mathematics? When is “educational reform” a debasement of knowledge? Are all “reforms” for the better?

Mac Lane would also like to see explanations of some of the current developments in various areas of mathematics. “Having heard a lot about nonlinear PDEs, I want to understand them better,” he remarked. “But the last talk I heard about them was so obscure that it took me forty minutes before I understood that it was a nonlinear PDE” that the speaker was discussing. Another question: Why are quantum groups not groups? Mac Lane said he thinks there are too many panel discussions at annual meetings (there were eighteen during the four days in Cincinnati). “There ought to be more arguments and fewer panels and more exposition of the exciting progress of mathematics taking place at our meetings.”

Allyn Jackson

MATHEMATICAL SURVEYS AND MONOGRAPHS

Analysis of and on Uniformly Rectifiable Sets
Guy David and Stephen Semmes
Volume 38

This book is about understanding uniform rectifiability of a given set in terms of the approximate behavior of the set at most locations and scales. In addition to being the only general reference available on uniform rectifiability, this book also poses many open problems, some of which are quite basic.

1991 Mathematics Subject Classification: 28; 42, 30, 49
Individual member $67, List price $111, Institutional member $89
To order, please specify SURV38/NA

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 3904, Boston MA 02266-3904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
Employment Issues Discussed at the Cincinnati Meeting

Edward F. Aboufadel
Southern Connecticut State University

A lot of attention was paid to employment issues at this year’s Joint Mathematics Meetings that were held in Cincinnati, Ohio. A focal point for this attention was a panel discussion entitled “What Can Be Done about Employment of Mathematicians in the 90s and Beyond?” The event was cosponsored by the Young Mathematicians Network (YMN) and by the AMS-MAA-SIAM Committee on Employment Opportunities (JCEO).

Different segments of the mathematics profession were represented on the panel. The moderator was JCEO chair Stanley J. Benkoski of Daniel H. Wagner Associates, a consulting firm in Sunnyvale, California. The panelists were: Curtis D. Bennett, an assistant professor at Bowling Green State University and a member (but not a representative) of YMN; Richard J. Shaker, chief of the Division of Mathematics Research at the National Security Agency (NSA); Steven G. Krantz, a professor at Washington University; and D. J. Lewis, chair of the mathematics department at the University of Michigan. Below is a report on some of the highlights of the discussion.

Current State and Future Prospects

The discussion began with Benkoski asking the following question of the panelists: “What is your view of the current state and future prospects for employment of mathematicians?”

Bennett responded first and straightforwardly: “It’s awful; it’s terrible; it’s bad. [Studies show that] we’re producing roughly 1,200 students a year for roughly 800 jobs, which should say something.” He felt that the current statistics about the job market, bad as they are, underestimate the problem. For example, some graduate students postpone graduation for a year simply because they cannot find jobs. Bennett said, “It’s going to be a while before we can hope for things to get better.”

Shaker was no more optimistic. “Life’s tough all over,” he began. “The job market’s lousy all over; it’s lousy in other disciplines, and no better in government or industry than in academia.” He felt that the causes of the current employment problem were “secular, rather than cyclical”. Referring to young mathematicians as being a part of Generation X (a term popular in the media denoting those born in the 1960s and 1970s), Shaker stated, “It will be a real loss to the mathematics community if special steps are not taken to bring this generation in.” and, turning to industry, that “industry needs Generation X mathematicians more than Generation X mathematicians need industry. Industry is too dumb to know this, but even worse, mathematicians are too dumb to tell them!” Shaker sees industry providing no help in the near future.

Looking to Washington, Krantz observed, “The NSF has said to us, ‘The Cold War is over—we don’t need you basic research guys anymore.’ And that’s too bad.” In turn, mathematics departments should rethink their missions: “It is no longer enough for mathematics departments to just crank out Ph.D.s and pure mathematicians and hope they land somewhere… We are moving in a direction where research has much less emphasis and teaching will have much more.” Krantz suggested a dark picture of twenty-first century academia, where “we are going to have math departments with a kernel of professors” and many adjuncts and temporary positions. “I hope I’m wrong,” he added.

“We’ve had some really glorious years,” Lewis remarked. “We’ve had good tracking of the people in employment… they know the age cohort of everyone who has a position in the universities right now. If you go and assume that they are going to retire at age seventy… then you could see that roughly there are about 800 jobs a year.”

Lewis also noted that there were eight new positions in his department last year. To get money for these positions, he had to make his case with his administration for more positions. Lewis felt that if you address the needs of teaching, “then you’ll find that there is money.”

Supply and Demand

After these responses, Benkoski asked a second question: “If you have a product that’s not selling, you either (1) decrease the supply, (2) increase the demand, or (3) change the product.
What steps can or should be taken to improve this situation, and please list them in priority order.”

Shaker considered the idea of changing the product, with respect to mathematicians in industry. “We need . . . senior research mathematicians helping young mathematicians interact with people from industry.” But Shaker thought that academic mathematicians were the “real villains”, that they do not concern themselves with the real world and with emerging problems in industry. It would also be helpful, Shaker thought, if “isolated mathematicians in industry could become a community.”

“The excitement of Fermat’s Last Theorem has captivated the press—but it’s described as recreational mathematics,” Shaker observed. On the other hand, elliptic curves have been used by industrial mathematicians (many of whom do not admit they are mathematicians, by the way).

Bennett’s response to the question was that “we should be honest to people” and change the expectations of graduate students. As an example, Bennett’s wife, while in graduate school studying history, was asked many times, “What are you going to do when you don’t get an academic job?” (This year there are twenty-two jobs in history.) He addressed a source of anger in young mathematicians today: “It was certainly implicitly said to me, ‘coming out with your degree, you’ll have your pick of jobs.’ I never stopped to think about what else I might want to do with my life if I couldn’t become an academic mathematician. If we [young mathematicians] have some preparation, we can make some adult choices . . . you have to give us the information,” he added.

Bennett also discussed the hiring process. “The hiring process needs to treat the less fortunate better,” he asserted. He suggested an idea: since many departments are keeping their graduates on an extra year due to the poor job market, why not exchange these graduates around so that new Ph.D.s from Huge University spend a year at Giant University, while graduates at Giant University spend a year at Huge University. He added: “You don’t want one-year positions going unfilled because the department doesn’t want to go through the effort of hiring.”

Krantz related an anecdote he had heard that at least 40% of graduating Ph.D.s at various Group I institutions were unemployed last April. “If people don’t want to hire the graduates from Berkeley, Harvard, and Princeton,” he asked, “who do they want to hire? Maybe the way that people at top institutions have been taught to apply for jobs is no longer appropriate,” he added. He also mentioned the decline of the quality of letters of recommendation: “I’ve seen junior people compared to Hardy and Gauss.”

Krantz observed that “the way we do our hiring can be abused and wasteful” and wondered if the AMS could get involved to reduce that waste. He felt that “the AMS does a good job of gathering information and disseminating it,” but asked if we could learn from the matching system used in the medical profession.

Lewis pointed out that this idea was seriously considered three years ago, but no universities were interested. He reminded the audience that in employment matters, the AMS really has no power other than as a “bully pulpit”.

Lewis was cautious about the idea of changing the product. “If you make it too vocational,” he said, “you’re liable to destroy what you have.” He pointed out that one mathematics department this past summer contacted all of their doctoral graduates to determine their status. It turned out that 50% of their graduates were in nonacademic positions. When the department asked for suggestions to change the program, the answer was not to change it.

Benkoski added to the discussion at this point. Animatedly, he pointed out that “the academic community turns to industry only in tough times.” He suggested that if universities want their graduate students to get some industrial training, then the universities should have students work in industry for two years, perhaps through a postdoctorate program sponsored by the mathematical community.

The Capability to Make Change

Benkoski then went on to his third question: “Who has the responsibility and/or the capability to make change?” Krantz felt that “the AMS could provide some guidance, but in the end, each has to tend his own garden.”

Bennett felt that the AMS, MAA, and SIAM could all act to make change. One reason YMN was formed was to get information out to help people solve these problems. Many YMN members want to know about industry.

What else can we observe from the medical profession? “The AMS is in a different world than the medical schools or the veterinary schools,” Bennett continued, “in that, as a society, it is usually in our interest to create graduate students. My father is a veterinarian, and he tells me that they never worry about creating more veterinarians, because that would be more competition.”

Echoing Krantz, Shaker paraphrased Voltaire: When things are such a mess, everyone should go home and try to do something well. Four years ago, fifty of the senior mathematicians at the NSA met to discuss the future. They decided that the flow of young people into the NSA was important, in spite of government austerity. To that end, they have been hiring twenty to thirty young mathematicians a year the past few years. Shaker added that getting money for hiring has required “continual pounding” on Congress, not unlike Lewis’s work with his administration. Shaker suggested, “Bring in a member of Generation X, and then downsize.”

Addressing older mathematicians, Shaker was vociferous. “I don’t believe the mathematicians of my generation are so wrapped up in hemi-demi-semi-groups that they can’t do some of this work”. He suggested that perhaps older, wiser, more experienced mathematicians should go work in industry for a while, opening up space in universities for the new generation.

Lewis said that “a lot of our problems are due to excessive dependence on TAs.” He has learned, though, that TAs are a lot more expensive than deans think. At Michigan, it is now cheaper for Lewis to hire a Ph.D. rather than a TA.
“Where You Start Is Where You End”
At this point, members of the audience asked questions. One question dealt with the idea of creating a national matching service. “What are the obstacles?”
Lewis thought it would work for the three-year postdocs. However, with tenure-track positions, you need to see the person in an interview and make sure they fit into the community. He did not see a matching system working well for liberal arts colleges or regional institutions, and he did not think that universities would cooperate.
Krantz added that we play “headgames” with these “fancy” named instructorships. On hiring committees, people say: “This guy is wonderful, but he didn’t get a named job—is he any good?”
Another member of the audience brought up the issue of “where you start is where you end.” This person was afraid that taking a job at a community college was professionally “slitting your throat”.
Lewis said that the societies need to make the case for being open-minded, to overcome the “brainwashing” we all get about careers. He worried that “the community colleges are hiring a lot of young people . . . at exploitive wages” and added major universities seem to be following this example. “That’s really an abuse of people.”
Bennett suggested selling yourself at MAA meetings. (“Give a talk—get noticed!”) Also, “moving down is not always possible, either.” Is it possible, he wondered, to go from a postdoc to a four-year institution? To summarize, he felt that “we all have to think about breaking those stereotypes.”
The last question from the audience concerned reducing the supply of Ph.D.s. “What about producing fewer graduate students?”
Krantz passed on a speculation by John Polking of Rice University on the consequences of cutting graduate admissions 20%: the ones who would be cut would be “the worst, who wouldn’t finish anyways.” Bennett thought that “brutal honesty” may downsize departments; and Krantz mentioned that in an earlier time, the AMS encouraged sending out letters describing the dire job market, letters that Krantz found “dreadful”. Shaker added: “I fear the downsizing of mathematics.”
Many people remained after the panel discussion to talk with the panelists and with members of the JCEO and YMN.

PROCEEDINGS OF SYMPOSIA IN APPLIED MATHEMATICS

Different Perspectives on Wavelets
Ingrid Daubechies, Editor
Volume 47

The wavelet transform can be seen as a synthesis of ideas that have emerged since the 1960s in mathematics, physics, and electrical engineering. The papers in this book give some theoretical and technical shape to the intuitive picture of wavelets and their uses. The papers collected here were prepared for an AMS Short Course on Wavelets and Applications, held at the Joint Mathematics Meetings in San Antonio in January 1993. Here you will find general background on wavelets as well as more detailed views of specific techniques and applications. With contributions by some of the top experts in the field, this book provides an excellent introduction to this important and growing area of research.

1991 Mathematics Subject Classification: 35, 42, 46, 62, 94
ISBN 0-8218-5503-4, 205 pages (hardcover), December 1993
Individual member $27, List price $45, Institutional member $36
To order, please specify PSAPM/47NA

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5980, Boston MA 02205-5980, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
Are Women Getting All the Jobs?

Panel Discussion Tries to Defuse Mounting Tensions over “Reverse Discrimination”

Do women mathematicians have an unfair advantage in the job market today? That was the subject of a panel discussion hosted by the Association for Women in Mathematics (AWM) at the Joint Mathematics Meetings in Cincinnati in January. Getting a job in mathematics seems to get tougher every year, so any appearance that someone has an unfair advantage is bound to stir discontent. The AWM decided to organize the panel to try to defuse the resentment by an open discussion.

The title of the panel, “Are Women Getting All the Jobs?”, had just the right touch of overstatement to bring in a crowd. The room was packed to capacity, with a few people sitting on the floor and peering in through the doorway. As panelist Helen G. Grundman of Bryn Mawr College pointed out, the answer to the question posed in the title is clearly no, because there aren’t enough new women doctorates being produced to fill the jobs that are open. So, being an algebraist, she tried a permutation of the words and rephrased it this way: “Are all the women getting jobs?” The answer to that is also clearly no, as data from the AMS-MAA Annual Survey show. Grundman pointed out that, according to the data about new doctorates, 85.5% of the males and 88.2% of the females were employed (the figures refer to new doctorates whose employment status was known). Looking at the numbers, she noted that if only five jobs that had gone to women had gone to men instead, the percentages would have been virtually the same.

“Some departments are making sincere attempts to get more women on the faculty, and I think that’s good,” Grundman declared. But she noted that sometimes there is too much emphasis on interviewing women candidates as opposed to actually hiring them. She told of cases in which women were brought in for interviews only to find that the department had already decided to hire someone else but had to meet an affirmative action quota on the number of women interviewed. She also said she has heard stories of women being hired as assistant professors and then “it’s made clear to them that they’re not expected to stay.” Further, looking again at the data for new doctorates, the average starting salary for male faculty members stayed the same over the past year, while for women it dropped by $1,000. From this and other data she concludes, “So even if women are getting more jobs, they’re not getting the high-paying ones.”

These days, recent doctorates are usually expected to have some postdoctoral experience under their belts in order to land good tenure-track positions. Are women getting more than their share of the nation’s top postdocs? To get a rough answer, the Notices telephoned twenty-four departments offering named instructorships or multiyear postdoctoral positions. Out of eighty-two people hired in these positions to begin in the fall of 1993, thirteen, or about 16%, were women. According to the AMS-MAA Annual Survey, women comprised 24% of 1993 doctorates. As for the National Science Postdoctoral Fellows, out of thirty-nine who began their fellowships in fall 1993, about one-quarter were women.

At the Employment Register during the Joint Mathematics Meetings, it is clear that women jobseekers are much sought after. However, institutions with what are generally considered the most desirable positions usually do not interview at the Employment Register. A follow-up survey conducted by the Joint Committee on Employment Opportunities after the Employment Register in San Antonio in January 1992 asked employers about the importance of various characteristics in their assessment of the candidates interviewed: one of the characteristics was “specific gender”. None of the fifty employers answering this question said that a specific gender was “required”, but 26% of them said it was “preferred”, and the remainder said it was “not important”.

Panelist Melvin Rothenberg of the University of Chicago said that he did not think women were getting more jobs than they were entitled to. He said that, at the “elite” departments (meaning the top five departments in the country), the percentage of women at the junior faculty level is far below the percentage of women doctorates from these departments, and, at the tenured level, there are almost no women. The representation of women in elite schools is especially important, said Rothenberg, because such schools have power, access to resources (such as money for visitors and conferences), and prestige, all of which influence directions in mathematical research. That there are few tenured women faculty at such institutions means that women are “locked out” of this power and influence, he said.

Rothenberg also spoke of a sense of “demoralization” among women students who notice the lack of women faculty and who sense the presence of the “glass ceiling” before they even reach it. Women suffer, and so does mathematics, he said. “When you deprive a talented group of people, you lose their potential contributions to the field.” Rothenberg believes that
the elite schools must take the lead and increase the number of women on their mathematics faculties. Of course, he noted, "this is not a popular proposal among my colleagues" at elite institutions. But what happens in hiring, he said, is that one sets minimal standards for a position and then looks at the pool of people who apply. Certain other criteria may apply; for example, the department may feel it needs a topologist or an algebraic geometer. "What if the department needs a woman?" he asked. "There are excellent women mathematicians who could and should be appointed to tenured positions at the elite institutions. This would in no way compromise the research quality of these institutions. What's lacking is the will to do it."

Panelist Lynne Billard, a statistician at the University of Georgia, said that the data she has seen show that the percentage of women getting assistant professorships in the last five to six years is about the same as the percentage of men and women doctorates. However, she noted that women are paid less than men, they are less likely to be full professors, and they take longer to achieve tenure.

The idea that hiring more women in elite institutions would necessitate a lowering of standards is "the old copout", said Billard. A number of studies have shown that both men and women tend to judge work done by women as being of lower quality than that done by men. Billard discussed one study from 1983, in which a research paper was sent out to 180 male and 180 female reviewers. One-third of the papers listed the author as John T. McKay, one-third as Joan T. McKay, and one-third as J. T. McKay. The lowest ratings (by both men and women) went to the paper "authored" by Joan T. McKay. (It should be noted that the study used a paper in the social sciences, not in mathematics.)

The panel provided some views countering the perception that women have an unfair advantage in the job market. However, no one presented the opposing view, which some might label as "politically incorrect". But privately, some men will confess to feelings of resentment over what they see as reverse discrimination. They say they look around and see their women contemporaries getting more interviews, more offers, and better jobs. Various stories circulate; for example, one new Ph.D. who has been on the job market a number of times in the past few years told of one woman who had received twelve offers. Her advisor said that she was not his strongest student, and yet his male students were having trouble finding jobs. Another recent Ph.D. told of a woman who had her pick of tenure-track offers from top schools and a postdoc at one of the elite universities. Although her qualifications were exceptional, he noted that her offers were more numerous and more generous than those of men at her level.

One panelist, Mark Winstead of the University of California at San Diego, a recent Ph.D. who has been active in the Young Mathematicians Network, pointed out that the perceptions of reverse discrimination are sometimes based on anecdotes that cannot be trusted. He said that fellow students and jobseekers were the source of many of the stories he heard about women having an advantage, and such people may not be in the position to judge the qualifications of women who allegedly got hired because of their gender. In addition, he said that he thought that because of various social factors, women usually face a tougher road to getting a doctorate than men; so it is quite probable that the average female mathematician is better qualified than the average male mathematician.

In addition, the past few years have brought changes in what qualifications schools are emphasizing. Amy Cohen of Rutgers University pointed to two women who had just finished their doctorates at Rutgers and who had gotten better jobs than their male counterparts. She said that some of the men were grumbling about reverse discrimination. However, she noted, these two women both had had previous corporate experience, they had good teaching records, and they were skilled communicators—all attributes that made them desirable on the job market. Schools today are looking for a wider range of skills and not focusing solely on research prowess. Said Cohen, "The men didn't seem to realize that the times have changed."

The men who complain of disparate treatment usually do not say that the women are poorly qualified. What they see is that men and women with similar qualifications and skills do not seem to have equal footing on the job market. David Atkinson is a recent Ph.D. who started a tenure-track job at Western Kentucky University this year. He said he considered himself neither worse nor better than his female counterparts in graduate school: "We were all friends working toward a common goal." But then, he began to feel a sense of unfairness when he found "after years of hard work that many hiring decisions [were] heavily influenced by the presence or lack of the Y chromosome." At one school where he interviewed, the department head told him that he anticipated considerable difficulty with the affirmative action officer if the department did not hire a woman.

Some would argue that, in making hiring women a priority, departments are simply trying to fulfill their responsibilities to provide role models for women students. Although some male jobseekers will concede that this is important, others say that they believe men or women can provide good role models for students of either gender. Said Atkinson, "the representation of females in many departments is lower than we would like, [but] I cannot agree that discriminating on the basis of gender is the solution. To me, the issue is whether females are discriminated against or discouraged," he went on to say. "That is wrong, and where it occurs action is warranted. . . . I don't believe that the gender or race of the person standing in front of your classes is nearly as big a factor in a person's career decision as an individual's upbringing, talents, and interest. To say that only women provide suitable role models for women is a divisive and unsubstantiated argument to me."

Allyn Jackson
The Council of the AMS is seeking comments on a set of ethical guidelines drafted by the ad hoc Committee on Professional Responsibility. The proposed guidelines and some introductory material are presented here.

The Council of the American Mathematical Society, in response to several cases in the mathematical community alleging serious breaches of professional ethics and perceiving the need of a national professional society for a code of ethics, resolved in March 1992 to establish a Committee (later called the ad hoc Advisory Committee on Professional Responsibility) to make recommendations concerning the role of the Society. The committee consisted of Murray Gerstenhaber; Frank Gilfeather; Linda Keen, chair; and Elliott Lieb. After reviewing the statements on ethics published by other societies, one recommendation of this committee was that the Society should promulgate a set of ethical guidelines, a preliminary draft of which was submitted by the Committee to the Council in January 1995 and which is printed here by vote of the Council in order to solicit comments.

Ethical Guidelines

To assist in its chartered goal, “... the furtherance of the interests of mathematical scholarship and research...”, and to help in the preservation of that atmosphere of mutual trust and ethical behavior required for science to prosper, the American Mathematical Society, through its Council, sets forth the following guidelines. While the Society speaks only for itself, these guidelines reflect its expectations of behavior both for its members and for all members of the wider mathematical community, including institutions engaged in the education or employment of mathematicians or in the publication of mathematics. The guidelines are not a complete expression of the principles that underlie them but will, it is expected, be modified and amplified by events and experience.

The American Mathematical Society, through its Committee on Professional Ethics (COPE), accepts the responsibility of providing an avenue of redress for individual members injured in their capacity as mathematicians by violations of its ethical principles.

I. Mathematical Research and Its Presentation

The public reputation for honesty and integrity of the mathematical community and of the Society is its collective treasure, and its publication record is its legacy.

The correct attribution of mathematical results is essential, both as it encourages creativity by benefiting the creator whose career may depend on the recognition of the work and as it informs the community of when, where, and sometimes how original ideas have entered into the chain of mathematical thought. To that end mathematicians have certain responsibilities which include the following: To be knowledgeable; to be aware of related work; to be certain of the originality of their own work; to give proper credit even to unpublished sources because the knowledge that something is true or false is valuable, however it is obtained; to use no language that suppresses or improperly detracts from the work of others; and to correct in a timely way or withdraw work that is erroneous or previously published. On appropriate occasion it may be desirable to offer or accept joint authorship when independent researchers find that they have produced identical results. However, the authors listed for a paper must all have made a significant contribution to its content, and all who have made such a contribution must be offered the opportunity to be listed as an author. A claim of independence may not be based on ignorance of well-disseminated results, and it must be convincing. A mathematician may not claim a result in advance of its achievement, for that injures the community by restraining those working toward the same goal. Publication of results that are announced must not be unreasonably delayed.

Because the free exchange of ideas necessary to promote research is possible only when every individual’s contribution is properly recognized, the Society will not knowingly publish anything that violates this principle, and it will seek to expose violations anywhere in the mathematical community.

II. Social Responsibility of Mathematicians

The Society promotes mathematical research together with its unrestricted dissemination, and to that end encourages all and will strive to afford equal opportunity to all to engage in this endeavor. Mathematical ability must be respected wherever it is found, without regard to race, gender, ethnicity, sexual orientation, or religious or political belief.
The growing importance of mathematics in society at large and of public funding of mathematics may increasingly place members of the mathematical community in conflicts of interests. Even the appearance of bias in reviewing, refereeing, or in funding decisions must be scrupulously avoided, particularly where decisions may affect one’s own research, that of close colleagues, or of one’s students; in extreme cases one must withdraw.

Any relevant relationship between a person asked for a reference or report must be assumed, unless there is funding, should be explicitly revealed.

A reference or referee’s report fully and accurately reflecting the writer’s views is often given only on the understanding that it be confidential or that the name of the writer be withheld from certain interested parties; therefore, a request for a reference or report must be assumed, unless there is a statement to the contrary, to carry an implicit promise of confidentiality or anonymity which must be carefully kept unless negated by law. The writer of the reply must respond fairly, withhold no essential information of which the writer is aware, and keep confidential any privileged information, personal or mathematical, which the writer receives. When information received with the request substantially affects the writer’s own work, the report must reveal that fact. If the requesting individual, institution, agency, or company becomes aware that confidentiality or anonymity cannot be maintained, that must immediately be communicated and, if known in advance, must be stated in the original request.

Where choices must be made and conflicts are unavoidable, as with editors or those who decide on appointments or promotions, it is essential to keep careful records which, even if held confidential at the time, would, when opened, demonstrate that the process was indeed fair.

Freedom to publish must sometimes yield to security concerns, but mathematicians should resist excessive secrecy demands, whether by government or private institutions.

In those instances where mathematics impacts on the “real world” it is the duty of mathematicians to disclose to their employers and to the public, if necessary, the implications of their work, particularly when the impact may be on the public health, safety, or general welfare. This includes disclosing knowledge of false or overblown claims.

It is the duty of individual mathematicians to reveal unethical professional acts or practices of which they may have knowledge. When this may bring retaliation, the Society is obligated to help protect the “whistleblower”, particularly when the complaint has been made to the Society.

III. Education and Granting of Degrees

Holding a Ph.D. degree is virtually indispensable to an academic career in mathematics and is becoming increasingly important as a certificate of competence in the wider job market. An institution granting a degree in mathematics is certifying that competence and must take full responsibility for it by insuring the high level and originality of the thesis work and sufficient knowledge by the recipient of important branches of mathematics outside the scope of the thesis. A thesis must adhere to the same rules as a publication and should be publishable in a recognized journal. When, despite diligent search by the candidate and without the candidate’s knowledge or fault, the work is found to have been anticipated in the literature, the degree should be granted. But when there is evidence of plagiarism, it must be carefully investigated, even if it comes to light after granting the degree. and, if proven, the degree should be revoked.

IV. Publications

The Society will not publish, print, promote, or aid in the publishing, printing, or promoting of any research journal where there is some criterion for acceptance of a paper other than its content. It will promote the quick refereeing and timely publication of articles accepted to its journals.

Editors are responsible for the timely refereeing of articles and must judge articles by the state of knowledge at the time of submission.

If the contents of a paper become known in advance of publication solely as a result of its submission to or handling by a journal, and if a second paper based on knowledge of the privileged information is received anywhere by an editor aware of the facts, then unless the first author agrees the editor must refuse or delay publication of the second paper until after publication of the first.

At the time a manuscript is submitted editors should notify authors whenever a large backlog of accepted papers may produce inordinate delay in publication; notice of these backlogs should also be published openly. A journal may not delay publication of a paper for reasons of an editor’s self-interest or of any interest other than the author’s. Editors must be given and accept full scientific responsibility for their journals: when a demand is made by an outside agency for prior review or censorship of so-called “sensitive” articles, that demand must be resisted, and, in any event, knowledge of the demand must be made public.

All mathematical publishers, particularly those who draw without charge on the resources of the mathematical community through the use of unpaid editors and referees, must recognize that they have made a compact with the community to disseminate information, and that compact must be weighed in their business decisions.

Both editors and referees must respect the confidentiality of materials submitted to them unless these have previously been made public and above all may not appropriate to themselves ideas in work submitted to them or do anything that would impair the rights of authors to the fruits of their labors. Editors must preserve the anonymity of referees unless there is a credible allegation of misuse.

These are ethical obligations of all persons or organizations controlling mathematical publications, whatever their designation.
Mathematics and National Goals

Science Policy Panel in Cincinnati Discusses
COSEPUP Report on Federal Funding of Science

At the Joint Mathematics Meetings in Cincinnati in January, the AMS and MAA Committees on Science Policy hosted a panel entitled, “The Place of Mathematics in National Science and Technology Goals”. The panelists were: Hyman Bass of Columbia University, chair of the Mathematical Sciences Education Board of the National Academy of Sciences (NAS); Phillip A. Griffiths, director of the Institute for Advanced Study and chair of the Commission on Science, Engineering, and Public Policy (COSEPUP) of the NAS; John C. Polking of Rice University, chair of the AMS Board of Trustees; and Margaret H. Wright of AT&T Bell Laboratories, president-elect of the Society for Industrial and Applied Mathematics.

Bass, Polking, and Wright are also members of the Federal Policy Agenda Subcommittee of the AMS Committee on Science Policy. This subcommittee has produced an AMS National Policy Statement for 1994-1995 which outlines the Society’s major goals in the area of national science policy. At the Cincinnati meetings the AMS Council discussed this document and, after suggesting a few changes, requested that it be brought back to the Council for final approval after thirty days. (This is the procedure required by the AMS Bylaws for the Council to approve a statement in the name of the AMS.) The text of the National Policy Statement will be published in the Notices when it has received Council approval.

Last year COSEPUP issued a report called Science, Technology, and the Federal Government: National Goals for a New Era. The report outlines a rationale for making decisions and setting priorities for federal funding of science, engineering, and technology. Part of the discussion at the panel focused on the ideas in the report and how they affect mathematics. The following pieces are adapted from the panelists’ presentations.

Phillip A. Griffiths

I will be speaking about the public support of research in the sciences and engineering. While I will not talk specifically about mathematics, I will discuss the role of the field in the overall picture.

I will briefly summarize the COSEPUP report, discuss the responses to the report, and offer some personal observations about the current situation.

The Context

To put this all in context, let me provide some budget numbers. The total federal budget is about $1.5 trillion. Expenditures on research and development from both private and public sources in the country total about one tenth of that: $150 billion. Of that, approximately half is in the private sector in industry (though that has been decreasing). The remaining $75 billion is the federal R&D budget. Of that, about 60% is in the military (and too has been decreasing). Within the federal budget, about $15-20 billion goes toward what is called “basic” research, and that represents about 20-25% of federal R&D expenditures. The National Science Foundation budget is about $3 billion, or about 4% of the federal R&D budget and 0.2% of the overall federal budget.

The COSEPUP Report

In preparing the report, COSEPUP had before it two questions that might be expressed informally as follows: In today’s world, what is the rationale for public support of science? How much science is in the national interest?

With these questions in mind, the committee developed two proposed goals for science. The first is that the U.S. should be at least among the leaders in all major areas of science. One rationale for this goal is that being in the forefront in all major areas of science allows the nation to take advantage of advances wherever they might occur. The discovery of high-temperature superconductivity is an example of this; because we had scientists working at the forefront in that field, we were active in the development of this area for both scientific and technological purposes. And only by conducting research at the frontier can we be assured of having the highest quality educational programs; there is a vital linkage between education and research. What the report does not say is that all sufficiently promising research opportunities need to be taken.

The report’s second goal is that in selected major areas of science, the U.S. should strive for leadership. The report goes on to propose criteria for selection of fields of science that should occupy leadership positions. Among the suggested criteria are that the field be tightly coupled to national objectives (such as molecular biology, which has an impact on important areas including health care, biotechnology, and agriculture); and that the field affect other areas of science disproportionately, producing a multiplicative effect. I think mathematics falls into this category.

One of the more controversial conclusions of the COSEPUP report, reached after considerable deliberation within the committee, is that these national goals can be met essentially within
the existing R&D budget. The report does not call for new money.

Reactions
Reactions to the report have been numerous and varied. The scientific community asked why we should not strive for leadership in all areas of science. I think many of us would have liked to state that as a goal, but there was not a compelling argument that this was sufficiently in the national interest to merit public support. And even if it were a goal, the question of how much science is enough would remain.

Places like the Office of Management and Budget asked why we should strive to be at the frontier in all fields of science. After all, they argued, science is in some sense an international common good, so why not select only certain fields that we wish to emphasize; then if something happens in other fields, try to take advantage of it as soon as possible. This is not an easy argument to counter, especially to non-scientists. Considerable effort went into addressing this in the report.

Policymakers contended that the goals in the report are not actionable. They asked about how to measure performance and also said that the resource allocation system for scientific research is by now too political to be subject to rationally defined goals. To counter these objections, exercises have been carried out within the National Academy of Sciences—‘toy models’, if you like—showing how these goals can be actionable and how one can use them to develop a budget. In fact, some of the report’s recommendations have begun to show up in legislative language.

Personal Observations
What strikes me as an outsider is that the current discussion about public support of science and technology is rather confused, in part because of the changing nomenclature. We have traditionally spoken of research as basic, applied, and development. Although we have a general sense of what those terms mean, I think their definitions are increasingly imprecise. Recently, the adjectives “strategic” and “curiosity-driven” have entered the vocabulary, as have “pioneering”, “discovery”, and “foundational”. This reminds me of the discussions of “political correctness”, where one can become so tied up in the language that one loses sight of the real objectives.

Still, I think that there are several significant issues underlying this. One of those is purely scientific, that is, maintaining the proper balance within a field (or within science as a whole) between internal influences and external stimuli such as practical problems and interaction with other fields. Science will be stronger if the balance is right. And history teaches us that if the balance is right, science will also be more useful. But this is an evaluation that needs to be made within the scientific community. Last year at the Institute for Advanced Study, which certainly supports the least strategic research of anyone, Freeman Dyson was asked if the Institute should do practical work. He replied that the Institute should not do something just because it is practical; but on the other hand, if it is practical, that should not be a reason for not doing it.

My second observation concerns research in support of national objectives; economic ones are the most commonly discussed. Clearly, public support of science is justified by its benefit to society. The question as I see it is not whether the scientific community should pitch in and help on current national problems, but how they can best do this. For example, some in the government are asking the sciences to do research which is intended to support industry but which industry has not asked for. What industry has asked for has been very clearly formulated by some of the industrial research institutes. In rank order, they want (1) the scientific community to provide the best possible education to scientists and engineers, especially those who will work in industry; (2) the scientific community to continue to carry out basic research of the highest quality; and (3) more permeability with the industrial scientific community through industrial postdocs and sabbaticals; through education, where a better balance could be struck between theory and practice, between individual work and team work; and other means. So I see confusion in that some are asking the scientific community to redirect its research agendas toward strategic goals in support of industry—and industry is asking for something else.

For the sciences, I think we should proactively, rather than reactively, suggest how we can best contribute to national objectives such as economic competitiveness. Here the private sector is the best guide, in my opinion, and also a natural ally. Recently, there have been suggestions that the federal role in the research and development activities that support industry should not be done through the federal agencies; that they should receive public support through other mechanisms such as the proposed Civilian Technology Corporation and consortia of groups of industries with common research interests. Perhaps we do need to come up with other mechanisms rather than to confuse the issue by wholesale redirection of the activities of the federal agencies.

For the mathematical community, it is important to emphasize the unity of research, education, and applications. Each is part of an overall enterprise, and all need to be functioning well and in harmony for our discipline to be fully effective. We also need to suggest concrete ways in which the mathematical sciences can be used as an enabling discipline.

Finally, I think we in the scientific community should constructively challenge and offer better alternatives to what we see as questionable policies being put forward.

John C. Polking
In considering federal funding for mathematics research, I think it is a good idea to look at the issues in the more general context of federal funding for all of science. I also think it is a good idea to look back at the history of federal funding to discover how circumstances are different now than they used to be.
A Short History of Federal Funding

Federal funding essentially began with World War II, when science made several major contributions to the Allied victory, including the development of radar, advances in cryptography, the beginnings of operations research in support of the bombing efforts of the Air Corps, and, of course, the atomic bomb. Influenced by these successes, the Roosevelt administration moved in 1944 to set up a structure for the continued funding of research during peace time. Vannevar Bush chaired a committee which produced a report entitled Science: The Endless Frontier, which called for a new agency to oversee all federal funding for scientific research. This led to the founding of the National Science Foundation (NSF) in 1950.

From the beginning, federal funding for research was aimed at well-defined national goals, which the Bush report identified as: 1) the war against disease, 2) national security, and 3) public welfare. The last item covered the creation of new jobs, new products, and new industries—"economic competitiveness" in today's jargon. To achieve these goals, the Bush report called for federal support for scientific research, primarily at colleges and universities, and for improved scientific education of all citizens.

These goals have not changed over the years. However, their relative priority has fluctuated with the political and economic climates in the U.S. and around the world, especially in the last five years. Now that the U.S. faces no major military danger and future conflicts between nations are predicted to be economic in nature, there has been a strong shift to economic competitiveness as the principal goal.

From the beginning there were conflicting opinions about the relative importance of directed and undirected research. In the 1940s many influential people believed the government should only fund research that was aimed specifically at national goals. Fortunately for the nation this opinion did not prevail. However, at the present time there are even stronger adherents of this philosophy.

The Bush report reasoned that industry could not be expected to fund research of a truly basic nature; so it was the responsibility of the federal government to fund basic research, and private industry would be responsible for applied research and product development. This defined a sort of contract between government and industry that remained in effect until recently.

How Circumstances Have Changed

In the fifty years or so since the appearance of Science: The Endless Frontier, basic science has, with federal support, flourished in American universities and in the government labs. In almost all areas of science the basic research done in the U.S. leads the world and feeds industrial innovation everywhere.

The news is not all good, however. In some areas of science the research establishment has grown beyond the level dictated by national needs alone. This circumstance is frequently characterized by large groups of scientists supported entirely by federal funds. If they are at a university, they have little or no connection with the educational mission of their institution. These groups continue to produce Ph.D.s, putting more and more demands on federal support. The reaction among policymakers in Washington is that scientists consider federal support an entitlement and that the scientists themselves do not have the nation’s goals in mind.

The situation has been changing on the industrial side as well. Immediately after World War II, industrial labs were flourishing. In the past thirty years, however, industrial support for research has decreased dramatically. The reasons for this are complex and not easily understood. But it is clear from surveys done by the NSF, and from even a casual reading of the financial pages, that the search for short-term profits is dominating industrial America and is a principal factor in the reduction of support for corporate research.

Nevertheless, it is widely recognized that the type of research that used to be done in the industrial labs is still important, leading to increased pressure on the government to take over this responsibility. There are calls for a federal "industrial policy" and for more emphasis on technology transfer from the universities to industry. This is only natural, given that economic competitiveness is now the most important of the national goals motivating support of research. All of this is happening at a time when the federal budget is severely strained, causing our leaders to search for areas of the budget that can be cut in order to pay for these new ventures. Unfortunately, too many of them see basic research as such an area, especially since parts of the basic research establishment are demonstrably bloated.

The Response of Mathematicians

How should we as mathematicians, practioners of the most basic of the sciences, react to these unpleasant circumstances? I do not have any startling new strategies to offer. I can only say that we should do what we have always done, only better. To be more specific, I would make four points.

First, we have to continue to emphasize the importance of basic, undirected research. We should resist falling into the trap of promising too much. We have a wonderful track record, so we should emphasize the past successes rather than trying to predict the future.

Second, we have to recognize that the country as a whole has a problem when it comes to what used to be industrial research. Although we may wish to argue that an industrial policy is not really good policy, it is an attempt at a solution of a very real problem. Furthermore, many mathematicians are well situated to participate in such a venture and can make significant contributions.

Third, we have to do a much better job of describing the mathematics community, especially to policymakers. For example, it is not widely understood that mathematics is the largest of the academic scientific communities. (There are more engineers in total, but not more in any specific area of engineering.) The reason is our large teaching mission, and not because we are one of those areas of science that are growing largely as a result of federal support. In fact, it can be argued that mathematics is one of the most poorly supported of all the scientific disciplines.
Finally, we should emphasize all of the ways in which mathematics contributes to the nation’s research effort. We talk of mathematics as the “enabling discipline”, but we rarely talk about how this enabling is accomplished. In fact, the principal way it is effected is in our classrooms, where we teach future scientists and engineers.

I recently had cause to look back and compare the mathematics that science and engineering students at Rice took twenty-five years ago with what our current students take. The number of courses is about the same, but the content has changed dramatically. What we used to offer to juniors and seniors we now routinely teach to sophomores. The magnitude of the change surprised me, even though I participated in it. The point is that the faculty was able to change the mathematics curriculum continuously over this period in response to changing needs of the students. I think they were able to do this so easily primarily because they were active researchers and as a result were current in what needed to be taught. The importance of an active research faculty to our teaching mission is a point that we have not made as strongly as we could.

We have a very strong case to make based on the very real contributions of our discipline toward the goals of the nation. Only arguments of this sort will be persuasive. We need to make these arguments forcefully to national policymakers.

Margaret H. Wright

The first two speakers have discussed broad issues of national science policy. My remarks will focus more narrowly on specific policies and strategies for the mathematical sciences community in the present situation.

One of my initial assumptions, supported by practical experience thus far, is that (unfortunately!) mathematicians as a group do not have enough political clout to ensure that their wishes are always followed without question by the president and the Congress. Furthermore, we tend to have insufficient emotional appeal to the public to allow us make a compelling case in the media. We are therefore forced to argue entirely on the merits, which means that we need to present a cogent and logical case that responds directly to recent questions raised by policymakers in Washington and the public.

In trying to make our case, I feel strongly that we must avoid the appearance of simply saying the same old things over and over again. For example, I once had a math professor who replied to a question by saying, in effect, “I know only one way to explain this point, and you’ve just heard it”. Although probably not intended in this unresponsive spirit, some remarks made recently by prominent scientists sound exactly like this professor! We would be foolish indeed if we assumed that everyone else shares our values and that, if we repeat ourselves often enough, people must eventually agree with us. The effect of repeating the same answers, even with increasing volume, is usually that people soon stop listening. So my first point is: mathematical scientists should try very hard to say something different. It comes as a surprise to no one that we support mathematical research; having made this point, we should move on to other issues.

In particular, two broad issues need to be considered by the mathematical sciences community in the present discussion:

1. How should we interpret the questions asked by Washington and the public?

2. How should we respond to them?

(As in many mathematics exams, the answer to (2) depends on the answer to (1).)

With respect to the first issue, my view is that the questions are genuine and serious—and, in fact, that those in government should be asking these questions. The end of the cold war has been mentioned repeatedly as a forcing function leading to new directions in national science policy. In addition, science funding has recently involved an increasing number of elements that appear haphazard and controversial (or both), such as earmarked funding for certain projects. I believe that now is a good time for those in both government and science to look explicitly at their common underlying purposes. Hence we should welcome the chance to discuss the overall role of the mathematical sciences in national science priorities.

In this process it is important for the mathematical sciences community to respond to the substance of the questions, rather than react (negatively) to their form and tone. Various incidents within the past few years have tended to damage the credibility of scientists as a group, to the point that some in Washington perceive scientists’ main concern to be perpetuation of an entitlement system. Although we may feel that it is unfair to question the motives of all scientists, nonetheless we as a community should recognize this problem as real and deal with it honestly—not compound it by bristling with indignation.

Turning now to question (2), my view is that the mathematical sciences community can achieve three realistic objectives: first, an improved understanding by Washington and the public of what mathematical scientists do and why it is important to the nation (not just to us); second, a constructive and substantive contribution to broad national goals, as defined in the COSEPUP report; and finally, participation in formulation of federal science policy.

In trying to work toward these goals, I believe that we should carefully avoid various strategies that seem almost certain to be unproductive. For example, we should not assume that the present situation will go away if we simply wait it out; we should not view questions about science funding as threatening; we should not make generic arguments, i.e., issue proclamations of the form “... should be supported because it is beautiful and important” , where ... could be mathematics or any other field; and, finally, we should not fail to acknowledge that painful choices will need to be made and that our community must accept responsibility for the pain if we wish to be treated as a serious participant in making these choices.

One of the reasons that I am pleased with the draft AMS Federal Policy Statement is that it stresses the interdependence of three themes: research in mathematics, applications of mathematics, and education. These components together constitute a set of focused and realistic arguments for the mathematical sciences, and the draft agenda states that “none of these components can be neglected without weakening the
Mathematics and National Goals

other. I think this point needs to be made as forcefully as possible in our discussions in Washington—that we are not asking for support to do research in a vacuum. We have strong and convincing arguments to make for the mathematical sciences; I hope very much that we will make them.

Hyman Bass

The Problem

For several years now, mathematicians have been confronting what was perceived to be inadequate levels of federal funding for basic research. Not only has this condition not been relieved, it is now compounded with a much graver problem: the traditional academic job market, which was predicted to be opening up about now, has instead become supersaturated, throwing our new Ph.D.'s into a desperate predicament and spawning anger and disillusion.

The response of the community, myself included, has been to plead for increased support, evoking the historic, albeit long-term, benefits of basic research and the role of mathematics as an enabling discipline for all of science and technology. And this response has cited the plight of young mathematicians whose training and talent is being squandered for lack of research support and even of jobs. These kinds of appeals have not lately succeeded in generating the desired resources, and they now seem to be falling on increasingly deaf ears in Washington. Some in our ranks feel that we should continue to make the same case but now make it even louder.

I want to discuss a different strategy, one that flows from a newly emerging analysis of the nature of the problem.

Analysis of the Problem

Our basic problem has two aspects, which it is important to distinguish:

• inadequate research funding, and

• unemployment.

The second problem is newer and far more grave than the first. It is not going to be redressed by any present or future actions by federal agencies.

1. Population Growth. A recent article by the physicist David Goodstein, vice provost of the California Institute of Technology (American Scholar, spring 1993), cites evidence that science has been growing roughly exponentially since about 1700, with a ten-year doubling period. This astounding observation seems to be essentially consistent with what we are now witnessing. The first signs of saturation appeared around 1970. Various adjustments occurred thereafter, including replacement of most domestic graduate students by foreign students, and from 1970 to 1990 there was only one doubling, not two; but federal support for university research (inflation corrected) also doubled during this period.

2. How Much is Enough? For What? In this exponential growth scenario, it is clear that appeals for resources for the research community can never be adequately satisfied. We must couch our pleas in a framework that defines not only what is needed, but also what is sufficient. Sufficient for what?

To meaningfully answer this, we must define our professional mission in terms of external material and social goals, since the appetite of creative research and discovery is inherently boundless.

This is the kind of framework advanced in the COSEPUP report. This report argues for two national goals: (1) the U.S. should be among the world leaders in all major areas of science, and (2) the U.S. should maintain clear world leadership in some major areas of science. Among the possible criteria cited for the second category is that, "the field affects other areas of science disproportionately and therefore has a multiplicative effect on other scientific advances." I think that mathematics clearly qualifies by this criterion. On the other hand, even with our strained resources, the U.S. maintains clear world leadership now in mathematics (thanks in large measure to the influx of foreign talent), and it is not likely that any other nation will soon challenge that lead.

So this world leadership does not, by itself, assure the broad level of professional excellence that is required for mathematics to maintain its enabling role for science and the high-quality mathematical training of scientists and engineers.

3. The Professional Mission. The mathematical sciences community is engaged in three broad areas of professional activity—research, applications, and education. Historically, our community has segregated these activities both culturally and organizationally—AMS, SIAM, MAA. While the boundaries are diffuse and increasingly artificial, inherited attitudes continue to impede movement toward cultural and professional assimilation.

During the cold war era, basic and applied research were national priorities, and this created a value system in which education became gradually devalued and neglected. The economic pressures and competition that have now replaced cold war security challenges have transferred national priorities to applied science and technology, and now increasingly also to math and science education, to serve the needs of a productive work force in the global economy. In this current environment, applications and education are being favored by national policy, to the neglect of research, particularly basic research.

I favor the position that it is intellectually, culturally, and socially healthy for our community to view research, applications, and education as synergistic components of a common professional enterprise, one in which neglect of any of the three components will undermine the other two. This view, advanced in the draft AMS Federal Policy Statement, encourages much closer collaboration between the organizations of the Joint Policy Board for Mathematics—AMS, SIAM, MAA—and openly sharing professional concerns, rather than fencing each of them off as appropriate for only one of the three organizations and communities.

First Conclusions

If we accept the exponential population growth analysis—and there are strong indications that it is fundamentally sound—then we have an endemic problem that cannot be solved by available infusions or redeployment of federal funds.
Our graduate programs provide some of the finest advanced mathematical training in the world; indeed this is one of our most successful exports, if measured by foreign consumption. (However, we mostly subsidize that consumption.) Further, these graduate programs, to remain viable, require a certain critical mass, not only to animate the research environment but also to serve the departmental teaching mission. In turn, these robust graduate programs will defeat any efforts at Ph.D. population control. That is our Malthusian dilemma.

Mathematics has, among the sciences, the largest undergraduate teaching mission. Consequently, for now, whether or not research is nurtured and supported, our professional ranks will maintain a certain threshold simply to serve educational needs. However, if research does not flourish, then the quality of this teaching enterprise will diminish. Meanwhile, this teaching jurisdiction becomes highly valued territory which invites takeover by equally hungry outsiders, like engineering schools, who can reasonably claim professional competence to offer the mathematics that their students require.

The Choice: Downsize or Redesign

Our traditional mathematics Ph.D.s are trained to become, essentially, intellectual clones of their professors. They are excellent candidates for professorships in research universities or for research in mathematically focused laboratory environments. Our production capacity for such Ph.D.s far exceeds market demand, both current and future. Our choice is either to downsize or to redesign our product. Doing nothing will be a de facto choice to downsize.

Fortunately, there are attractive, feasible, and productive options for redesign. We often evoke the enabling power of mathematics, and there is plenty of evidence to demonstrate this. Many of our Ph.D.s have found productive employment in nonmathematically-focused environments in which their disciplinary training in mathematics has much to contribute. However, our graduate programs show little recognition of these nontraditional career paths. In particular, they do not supplement or enhance the disciplinary courses to provide broader and more versatile professional skills. An obvious and compelling need here is for greater attention to cultivating pedagogical and communication skills. Other basic training (in computation, probability and statistics, and so on) might be designed in accordance with the style and environment of each individual department.

In conclusion then, I recommend that we identify the wide variety of professional environments in which advanced mathematical training can significantly contribute and that, without diluting our core disciplinary training, we enhance our graduate programs so as to give our students some of the professional tools to facilitate their effectiveness in such settings. This is the only way that I can see to relieve the problems confronting us, not least our Malthusian dilemma.
The Forum on Science in the National Interest: World Leadership in Basic Science, Mathematics, and Engineering took place at the National Academy of Sciences on January 31 and February 1, 1994 and was sponsored by the Office of Science and Technology Policy (OSTP). The purpose of the event, as described by the president’s science advisor, Jack Gibbons, was “to gather and share information and views on the national investment in fundamental science and the critical challenges facing U.S. science today [and] to use this forum in the development of a national strategy for science that parallels the technology initiative developed in 1993 by the Administration.” The following report on the forum was written by John S. Bradley, managing editor of the Notices and director of the AMS Washington Office.

In addition to Gibbons, the speakers whose presentations are described here are Senator Barbara Mikulski, Senator John D. Rockefeller IV, Congressman George Brown, and Vice-President Al Gore. The forum was cochaired by Gibbons and Harold Varmus, director of NIH and was organized by M. R. C. Greenwood, associate director for science at OSTP.

Jack Gibbons
Gibbons stressed that funding basic science is an investment that has paid off enormously. He cited a number of examples, from transistors, to DNA, to the “unreasonable effectiveness” of basic research in mathematics, and discussed Vannevar Bush’s linear model where basic research leads to applied research, to development, and eventually to commercialization. He also discussed examples for which the linear model is inappropriate. He concluded that continued economic development, improvements in health, and a secure future will be enhanced by a healthy American scientific enterprise. He acknowledged the value of the creation of new knowledge and pushing back the barriers of ignorance, but recognized that a substantially altered rationale for continued federal support of science and technology is emerging. This new rationale is predicated on the fundamental interdependence between science and technology, the growing dependence of modern economies on a vibrant science and technology system, and broad national objectives, including industrial performance, health care, and environmental protection.

Barbara Mikulski
Perhaps the most interesting talk of the forum was by Senator Barbara Mikulski, chair of the Senate Appropriations Subcommittee for Housing and Urban Development, Veterans’ Affairs, and Independent Agencies. She began by saying that she was most interested in where we thought we would be in the year 2000 or 2020 in developing research and our intellectual capacity. She is interested in how to make national investments yield dividends and said, “We have seen the end of the cold war, but we are now in a new war—the war for America’s economic future—and we must be an economic superpower.” She recalled that federal support for research in the last fifty years was driven by defense needs. Support has always been for strategic objectives, she stressed, but what is new is the need to devise strategies for the new world order, which began with the end of the cold war.

She came across as being very protective of the budgets for science and technology. She talked about the “cut-cruisers” in Congress who cruise the pages of the budget looking for things to cut. She said she must answer to people in Baltimore listening to Rush Limbaugh, who tells them that we can cut $8 billion from the budget without taking any street person out of a shelter and without cutting any veteran’s benefits. She wants a strategy to defend against the cut-cruisers and seemed to be asking the scientific community to help her find one.

Mikulski recalled the language in her subcommittee report last fall calling for greater investment in “strategic” research and admitted that it was controversial. She said there was confusion about what strategic research is and said that what she means is investments in science that are focused around important national goals. Some of these have been identified already: climate change, advanced manufacturing, biotechnology, and high-performance computing. This does not mean that every grant must result in six patents and four commercial licensing agreements, nor does it mean that every proposal must guarantee a private sector payoff in a specific number of years, but it does mean spending more than half of our basic research dollars in areas we consider strategic.

“The implications of this change to a more strategically-driven approach do not mean the end of basic research, but
those doing this research must realize that their work is funded by ordinary taxpayers—the checkout clerk at the grocery or a machinist on the assembly line,” she said. “It is not an entitlement, and it is not always guaranteed. And people will expect to see results—not necessarily immediately, or so that every idea leads instantaneously to the marketplace, but that basic research is part of a continuum of excellence to solve problems with new ideas and new theories.”

**John D. Rockefeller**

Next came Senator Rockefeller, who chairs the Senate subcommittee responsible for handling the reauthorization of the National Science Foundation (NSF). His speech almost made Mikulski sound flexible. National priorities have changed dramatically in recent years, he said, and Congress and the public expect federally-funded basic research to change as well. After decades in which defense was the priority of science policy the goal now is to generate jobs and growth. Historically, he said, America has lacked clear policies and programs for using university basic research to help industry and the general economy. He said he didn’t have all the answers and asked for input from the community.

Rockefeller feels strongly that NSF and other government agencies should focus more on strategic research, which he defines as basic research in areas of strategic importance to the nation. He wants to see more robust mechanisms for university researchers to reach out to users of research. There should be more proactive methods than simply publishing articles, holding seminars, and licensing the occasional patent.

Then, we must find the appropriate agency to lead the effort to increase federal support for university research in support of the economy, he said, asking whether the NSF or mission-oriented agencies are right for this. He agreed with Mikulski’s message to the university community: if you want new money in this new era, then show us how universities can be more helpful to the economy; otherwise, funding increases should go to other agencies. Rockefeller noted that the proposed balanced budget amendment, if passed, would severely constrain all budgets, and that science funding would be particularly hard hit. He closed with the invitation to work together with the scientific community on these important issues.

**George E. Brown**

Congressman George E. Brown, Jr., chairman of the House Committee on Science, Space and Technology, reiterated the theme that science funding has been driven during the last few decades by national security. “Over the last half century, we have achieved spectacular scientific and engineering accomplishments in the service of a vigilant society,” he said. “We now need to enlist our science and technology in the service of a humane society where work is meaningful, families are secure, children are well-fed and well-educated, where prevention is the first line of defense in health care, where the environment is respected and protected for future generations, and where sustainable development becomes the conscience of our progress. This new agenda, by its very nature, will upset the status quo in our research system and in many of our institutions... We cannot have a research system running on its own predetermined track and hope that it will intersect serendipitously with the needs of a dynamic, changing society. We must have, instead, a research system that arches, bends, and evolves with society’s goals.”

Brown said that he hoped not to hear again the term “strategic research”, a term that has no meaning. Instead, we should have strategic goals for the nation and we should invest in research as part of a strategy to advance those goals. He described a fundamentally flawed dogma in the science community, which sees basic research and applied research as mutually exclusive. He said that there is a massive amount of evidence suggesting that a major portion of basic research is driven simultaneously by the quest for knowledge and by the quest for use.

He closed with the observation that the task of making course adjustments would not be easy and should be guided by the words of Alfred North Whitehead, who said, “The art of progress is to preserve order amid change and to preserve change amid order.”

**Al Gore**

The last speaker on the program was Vice-President Al Gore. His message was that the administration is as interested in science as it is in technology because of the recognition that science is the foundation of knowledge on which technology is built. While he talked about the wonders of and need for basic science and did not tie basic science as closely as the other politicians to national needs, his closing remarks concerned the problem basic science has in getting attention in the political arena: Science is a priority, but in Congress, it often is second to a new road system.

**Feedback**

There were other speakers, including scientists, university administrators, and economists, who presented different perspectives. The mathematicians making presentations were Ronald L. Graham, AMS president; Carlos Castillo-Chavez, Cornell University; Avner Friedman, University of Minnesota; Rhonda Hughes, Bryn Mawr College; and Donald Kreider, Dartmouth College. There were also a number of break-out sessions in which participants contributed their views on issues. The session I attended was “The Research Portfolio: Priority Setting for the Federal Investment in Fundamental Science and Engineering.”

The following proposal came out of this group. Long-term research priorities should be set in an ongoing dialogue involving: Congress, through the Science, Space, and Technology Committee; the administration, through the newly created National Science and Technology Council; and scientists, through a standing forum on science and technology. The proposal also suggested that NSF organize itself along strategic lines, with a coordinated program of initiatives, each having a fixed time frame, a well-defined scope, and a plan for allocation of funds on the basis of peer-reviewed, investigator-initiated grant systems.
Doctoral Degrees Conferred

Supplementary List

1992–1993

The following list supplements the list of thesis titles published in the November 1993 issue of the Notices. Each entry contains the name of the recipient and the thesis title. The number in parentheses following the name of the university is the number of degrees granted by the department.

<table>
<thead>
<tr>
<th>University of California, Riverside (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Forkeotes, Ann Alexandra, Lattices of lower finite breadth.</td>
</tr>
<tr>
<td>Shaw, Frank Holcomb, Discontinuity in codimension-k manifold decompositions.</td>
</tr>
<tr>
<td>Swift, Randall James, Structural and sample path analyses of harmonizable random fields.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>University of New Hampshire (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Kirtland, Joseph, Finite groups as a generalization of vector spaces through the use of splitting systems.</td>
</tr>
<tr>
<td>Wanpen, Pachara, Hankel operators on Hilbert spaces.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tulane University (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Chui, Wing-Kwong, A numerical model of two dimensional incompressible flow and heat transfer in a boundary layer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>University of Washington (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Mannix, Charles E., Jr., An investigation of numerical methods applicable to a certain class of singular integral equations.</td>
</tr>
<tr>
<td>Shyue, Keh-Ming, Front tracking methods based on wave propagation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEW HAMPSHIRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Carbone, Alessandra, On logical flow graphs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CALIFORNIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Lunsford, Matthew, Indecomposable modules over valuation domains.</td>
</tr>
<tr>
<td>Macias-Alvarez, Sergio, Covering spaces of homogeneous continua.</td>
</tr>
<tr>
<td>Zhang, Han, Dualities of domains.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOUISIANA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Chui, Wing-Kwong, A numerical model of two dimensional incompressible flow and heat transfer in a boundary layer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEW YORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Carbone, Alessandra, On logical flow graphs.</td>
</tr>
</tbody>
</table>

Erratum

The thesis title for Thomas Morrissey, Department of Mathematics, Northwestern University, was listed incorrectly in the November 1993 Notices. The correct title is Decoupling degenerate diffeomorphisms.
This month's column

Three software reviews make up this month's column. First off, John Crow presents the second installment of his two-part comparative review of Maple and Macsyma. Part I appeared in the March column. It should be noted that a new version of Macsyma was released late in 1993, after Crow had completed his review. A review of the new version will appear in due course. Second, Mario Vassallo reports on his experiences with Spreadsheets and Mathematics. Finally, Gustaf Gripenberg takes a look at MAX.

Editor's address:
Professor Keith Devlin
School of Science
Saint Mary's College of California
P.O. Box 3517
Moraga, California 94575

Correspondence by electronic mail is preferred, to:
devlin@msri.org.

Reviews of Mathematical Software

Maple & Macsyma
Part II. Macsyma
Reviewed by John A. Crow*

This report describes my experiences with Macsyma as installed on a Sun SparcStation; a previous report, Part I, has dealt with Maple. The intention is to give the reader a flavor of these packages and a notion of what a user might expect to do with them and how. In addition, comments on the two packages will be made, followed by a few notes on difficulties I observed. Description of some of the specialized features is not in the scope of this review, but the interested reader may want to contact Macsyma for further information.

2. Macsyma

Macsyma is one of the first symbolic manipulation packages, with its roots in artificial intelligence developments at MIT in the late 1950s. Macsyma has retained its relationship with MIT and with Symbolics, Inc. over the years and it now is a mature product of Macsyma, Inc., available for a large number of platforms. I would like to thank Richard Petti of Macsyma for providing the software for the Macsyma evaluation.

2.1 Scope. Macsyma is a Lisp-based, command-line interpreting package for mathematical calculations, both numeric and symbolic. Most of the capabilities described for Maple in Part I also apply to Macsyma.

2.2 Using Macsyma. The UNIX version tested did not provide a windowed interface. However, and as an aside, I have had the good fortune of examining the MS-Windows version on my PC and found it to be very easy to use. The introduction of Macsyma into a windowed environment is fortuitous since it provides rapid access to help menus, no small task for Macsyma. It was mentioned to me that an X version of Macsyma is forthcoming and will be very similar in format to the MS-Windows version.

Macsyma in its standard version is accessed from the operating system prompt by entering macsyma. While the program is loading, several lines appear describing the loading process and copyright information after which the user is presented with the prompt (c1) which means Macsyma is waiting for input. To get the flavor of Macsyma, here is a sample session involving the evaluation of an integral; text following the (cn) prompts is entered by the user:

(c1) f(x, y) := 1 / (1 + y * EXP(x))$
(c2) INTEGRATE(f, x, 0, INF); Is Y positive or negative? positive;
(d2) LOG(Y + 1) - LOG(Y)
(c3) SUBST(1, y, (d2));
(d3) LOG(2)
(c4) QUIT();

As seen, there are command lines of the form (cn) at which the user enters commands, and display lines of the form (dn) which show the results of the command's execution.

The first line of this example defines the function f of two real variables. The operator := is the function assignment operator. Macsyma has many "equals" operators:

*John A. Crow, Autonetics Electronic Systems Division, Rockwell International Corporation, 3370 Miraloma Avenue, MS DC-28, Anaheim, California 92803; crow@power.amasd.anatcp.rockwell.com
Tensor analysis and operations

Setting properties of the dot

package

Macsyma

list of ODE-solving packages echoed to the screen during the loading process. Here is a list of most of the major packages

In another trial, I dealt with the complex function

to this over

At this point, the appropriate answer is returned.

As a final note on this example,

A more notes on this example. First of all, the integration over x involves the symbol INF which corresponds to +\infty; there also is a predefined symbol INFINITY, representing complex infinity. Other constants that are a part of Macsyma are \pi (%PI), e (%E), Euler's constant \gamma (%GAMMA), and the imaginary unit i (%I). These are symbolic constants and may be evaluated to the desired precision when numerical results are required. Unlike Maple, the Macsyma language is case-insensitive.

As a final note on this example, Macsyma is an interactive program. In the example, Macsyma asks about the sign of y, evidently assuming it to be real. If the user responds saying y is negative, further questions are asked about it: Macsyma indicates the integral diverges when y \leq -1.

In another trial, I dealt with the complex function g where

g(x, u, v) = 1/(1+(u+iv) \exp(x)). Using Macsyma to integrate this over 0 < x < \infty, here is one set of queries the program makes (my responses are indicated in parentheses):

- Is U positive, negative, or zero? (positive)
- Is V zero or nonzero? (zero)
- Is V^2 + U^2 - 1 positive, negative, or zero? (positive)

At this point, the appropriate answer is returned.

2.3 Macsyma Packages. Macsyma provides a very large number of commands and operations. There are, it appears, a number of specialized packages that are loaded on-the-fly as needed, in addition to the standard loaded program. For example, when solving an ordinary differential equation, an inkling of the solution technique becomes apparent by the list of ODE-solving packages echoed to the screen during the loading process. Here is a list of most of the major packages Macsyma makes available:

- ATENSUR — Tensor analysis and operations
- AVG_PODE — Package implementing the method-of-averaging for perturbation analysis of "time-dependent" periodic ordinary differential equations
- BLINALG — Linear algebra operations (e.g., LU/LDU/QR/Cholesky decompositions)
- CARTAN — Exterior calculus package
- CTENSOR — "Component tensor" package (components of tensor depend upon the local coordinate system)
- DIFFER — Solution of linear difference equations with constant coefficients
- DIMEN — Enables dimensional analysis and checking of expressions
- DOTOPERATOR — Setting properties of the dot operator "\cdot" which is the intrinsic noncommutative operator of Macsyma
- EIGEN — Exact calculation of eigenvalues and eigenvectors
- FDIF_PDE — Generates finite-difference approximations of partial differential equations
- FFT — Calculation of discrete Fourier transforms using the FFT algorithm
- FOURIER — Fourier analysis, coefficient calculation
- FUNCTS — Functions in combinatorics, series manipulation, trigonometry, Boolean operations, polynomial factoring, etc.
- GROBNER — Gröbner basis calculations and applications
- INTEQ — Package for solving first- and second-kind integral equations
- INTERPOL — Interpolation of tabular data, table look-up functions
- ITENSOR — "Indicial tensor" package (deals with tensors as indexed symbols)
- KACH — Hacijan algorithm for linear programming
- LINDST — An implementation of the Lindstedt perturbation method for weakly periodic or autonomous perturbations of the simple harmonic oscillator
- LSQ — Least-squares fit to data
- MATFUNCS — Matrix functions (e.g., submatrix extraction, determinants and permanents, Wronskians, &c.)
- MSCALES — Approximate (symbolic) solutions of ordinary differential equations, using the method-of-multiple-scales
- NDIFF — A package for partial derivative representation, included in the package OPALG below
- NUSUM — Package for evaluation of indefinite sums
- NUSUM1 — For finding closed-form representations of series and products; solution of first-order linear nonhomogeneous difference equations
- ODE — Package for solving systems of first- and second-order ordinary differential equations
- OPALG — Operator algebra package, functions for manipulating algebraic, differential, and integral operators
- OPTIMZ — Optimization package, finds stationary points of multivariate objective function, unconstrained
or equality/inequality constraints

POISSON — Manipulations of (and conversions to) Poisson series (e.g., \( \sum a_i \cos(p_i \theta + q_i) \))

POLY — Package for finding the roots of polynomial equations

RECUR — Solution of linear recurrence relations and linear difference equations

RUGKUT — Package for numerical integration (Runge-Kutta) of initial value problems for systems of ordinary differential equations

SET — Primitives of set theory (intersections, unions, complements)

SPECIAL — Special functions (Bessel, gamma, etc.)

STAT — Elementary functions of statistical analysis

SYM.DE — Package for finding symmetries of systems of ODEs and PDEs

VECT — Vector analysis package

There are very many functions distributed across these packages. Unfortunately, this wealth leads to a real potential for confusion over operator syntax and description, and for this reason, the recent introduction of GUI’s version is a great step in the right direction. As an aside, a few of my colleagues who had used Macsyma in the distant past only remembered it as obscure and difficult to use. This no longer is the case, although it might be fair to say the learning curve is steep. At times, I found it a little difficult to find the command sequence I needed.

2.4 Integration, Differentiation, Limits. Macsyma provides the ability to evaluate definite integrals as was shown in the example above. Indefinite integration calls are made by leaving off the integration interval; e.g., replace INTEGRATE (f(x, y), x, 0, INF) with INTEGRATE (f(x, y), x). Definite integrals may be evaluated numerically by specifying the integrator type: ROMBERG or BROMBERG for Romberg integration, QUANC8 for adaptive quadrature based upon a Newton-Cotes rule.

My experience with Macsyma is that, like Maple, it handles large classes of integrals rather nicely, especially those involving the elementary functions. All the comments on Maple integration in Part I apply here; however, Macsyma is more interactive as was shown in the example above, whereas Maple assumed the integrand parameters were such that the integral converged.

In addition to INTEGRATE introduced in the example above, there also are FOURIER, LAPLACE, and IILT (the inverse Laplace transform) to compute those integral transforms. The simple test I used with Maple—attempting to integrate symbolically the Bessel function \( J_1 \)—also was unsuccessful in Macsyma; however, integration over \((0, \infty)\) was successful.

Macsyma also can perform differentiation (ordinary and partial) on internal or user-defined functions using the command DIFF. To compute the third derivative of some univariate function \( f \), say \( f(x) = e^{-x^2/2} \sin(px) \), the function would first have to be defined (using the := assignment), then DIFF (f(x), x, 3) would provide the desired result. As an aside, derivatives appearing in differential equations require the “noun form” of this operator, 'DIFF.

Macsyma provides the function LIMIT to evaluate univariate limits. For example, the user would enter LIMIT (f(x), x, 0, PLUS) to request the evaluation of \( \lim_{x \to 0^+} f(x) \). As in the case of Maple, this was not so impressive, though to its credit it did seem to ferret out easy cases (e.g., the limit not existing for certain free parameters in the expression) rather rapidly due to the interactive nature of the software.

2.5 Series Operations. Macsyma provides functions to obtain series expansions of functions and to manipulate series. A series here means, for the most part, a Taylor or Laurent series. Expansion of a function \( f \) about \( x = 0 \) to thirteenth order is made by a call of the form TAYLOR (f(x), x, 0, 13). There also are functions SUM, Powseries, and DefTaylor that are useful for setting up series. Series in descending powers are computed using an option of the Taylor expansion function: TAYLOR (d(x), [x, 0, 13, ASYMPT]). SUM is used to produce finite or infinite symbolic sums in which the user specifies the general term of the sequence. Series may be subjected to the usual arithmetic operations. Padé approximants can be set up using PADE. Closed-form identification of series, sums, and products may be attempted using the CLOSEFORM function of the NUSUM package.

2.6 Solving Equations. Macsyma has several equation-solving functions:

SOLVE—General purpose exact-solution solver for systems of equations

NEWTON—Numerical solution of a system of equations over the real (or optionally, complex) field

TAYLOR—Taylor series representation of solutions (e.g., solving \( x^3 - ax + 1 = 0 \) for \( x \) as a series) function of a

ODE, ODELSINGYS—Solution of first and second-order ordinary differential equations, initial and boundary value problems

RUNGEKUTTA—Solution of a system of first-order ordinary differential equations, initial value problems

IEQN—Solution of first- and second-kind integral equations.

As in the case of Maple, the solvers can be painfully slow, and in some cases, one begins to rethink the necessity of a symbolic solution. On the other hand, I found the function TAYLOR was particularly handy and not too time consuming. One nice feature of the solver NEWTON is that the user can get a posteriori information on the number of iterations required to achieve the requested accuracy. NEWTON is called as NEWTON (equation, variable, initial guess). To find the first few terms of the series \((a)\) representing \( x \) in \( \sin x = (1 - a) \cos x \) near \( a = 0 \), one sets up the equation as \( (c426) eq : \sin(x) = (1 - a) \cos(x) \$ \) and then enters TAYLOR (eq, x, a, 0, [3]). This returns the first three terms of the series for \( x \) in terms of \( a \).

The ordinary differential equation solvers ODE, ODELSINGYS, etc., handle systems of differential equations and obtain general solutions; initial or boundary value problems are solved by providing this information in a call to ATVALUE.
Here is an example of how one might set up the system
\[ x'(t) = -x(t) + ay(t), \quad y'(t) = bx(t) - y(t) \]
subject to the initial conditions \( x(0) = 1, y(0) = 0 \):

\[
\begin{align*}
(c33) \ deq1 & : \text{'DIFF}(x(t), t) + x(t) = a \cdot y(t) \\
(c34) \ deq2 & : \text{'DIFF}(y(t), t) = b \cdot x(t) - y(t) \\
(c35) \ ATVALUE & (x(t), t = 0, 1) \\
(c36) \ ATVALUE & (y(t), t = 0, 0) \\
(c37) \ sol & : \text{ODELINSYS}([deq1, deq2], [x(t), y(t)])
\end{align*}
\]

Here, the variable \( \text{sol} \) is set to the solutions of the system, and subsequently can be used for further analysis. The user also can apply initial conditions or boundary conditions to general solutions found with ODE by using the functions IC1 (first-order, initial conditions), IC2 (second-order, initial conditions), and BC2 (second-order, boundary conditions).

The ordinary differential equation solvers can be described as outstanding. Just as in Maple, the call to run the solver for a particular equation was very convenient. I found Macsyma to be superior in its ability to find solutions. Maple was a bit disappointing in its dealing with linear nonhomogeneous ODEs, but Macsyma definitely was not.

The integral equation solver IEQN is part of the integral equation package INTEQ. This package can be used for constructing exact and approximate solutions. Exact solutions are more likely to be found when the kernel is separable and of finite rank. Approximate solution techniques include Taylor and Neumann series expansions, and collocation.

2.7 I/O. Macsyma allows the user to enter information via input files of information saved from a previous session. This saving is done by issuing a SAVE command prior to leaving a session, and this information can be reused by using a LOADFILE command in a later session to read the saved information. This procedure can be used to save an entire session, or just particular expressions and operations. Another way is simply to create an input file to be read by Macsyma; in the case of an input list of floating-point numbers, one would use READ_NUMERICAL_DATA.

Output from Macsyma can be in several forms. In addition to the monitor output, the user can request output to a file using:
- SAVE to retain expressions or the session,
- GENTRAN to convert expressions to C, FORTRAN, or RATFOR code,
- TEX to convert expressions to \( \TeX \).

Conversion of a Macsyma expression, \( r: \sqrt{x + y} \), to C, sending the result to the file \( \text{foo.c} \), looks like this, using GENTRAN:

\[
\begin{align*}
(c421) \ GENTRANLANG & : \text{'C} \\
(c422) \ GENTRAN & (r : \text{SQRT}(x + y), ["\text{foo.c}"])$
\end{align*}
\]

The first of these lines sets the target language and the second line performs the desired conversion.

I was unable to find out if Macsyma could be used via function calls by programs of another language, but I suspect that it can from codes in Lisp.

2.8 Numerical Precision. There are three kinds of floating-point numbers used in Macsyma: SFLOAT (single precision), DFLOAT (double precision), and BFLOAT ("Big floats"). BFLOATs are multiple-precision numbers, with precision set by the environmental variable BFPRECISION. For example:

\[
\begin{align*}
(c1) \ BFPRECISION & : 250 \\
(c2) \ BFLOAT & (\text{EXP}(%PI))
\end{align*}
\]

will cause the first 250 significant digits of \( e^\pi \) to be written to the monitor. In some cases, specifying a floating-point number in a call will cause the corresponding accuracy to be retained in the result. In NEWTON, setting the initial estimate to be a BFLOAT (e.g., \( 3.141592653589793238462643383279502884197169399375105820974944592307816406286 $\)), will cause the computed root to have (hopefully!) the current BFLOAT accuracy.

2.9 Getting Help. Macsyma is a rather sprawling program with lots of commands to do things. As in anything else, you need to know something in order to do something, and in Macsyma it can be a little daunting to know how to take the first step. For example, I tried solving a system of linear ODEs with the ODE command, but was told by Macsyma that ODE does not handle systems; it also gave me no clue that ODELINSYS existed. At some point, you have to stop guessing at things and read the book or work from examples, but you need to do this a lot sooner with Macsyma than with Maple.

Once the user knows the command he or she wants, there are several types of on-line information: descriptions, examples, and demonstrations. For example, to get information on ATENSOR, the user would enter DESCRIBE(ATENSOR) for a description of what the function does, USAGE(ATENSOR) for the call syntax and its options, EXAMPLE(ATENSOR) for an example of how one would use the function and its output, and DEMO(ATENSOR) for several live examples of the function. The DEMOs are particularly nice since they not only show how to use the function, but also show the set-up operations (e.g., setting of environmental variables) that ought to precede the actual call. There also is APROPOS to help locate forgotten commands; APROPOS(BESS) causes the names of Bessel function-related topics to be returned for further look-up.

Depending upon the options purchased with Macsyma, help and technical support are available to the user via email and/or telephone. There is a Macsyma Newsletter that describes software enhancements and other technical information such as benchmark performance.

2.10 Programming Macsyma. Macsyma allows the user to write procedures (user-defined operations) using BLOCK to assemble built-in operations into a compound operation. Here is an example of a function I wrote to compute the trace of the product of a pair of 3 \( \times \) 3 matrices:

\[
\begin{align*}
(c115) \ f & (p, q) := \text{BLOCK}([[i, s, t], \ t : p \cdot q, \ s : 0, \ FOR \ i : 1 \ \text{STEP} \ 1 \ \text{THRU} \ 3 \ \text{DO} \ (s : s + t[i, i]), \ s])
\end{align*}
\]

The subsequent call \( f(A, B) \) will return the value of trace(\( AB \)). To see what is happening here, \( f \) is being set up as a compound statement that returns a value, so it really is like a subroutine. The arguments \( p \) and \( q \) are passed to it,
and in this case they are three-by-three matrices. As indicated, 
BLOCK is used to bind the collection of statements together, 
and its first entry, [i, s, t], is a set of local dummy 
variables to be used during the course of the block opera­
tions. The next several commands, all separated by commas, 
compute the matrix product (i = pq) and its trace. The value 
of the block is the last value taken, and this is s as shown 
in the final line. To get other values out, one can use the ::
assignment operator described in Sec. 2.2.

Procedures may use programming structures such as 
FOR-THRU, FOR-WHILE, and FOR-UNLESS for loops, and 
IF-THEN-ELSE for conditionals.

2.11 Further Information. Macsyma is available from 
Macsyma, Inc. For further information, contact Macsyma via 
email info-macsyma@macsyma.com (Internet) or telephone 
(800) 622-7962. The company’s address is:

Macsyma, Inc. 
20 Academy Street 
Arlington, MA 02174, USA

3. Comments on Maple and Macsyma

One problem with mathematical software of this kind is that it 
can fool the uninitiated into thinking the impossible can 
be done—a colleague requested a horrible integration to be 
performed, and then was disappointed that no closed-form was 
found, thinking this was a limitation of the software. The same 
consideration holds for the ODE solvers. Don’t throw away 
your tables of integrals or ODE solutions, as most of them 
can’t be handled by this kind of software. Integral calculation 
and ODE solutions are sort of unique beasts for symbolic 
manipulation software—they represent a rather sophisticated 
“table look-up”. Most other aspects of the software represent 
mathematical tools for creating, manipulating, and modifying 
expressions.

Here, I think, is the right perspective: if you can perform 
the desired process or manipulation (given enough patience and time), or know how it’s done, then the software likely will 
be able to also. If you can’t, then it’s likely it can’t either. For 
example, it is straightforward to invert exactly the 200 × 200 
Hilbert matrix by hand; the difficulty of course is that I 
couldn’t do it without messing up something somewhere, 
and moreover, it would take too long. This is a good candidate for 
Maple or Macsyma.

This leads to the next point: despite the fact that these soft­
ware packages are rich in mathematical tools, it nonetheless is 
the case that these might not be the right tools. For example, 
numerical solution of a system of ODEs probably is better 
dealt with via dedicated software than general purpose soft­
ware such as Maple or Macsyma. This was one of the reasons 
for down-playing the role of graphics in this review—most of 
the visualization I have required in my work is better done by 
other software.

As a final note, it ought to be pointed out that the software 
is not perfect; e.g., Maple obtained least-square solutions to 
the linear system \( y = Ax \) by solving the normal equations 
\( A^T y = A^T Ax \) for \( x \), even in the complex case in which 
\( A^H y = A^H Ax \) ought to have been used. This error is being 
corrected. Both Maple and Macsyma suffer from difficulties 
with multiple-valued functions in the complex plane—branch 
cut problems. For example, both Maple and Macsyma had trouble with the integral \( \int_0^\pi f(\xi)d\xi \) where

\[
f(\xi) = \frac{1}{1 + \sin^2\xi}
\]

which looks innocent enough. In fact, the problem lies in the 
manner in which the evaluation is done. In Macsyma,

\[
(c1) \text{INTEGRATE}(f(t), t, 0, \%PI);
\]
gives \( \pi/\sqrt{2} \), which is the right answer, whereas the sequence

\[
(c1) \ g : \text{INTEGRATE}(f(t), t, 0, x)
\]
\[
(c2) \ \text{BFLOAT}((\text{SUBST}(\%PI, x, g)));
\]
gives zero, which is a wrong answer. The reason is that the 
indefinite integral is retained symbolically in the intermediate 
result as

\[
g(x) = \arctan(\sqrt{2}\tan x)/\sqrt{2}
\]

which really is applicable only for \( |x| < \pi/2 \). My comment:
don’t use symbolic manipulation software blindly—tread 
lightly and keep your wits about you.

Both Maple and Macsyma are very fine products, very 
rich in operations and abilities, yet different. Maple seemed 
to me easy to learn and easy to use, and rather friendly. 
Macsyma was sprawling, rather difficult for a beginner, but 
very powerful for the experienced user. Each has a different 
feel and I have tried to indicate this in these reports. For 
further information, contact the vendors; I found both to be 
very helpful and responsive.

The statements and opinions expressed herein are those 
of the author and do not necessarily reflect those of Rockwell 
International.

Spreadsheets and Mathematics

Reviewed by Mario Vassallo*

Spreadsheets and Mathematics is a very interesting book 
written by Jack D. Murphy and Roger E. Davis for Davis/Murphy 
Publishing Company. The book is accompanied by a student’s 
disk storing spreadsheet files for use with some of the exercises 
and projects at the end of each chapter. An instructor’s disk with files for classroom use is also available. It can be 
used with either Lotus 1-2-3 or Quattro. Any DOS-based 
computer system that runs one of these spreadsheet programs 
may be used provided that it is equipped with a hard drive or 
two floppy diskdrives.

Spreadsheets and Mathematics is probably the first text­
book that uses mathematics as a vehicle for developing 
spreadsheet skills. It is intended for students who have the

*Mario Vassallo is an Assistant Professor of Mathematics and Computer 
Science at the State University of New York College at Fredonia, NY 14063. His 
e-mail address is: vassallo@mary.cs.fredonia.edu.
required background to take college algebra. The topics dis­
cussed in the book can make a good syllabus for a liberal arts oriented introductory course in mathematics and micro­
computers. The book can also be used by students with some background in spreadsheets who wish to learn more about macro programming.

The book covers various basic DOS commands and all the Lotus 1-2-3 commands. However, the emphasis is on template design and macro programming. Concepts such as branching, counters, loops, and subroutines are discussed in detail. The book also provides a number of applications of mathematical topics such as equations, functions, graphs, statistics, and fractals.

I worked through all of the computer exercises in the book. In one of these exercises, I had to construct a template to evaluate a quadratic equation by using subroutines and moving prepared screens to the home screen. The following is essentially the macro program given in the book to solve the problem (I added my own comments to make the program more readable to the general reader):

```
\0
\Q
START

MODULES

MAINLOOP
QUIT

SUBROUTINES

DATAENTRY
CALC
POSITIVE
NEGATIVE
ZERO

NOTICES OF THE AMERICAN MATHEMATICAL SOCIETY
```
I used the program to solve three quadratic equations which have different kinds of solutions. On my first attempt, I used \(2x^2 + 7x + 3 = 0\). The following are the results obtained as they appeared on the screen:

```plaintext
* ******************************************************
* ROOTS OF THE QUADRATIC EQUATION
* AX^2 + BX + C = 0
* Type {Alt}Q to start execution
* A =  2
* B =  7
* C =  3
* ROOTS: X1 =  -0.5  
*        X2 =  -3
* DISCRIMINANT =  25
* ******************************************************
```

The results for \(16x^2 + 40x + 25 = 0\) were displayed as follows:

```plaintext
* ******************************************************
* ROOTS OF THE QUADRATIC EQUATION
* AX^2 + BX + C = 0
* Type {Alt}Q to start execution
* A =  16
* B =  40
* C =  25
* ROOT:  X =  -1.25
* DISCRIMINANT =  0
* ******************************************************
```

My third equation was \(2x^2 - x + 4 = 0\). These are the results obtained:

```plaintext
* ******************************************************
* ROOTS OF THE QUADRATIC EQUATION
* AX^2 + BX + C = 0
* Type {Alt}Q to start execution
* A =  2
* B = -1
* C =  4
* NO REAL ROOTS
* DISCRIMINANT = -31
* ******************************************************
```

Spreadsheets and Mathematics is a very well organized book. Most of the numerous computer exercises are very well presented and interesting to do. The book has the necessary ingredients to be a useful resource both for the instructor as well as the student.

**MAX**

Reviewed by Gustaf Gripenberg*

MAX, the MAtriX Algebra Calculator, written by C. H. Jepsen and E. A. Herman, is a software package to be used in teaching and learning linear algebra. The manual for the program is contained in an appendix of the accompanying book, *Linear Algebra Problems for Computer Solutions*, by the same authors. In fact, there is not much point in trying to use one of these without the other, as they are so closely related. Although the book contains definitions and brief explanations of the central concepts, it is not intended to be an introductory linear algebra textbook.

The system requirements are an IBM-PC or compatible with at least 256 K of RAM and MS-DOS 2.0 or higher, easy to come by today. A consequence is, of course, that although the user interface in the program is decent, including, among other things, the online help function, it is definitely not spectacular. The nicest feature of the interface is perhaps the possibility to edit matrices easily. Unfortunately, some of the syntax used in the program differs from other symbolic and numerical software packages, but one gets used to this. It would be unfair to criticize the software for not being

---

*Gustaf Gripenberg is a docent in the Department of Mathematics at the University of Helsinki. He can be reached by e-mail at Gustaf.Gripenberg@Helsinki.Fi*
something it is not supposed to be, namely a general purpose linear algebra program one wants to use when one encounters some "real" problem.

The 179 matrices used in the examples and the exercises in the book are in so-called "group storage" (in files on the disk) and can be read into the workspace. One has only to give the command get 4 in order to get the matrix number 4 loaded into the workspace. With this command, matrix 4 is stored in \( M_4 \). Giving the command get 4 a stores it in \( A \). One can also give just the command get, in which case one is prompted for the number and the name, or can write out the command in full (or anything in between) as get matrix 4 and store it in \( A \). If one then wants to calculate \( AA \) and store the result in \( B \) one writes mul a a b or com a*a b. It is also possible to use so-called script files that can be either "demonstrated" (in which case one has to press the RETURN button before execution of each command) or "executed" automatically.

Notable features of the book and the program are the emphasis on ranks and the minor role played by determinants. For example, if one wants to calculate the inverse of a matrix, one is asked its rank, unless it has already been determined. If one wants the program to calculate the rank, one is presented with the \( R \) factor in a QR factorization that has the same rank as the original matrix, and from this information one has to decide the rank. The determinant and the inverse of the condition number are given to aid in this decision. The user is thus all the time reminded that numerical inaccuracies are present and that judgments have to be made, or as the authors state, "MAX is designed to save you from tedious computations, not to save you from making judgments".

Students using MAX should perhaps be warned that the judgments also depend on the precision built into the program and, unfortunately, one cannot change the number of digits used in the calculations in order to see how it affects the results. Hence, there is a danger that the user could be lead to believe that a number of the order \( 10^{-7} \) is always 0, plus or minus some roundoff errors. In an appendix, the authors give a brief but well-written presentation of the numerical algorithms, based on the LINPACK and EISPACK packages, used in the program.

A lot of the exercises in the book are fairly routine, as they must be, but there are many very nice applications from several applied fields that should convince most students that linear algebra is powerful and useful. These examples and exercises would make the book a valuable teaching tool even without the program. But if the program is used, the teacher must when assigning problems (as the authors note), occasionally require the students to derive the matrices in group storage, because otherwise it may become "too easy" to formulate the problem in matrix terms. Moreover, one should note that the authors define a stochastic matrix to be a matrix with nonnegative elements so that the column and not row sums are 1, so that one can multiply these matrices from the right with probability vectors.

The software and the accompanying book is available from
Brooks/Cole Publishing Company
511 Forest Lodge Rd
Pacific Grove CA 93950
408-373-0728

---

**AMERICAN MATHEMATICAL SOCIETY TRANSLATIONS—SERIES 2**

**Wave Propagation. Scattering Theory**

M. Sh. Birman, Editor

*Volume 157*

The papers in this collection were written primarily by members of the St. Petersburg seminar in mathematical physics. The seminar, now run by O. A. Ladyzhenskaya, was initiated in 1947 by V. I. Smirnov, to whose memory this volume is dedicated. The papers in the collection are devoted mainly to wave propagation processes, scattering theory, integrability of nonlinear equations, and related problems of spectral theory of differential and integral operators. The book is of interest to mathematicians working in mathematical physics and differential equations, as well as to physicists studying various wave propagation processes.

1991 Mathematics Subject Classification: 81, 35; 41
ISBN 0-8218-7507-8, 256 pages (hardcover), December 1993
Individual member $63. List price $105, Institutional member $84
To order, please specify TRANS2/157NA

All prices subject to change. Free shipment by surface; for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 6248, Providence, RI 02904-6248, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
The Enhanced Notices of the AMS

Hugo Rossi,
University of Utah

Hugo Rossi will serve as Editor of the Notices beginning in January 1995, when the new format and new organizational structure are in place. He welcomes comments from the community. His e-mail addresses are rossi@math.utexas.edu until June 5, 1994, and rossi@math.utah.edu thereafter.

The members of the Editorial Board will be:
Robert Fossum, University of Illinois at Urbana-Champaign
Susan Friedlander, University of Illinois at Chicago
Steven Krantz, Washington University
Susan Landau, University of Massachusetts, Amherst
Andy Magid, University of Oklahoma
Hugo Rossi, University of Utah
Mary Beth Ruskai, University of Lowell

In January 1995, the first issue of a new Notices of the American Mathematical Society will appear. This new Notices will contain the kinds of information at present associated with the Notices and will continue to develop the kind of features and articles which have been initiated during the past decade and which have been well received. The significant changes in the Notices will follow from a new vision of the journal's purpose. At present the Notices is conceived as the journal of record of the Society, containing information about the discipline of mathematics, activities of the Society and other organizations concerned with mathematics, as well as features and articles considered to be of general interest to the membership. The new Notices is to be, primarily, the Society's publication which communicates, in language that is accessible to all in the mathematical community, a broad overview of contemporary mathematics: current developments in research, trends in subject matter, and directions of the profession. The Notices will continue to be the journal of record of the Society.

Background
At its spring meeting in 1992, the Executive Committee of the AMS Council created a special task force, called the Committee to Review Member Publications (CRMP), to study issues which had arisen over the past five or so years concerning those AMS publications which are directed primarily to the members of the Society, and to make recommendations which address these issues.

The member publications of the AMS differ from its other publications in that they are at least partially supported by dues, meetings registration fees, or other such payments. This technicality brings with it the implication that, at least in part, these journals are targeting audiences with specific interests, the presumption being that most of the time this includes most of the membership. This sets member publications apart from the research journals in purpose, in content, and in the method of generating material. The CRMP found it necessary to articulate these purposes and to correspondingly identify the journals under review in order to evaluate their effectiveness. They found that three major objectives of these publications are to communicate to the membership on:

- the current state of the discipline and the directions in which it is advancing;
- mathematical activities and programs, especially (and in detail) those of the AMS; and
- the status of the profession.

Overwhelmingly, mathematicians join the AMS to have access to this information in the above order of priority. Beyond this, the level of interest and depth of involvement are very highly varied, so that the membership in no way presents a single target audience. The CRMP set goals for recommendations which paralleled these purposes, namely:

- To present contemporary mathematics in a comprehensive way which exhibits both the content and the context of new advancements and in a flexible and highly varied way which reflects the heterogeneity of the membership
- To provide members with timely, meaningful information on meetings, conferences, and other AMS activities
- To provide news and commentary on the profession, its people, and their activities

The Notices and the Bulletin
The CRMP's recommendations follow from the above purposes and as such were especially focused on the Notices and the Bulletin. The Council of the AMS, at its meeting in summer 1993, approved the CRMP report and by doing so
adopted the CRMP recommendations. The following excerpt from the committee’s final report deals with the objectives of the enhanced Notices:

The principal mission of the AMS is the furtherance of mathematical research through its programs and publications. It does so by publishing a number of research journals, along with the Bulletin, all of which are primarily aimed at research mathematicians. On the other hand, the Society has a diverse membership including many who, while not actively engaged in mathematical research, are intensely interested in learning about new developments and ideas. The goal of the enhanced Notices is to serve all mathematicians by providing a lively and informative magazine which contains news about mathematics and mathematicians as well as information about the Society and the profession... [The enhanced Notices] would communicate information on the discipline, the profession, and the Society and its activities; be a privilege of membership in the AMS; and serve as the journal of record of the Society.

The preface to the recommendations regarding the Bulletin reiterated the Society’s commitment to it:

A powerful way of inspiring our community to provide more good expository writing is to set high standards and provide examples—mathematical and literary—in respected journals. The current Bulletin is such a journal, reporting mathematics to a sophisticated audience. It plays an irreplaceable role in maintaining the identity and cohesiveness of the AMS, providing the unique sample of mathematical research to which the entire membership is exposed.

Because the enhanced Notices and the Bulletin are both concerned with current mathematical activity, significant overlap in coverage is likely. However, the purposes of the communication will differ. Being a leading international research journal, the Bulletin stresses content and precision: it is a journal from which researchers can continue their work. On the other hand, the mathematics in the Notices will stress context over content and brevity over completeness; the intent shall clearly be to communicate to a significant fraction of the mathematical community “what is going on” in new breakthroughs, how they relate to the existing body of knowledge, and how they generate new directions for future research.

We are talking here of emphasis and not implying exclusivity. Many Bulletin articles have been outstanding pieces of exposition in the broadest sense, appealing to large segments of the readership. We fully expect this to continue and enlarge. Similarly, not every article in the Notices will be directed to the entire AMS membership; indeed it is to be expected that very few will accomplish that, given the great heterogeneity of the membership. The hope is that in the aggregate everyone’s interest is touched and everyone gets some sense of the nature of current mathematical activity.

The new Notices will continue to develop its communications on the profession: employment issues, funding issues, applications of mathematics, mathematics education, and academic issues as they relate to our science. And, of course, the Notices will continue to report fully on Society activities, including programs of meetings.

It is anticipated that the bulk of articles and features in the Notices will be written by mathematicians close to the information being communicated. The Editorial Board will be committed to aggressively generating and soliciting articles by mathematicians on the discipline and the profession.

It is a fact of our profession, and probably unique to mathematics, that writing about our discipline does not come naturally. In our discourse we can be vague and intuitive, presenting reasons why we thought something to be true, illustrating proofs by example, and elaborating on those dead ends we ran into before we struck upon the proof. But little of that goes into our writing, nor is there much discussion of the context of our mathematics. It is the nature of our profession to be deeply committed to the objectivity of the content, with little tolerance for commentary.

This attitude is, of course, the source of the strength and the durability of our discipline. But, a corollary result is that survey articles about contemporary mathematics are hard to come by. We must congratulate the Bulletin editors for doing as well as they do: the best of the Bulletin articles are very good indeed. Because of this effort, there already exists a core of mathematicians who understand this kind of writing, its importance, and how to do it well. We plan to build on these existing talents, developing, slowly of necessity, an appreciation of and participation in scholarship, broadly defined, which pervades the entire community. To get started, we envision a Scientific Advisory Board, comprising leading mathematicians covering the breadth of the subject, who can direct us to the most significant contemporary research and help us identify the people to report on it. In addition, we shall have a board of Contributing Editors, consisting of mathematicians who can write for the Notices, or who, through their contacts, can generate such writing.

Finally, we want to stress that we strongly encourage direct contributions from the membership. The criteria for publication are 1) significance to the discipline and/or profession, 2) interest to the membership, and 3) clarity of exposition. Articles may be about 1) mathematics, 2) applications of mathematics, 3) educational issues, 4) mathematicians, 5) the profession, or other topics meeting the criteria above. An article sent to the Notices Editorial Board for consideration will be forwarded to the appropriate Associate Editor for a decision. In most cases, articles will be sent out for refereeing; all articles with mathematical content will be refereed. The Notices so envisioned must be timely; thus we anticipate quick decisions (six weeks) and quick publication of all accepted material. This may entail bumping, or pushing forward, articles in order to make room for reports on fast-breaking events. We intend to make the Notices a reader-oriented, rather than author-oriented, publication.
**AMS-fSU Aid Fund Makes Final Awards**

In November, the AMS-fSU Aid Fund made awards to fifty-eight more individuals, bringing the total supported to 367. These small, three-year grants are designed to assist mathematicians during the economic crises plaguing the nations of the former Soviet Union (fSU). In support of this effort, the AMS has received contributions from many generous individuals. In addition, the Society has received grants from the Alfred P. Sloan Foundation, the Soros Humanitarian Foundation, the International Science Foundation, and the National Science Foundation. Overall, the AMS has raised nearly $650,000 in aid. In addition to grants to individual mathematicians, the AMS fSU-Aid Fund also assists mathematical institutions and libraries in the fSU.

**List of Grantees**

The September 1993 issue of the Notices carried a list of approximately 260 mathematicians who had received grants through the AMS-fSU Aid Fund. Listed below are the remaining approximately 60 individuals who were granted awards since then.

- Alexander Aref’ev
- I.K. Babenko
- Fedor Bogomolov
- Il'ya Vladimirovich Brailovskii
- Vadim Chernov
- Sergei Yurievich Dobrokhotov
- Dmitrii Il'ich Dolgopyat
- Oleg M. Fomenko
- Andrei Gulchak
- Sergei Ivanov
- Stasys Jukna
- Vyacheslav Kalnitski
- Georgi Nikolaevich Khimshiashvili
- Boris Khuruzhenko
- Eugeny Yakovlevich Khruslov
- A.N. Kirillov
- Alexander Kovalenkov
- Rimvydas Krasauskas
- Boris Kunyavskii
- Aleksandr Gennadievich Kuznetsov
- Victor Lapitski
- Vladimir Leonov
- Boris V. Lidskii
- Mark V. Losik
- Gennadii Semenovich Makanin
- Larisa L. Maksimova
- Andrei Yakovlevich Mal’tsev
- Vladimir Alexandrovich Marchenko
- Vladimir Sergeevich Matveev
- Anvar Mavlutov
- Alexander Mironov
- Yuri Nikonorov
- Olga Evgen’evna Orel
- Elena Pantelei
- Anna Evgen’evna Pentus
- Mikhail Georgievich Peretyat’kin
- Vladimir S. Pjasetski
- Sergei Polshkov
- Eugene Ponikarov
- Vladimir A. Ponomarev
- Vladimir Potapov
- Aleksandr Valentinovich Pukhlikov
- Nikolai Pultsin
- Igor Pushkarev
- Dmitri Ruminin
- A.B. Shabat
- Irina D. Suprunenko
- Nikolai Nikolaevich Tarkhanov
- Evgenii Arkadievich Telev
- A. S. Tihomirov
- Dmitrii Andreevich Timashev
- Saken Myrzataevich Tuleshev
- Victor Anatolievich Ufnarovski
- Oleg Vasil’evich Verbitskii
- Lev Vertgeim
- Oleg Vinogradov
- Vadim Alexandrovich Vologodskii
News and Announcements

NSF Young Investigator Awards Announced

The National Science Foundation (NSF) Young Investigators program provides support for the nation's most promising young scientists and engineers. The awards provide a base grant of $25,000, and the NSF will provide additional matching funds of up to $37,500, for a total of up to $100,000 per year.

In 1993 five mathematical scientists received NSF Young Investigator awards. Their names, institutional affiliations, and research areas are listed below.

TOMASZ S. MROWKA, California Institute of Technology, differential topology of four-manifolds; ZHIHONG XIA, Georgia Institute of Technology, dynamical systems and Hamiltonian mechanics; JONATHAN L. BLOCK, University of Pennsylvania, elliptic operators on noncompact manifolds; LARRY A. WASSERMAN, Carnegie-Mellon University, Bayesian statistical inference; and NICOLAOS KAPOULEAS, Brown University, differential geometry and general relativity.

COMAP Report: A New Start for Collegiate Mathematics

“For mathematics, this is the best of times and the worst of times. At the research frontiers, progress is satisfying and often breathtaking. However, at the undergraduate level, we seem unable to convey the excitement, the power, and the integrity of our subject.”

So begins The Foundation: A New Start for Collegiate Mathematics, a report recently issued by the Consortium for Mathematics and its Applications (COMAP). In fact, it is not exactly a report but rather a draft of the first chapter of a collegiate mathematics textbook to be called Principles and Practice of Mathematics and to be published in 1996. This first chapter, entitled “Change,” was written by Frank Giordano and Chris Arney of the United States Military Academy at West Point. COMAP has made available this chapter in order to get feedback and suggestions for improvement. In addition, they are interested in volunteers to field-test this material beginning in September 1994. The other eight chapters are under revision and will also be available for field testing in September.

The philosophy of the planned textbook is set forth in the preface, written by the directors of the project, Walter Meyer of Adelphi University and Solomon Garfunkel, executive director of COMAP. One of its goals is to broaden first-year mathematics so that students get a taste of subjects other than calculus. “Currently, if a student drops out of serious study of mathematics after a year of calculus, he or she has no idea of how mathematics can deal with probabilistic matters; has no idea of how mathematics provides a conceptual basis for computer science, has only a limited concept of abstraction, and, perhaps most damming, has seen little or no mathematics more modern than the eighteenth century.” They note that even mathematics majors can graduate with little exposure to some topics in mathematics often taught to students in other areas—topics like graph theory, linear programming, and the study of algorithms.

“We believe that a course based on breadth, immediate applicability, and modernity could have appeal beyond mathematics majors,” the preface continues. “We are accustomed to offering ‘client’ departments ‘service courses’ that are little slices of mathematics designed to be useful for special purposes at the current moment. No other subject sells itself in slices. When we recommend that our mathematics majors take a course in history, for example, we do not first lobby the history department to provide an offering which focuses on science and technology and avoids matters of politics.”

The first chapter they offer attempts to put this philosophy into practice. “Change” looks at various manifestations of change in familiar situations and then brings in the mathematics appropriate to analyzing them. The application areas range from forensics (there is a section entitled “How long have these bodies been dead?”) to global warming. But this does not mean watering-down: for example, there is a bona fide definition of a limit value, complete with epsilons. At the other end of the spectrum, the exercises are not just “plug and chug” renditions of examples given in the text. One exercise has students place a cold can of soda in a room, measure its temperature at different times, and formulate a model to predict the change in temperature.

“Change” brings in elements of popular culture without making a big deal of it: a section on chaos segues easily from a reference to the movie “Jurassic Park” to a discussion of difference equations. One wonders if some of the more whimsical parts of the book will survive editing; for example, there is an amusing stream-of-consciousness paragraph that manages to move from “Jurassic Park”
to Isaac Newton and even to toss in a joke about fig cookies. It might be argued that the paragraph is unnecessary, but it certainly persuades the reader that the chapter was written by people, not by formula.

For more information about or copies of The Foundation: A New Start for Collegiate Mathematics, contact: COMAP, Inc., Suite 210, 57 Bedford Street, Lexington, MA 02173; telephone 617-862-7878.

News from the Mathematical Sciences Institute
Cornell University
University of Puerto Rico,
and SUNY Stony Brook

Moss Sweedler of Cornell University will host the Algorithmic Number Theory Symposium (ANTS) on May 6–9, 1994, at Cornell University. The conference will deal with algorithmic aspects of number theory in the broad sense. For example, algorithmic aspects of the following topics would be among those considered appropriate for the conference: 1) elementary number theory (e.g., primality testing, factoring, polynomials); 2) algebraic geometry (e.g., elliptic curves, abelian varieties); 3) geometry of numbers (e.g., lattice reduction); 4) analytic number theory (e.g., zeta-functions, distribution of primes); 5) algebraic number theory (e.g., cyclotomic fields, class numbers); 6) connections with logic (e.g., complexity of first-order theories, reductions); and 7) applications (e.g., coding theory, cryptography, program-checking). Carl Pomerance and Leonard Adleman are invited speakers.

For more information please contact Valerie Kaine at vdk1@cornell.edu, reference ANTS.

MSI Director A. Nerode is program chair for LFCS‘94: Logic at St. Petersburg, a symposium on logical foundations of computer science to be held July 14–18, 1994, in St. Petersburg, Russia. For more information contact V. Marek at marek@ms.uky.edu.

The Mathematical Sciences Institute (MSI) at Cornell University will sponsor a workshop, “Women in Probability”, to be held at Cornell on October 16–18, 1994. Molly Hahn and Ruth Williams are the organizers of this workshop. The workshop will begin Sunday morning and end Tuesday at noon.

The workshop will feature talks given by Carol Bezuidenhout (U. of Rochester), Jennifer Chayes (UCLA), Alison Etheridge (U. of Edinburgh), Raya Feldman (UCSB), Antonia Folds (CUNY, Staten Island), Cindy Greenwood (UBC), Molly Hahn (Tufts U.), Claudia Neuhauser (U. of Wisconsin), Vien Nguyen (MIT), Magda Peligrid (U. of Cincinnati), Marta Sanz (U. of Barcelona), and Ruth Williams (UCSD). In addition, anyone attending the workshop may present a contributed talk.

Recent Ph.D.s and finishing graduate students are especially encouraged to prepare a short presentation for this part of the workshop. Other activities include lunchtime discussions and one or two panels on issues of interest to all participants (the exact subjects of the panel discussions will be announced later).

On Sunday evening there will be a dinner for workshop participants at which Alexandra Bellow has agreed to be the guest speaker.

It is hoped that as many women in probability as possible will attend. Of course, the conference will also be open to others who wish to attend. There is funding from MSI to partially support women probabilists, especially young researchers.

Those wishing to attend the Cornell workshop should send a request for registration materials to dl@dl@cornell.edu or Diana Drake, Mathematical Sciences Institute, 409 College Avenue, Ithaca, New York 14850, phone: 607-255-8005. Information on how to register, how to submit an abstract for a short presentation, and how to apply for a travel grant will be sent by return e-mail or return regular mail, as appropriate. Other questions may be directed to the organizers at womprob@math.ucsd.edu.

Staff at the NSF’s Division of Mathematical Sciences

Last year, the National Science Foundation (NSF) moved to new quarters in Arlington, Virginia. Listed below is the staff for the Division of Mathematical Sciences, together with their e-mail addresses and new telephone numbers. E-mail addresses on Bitnet are the same as on the Internet (given below), except that the Bitnet addresses use the extension @nsf instead of @nsf.gov.

Algebra and Number Theory
Ann K. Boyle (Program Director) 703-306-1875
aboyle@nsf.gov
Daniel Madden (Program Director) dmadden@nsf.gov 703-306-1876
Gary Cornell (Adjunct Program Director) gcornell@nsf.gov 703-306-1979

Applied Mathematics
Daljit Ahluwalia (Program Director) dahluwal@nsf.gov 703-306-1877
Deborah F. Lockhart (Program Director) dlockhar@nsf.gov 703-306-1882
James Alexander (Adjunct Program Director) jalexand@nsf.gov 703-306-1977
John Lagnese (Adjunct Program Director) jlagnese@nsf.gov 703-306-1977

Classical Analysis
John V. Ryff (Program Director) 703-306-1879
jryff@nsf.gov

Computational Mathematics and Mathematical Biology
Michael Steuerwalt (Program Director) mstevew@nsf.gov 703-306-1878

Geometric Analysis
James Glazebrook (Program Director) 703-306-1881
jglazebro@nsf.gov

Statistics and Probability
Keith Crank (Program Director) 703-306-1885
kcrank@nsf.gov

Modern Analysis
Kevin Clancey (Program Director) 703-306-1887
kclancey@nsf.gov
Joe Jenkins (Adjunct Program Director) jjenkins@nsf.gov 703-306-1978

Probability
Molly Hahn and Ruth Williams

News and Announcements
Project NExT: New Experiences in Teaching

Project NExT (New Experiences in Teaching) is a program for new or recent Ph.D.s in the mathematical sciences who are interested in improving the teaching and learning of undergraduate mathematics. Faculty who are just beginning or just completing their first year of full-time teaching at the college/university level are invited to apply to become Project NExT Fellows. The project is sponsored by the Mathematical Association of America.

The first event for fellows will be a workshop, August 12-14, 1994, just prior to the summer MathFest in Minneapolis. At this workshop fellows will explore and discuss issues of special relevance to beginning faculty, including: perspectives on undergraduate mathematics education, alternatives to the lecture method, the role of technology in the classroom, calculus and precalculus reform, lessons from pedagogical research, and the faculty member as teacher and scholar.

Following the workshop, Project NExT Fellows will attend the MathFest (August 15-17, 1994), participating in all the opportunities of that meeting, and will choose among special short courses on precalculus and the pedagogical use of graphing calculators and computers. During the following year, fellows will participate in several activities: a network that links fellows with one another and with distinguished teachers of mathematics, the Joint Mathematics Meetings in San Francisco in January 1995, and a workshop at the MathFest at the University of Vermont in August 1995.

Sixty Project NExT Fellows will be selected for the 1994-1995 year. Funding for room and board at the workshop in Minneapolis and for the short courses at the 1994 MathFest will be provided by a grant from the Exxon Education Foundation. Institutions employing the Project NExT Fellows are expected to provide financial assistance. Limited funds are available to assist those institutions that are unable to afford full or partial support.

Application forms and a letter of support from the applicant’s department chair are due by May 10, 1994. Applications received after that date will be considered until all spaces are filled. Applicants will be notified by June 1, 1994, whether they have been accepted as Project NExT Fellows.

Send applications and other inquiries to: T. Christine Stevens, Department of Mathematics, Saint Louis University, 221 N. Grand Blvd., St. Louis, MO 63103; phone 314-658-2444; fax 314-658-3874; or e-mail stevensc@slu.slu.edu.

Erratum

The January 1994 issue of the Notices carried an announcement on page 30 of the recipients of awards from the Alexander von Humboldt Foundation. Because of incorrect information supplied to the Notices, the list of awardees contained two errors. First, Michael Fried of the University of California at Irvine should have appeared on the list of Humboldt Senior Scientist Awardees. Second, Jon Gordon Wolfson of Michigan State University should not have appeared on the list of Humboldt Post-doctoral Fellowship recipients, because, although awarded a fellowship, he did not accept it.

The March 1994 issue of the Notices carried an article entitled “Fighting for Tenure: The Jenny Harrison Case Opens Pandora’s Box of Issues about Tenure, Discrimination, and the Law”. The article incorrectly reproduced a quote from a report about the Harrison case prepared by the Privilege and Tenure Committee of the University of California at Berkeley. The quote, which appears on page 191, is the last sentence in the first paragraph under the heading “Charges of Discrimination”. The correct quote is: “We find it unfortunate that Dr. Harrison has concluded that anyone who does not believe that she warrants tenure is biased and that he or she could not have a legitimate reason for a negative view and position.”
Funding Information for the Mathematical Sciences

1995–1996 Fulbright Competition Opens

Fulbright grants are available for lecturing or advanced research in nearly 140 countries. Awards range from two months to a full academic year, and many assignments are flexible to the needs of the grantee.

The basic eligibility requirements are U.S. citizenship and a Ph.D. or comparable professional qualifications. For lecturing awards, university or college teaching experience is expected. Language skills are needed for some countries, but most lecturing assignments are in English.

August 1, 1994, is the deadline for research or lecturing grants, though other deadlines apply for special programs. For further information and application materials, contact: Council for International Exchange of Scholars, 3007 Tilden Street, NW, Suite 5M, Box GNEWS, Washington, DC 20008-3009; telephone 202-686-7877. Application requests only may be sent by e-mail to cies1@gwuvm.gwu.edu.

NAS Travel Grants Available

The Office for Central Europe and Eurasia of the National Academy of Sciences/National Research Council offers grants to individual American researchers to conduct research with colleagues from Central or Eastern Europe and the former Soviet Union.

Short-term Project Development Grants of $2,200 support American researchers who wish to host or visit colleagues for a two-week period in order to prepare a collaborative research proposal for submission to the National Science Foundation or other funding organizations. Long-Term Grants of $3,600-$12,100 support American researchers who wish to host or visit colleagues for familiarization with research for a period of one to six months. Significant publications jointly authored by program participants as a result of these long-term visits are strongly encouraged.

Applications must be postmarked by June 24, 1994 (for either short-term or long-term grants) or December 9, 1994 (for short-term grants only). For more information, write to: Office for Central Europe and Eurasia, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington, DC 20418; telephone 202-334-3680; fax 202-334-2614; e-mail ocee@nas.edu.

Deadlines at NSF

Two programs of the Division of Mathematical Sciences of the National Science Foundation (NSF) have deadlines that are fast approaching.

Proposals for Conferences, Workshops, and Special Years in the Mathematical Sciences are due May 1, 1994. For information, request publication number NSF 93-138.

Proposals for Collaborative Research in Geosciences, Geography, and Mathematical Sciences are due June 1, 1994. For information, request publication number NSF 92-127.

Program announcements may be obtained by contacting: Division of Mathematical Sciences, National Science Foundation, 4201 Wilson Boulevard, Room 1025, Arlington, Virginia 22230; telephone 703-306-1870.

Program announcements may also be requested by sending electronic mail to pubs@nsf.gov (Internet) or pubs@nsf.gov. Be sure to give your full mailing address, specify the publication number, and tell how many copies you need. Program announcements are also available through STIS, NSF’s online information service. For an informational flyer about STIS, send an e-mail message to stisfly@nsf.gov (Internet) or stisfly@nsf (Bitnet).
For Your Information

Reports from BMS

In 1993, the Board on Mathematical Sciences (BMS) of the National Academy of Sciences (NAS) issued three reports on areas of application of mathematics to important scientific and technological problems. The reports are part of an ongoing series highlighting areas on the interface between the mathematical sciences and other fields. In addition, the BMS has made available three articles describing organizations that work at the international level to further research and education in the mathematical sciences.

The heftiest of the three BMS reports is *Mathematical Research in Materials Science: Opportunities and Perspectives*, produced by a committee chaired by Avner Friedman of the Institute for Mathematics and its Applications at the University of Minnesota. The committee asked a large number of researchers to contribute short writeups describing the mathematical aspects of various areas in materials science. These writeups were incorporated into the descriptions presented in the report. The report has seven chapters, each surveying a particular scientific theme, with emphasis on the contributions that mathematics has made and where it could make further contributions. The report ends with a series of recommendations to academia, government, industry, and professional societies. Unlike the other two reports and the articles, which are available through BMS, *Mathematical Research in Materials Science* is distributed by National Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20418.

*Clinical Trials and Statistics* contains the proceedings of a symposium held in late 1992 at the NAS. Focusing on the increasing use of the statistical sciences in the design and evaluation of clinical trials, the symposium was organized by the BMS with the assistance of the Institute of Medicine. The papers presented describe some of the medical, statistical, ethical, and even political issues that arise in designing clinical trials. The difficulties and pitfalls of designing such experiments are many, particularly when they involve diseases such as AIDS. The contributors' affiliations were as diverse as the Dana-Farber Cancer Institute, the Food and Drug Administration, and the Burroughs-Wellcome Company.

*Transportation and the Mathematical Sciences: The Changing Interaction* also contains the proceedings of a symposium held in 1993 and organized jointly by BMS and the Transportation Research Board. The symposium focused on the increasing use of mathematics, statistics, and optimization in planning and operations for surface and air transportation. The presenters discussed both research and policy issues, concluding that increasing transportation capacity was not sufficient and that approaches using "intelligent systems" are of increasing importance. Like the report on statistical clinical trials, this report indicates some of the areas in which mathematics can make contributions to resolving important problems facing industry and the nation.

The BMS articles on international affairs focus on the International Mathematical Union (IMU) and the International Commission on Mathematics Instruction (ICMI), which help to foster interactions among mathematicians worldwide. IMU is a member organization of the International Council of Scientific Unions. The U.S. National Committee for Mathematics (USNCM) and the U.S. National Commission on Mathematics Instruction (USNCMI), which represent the U.S. to IMU and ICMI, respectively, have recently been the subject of much discussion in the mathematical sciences community because of changes in their structure and because of the increasing importance of international activities in the mathematical sciences. To provide background information, three articles have been written by John Lavery, director of BMS.

The first article, "The International Council of Scientific Unions and U.S. National Committees", is devoted to the history and structure of international organizations for the scientific enterprise overall. In a second article, "The International Mathematical Union and Its Commissions", international organizations in the mathematical sciences and in mathematics education, including IMU and ICMI, are described. The third article, "U.S. National Committees in the Mathematical Sciences", outlines the activities of USNCM and USNCMI.

The e-mail address of the Board on Mathematical Sciences is bms@nas. edu. The fax number is 202-334-1597; telephone 202-334-2421. The mailing address is: Board on Mathematical Sciences, National Research Council, NAS 315, 2101 Constitution Avenue, NW, Washington, DC 20418-0001.

Allyn Jackson
Polytechnic University, Brooklyn, New York
April 8–10, 1994
Preliminary Program

The eight hundred and ninety-second meeting of the American Mathematical Society (AMS) will be held at Polytechnic University, Brooklyn, New York, on Friday, Saturday, and Sunday, April 8–10, 1994.

Invited Addresses

David Bayer, Columbia University, The impact of computation on algebraic geometry.

Peter B. Kronheimer, Merton College, Embedded surfaces in 4-manifolds.

Debasis Mitra, AT&T Bell Labs, Some recent directions in the analysis of high speed communication networks.

Nicholai Reshetikhin, University of California, Berkeley, Quantum topology.

Special Sessions

Computational geometry, Boris Aronov, Polytechnic University.

Mathematical problems in molecular biology, Craig J. Benham, Mt. Sinai Medical Center.

Invariants of low dimensional manifolds, Joan S. Birman, Columbia University; Sylvain E. Cappell, NYU Courant Institute; and Edward Miller, Polytechnic University.

Geometric analysis, Jozef Dodziuk and Edgar A. Feldman, Graduate School and University Center, CUNY.

Combinatorial group theory and related topics, Benjamin Fine, Fairfield University; Anthony M. Gaglione, United States Naval Academy; and Kathryn Kuiken, Polytechnic University.

Teichmüller theory and dynamical systems, Frederick P. Gardiner and Yunping Jiang, Brooklyn College, CUNY.

Analytic number theory, Dorian Goldfeld, Columbia University.

Geometric convexity, Jacob E. Goodman, City College, CUNY, and Erwin Lutwak, Polytechnic University.

Topological methods; topological measure theory, Pao-sheng Hsu, University of Maine, Orono, and L. Naristi, St. Johns University.

Partial differential equations, Yanyan Li, Rutgers University.

Discrete geometry, Janos Pach, New York University, and William Steiger, Rutgers University.

Gauge theory and applications, Robert J. Sibner, Brooklyn College, CUNY.

Models in telecommunications, Alan A. Weiss, AT&T Bell Labs.

There will also be sessions for contributed ten-minute papers. The deadline for submission of abstracts for these sessions has expired. Unfortunately, late papers cannot be accommodated.

Accommodations

Rooms have been blocked in the following hotels. Participants should make their own arrangements with the hotel of their choice. The AMS is not responsible for rate changes or the quality of the accommodations offered by these hotels/motels. The deadline for reservations was March 17, 1994.

Barbizon Hotel: 140 East 63rd St., New York, NY 10021.
Telephone: 800-223-1020 or 212-838-5700 (within New York only). Single $90 and double $95 (with queen bed $110).

Pickwick Arms: 230 East 51st St., New York, NY 10022.
Telephone: 212-355-0300. Single $60 and double $80.

Council

The Council of the Society will meet on Saturday, April 9, 1994, at the Barbizon Hotel, located at 140 East 63rd Street at Lexington Avenue, New York, New York 10021.

Open Forum

The AMS Committee on the Profession (M. Salah Baouendi, chair) will host an open forum on issues related to the employment of mathematicians on Saturday, April 9, at 2:30 p.m. in the Auditorium. The main purpose of the forum is to foster dialog and seek input from the community of mathematical scientists on the role that the AMS can take in improving employment opportunities. Please refer to the February 1994 issue of the Notices for further information.

Other Events of Interest

Raoul Bott, Harvard University, will present the Magnus Lectures on Thursday, April 7, and Friday, April 8, at 4:00 p.m.

Registration

The meeting registration desk will be located in the lobby of the Law Building and will be open from noon to 4:00 p.m. on Friday, April 8; from 9:00 a.m. to noon on Saturday, April 9; and from noon to 1:00 p.m. on Sunday, April 10. The registration fees are $30 for members of the AMS; $45 for nonmembers; and $10 for emeritus members, students, or unemployed mathematicians. There will also be a special one-day registration fee of $20.
Meetings

Travel

American Airlines has been selected as the official airline for this meeting. The following benefits are available exclusively to mathematicians and their families attending the meeting: a savings of up to 10% off any published domestic fare (includes U.S., Canada, Bermuda, the Bahamas, Puerto Rico, and the U.S. Virgin Islands) subject to applicable fare restrictions. Seats are limited. Call 1-800-433-1790 between 8:00 a.m. and 11:00 p.m. EST to contact American directly or call any licensed travel agent. Instruct the ticket agent to refer to file #SO144CE in order to qualify for the applicable discount (10 tickets must be sold).

From Manhattan: By Subway—A, C, or F train to Jay St.-Borough Hall, or the 2, 3, 4, or 5 subway to Borough Hall (walk to Fulton and make a left onto Jay), or the R or M subways to Lawrence St.

By Car—Take the FDR Drive to the Brooklyn Bridge, make the first left after the bridge onto Tillary and a right onto Flatbush Ave. *From Flatbush Ave, go right onto Myrtle Street and take the second left onto Bridge Street. Public parking is available on the lower levels of the SIAC and Brooklyn Union Gas buildings for $10 per day.

From Queens or the Bronx: By Car—Take the Brooklyn-Queens Expressway to the Brooklyn Bridge or the Triborough, Whitestone, or Throgs Neck Bridge to the Brooklyn-Queens Expressway to Tillary Street. Public parking is available on the lower levels of the SIAC and Brooklyn Union Gas buildings for $10 per day.

From Staten Island: By Car—Take the Verrazano Narrows Bridge to the Brooklyn-Queens Expressway to the Tillary Street exit. Make a left turn onto Flatbush Ave. *See directions from Flatbush Ave.

From New Jersey: By Car—From the George Washington Bridge take the Harlem River Drive to the FDR Drive or the Holland Tunnel to the Brooklyn Bridge. (Continue as from Manhattan.)

From Brooklyn or Long Island: By Train—Take the Long Island Railroad to Flatbush Ave. Then take a taxi, bus #B67 to Metrotech on Jay Street, or the R or M subway to Lawrence Street. If walking from the LIRR station, go to the Fulton Mall and make a left turn, then a right onto Jay Street. By Car—Take the Brooklyn-Queens Expressway to the Tillary Street exit. Go left on to Flatbush Ave. *See directions from Flatbush Ave.

From Westchester: By Car—Take the Major Deegan or Cross Bronx Expressway to the FDR Drive to the Brooklyn Bridge or the Triborough, Whitestone, or Throgs Neck Bridge to the Brooklyn-Queens Expressway to Tillary Street, go left on to Flatbush Ave. *See directions from Flatbush Ave.

Weather

Weather in Brooklyn in April is variable. Participants are advised to check weather forecasts just prior to the meeting.
Presenters of Papers

Numbers following the names indicate the speakers' positions on the program.

• Invited Lecturer  • Special Session Speaker

*Browne, C. J., 99
*Bencsath, K. A., 168
*Avis, D., 3
*Dey, T. K., 55
*Curtis,  
*Crane,  
*Comfort,  
*Chen, Z.-h., 175
*Chan,  
*Cao, J., 18
*Bombieri, E., 125
*Bezdek, K., 34
*Beckenstein, E., 133
*Bencsath, K. A., 168
*Benham, C. J., 99
*Benjamini, I., 50
*Benjamini, I., 50
*Benjamin, I., 50
*Bezdek, A., 33
*Bezdek, K., 34
*Bisztriczky, T., 25
*Boardman, J. P., 136
*Bombieri, E., 125
*Bridson, M. R., 22
*Bronnimann, H., 4
*Bronsard, L., 152
*Browne, S., 209
*Bryan, J., 78
*Cabre, X., 68
*Cao, J., 18
*Capeyleas, V., 5
*de Carvalho, A., 259
*Cawley, E., 156
*Chao, C. S., 55
*Chang, W. I., 158
*Chamillo, S., 187
*Chazelle, B., 6
*Cheeger, J., 47
*Chen, Z.-h., 175
*Christiansen, T., 13
*Clarkson, K. L., 54
*Comfort, W. W., 239
*Connelly, R., 36
*Coxeter, H. S., 70
*Crane, L., 224
*Csima, J., 71
*Curtis, C. L., 223
*Danov, S., 193
*Dekster, B. V., 26
*Delman, C. I., 103
*Dey, T. K., 55
*Doherty, K. R., 84
*Dostoglou, S., 144
*Du, D.-Z., 57
*Duke, W., 126
*Earle, C. J., 162
*Eppstein, D., 91
*Epstein, C. L., 108
*Esken, A., 233
*Farach, M., 102
*de Faria, E., 53
*Farmer, D., 229
*Feest, P. M., 40
*Fejes-Tóth, G., 72
*Finkelnstein, E., 12
*Fisher, A. M., 163
*Fortune, S., 92
*Füredi, Z., 73
*Gallagher, P. X., 85
*Gardner, R. J., 27
*Gilman, R. H., 21
*Goldstein, R., 20
*Goodey, F., 28
*Greenberg, A., 252
*Guo, B., 153
*Gunopulos, D., 56
*Guo, G.-Y., 148
*Halperin, D., 153
*Harris, A., 52
*Hastings, H. M., 203
*Head, T., 221
*Henriksen, M., 240
*Hoffstein, J., 123
*Hsu, T., 169
*Hu, J., 155
*Hu, S., 157
*Hurtubise, J., 42
*Hwang, F., 94
*Ivanov, N. V., 111
*Ivaniec, H., 122
*Jaffe, A., 77
*Jeffrey, L., 146
*Jerison, D., 150
*Ji, L., 17
*Jiang, R., 64
*Jorgensen, J., 15
*Kaiser, M., 29
*Kalfagianni, E., 105
*Kedem, K., 95
*Keen, L., 164
*Khachiyan, L., 96
*Klain, D. A., 30
*Knight, J., 87
*Kobon, R. V., 56
*Kopperman, R., 185
*Kronheimer, P., 89
*Krste, S., 23
*Kuperberg, W., 137
*Lagarias, J. C., 245
*Lambropoulou, S., 104
*LeBrun, C., 181
*Lee, C., 139
*Li, Y., 189
*Lieman, D., 230
*Lin, F.-H., 67
*Lin, X.-S., 58
*Lockhart, J. M., 65
*Lockhart, P., 228
*Luo, F., 61
*Luo, W., 232
*Lutzak, E., 114
*Lysubich, M., 256
*Maehara, H., 140
*Maier, R. S., 255
*Malinovsky, J., 160
*Manning, G. S., 161
*Marbukh, V., 210
*Masur, H., 52
*McLaughlin, D. A., 173
*McMullen, P., 246
*Medvedev, Y., 119
*Miller, D., 177
*Milnor, J., 51
*Minsky, Y. N., 257
*Mitra, D., 211
*Mittag, B., 183
*Montejano, L., 74
*Morelli, R., 141
*Morgan, J. W., 37
*Mortensen, K. P., 109
*Moulton, V. L., 10
*Naiman, D. Q., 142
*Nguyen, D., 107
*Noordewier, M., 100
*Okikiolu, K., 14
*Oliver, V., 238
*Olson, W. K., 45
*Osgood, B., 165
*Orway, T. H., 179
*Ouyang, M., 59
*Ozsvath, P., 41
*Parker, T. H., 197
*Perko, K. A., Jr., 8
*Pilgrim, K., 258
*Pollack, D., 151
*Pollack, R., 143
*Pribitkin, W. D., 234
*Rabinowitz, S., 200
*Rackovske, S., 218
*Ratecliffe, J., 60
*Reintz, J., 222
*Reisner, S., 75
*Reshetikhin, N., 90
*Retakh, V., 227
*Ribes, L., 116
*Rimlinger, P., 62
*Rivin, I., 191
*Robert, J. M., 192
*Rong, Y., 11
*Rosenberg, S., 48
*Ruberman, D., 249
*Rudnick, Z., 231
*Sack, J. R., 97
*Sadun, L., 196
*Salowe, J. S., 171
*Sander, H., 81
*Sangwine-Yager, J. R., 76
*Sarnak, P., 16, 124
*Sawin, S., 226
*Schlick, T., 96
*Schmidt, J. P., 219
*Schröckenschläger, M., 127
*Schneider, R., 128
*Schulte, E., 193
*Schütz, C., 129
*Schutz, R. W., 186
*Scofield, P. D., 80
*Segert, J., 195
*Selberg, A., 121
*Sellers, P. H., 159
*Sengupta, A., 251
*Sheingorn, M., 24
*Shepp, L. A., 172
*Simanca, S. R., 182
*Sloane, N. J., 194
*Slutskin, L., 202
*Smith, E. H., 83
*Smith, P., 180
*Sourdenwe, D. L., 173
*Sowa, A., 39
*Sprellman, D. E., 63
*Spruck, J., 113
*Starr, E., 9
*Stille, M., 167
*Stone, D. A., 250
*Stratigos, P. D., 184
*Sugar, I., 220
*Sullivan, M. C., 7
*Suri, S., 174
*Szwiatek, G., 154
*SZemerédi, E., 241
*Talavera, S. J., 79
*Tamassia, R., 213
*Tang, C., 115
*Tannenbaum, A., 130
*Thompson, A. C., 131
*Tian, Y., 38
*Tobias, I., 44
*Todd, A. R., 204
*Toussaint, G., 214
*Troina, C., 134
DIMACS: Series in Discrete Mathematics and Theoretical Computer Science

Groups and Computation
Larry Finkelstein and William M. Kantor, Editors
Volume 11

This volume contains papers presented at the Workshop on Groups and Computation, held in October 1991. The workshop explored interactions among four areas: symbolic algebra and computer algebra, theoretical computer science, group theory, and applications of group computation. The papers also discuss such topics as parallel algorithms for groups, computation in associative algebras, asymptotic behavior of permutation groups, the study of finite groups using infinite reflection groups, combinatorial searching, computing with representations, and Cayley graphs as models for interconnection networks.

1991 Mathematics Subject Classification: 20
ISBN 0-8218-6599-4, 313 pages (hardcover), September 1993
Individual member $41, List price $69, Institutional member $55
To order, please specify DIMACS/11NA

Network Flows and Matching
First DIMACS Implementation Challenge
David S. Johnson and Catherine C. McGeoch, Editors
Volume 12

The DIMACS Implementation Challenge was organized to encourage experimental work in the area of network flows and matchings. Participants at sites in the U.S., Europe, and Japan undertook projects between November 1990 and August 1991 to test and evaluate algorithms for these problems. The Challenge culminated in a three-day workshop held in October 1991 at DIMACS. This volume contains the revised and refereed versions of twenty-two of the papers presented at the workshop, along with supplemental material about the Challenge and the Workshop.

1991 Mathematics Subject Classification: 68, 90
ISBN 0-8218-6598-6, 592 pages (hardcover), October 1993
Individual member $58, List price $96, Institutional member $77
To order, please specify DIMACS/12NA

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
Program of the Sessions

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.

Abstracts of papers presented in the sessions at this meeting will be found in the April 1994 issue of Abstracts of papers presented to the American Mathematical Society, ordered according to the numbers in parentheses following the listings below.

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 (▲) may be of interest to undergraduate students.

Friday, April 8

Special Session on Computational Geometry, I

1:00 p.m.–3:50 p.m. Room 708, Rogers Hall

1:00 p.m. Computing many faces in arrangements of lines and segments.
                      (1) Shankar K. Agarwal, Duke University, Jiri Matousek, Charles University, Czech Federal Republic, and Otfried Schwarzkopf, University of Utrecht, Netherlands (892-52-235)

1:30 p.m. Hamiltonian triangulations for fast rendering.
                      (2) Esther M. Arkin*, Martin Held, Joseph S. B. Mitchell and Steven S. Skiena, State University of New York, Stony Brook (892-68-229) (Sponsored by Boris Aronov)

2:00 p.m. Large convex hull problems. Preliminary report.
                      (3) David Avis, McGill University (892-52-04) (Sponsored by Boris Aronov)

2:30 p.m. Almost optimal set covers in finite VC-dimension.
                      (4) Herve Bronnimann, Princeton University (892-52-248)

3:00 p.m. Weak r-nets for points on a hypersphere.
                      (5) Vasilelis Capoyleas, Purdue University, West Lafayette (892-52-81) (Sponsored by Boris Aronov)

3:30 p.m. Discrepancy and derandomization.
                      (6) Bernard Chazelle, Princeton University (892-52-243)

Special Session on Invariants of Low Dimensional Manifolds, I

1:00 p.m.–3:50 p.m. Room 505, Rogers Hall

1:00 p.m. When can a positive braid be factored?
                      (7) Michael C. Sullivan, City College, City University of New York (892-57-08)

1:30 p.m. The first 801 prime knots.
                      (8) Kenneth A. Perko, Jr., Rockefeller Group, New York (892-57-182)

2:00 p.m. Embedding curves in the boundary of a handlebody.
                      (9) Edith Starr, Vassar College (892-57-185)

2:30 p.m. Vector braids. Preliminary report.
                      (10) Vincent L. Moulton, Duke University (892-57-151)

3:00 p.m. Mutations and Witten invariants.
                      (11) Yongwu Rong, George Washington University (892-57-16)

Special Session on Geometric Analysis, I

1:00 p.m.–3:50 p.m. Room 200, Rogers Hall

1:00 p.m. Scattering theory for manifolds with cylindrical ends.
                      (13) Tanya Christiansen, University of Pennsylvania (892-35-49)

1:30 p.m. Determinants of the Laplacians.
                      (14) Kate Okikiolu, Institute for Advanced Study (892-47-63)

2:00 p.m. Analytic number and spectral theory.
                      (15) Jay Jorgenson* and Serge Lang, Yale University (892-58-105)

2:30 p.m. Eigenfunctions on hyperbolic manifolds. Preliminary report.
                      (16) Peter Sarnak, Princeton University (892-58-139)

3:00 p.m. Geometry of compactifications of locally symmetric spaces.
                      (17) Lizhen Ji* and Robert MacPherson, Massachusetts Institute of Technology (892-22-116)

3:30 p.m. The rigidity of marked length spectrum for non-compact surfaces.
                      (18) Jianguo Cao, Cornell University, Ithaca (892-58-05)

Special Session on Combinatorial Group Theory and Related Topics, I

1:00 p.m.–3:50 p.m. Room 503, Rogers Hall

1:00 p.m. Test words for automorphisms of free groups.
                      (19) Edward C. Turner, State University of New York, Albany (892-20-67)

1:30 p.m. Tessellations of $S^2$ and equations over groups.
                      (20) Andrew Clifford and Richard Goldstein*, State University of New York, Albany (892-20-21)

2:00 p.m. Groups and languages.
                      (21) Robert H. Gilman, Stevens Institute of Technology (892-20-214)

2:30 p.m. Isoperimetric inequalities and subgroup structure.
                      (22) Martin R. Bridson, Princeton University (892-20-131) (Sponsored by Benjamin Fine)
**Friday, April 8  (cont’d)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00 p.m.</td>
<td>Finite presentability of $GL_n(Z)$,</td>
</tr>
<tr>
<td>(23)</td>
<td>Geoffrey Kiralis, Cornell University, Ithaca, Sava Kristic, Tufts University, and James McCool,</td>
</tr>
<tr>
<td></td>
<td>University of Toronto (892-20-168)</td>
</tr>
<tr>
<td>3:30 p.m.</td>
<td>Length spectra of Hecke triangle groups.</td>
</tr>
<tr>
<td>(24)</td>
<td>Mark Sheingorn*, Bernard M. Baruch College, City University of New York, and Thomas A. Schmidt,</td>
</tr>
<tr>
<td></td>
<td>Oregon State University (892-11-01)</td>
</tr>
</tbody>
</table>

**Special Session on Geometric Convexity, I**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 p.m.–3:50 p.m.</td>
<td>Room 721, Rogers Hall</td>
<td>A new class of convex polytopes.</td>
</tr>
<tr>
<td>(25)</td>
<td></td>
<td>Tibor Bisztriczky, University of Calgary (892-52-12)</td>
</tr>
<tr>
<td>1:30 p.m.</td>
<td></td>
<td>A convex $n$-body with a smooth belt can be illuminated by $n + 1$ directions.</td>
</tr>
<tr>
<td>(26)</td>
<td></td>
<td>Boris Dekster, Mount Allison University (892-52-02)</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Convex bodies with similar projections.</td>
<td>R. J. Gardner*, Western Washington University, and A. Volčič, University of Trieste, Italy (892-52-208)</td>
</tr>
<tr>
<td>(27)</td>
<td></td>
<td>Paul Goodey*, University of Oklahoma, Hermann Fellert and Wolfgang Weil, University of Karlsruhe, Germany (892-52-154)</td>
</tr>
<tr>
<td>2:30 p.m.</td>
<td></td>
<td>On the Santaló and Blaschke-Steinhardt point of a convex region.</td>
</tr>
<tr>
<td>(28)</td>
<td></td>
<td>Mark Kaiser, Auburn University, Auburn (892-52-141)</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td></td>
<td>Star measures and dual mixed volumes.</td>
</tr>
<tr>
<td>(29)</td>
<td></td>
<td>Daniel A. Klein, Massachusetts Institute of Technology (892-52-209)</td>
</tr>
</tbody>
</table>

**Special Session on Discrete Geometry, I**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 p.m.–3:50 p.m.</td>
<td>Room 705, Rogers Hall</td>
<td>A survey of problems concerning distance sums on spheres. Preliminary report.</td>
</tr>
<tr>
<td>(31)</td>
<td></td>
<td>Ralph Alexander, University of Illinois, Urbana-Champaign (892-52-203)</td>
</tr>
<tr>
<td>1:30 p.m.</td>
<td>Realizations of weighted graphs in Euclidean spaces.</td>
<td>Alexander I. Barvinok, Cornell University, Ithaca (892-52-43)</td>
</tr>
<tr>
<td>(32)</td>
<td></td>
<td>Finite and uniform stability of sphere packings and coverings.</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td></td>
<td>András Bezdek*, Auburn University, Karoly Bezdek, Eotvos Lorand University, Hungary, and Robert Connelly, Cornell University, Ithaca (892-52-143)</td>
</tr>
<tr>
<td>(33)</td>
<td></td>
<td>Light-sources that illuminate the boundary points all but the vertices of a convex polytope. Preliminary report.</td>
</tr>
<tr>
<td>2:30 p.m.</td>
<td></td>
<td>Karoly Bezdek, Eotvos Lorand University, Hungary (892-52-242)</td>
</tr>
</tbody>
</table>

**Saturday, April 9**

**Special Session on Mathematical Problems in Molecular Biology, I**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 a.m.–10:50 a.m.</td>
<td>Room 605, Rogers Hall</td>
<td>Introduction by Craig Benham</td>
</tr>
<tr>
<td>8:30 a.m.</td>
<td></td>
<td>Linking number and twist of surface-wrapped closed duplex DNA.</td>
</tr>
<tr>
<td>(43)</td>
<td></td>
<td>James H. White, University of California, Los Angeles, and William R. Bauer*</td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td></td>
<td>Theory of elastic rods - Applications in molecular biology</td>
</tr>
<tr>
<td>(44)</td>
<td></td>
<td>Irwin Tobias*, Bernard D. Coleman and Wilma K. Olson, Rutgers University, New Brunswick (892-92-178)</td>
</tr>
<tr>
<td>9:40 a.m.</td>
<td></td>
<td>Computer simulation of spatially constrained DNA.</td>
</tr>
</tbody>
</table>

Special Session on Mathematical Problems in Molecular Biology, I
Program of the Sessions

Special Session on Geometric Analysis, II

8:30 a.m.–10:50 a.m. Room 315, Rogers Hall

8:30 a.m. Compactness of isospectral conformal metrics of 4-manifolds.
(46) Xingwax Xu, National University of Singapore (892-58-87)

9:00 a.m. Almost rigidity and the structure of spaces with Ricci curvature bounded below.
(47) Jeff Cheeger*, Courant Institute of Mathematical Sciences, New York University, and Toby Colding, Mathematical Sciences Research Institute, Berkeley (892-53-90)

9:30 a.m. Eigenvalue estimates and measure theoretic aspects of compactness theorems. Preliminary report.
(48) Terry Lyons, Imperial College, United Kingdom, and Steven Rosenberg*, Boston University (892-53-10)

10:00 a.m. Maximally degenerate Laplacians.
(49) Steven Zelditch, Johns Hopkins University (892-35-89)

10:30 a.m. Hyperbolic geometry and percolation.
(50) Itai Benjamini, Cornell University, Ithaca (892-58-92)

Special Session on Teichmüller Theory and Dynamical Systems, I

8:45 a.m.–10:50 a.m. Room 705, Rogers Hall

8:45 a.m. Entropy of cubic maps.
(51) John W. Milnor, State University of New York, Stony Brook (892-30-126)

9:50 a.m. Random walks on Teichmüller space and the mapping class group.
(52) Howard Masur, University of Illinois at Chicago (892-32-112)

10:25 a.m. Asymptotic rigidity of scaling ratios for critical circle mappings.
(53) Edson de Faria, University of Sao Paulo, Brazil (892-30-86)

Special Session on Computational Geometry, II

9:00 a.m.–10:50 a.m. Room 200, Rogers Hall

9:00 a.m. Algorithms for polytope covering and closest-point queries. Preliminary report.
(54) K. L. Clarkson, AT&T Bell Laboratories, Murray Hill, New Jersey (892-52-247)

9:30 a.m. Applications of crossings in geometric graphs in higher dimensions.
(55) Tamal K. Dey, Indiana University-Purdue University, Indianapolis (892-52-136) (Sponsored by Boris Aronov)

10:00 a.m. Computing the rectangle discrepancy.
(56) David P. Dobkin and Dimitrios Gunopulos*, Princeton University (892-51-222)

10:30 a.m. Steiner trees in Minkowski planes.
(57) Ding-Zhu Du, University of Minnesota, Minneapolis (892-55-256) (Sponsored by Boris Aronov)

Special Session on Invariants of Low Dimensional Manifolds, II

9:00 a.m.–10:50 a.m. Room 721, Rogers Hall

9:00 a.m. Braid algebras, trace modules, and Vassiliev invariants. Preliminary report.
(58) Xiao-Song Lin, Institute for Advanced Study (892-57-231)

9:30 a.m. Mutation and the $\gamma$-invariant of hyperbolic links.
(59) Mingqin Ouyang, Ohio State University, Columbus (892-57-68)

10:00 a.m. The volume spectrum of hyperbolic 4-manifolds.
(60) John Ratcliffe* and Steven Tschantz, Vanderbilt University (892-57-20)

10:30 a.m. Conformally flat cone structures on 3-manifolds.
(61) Feng Luo, Rutgers University, New Brunswick (892-57-45)

Special Session on Combinatorial Group Theory and Related Topics, II

9:00 a.m.–10:50 a.m. Room 503, Rogers Hall

9:00 a.m. Maximal commutative transitive quotients. Preliminary report.
(62) Frank Rimlinger, Fairfield University (892-20-211)

9:30 a.m. The commutative transitive kernel. Preliminary report.
(63) Dennis Spellman, Philadelphia, Pennsylvania (892-20-11)

10:00 a.m. Collapsing of graphs of groups and length functions.
(64) Renfang Jiang, Michigan Technological University (892-20-224)

10:30 a.m. The conjugacy problem for graph products. Preliminary report.
(65) Jody Meyer Lockhart, United States Naval Academy (892-20-138)

Special Session on Partial Differential Equations, I

9:00 a.m.–10:50 a.m. Room 505, Rogers Hall

9:00 a.m. Relaxation and regularization on nonconvex variational problems.
(66) Robert V. Kohn*, Courant Institute of Mathematical Sciences, New York University, and Stefan Müller, Institute for Mathematics, Germany (892-49-201)

9:30 a.m. Some dynamical properties of the Ginzburg-Landau vortices. Preliminary report.
(67) Fang-Hua Lin, Courant Institute of Mathematical Sciences, New York University (892-35-66) (Sponsored by Yanyan Li)

10:00 a.m. On the Alexandroff-Bakelman-Pucci estimate and the reversed Hölder inequality for solutions of elliptic and parabolic equations.
(68) Xavier Cabrè, Courant Institute of Mathematical Sciences, New York University (892-35-15)

10:30 a.m. An inverse problem on $\Delta u = -f(u)$.
(69) Michael Vogelius, Rutgers University, New Brunswick (892-35-233)
### Saturday, April 9 (cont’d)

#### Special Session on Discrete Geometry, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m.</td>
<td><strong>Symmetrical combinations of 3 or 4 hollow triangles.</strong></td>
<td>Room 202, Rogers Hall</td>
</tr>
<tr>
<td></td>
<td>H. S. M. Coxeter, University of Toronto (892-51-33)</td>
<td></td>
</tr>
<tr>
<td>9:30 a.m.</td>
<td><strong>Geometry in the computer construction of school timetables.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>J. Csima, McMaster University (892-52-167)</td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td><strong>Are lattice arrangements optimal?</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gábor Fejes-Tóth, Hungarian Academy of Science, Hungary (892-52-215)</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td><strong>On the best constant for the Besicovitch covering theorem.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zoltan Füredi, University of Illinois, Urbana-Champaign (892-28-240)</td>
<td></td>
</tr>
</tbody>
</table>

#### Special Session on Geometric Convexity, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30 a.m.</td>
<td><strong>Acyclic sections of fiber bundles and acyclic support sets.</strong></td>
<td>Room 204, Rogers Hall</td>
</tr>
<tr>
<td></td>
<td>Luis Montejano*, University Nacional A. de Mexico, Mexico, and E. V. Schepin, Steklov Institute of Mathematics, Russia (892-52-41)</td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td><strong>Volume approximation of convex bodies by polytopes - A constructive method.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yehoram Gordon, Technion-Israel Institute of Technology, Israel, Shlomo Reisner*, University of Haifa, Israel, and Mathieu Meyer, University of Paris, France (892-52-228)</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td><strong>Minkowski’s inequality for bodies with corners and edges.</strong> Preliminary report.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J. R. Sangwine-Yager, Saint Mary's College (892-52-32)</td>
<td></td>
</tr>
</tbody>
</table>

### Contributed Paper Session, I

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:40 a.m.</td>
<td><strong>Solving natural equations by inverting integral operators.</strong></td>
<td>Room 304, Rogers Hall</td>
</tr>
<tr>
<td></td>
<td>Paul D. Scofield, Washington &amp; Lee University (892-53-71)</td>
<td></td>
</tr>
<tr>
<td>9:55 a.m.</td>
<td><strong>Distance formulas in complex hyperbolic space.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hanna Sandler, American University (892-51-75)</td>
<td></td>
</tr>
<tr>
<td>10:10 a.m.</td>
<td><strong>A removable singularities theorem for families of ruled surfaces.</strong> Preliminary report.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adam Harris, State University of New York, Stony Brook (892-32-82)</td>
<td></td>
</tr>
<tr>
<td>10:25 a.m.</td>
<td><strong>Covering the plane with congruent copies of a convex disk.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Edwin Hardy Smith, Auburn University, Auburn (892-51-169)</td>
<td></td>
</tr>
<tr>
<td>10:40 a.m.</td>
<td><strong>A higher lower bound for packing density of convex bodies in the plane.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kevin R. Doheny, Auburn University, Montgomery (892-52-47)</td>
<td></td>
</tr>
</tbody>
</table>

### Special Session on Analytic Number Theory, I

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 a.m.</td>
<td><strong>Arithmetic of means of squares and cubes.</strong></td>
<td>Room 215, Rogers Hall</td>
</tr>
<tr>
<td></td>
<td>P. X. Gallagher, Columbia University (892-11-65)</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td><strong>Zeta functions, one-way functions, and cryptography.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Michael Anshel* and Dorian Goldfeld, City College, City University of New York (892-11-157)</td>
<td></td>
</tr>
</tbody>
</table>

### Special Session on Topological Methods: Topological Measure Theory, I

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 a.m.</td>
<td><strong>Finitely subadditive outer measures.</strong></td>
<td>Room 505, Rogers Hall</td>
</tr>
<tr>
<td></td>
<td>John Knight, Long Island University, Brooklyn Center (892-28-170)</td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td><strong>Lattice and measure characterizations in terms of the Wallman space.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>James Alfa Allan, Long Island University (892-28-133)</td>
<td></td>
</tr>
</tbody>
</table>

### Invited Address

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00 a.m.</td>
<td><strong>Embedded surfaces in 4-manifolds.</strong></td>
<td>Auditorium, Dibner</td>
</tr>
<tr>
<td></td>
<td>Peter Kronheimer, Oxford University and Merton College, United Kingdom (892-99-259)</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.-2:20 p.m.</td>
<td>Invited Address&lt;br&gt;<strong>Auditorium, Dibner</strong>&lt;br&gt;<strong>Nicolai Reshetikhin</strong>, University of California, Berkeley (892-99-261)</td>
<td></td>
</tr>
<tr>
<td>2:30 p.m.-5:50 p.m.</td>
<td>Special Session on Computational Geometry, III&lt;br&gt;<strong>Room 200, Rogers Hall</strong>&lt;br&gt;2:30 p.m. Dihedral bounds for mesh generation in high dimensions.&lt;br&gt;<strong>David Eppstein</strong>, University of California, Irvine (892-51-125)&lt;br&gt;3:00 p.m. An error analysis of the 2 D sweepline algorithm for Delaunay triangulations. Preliminary report.&lt;br&gt;<strong>Steven Fortune</strong>, AT&amp;T Bell Laboratories, Murray Hill, New Jersey (892-68-134) (Sponsored by Boris Aronov)&lt;br&gt;3:30 p.m. Almost tight upper bounds for the single cell and zone problems in three dimensions.&lt;br&gt;<strong>Dan Halperin</strong>, Stanford University, and <strong>Micha Sharir</strong>, Tel Aviv University, Israel and Courant Institute of Mathematical Sciences, New York (892-68-54) (Sponsored by Boris Aronov)&lt;br&gt;4:00 p.m. Interconnecting highway exits. Preliminary report.&lt;br&gt;<strong>Frank Hwang</strong>, AT&amp;T Bell Laboratories, Murray Hill, New Jersey (892-52-121) (Sponsored by Boris Aronov)&lt;br&gt;4:30 p.m. Exploring the Hausdorff distance for problems in geometric pattern matching.&lt;br&gt;<strong>Kiara Kedem</strong>, Ben-Gurion University of the Negev, Israel (892-16-144) (Sponsored by Boris Aronov)&lt;br&gt;5:00 p.m. On the hardness of approximating extremal subdeterminants in matrices.&lt;br&gt;<strong>Leonid Khachiyan</strong>, Rutgers University, New Brunswick (892-52-258)&lt;br&gt;5:30 p.m. Ray-shooting from a stage.&lt;br&gt;<strong>E. Kranakis</strong>, <strong>D. Krizanc</strong>, Carleton University, <strong>A. Maheshwari</strong>, Tata Institute of Fundamental Research, India, <strong>J. R. Sack</strong>, Carleton University, and <strong>J. Urrutia</strong>, University of Ottawa (892-68-39) (Sponsored by Boris Aronov)</td>
<td></td>
</tr>
<tr>
<td>2:30 p.m.-5:50 p.m.</td>
<td>Special Session on Mathematical Problems in Molecular Biology, II&lt;br&gt;<strong>Room 605, Rogers Hall</strong>&lt;br&gt;2:30 p.m. Simulating the dynamics of biomolecules.&lt;br&gt;<strong>Tamar Schlick</strong>, Courant Institute of Mathematical Sciences, New York University, and <strong>Wilma K. Olson</strong>, Rutgers University, New Brunswick (892-92-156)&lt;br&gt;3:10 p.m. Stressed DNA - It's structure and activities.&lt;br&gt;<strong>Craig J. Benham</strong>, Mount Sinai Medical Center (892-92-173)&lt;br&gt;3:50 p.m. Discovering structure in genetic regulatory sequences.&lt;br&gt;<strong>Michiel Noordewier</strong>, Rutgers University, New Brunswick (892-92-93) (Sponsored by Craig J. Benham)&lt;br&gt;4:30 p.m. Fast algorithms for computing and enumerating perfect phylogenies. Preliminary report.&lt;br&gt;<strong>Sampath Kannan</strong>, University of Arizona, and <strong>Tandy Warnow</strong>, University of Pennsylvania (892-68-195) (Sponsored by Craig J. Benham)&lt;br&gt;5:10 p.m. Metric spaces on trees.&lt;br&gt;<strong>Martin Farach</strong>, Rutgers University, Busch Campus (892-92-218) (Sponsored by Craig J. Benham)</td>
<td></td>
</tr>
<tr>
<td>2:30 p.m.-4:50 p.m.</td>
<td>Special Session on Invariants of Low Dimensional Manifolds, III&lt;br&gt;<strong>Room 721, Rogers Hall</strong>&lt;br&gt;2:30 p.m. The numerology of persistent laminations.&lt;br&gt;<strong>Charles L. Epstein</strong>, University of Pennsylvania (892-32-16)&lt;br&gt;3:00 p.m. Braids, Hecke algebras and the 2-variable Jones polynomial in the lens spaces L(1, 1).&lt;br&gt;<strong>Sofia Lambropoulou</strong>, University of Cambridge, United Kingdom, and <strong>Jozef H. Przytycki</strong>, Odense University, Denmark and Warsaw University, Poland (892-57-236) (Sponsored by Joan S. Birman)&lt;br&gt;3:30 p.m. Finite type invariants for knots in 3-manifolds.&lt;br&gt;<strong>Erstrafia Kalfagianni</strong>, Columbia University (892-57-188)&lt;br&gt;4:00 p.m. Yang-Baxter models for Vassiliev knot invariants.&lt;br&gt;<strong>Arkady Vaintrob</strong>, New Mexico State University, Las Cruces (892-57-129)&lt;br&gt;4:30 p.m. Equivariant Vassiliev invariants. Preliminary report.&lt;br&gt;<strong>Du Nguyen</strong>, University of Ottawa (892-17-85)</td>
<td></td>
</tr>
</tbody>
</table>
| 2:30 p.m.-5:50 p.m. | Special Session on Geometric Analysis, III<br>**Room 315, Rogers Hall**<br>2:30 p.m. Embeddability of 3-dimensional CR-manifolds.<br>**Charles L. Epstein**, University of Pennsylvania (892-32-16)<br>3:00 p.m. Characterization of certain Hermitian symmetric spaces via Hessian equations.<br>**Robert Molzon** and **Karen Pinney Mortensen**, University of Kentucky (892-53-130)<br>3:30 p.m. Conformally homeomorphic Lorentz surfaces need not be conformally diffeomorphic.<br>**Tilla Weinstein**, Rutgers University, New Brunswick (892-53-104)<br>4:00 p.m. Action of Möbius transformations on homeomorphisms: Stability and rigidity.<br>**Nikolai V. Ivanov**, Michigan State University (892-22-119)<br>4:30 p.m. Infinite Nielsen kernel of a hyperbolic surface.<br>**John A. Velling**, Brooklyn College, City University of New York (892-58-91)<br>5:00 p.m. On the existence of convex surfaces of constant Gauss curvature in hyperbolic space.<br>**Harold Rosenberg**, University of Paris VII, France, and **Joel Spruck**<br>**Erwin Lutwak**, Polytechnic University, and **Vladimir Oliker**, Emory University (892-58-88)
Program of the Sessions

Saturday, April 9  (cont'd)

Special Session on Combinatorial Group Theory and Related Topics, III

2:30 p.m. – 5:20 p.m.  Room 503, Rogers Hall

2:30 p.m.  Adjoining roots to conjugacy separable groups.  
(115)  Preliminary report.  
G. Kim, Kangnung National University, Korea, J. McCarron and C.Y. Tang*, University of Waterloo (892-20-48)

3:00 p.m.  Conjugacy separability of amalgamated free products of groups.  
(116)  Luis Ribes*, Carleton University, and Pavel A. Zaleskii, Academy of Science of the Byelo SSR, Belarus (892-20-153)

3:30 p.m.  Some infinite permutation groups.  
(117)  Marvin Tretkoff, Stevens Institute (892-20-249)

4:00 p.m.  Some properties of fully invariant ideals of free group rings.  
(118)  Preliminary report.  
Samuel M. Vovsi, Trenton State College (892-20-146)

4:30 p.m.  \(p\)-deformations of Lie algebras and \(p\)-groups.  
(119)  Preliminary report.  
Yuri Medvedev, University of Wisconsin, Madison (892-20-225) (Sponsored by Anthony M. Gaglione)

5:00 p.m.  On narrow groups.  
(120)  Preliminary report.  
E. Zelmanov, University of Wisconsin, Madison (892-20-226) (Sponsored by Anthony M. Gaglione)

Special Session on Analytic Number Theory, II

2:30 p.m. – 5:30 p.m.  Room 215, Rogers Hall

2:30 p.m.  On the distribution of \(\log|z|^{\frac{1}{2} + it}\).  
(121)  A. Selberg, Institute for Advanced Study (892-11-180)

3:10 p.m.  Class group \(l\)-functions.  
(122)  Henryk Iwaniec, Rutgers University, New Brunswick (892-11-161)

3:40 p.m.  A non-vanishing theorem for automorphic \(L\)-series on \(GL(2)\).  
(123)  Jeffrey Hoffstein*, Brown University, and Sol Friedberg, University of California, Santa Cruz (892-11-164)

4:10 p.m.  Chebyshev's bias.  Preliminary report.  
(124)  P. Sarnak* and M. Rubinstein, Princeton University (892-11-159) (Sponsored by Dorian Goldfeld)

4:40 p.m.  Dirichlet polynomial approximations to Zeta functions.  
(125)  Enrico Bombieri, Institute for Advanced Study (892-11-165) (Sponsored by Dorian Goldfeld)

5:10 p.m.  On automorphic \(L\)-functions with large level.  
(126)  William Duke, Rutgers University, New Brunswick (892-11-158)

Special Session on Geometric Convexity, III

2:30 p.m. – 5:20 p.m.  Room 204, Rogers Hall

2:30 p.m.  A new proof of Petty's projection inequality.  
(127)  Michael Schmuckenschlaeger, University of Kiel, Germany (892-52-207)

3:00 p.m.  Best asymptotic approximation of smooth convex bodies by polytopes.  Preliminary report.  
(128)  Rolf Schneider, Mathematisches Institut der Albert Ludwigs Universitat, Germany (892-52-99)

3:30 p.m.  Random polytopes.  
(129)  Carsten Schütz, Oklahoma State University (892-52-09)

4:00 p.m.  Affine invariant evolutions of planar curves.  
(130)  Allen Tannenbaum, University of Minnesota, Minneapolis (892-52-216)

4:30 p.m.  The divergence theorem in Minkowski spaces.  
(131)  A. A. Thompson, Array Systems Computing Incorporated, Canada, and A. C. Thompson*, Dalhousie University (892-52-114)

5:00 p.m.  Quantitative Steiner/Schwartz-type symmetrizations.  
(132)  Antonios Tsolomitis, Ohio State University, Columbus (892-52-95)

Special Session on Topological Methods: Topological Measure Theory, II

2:30 p.m. – 4:20 p.m.  Room 503, Rogers Hall

2:30 p.m.  Bispacifying transformations.  Preliminary report.  
(133)  Jesus Araujo, University of Cantabria, Spain, Edward Beckenstein* and Lawrence Narici, Saint John's University (892-46-80)

3:00 p.m.  Outer measures associated with lattice measures, and some applications.  Preliminary report.  
(134)  Charles Traina, Saint John's University (892-28-101)

3:30 p.m.  Quasi-measures and dimension theory.  Preliminary report.  
(135)  Robert F. Wheeler, Northern Illinois University (892-28-78)

4:00 p.m.  Quasi-measures on completely regular spaces.  
(136)  Preliminary report.  
John P. Boardman, Northern Illinois University (892-28-79)

Special Session on Discrete Geometry, III

2:30 p.m. – 5:50 p.m.  Room 202, Rogers Hall

2:30 p.m.  Knotted lattice-like space fillers.  
(137)  Wlodzimierz Kuperberg, Auburn University, Auburn (892-52-117)

3:00 p.m.  Three problems on four-dimensional polytopes.  
(138)  Günter M. Ziegler, Konrad-Zuse ZIB, Germany (892-52-55)

3:30 p.m.  Gale transforms and triangulations.  
(139)  Carl Lee, University of Kentucky (892-52-202)

4:00 p.m.  Embedding a polytope in a lattice.  
(140)  Hiroshi Maehara, Ryuku University, Japan (892-52-52) (Sponsored by Janos Pach)
### Program of the Sessions

#### Special Session on Gauge Theory and Applications, III

**2:30 p.m.–4:50 p.m.** Room 615, Rogers Hall

- **2:30 p.m.** SU(2) representations of three-manifolds.  
  Stamatis Dostoglou, University of California, Santa Barbara (892-53-96)

- **3:00 p.m.** Diffeomorphism invariant representations of surface fundamental groups.  
  G. Daskalopoulos, Princeton University, S. Dostoglou, University of California, Santa Barbara, and R. Wentworth*, Harvard University (892-57-252)

- **3:30 p.m.** Group cohomology construction of the cohomology ring of moduli spaces of representations of surface groups.  
  Lisa Jeffrey, Princeton University (892-58-127)

- **4:00 p.m.** Some computations of Donaldson's invariants via flat connections.  
  Baozhen Yu, California Institute of Technology (892-57-62)

- **4:30 p.m.** Holomorphic bundles and instantons on cylindrical four manifolds.  
  Guang-Yuan Guo, Michigan State University (892-53-196) (Sponsored by Robert J. Sibner)

#### Special Session on Partial Differential Equations, II

**3:00 p.m.–5:20 p.m.** Room 505, Rogers Hall

- **3:00 p.m.** New applications of the method of critical points at infinity.  
  Abbas Bahri, Rutgers University, New Brunswick (892-58-102) (Sponsored by Yanyan Li)

- **3:30 p.m.** Third derivative estimates for Dirichlet's problem in convex domains.  
  Stephen J. Fromm, McMaster University, and David Jerison*, Massachusetts Institute of Technology (892-35-189)

- **4:00 p.m.** Moduli spaces of singular Yamabe metrics.  
  Daniel Pollack, Mathematical Sciences Research Institute, Berkeley (892-35-148)

#### Special Session on Teichmüller Theory and Dynamical Systems, II

**3:10 p.m.–5:35 p.m.** Room 705, Rogers Hall

- **3:10 p.m.** Induced expansion for quadratic polynomials.  
  Jacek Graczyk, University of Warsaw, Poland, and Grzegorz Swiatek*, Princeton University (892-58-111)

- **4:00 p.m.** Topological conjugacy of circle diffeomorphisms.  
  Jun Hu, Graduate School and University Center, City University of New York (892-26-110)

- **4:35 p.m.** Application of Gibbs theory to dynamical systems and Teichmüller spaces.  
  Elise Cawley, University of Chicago (892-32-115)

- **5:10 p.m.** Topological classification of real critically finite rational maps of degree two.  
  Sen Hu* and Yunping Jiang, Queens College, City University of New York (892-20-128)

### Sunday, April 10

#### Special Session on Mathematical Problems in Molecular Biology, III

**8:20 a.m.–10:50 a.m.** Room 605, Rogers Hall

- **8:20 a.m.** On the problem of detecting local similarity between sequences. Preliminary report.  
  William I. Chang, Cold Spring Harbor Laboratory, New York (892-92-197) (Sponsored by Craig J. Benham)

- **9:00 a.m.** Mathematical problems in developing a bio-mechanism data base.  
  Peter H. Sellers, Rockefeller University (892-92-213)

- **9:40 a.m.** Long range electron transfer.  
  Joseph Malinsky, Mount Sinai Medical Center, New York, New York (892-92-172)

- **10:20 a.m.** Interactions between line charges.  
  Jolly Ray and Gerald S. Manning*, Rutgers University, New Brunswick (892-82-174) (Sponsored by Craig J. Benham)
Program of the Sessions

Sunday, April 10  (cont’d)

Special Session on Teichmüller Theory and Dynamical Systems, III

8:25 a.m.–10:50 a.m. Room 705, Rogers Hall
8:25 a.m. Geometric isomorphisms between Teichmüller spaces. (162) 
Clifford J. Earle, Cornell University, Ithaca, and Frederick P. Gardiner, Brooklyn College, City University of New York (892-30-42)
9:15 a.m. Renormalization, scenery and the Teichmüller mapping flow. Preliminary report. (163)  
Pierre Arnoux, Faculty of Sciences of Luminy, France, and Albert M. Fisher, State University of New York at Stony Brook (892-32-77)
9:50 a.m. Rigidity in the tangent family. Preliminary report. (164) 
Linda Keen, Herbert H. Lehman College, City University of New York, and Janina Kotus, Technical University of Warsaw, Poland (892-30-76)
10:25 a.m. The area theorem, redux. Preliminary report. (165) Brad Osgood, Stanford University (892-30-07)

Special Session on Combinatorial Group Theory and Related Topics, IV

8:30 a.m.–10:50 a.m. Room 503, Rogers Hall
8:30 a.m. An independence problem in the commutator calculus. Preliminary report. (166) 
Anthony M. Gaglione, U. S. Naval Academy, and Hermann V. Waldinger, Polytechnic University (892-20-50)
9:00 a.m. Euler characteristic for generalized triangle and tetrahedron groups. Preliminary report. (167) 
Michael Stille, University of Dortmund, Germany (892-20-51) (Sponsored by Benjamin Fine)
9:30 a.m. Virtually one-relator groups. (168)  
Katalin A. Benczúr, Manhattan College, and Benjamin Fine, Fairfield University (892-20-97)
10:00 a.m. Combinatorial group theory of $T$-systems. (169)  
Tim Hau, Princeton University (892-20-69)
10:30 a.m. On splittings of groups acting freely on $R$-trees. (170)  
Luca Q. Zamboni, University of North Texas (892-20-73)

Special Session on Computational Geometry, IV

9:00 a.m.–10:50 a.m. Room 200, Rogers Hall
9:00 a.m. Steiner trees with generalized edge weight. (171)  
Joseph L. Galley and Jeffrey S. Salowe, University of Virginia (892-66-44) (Sponsored by Boris Aronov)
9:30 a.m. Discrete tomography. (172)  
L. A. Shepp, AT&T Bell Laboratories, Murray Hill, New Jersey (892-52-246)

10:00 a.m. Constructing piecewise linear homeomorphisms. (173)  
Diane L. Souvaine, Rutgers University, Piscataway, and Raphaël Wenger, Ohio State University, Columbus (892-52-245)
10:30 a.m. Surface approximation and geometric partitions. (174)  
Pankaj K. Agarwal, Duke University, and Subhash Suri, Bellcore, Morristown, New Jersey (892-68-53) (Sponsored by Boris Aronov)

Special Session on Invariants of Low Dimensional Manifolds, IV

9:00 a.m.–10:50 a.m. Room 721, Rogers Hall
9:00 a.m. $\pi_1$-train tracks, algebraic linearity theorem, and classification of surface diffeomorphisms. (175)  
Zhong-he Chen, Columbia University (892-57-221)
9:30 a.m. The Reshetikhin-Turaev representation of the mapping class group when $r = 6$. Preliminary report. (176)  
Gretchen Wright, Columbia University (892-57-186)
10:00 a.m. An extension of Milnor's $\mu$-invariants. (177)  
David Miller, William Paterson College (892-57-118)
10:30 a.m. The unitary structure of the WZW bundle over Teichmüller space. (178)  
Dennis A. McLaughlin, Princeton University, and Jean-Luc Brylinski, Harvard University (892-51-46)

Special Session on Geometric Analysis, IV

9:00 a.m.–10:50 a.m. Room 302, Rogers Hall
9:00 a.m. Variational problems on fiber bundles. (179)  
Thomas H. Oway, Yeshiva University (892-58-106) (Sponsored by Jozef Dodziuk)
9:30 a.m. Regularity of mass-minimizing sections of fiber bundles. Preliminary report. (180)  
David L. Johnson and Penelope Smith, Lehigh University (892-51-107)
10:00 a.m. A Kummer-type construction of anti-self-dual 4-manifolds. (181)  
Claude LeBrun, State University of New York, Stony Brook (892-58-03)
10:30 a.m. On the Kähler classes of extremal metrics. Preliminary report. (182)  
Santiago R. Simanca, Courant Institute of Mathematical Sciences, New York University (892-53-37)

Special Session on Topological Methods: Topological Measure Theory, III

9:00 a.m.–10:50 a.m. Room 505, Rogers Hall
9:00 a.m. On coseparation of lattices. (183)  
Barry Mittag, Kingsborough Community College (892-28-142)
9:30 a.m. A measure theoretic study of various modifications of compactness and the Lindelöf property. (184)  
Peter D. Stratigos, Brooklyn Center-Long Island University (892-28-60)
### Program of the Sessions

#### Special Session on Partial Differential Equations, III

**9:00 a.m.—10:50 a.m.**

- **Room 505, Rogers Hall**
- **9:00 a.m.**
  - The first eigenvalue of analytic level surfaces on spheres.  
  - [Sagun Chanillo](#), Rutgers University, New Brunswick (892-35-19)
- **9:30 a.m.**
  - Morse theory and min-max methods for an indefinite semilinear equation.  
  - [Stanley Alama](#), McMaster University, and [Manuel Del Pino](#), University of Chicago (892-35-147)
- **10:00 a.m.**
  - Prescribing scalar curvature on S^2 and related topics.  
  - [Yanyan Li](#), Rutgers University, New Brunswick (892-35-103)
- **10:30 a.m.**
  - On the Dirichlet problem for harmonic maps with prescribed singularities.  
  - [Gilbert Weinstein](#), University of Alabama, Birmingham (892-58-150)

#### Special Session on Discrete Geometry, IV

**9:00 a.m.—10:50 a.m.**

- **Room 202, Rogers Hall**
- **9:00 a.m.**
  - Geometry of sphere packing in bold E^d. Preliminary report.  
  - [Igor Rivin](#), Institute for Advanced Study (892-52-241)
- **9:30 a.m.**
  - Separating translates in the plane: Combinatorial bounds.  
  - [Jurek Czyzowicz](#), University of Quebec at Hull, [Hazel Everett](#), University of Quebec at Montreal, and [Jean-Marc Robert](#), University of Quebec at Chicoutimi (892-52-122) (Sponsored by Armel N. Mercier)
- **10:00 a.m.**
  - Chirality in abstract polytopes.  
  - [Egon Schulte](#), Northeastern University (892-51-135)
- **10:30 a.m.**
  - The tightest packings (or clusters) of N balls.  
  - [N. J. A. Sloane](#), AT&T Bell Laboratories, Murray Hill, New Jersey (892-51-98)

#### Special Session on Gauge Theory and Applications, IV

**9:00 a.m.—10:50 a.m.**

- **Room 615, Rogers Hall**
- **9:00 a.m.**
  - [Jan Segert](#), University of Missouri, Columbia (892-53-232)
- **9:30 a.m.**
  - Yang-Mills connections and ODE's.  
  - [Lorenzo Sadun](#), University of Texas, Austin (892-58-109)

### Contributed Paper Session, II

**9:25 a.m.—10:50 a.m.**

- **Room 304, Rogers Hall**
- **9:25 a.m.**
  - Method of quasi-control and its application for mathematical modelling of thermal power systems.  
  - [Stanislav Danov](#), Shoumen Defense Academy, Bulgaria (892-65-140)
- **9:40 a.m.**
  - A polynomial curve of constant width.  
  - [Stanley Rabinowitz](#), Westford, Massachusetts (892-52-57)
- **9:55 a.m.**
  - On norms of powers of absolutely convergent power series.  
  - [Bogdan Baishanski](#), Ohio State University, Columbus (892-30-187)
- **10:10 a.m.**
  - Computations on the pair of transverse measured foliations associated with a pseudo-Anosov automorphism of a surface.  
  - [Lev Slutskin](#), New York, New York (892-57-61)
- **10:25 a.m.**
  - A proof of the Williams conjecture on shift equivalence.  
  - [Harold M. Hastings](#), Marysia T. Weiss and [Yihren Wu](#), Hofstra University (892-54-217)
- **10:40 a.m.**
  - P-space extensions, light compactness, pseudocompleteness, and cardinality. Preliminary report.  
  - [Aaron R. Todd](#), Bernard M. Baruch College, City University of New York (892-54-124)

#### Special Session on Geometric Convexity, IV

**9:30 a.m.—10:50 a.m.**

- **Room 204, Rogers Hall**
- **9:30 a.m.**
  - Gaussian measure and convexity. Preliminary report.  
  - [Richard A. Vitale](#), University of Connecticut, Storrs (892-52-152)
- **10:00 a.m.**
  - Central sections of intersection bodies. Preliminary report.  
  - [Paul Goodey](#), University of Oklahoma, [Hermann Fellert](#), and [Wolfgang Weil](#), University of Karlsruhe, Germany (892-52-74) (Sponsored by Erwin Lutwak)
- **10:30 a.m.**
  - Illumination bodies and affine surface area.  
  - [Elisabeth Werner](#), Case Western Reserve University (892-52-17)

#### Special Session on Models in Telecommunications, I

**9:30 a.m.—10:50 a.m.**

- **Room 315, Rogers Hall**
- **9:30 a.m.**
  - Induced rare events in queueing networks.  
  - [Alan Weiss](#), AT&T Bell Laboratories, Murray Hill, New Jersey (892-60-24)
- **10:00 a.m.**
  - Some problems in polling with infinite servers.  
  - [Sid Browne](#), Columbia University (892-60-27)
Sunday, April 10  (cont’d)

10:30 a.m.  Routing and congestion control in ATM networks.

Invited Address

11:00 a.m.–11:50 a.m.  Auditorium, Dibner
(211) Some recent directions in the analyses of high speed communication networks.
Debasis Mitra, AT&T Bell Laboratories, Murray Hill, New Jersey (892-99-260)

Invited Address

1:30 p.m.–2:20 p.m.  Auditorium, Dibner
(212) The impact of computation on algebraic geometry.
Dave Bayer, Columbia University (892-14-132)

Special Session on Computational Geometry, V

2:30 p.m.–4:50 p.m.  Room 200, Rogers Hall
2:30 p.m.  Graph drawing. Preliminary report.
(213) Roberto Tamassia, Brown University (892-68-94)
(Sponsored by Boris Aronov)
3:00 p.m.  Some aperture-angle optimization problems.
(214) Prosenjit Bose, McGill University, Ferran Hurtado-Diaz, University Politecnica de Catalunya,
Spain, Elsa Omana-Pulido and Godfried Toussaint*, McGill University (892-68-255)
3:30 p.m.  Geometric drawings of trees.
(215) Sue Whitesides, McGill University (892-05-199)
4:00 p.m.  Applications of computational geometry in design and Manufacture. Preliminary report.
G. Wilfong*, American Tel & Tel Bell Laboratories, B. Asberg, M. Overmars, University of Utrecht,
Netherlands, G. Blanco, J. Garcia-Lopez, Escuela University de Informatica, Spain, P. Bose, Godfried
Toussaint and B. Zhu, McGill University (892-68-06)
4:30 p.m.  Steps towards exact geometric computation.
(217) Chee K. Yap, Courant Institute of Mathematical Sciences, New York University (892-68-254)

Special Session on Mathematical Problems in Molecular Biology, IV

2:30 p.m.–5:40 p.m.  Room 605, Rogers Hall
2:30 p.m.  Looking at proteins: Sequence, structure, and the folding code.
Shalom Rackovsky, Mount Sinai Medical Center, New York, New York (892-92-177) (Sponsored by
Craig J. Benham)

3:10 p.m.  Recognizing and comparing the outer surface of
coiled-coil proteins. Preliminary report.
Jeanette P. Schmidt, Polytechnic Institute of New York (892-68-192)
3:50 p.m.  Automated fitting of the simulated NOESY spectra to
the experimental ones by means of a global optimization technique.
Istvan Sugar*, Mount Sinai Medical Center, New York, New York, Yuan Xu and N. Rama Krishna,
University of Alabama, Birmingham (892-92-175) (Sponsored by Craig J. Benham)
4:30 p.m.  Splicing languages and DNA: Examples and analysis.
(221) Tom Head, State University of New York, Binghamton
(892-92-191)
5:10 p.m.  Segment determination in the fruit fly: Inverse
dynamical modeling.
David H. Sharp, Los Alamos National Laboratory, and
John Reinitz*, Mount Sinai Medical Center, New York, New York (892-92-251)

Special Session on Invariants of Low Dimensional Manifolds, V

2:30 p.m.–4:50 p.m.  Room 721, Rogers Hall
2:30 p.m.  A formula for computing the $\hat{S}(2, C)$ generalized
Gasson invariant.
Cynthia L. Curtis, Princeton University (892-57-237)
3:00 p.m.  The dimensional ladder for topological field theory.
(224) Louis Crane, Kansas State University (892-57-183)
3:30 p.m.  Geometry of the intersection ring of the moduli space
of flat connections and the conjectures of Newstead
and Witten.
Jonathan Weitsman, Columbia University
(892-58-149)
4:00 p.m.  $1 + 1$ dimensional topological quantum field theory.
(226) Stephen Sawin, Massachusetts Institute of
Technology (892-57-30)
4:30 p.m.  Topology of linked defects in condensed matter.
(227) Vladimir Retakh, Harvard University (892-55-155)

Special Session on Analytic Number Theory, III

2:30 p.m.–5:50 p.m.  Room 215, Rogers Hall
2:30 p.m.  Omega results for special values of automorphic
L-functions. Preliminary report.
Jeffrey Hoffstein and Paul Lockhart*, Brown
University (892-11-120)
3:00 p.m.  Average of cubic L-series. Preliminary report.
(229) David Farmer*, Columbia University, and Jeff
Hoffstein, Brown University (892-11-162)
3:30 p.m.  On the average values of cubic elliptic L-series.
(230) Daniel Lieman, Columbia University (892-11-166)
4:00 p.m.  The density of rational points on Hardy-Littlewood
varieties.
Ze'ev Rudnick, Princeton University (892-11-160)
4:30 p.m.  Zero density near the critical line for Hecke L-functions
associated with cusp forms.
Wenzhi Luo, Institute for Advanced Study
(892-11-163)
### Program of the Sessions

**5:00 p.m.** Counting lattice points on homogeneous varieties.  
(233) Alex Eskenzi*, Princeton University, Shahar Mozes, Hebrew University, Israel, and Nimish Shah, Tata Institute of Fundamental Research, India (892-11-239)

**5:30 p.m.** The Fourier coefficients of modular integrals and modular forms having small positive weight.  
Preliminary report.  
Wladimir de Azevedo Pribitkin, Temple University, Philadelphia (892-11-100)

---

**Special Session on Geometric Convexity, V**

**2:30 p.m.—4:20 p.m.**  
Room 204, Rogers Hall

- **2:30 p.m.** Dual kinematic formulas. Preliminary report.  
  (235) Geoyong Zhang, Temple University, Philadelphia (892-52-29)
- **3:00 p.m.** Analytic and geometric isoperimetric inequalities.  
  (236) Xin-Min Zhang*, University of South Alabama, Hsu-Tung Ku and Mei-Chin Ku, University of Massachusetts, Amherst (892-51-31)
- **3:30 p.m.** The isoperimetric inequality and analogues of Hadwiger’s theorem in space.  
  Jiayu Zhou, Temple University, Philadelphia (892-53-14)
- **4:00 p.m.** Redirecting and reshaping laser beams with Monge-Ampère equations.  
  (238) Vladimir Oliker, Emory University (892-53-56) (Sponsored by Erwin Lutwak)

---

**Special Session on Topological Methods: Topological Measure Theory, IV**

**2:30 p.m.—3:30 p.m.**  
Room 505, Rogers Hall

- **2:30 p.m.** The Bohr topology of a locally compact Abelian group.  
  (239) W. W. Comfort*, Wesleyan University, Salvador Hernandez, Universitat Jaume I, Castellon, Spain, and F. Javier Trigos-Arrieta, California State University, Bakersfield (892-22-184)
- **3:10 p.m.** More on the intermediate value theorem for polynomials with coefficients in a ring of continuous functions.  
  (240) Melvin Henriksen*, Wesleyan University, Suzanne Larson, Loyola Marymount University, and Jorge Martinez, University of Florida (892-54-181)

---

**Special Session on Discrete Geometry, V**

**2:30 p.m.—5:50 p.m.**  
Room 202, Rogers Hall

- **2:30 p.m.** Different distances.  
  (241) Endre Szemerédi, Rutgers University, New Brunswick (892-51-230)
- **3:00 p.m.** Polytopes related to the Picard group.  
  (242) B. Monson, University of New Brunswick, and Asia Ivic Weiss*, York University (892-52-58) (Sponsored by William Steiger)

---

**3:30 p.m.** On connected components of convex sets of lines in $\mathbb{R}^d$. Preliminary report.  
(243) Jacob E. Goodman, City College. City University of New York, Richard Pollack*, Courant Institute of Mathematical Sciences, New York University, and Raphael Wenger*, Ohio State University, Columbus (892-52-36)

- **4:00 p.m.** A new approach to packing and covering.  
  (244) Ulrich Betke, Martin Henke and Jörg M. Wills*, University of Siegen, Germany (892-52-35)
- **4:30 p.m.** Polytopes that fill $\mathbb{R}^n$ and scissors congruences.  
  (245) Jeffrey C. Lagarias*, AT&T Bell Laboratories, Murray Hill, New Jersey, and David Moews, University of California, Berkeley (892-52-13)

---

**Special Session on Models in Telecommunications, II**

**2:30 p.m.—4:20 p.m.**  
Room 315, Rogers Hall

- **2:30 p.m.** Prescribing topological defects for the Einstein and Abelian Higgs equations. Preliminary report.  
  (248) Yisong Yang, Institute for Advanced Study (892-58-171)
- **3:00 p.m.** Relations among Donaldson invariants arising from tori.  
  (249) Daniel Ruberman, Brandeis University (892-57-233)
- **3:30 p.m.** The Chern-Simons character of a lattice gauge field.  
  (250) Anthony V. Phillips, State University of New York, Stony Brook, and David A. Stone*, Brooklyn College, City University of New York (892-53-212)
- **4:00 p.m.** Gauge theory on compact surfaces.  
  (251) Ambar Sengupta, Louisiana State University, Baton Rouge (892-81-137)

---

**3:30 p.m.** Fast efficient, parallel algorithms for performance evaluation of communication systems.  
(252) Albert Greenberg, AT&T Bell Laboratories, Murray Hill, New Jersey (892-68-26)

- **3:00 p.m.** The Joseph and Noah effects and high-speed network traffic.  
  (253) Walter Willinger, Bellcore, Morristown, New Jersey (892-90-23)
- **3:30 p.m.** Heavy-traffic limits for an open network of finite-buffer overflow queues.  
### Sunday, April 10 (cont'd)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:00 p.m.</td>
<td>Large fluctuation rates and exit location distributions in a class of multidimensional discrete stochastic models.</td>
<td>Room 705, Rogers Hall</td>
</tr>
<tr>
<td></td>
<td><strong>Robert S. Maier</strong>, University of Arizona (892-93-70)</td>
<td></td>
</tr>
<tr>
<td>4:35 p.m.</td>
<td>Noncompactness of hyperbolic components.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Kevin Pilgrim</strong>, University of California, Berkeley (892-30-83)</td>
<td></td>
</tr>
<tr>
<td>5:10 p.m.</td>
<td>A conjectural universal family in 2-dimensional dynamics.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Andre de Carvalho</strong>, Graduate School and University Center, City University of New York (892-30-113)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Sponsored by Frederick P. Gardiner</em></td>
<td></td>
</tr>
<tr>
<td>3:10 p.m.-5:35 p.m.</td>
<td>Special Session on Teichmüller Theory and Dynamical Systems, IV</td>
<td></td>
</tr>
<tr>
<td>3:10 p.m.</td>
<td>Rigidity of quadratic polynomials.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Mikhail Lyubich</strong>, State University of New York, Stony Brook (892-20-84)</td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.</td>
<td>Product structures and non-hyperbolicity in Teichmüller space.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Yair N. Minsky</strong>, State University of New York, Stony Brook (892-32-72)</td>
<td></td>
</tr>
</tbody>
</table>

---

**HISTORY OF MATHEMATICS**

**Golden Years of Moscow Mathematics**

Smilka Zdravkovska and Peter L. Duren, Editors

Volume 6

This volume contains articles on Soviet mathematical history, many of which are personal accounts by mathematicians who witnessed and contributed to the turbulent years of Moscow mathematics. In today's climate of glasnost, the stories can be told freely for the first time, with a candor uncharacteristic of the "historical" accounts published under the Soviet regime. The articles focus on mathematical developments in that era, the personal lives of Russian mathematicians, and political events that shaped the course of scientific work in the Soviet Union. An important feature is the inclusion of two articles on Kolmogorov, perhaps the greatest Russian mathematician of the twentieth century. The volume concludes with an annotated English bibliography and a Russian bibliography for further reading. This book appeals to mathematicians, historians, and anyone else interested in Soviet mathematical history. The History of Mathematics series is published jointly with the London Mathematical Society (LMS). *

1991 *Mathematics Subject Classification: 01
ISBN 0-8218-9003-4, 269 pages (hardcover), October 1993
Individual member $56, List price $94, Institutional member $75
To order, please specify HMATH/6NA

* Members of the LMS are entitled to member prices. The LMS is incorporated under Royal Charter and is registered by the Charity Commissioners.

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
University of Oregon, Eugene, Oregon
June 16–18, 1994
Second Announcement

The eight hundred and ninety-third meeting of the American Mathematical Society (AMS) will be held at the University of Oregon, Eugene, Oregon, on Thursday, Friday, and Saturday, June 16–18, 1994. This meeting will be held in conjunction with a meeting of the Pacific Northwest section of the Mathematical Association of America (MAA).

Invited Addresses
Stephen A. Mitchell, University of Washington, K-theory for rings of algebraic integers.
Gustavo A. Ponce, University of California, Santa Barbara, Nonlinear dispersive equations.
Karen Parshall, University of Virginia, Algebras with a Scottish lilt: the life and work of Joseph H. M. Wedderburn (1882-1942).

Special Sessions
Rings and their representations, Frank W. Anderson, University of Oregon, and Kent R. Fuller, University of Iowa.
3-manifolds, Steven A. Bleiler, Portland State University.
Commutative algebra and probability groups, Frank R. DeMeyer, Colorado State University, and Thomas M. McKenzie, Bradley University.
Simple C*-algebras, Chris Phillips, University of Oregon.
Undergraduate research, Robby Robson, Oregon State University.
The deadline for submission of abstracts for consideration in any of these sessions has expired.
There will also be sessions for contributed ten-minute papers. The deadline for submission of abstracts for these sessions is April 4, 1994.

Events of Other Organizations
The MAA program will feature Carl Pomerance, University of Georgia, who will give the MAA Pólya Lecture on Witnesses of composite numbers. Doris Schattschneider, Moravian College and first vice-president of the MAA for 1994 and 1995, will give an invited address on Was Escher a mathematician? Millie Johnson, Western Washington University, will give a talk on Mathematics of meanders: rivers, channelization, floods, and the environment.
There will be two minicourses: the registration fees for each will be $20. James Tattersall, Providence College, will present a minicourse on the history of the first nine Lucasian professors at Cambridge, starting with Barrow and Newton, and proceeding through Woodhouse. Much of this material, which will include some of their mathematical accomplishments, will be useful in a modern classroom. Carl E. Swenson, Seattle University, is presenting a minicourse titled Using Mathematica to produce graphical classroom materials. The first presentation will be a presentation of techniques, samples, and ideas for classroom materials, including 3-D graphics, animation, and flipbooks. During the second session participants will create something for their own classroom. Mathematica experience will be helpful but not essential.
A panel discussion on Sensitivity and understanding of the job market will be moderated by Kenneth A. Ross, University of Oregon. The two-year college program will include a panel discussion on The baby and the bathwater problem, which will focus on what we throw out of algebra to make room for technological advances. There will be sessions of contributed papers. Presentations by students are especially solicited. For more information, contact Dick Koch, University of Oregon, Eugene, OR 97403-1222; e-mail: koch@math.uoregon.edu.

Accommodations
Rooms have been blocked in the following motels. Participants should make their own arrangements with the motel of their choice and ask for the "math conference rate". All rates are subject to applicable taxes. Reservations must be made by May 20, 1994. There may be a Grateful Dead concert in Eugene that weekend, so very early reservations are advised. The first four motels listed are within a mile of the meeting site; the nearest, Best Western New Oregon Motel, is across the street. The Village Green is 15 miles south of Eugene.


Best Western New Oregon Motel: P.O. Box 18, 1655 Franklin Blvd., Eugene, OR 97440. Telephone: 503-683-3669. Single or double $60.50 (restaurants, indoor pool).


Village Green: 725 Row River Road, Cottage Grove, OR 97424. Telephone: 503-942-2491 or 800-343-ROOM. Single or double $49 (restaurants, outdoor heated pool, tennis courts).
Meetings

Dormitory housing on the University of Oregon campus will be available. Details will appear in the spring newsletter of the Pacific Northwest Section (MAA) and are available directly from Ken Ross at the University of Oregon (ross@bright.uoregon.edu). Limited housing with local Eugene students will be available to students attending the meeting; those interested should contact Lorna at hanes@euclid.uoregon.edu.

Registration

Preregistration is recommended. Members of the MAA in the Pacific Northwest Section will receive a preregistration form and dormitory information in the spring newsletter. All other participants can receive this information by contacting Kenneth A. Ross, Department of Mathematics, University of Oregon, Eugene, OR 97403-1222; or e-mail: ross@math.uoregon.edu. The deadline for preregistration is June 10, 1994. The deadline for dormitory reservations is May 20, 1994.

The meeting registration desk will be located in the Fir Room of the Erb Memorial Union Building and will be open from 1:00 p.m. to 5:00 p.m. on Thursday, June 16, and 8:00 a.m. to 5:00 p.m. on Friday, June 17, and 9:00 a.m. to noon on Saturday, June 18. The registration fees are $30 for members of the AMS; $20 for participants who are members of MAA only; $45 for nonmembers; and $10 for emeritus members, students, or unemployed mathematicians.

Social Event

The MAA is sponsoring a salmon bake on Friday evening, June 17. All participants are invited to join in. To order tickets, refer to the preregistration procedure described previously.

Travel

American Airlines has been selected as the official airline for this meeting. The following benefits are available exclusively to mathematicians and their families attending the meeting: a savings of up to 10% off any published domestic fare (includes U.S., Canada, Bermuda, the Bahamas, Puerto Rico, and the U.S. Virgin Islands) subject to applicable fare restrictions (10 tickets must be sold). Call 800-433-1790 between 8:00 a.m. and 11:00 p.m. EST to contact American directly or call any licensed travel agent. Instruct the ticket agent to refer to file #SO264CE to qualify for the applicable discount.

---

Mathematics and Sports

L. E. Sadovskii and A. L. Sadovskii

This unique book presents simple mathematical models of various aspects of sports, with applications to sports training and competitions. Requiring only a background in precalculus, it would be suitable as a textbook for courses in mathematical modeling and operations research at the high school or college level. Coaches and those who participate in sports will find it interesting as well. The lively writing style and wide range of topics make this book especially appealing.

1991 Mathematics Subject Classification: 92; 90
ISBN 0-8218-9500-1, 152 pages (softcover), December 1993
Individual member $24, List price $40, Institutional member $32
To order, please specify MAWRLD3/NA

All prices subject to change. Free shipment by surface; for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5904, Boston MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
Minneapolis Mathfest
Minneapolis, Minnesota, August 15–17, 1994
Preliminary announcement

Opening Banquet
On Sunday evening, all participants are invited to a banquet to officially open the Mathfest. This festive event will feature the awarding of AMS and MAA prizes. Details on the banquet, including how to purchase tickets, can be found in the section on Social Events.

The Scientific Program
The Minneapolis Mathfest, including the 96th Summer Meeting of the AMS, the 72nd Summer Meeting of the Mathematical Association of America (MAA), and the 1994 summer meeting of Pi Mu Epsilon (PiME), will be held August 15–17, 1994, at the University of Minnesota, Minneapolis. All sessions will take place on the campus of the university.

AMS-MAA Invited Addresses
Todd J. Arbogast, Rice University, Mathematical simulation of flow in porous media, 8:30 a.m. on Wednesday.
Cameron M. Gordon, University of Texas, Austin, Knots, 8:30 a.m. on Tuesday.
Carole B. Lacampagne, U. S. Department of Education, Reform in mathematics education: New or simply a variation on an old theme?, 8:30 a.m. on Monday.

96th Summer Meeting of the AMS
History of Mathematics Lecture: George E. Andrews, Pennsylvania State University, University Park. The well-poised thread: Some amazing sums of Gauss, Kummer, Ramanujan, and others, 10:40 a.m. on Tuesday.

Progress in Mathematics Lectures: Pierre Louis Lions, University of Paris IX, On Boltzmann’s equation and its applications, 10:40 a.m. on Monday.
Kenneth A. Ribet, University of California, Berkeley, Galois representations and modular forms, 10:40 a.m. on Wednesday.

Special Sessions and Contributed Papers: For Special Sessions, the names and affiliations of the organizers, the topics, and the tentative days they will meet are:
George E. Andrews and Dennis W. Stanton, University of Minnesota, Minneapolis, q-Series, Monday, Tuesday, and Wednesday afternoons.
Thomas L. Drucker, Modern Logic Publishing, History of mathematical logic and theoretical computer science, Monday, Tuesday, and Wednesday afternoons.

While most of the papers presented in these Special Sessions are invited papers, any member of the Society may submit an abstract for consideration for presentation, provided it is received by April 26. There is a limitation in size of a single Special Session, so that sometimes all places are filled by invitation. Papers submitted for consideration for a Special Session but not accepted will receive consideration for a 10-minute contributed paper session, unless specific instructions to the contrary are given.

Contributed papers will be grouped by related Mathematical Reviews subject classifications into sessions, insofar as possible. Contributed paper sessions are scheduled for Monday, Tuesday, and Wednesday afternoons.

Papers submitted for all sessions must be received by May 17 or April 26 (see above) by the Abstracts Coordinator, AMS Meetings Department, P.O. Box 6887, Providence, RI 02904. See the January issue of the Notices for submission details. Unfortunately, late papers cannot be accommodated.

Committee on Science Policy Panel Discussion: 2:00 p.m. to 3:30 p.m. on Monday.
Committee on Education Panel Discussion: 2:45 p.m. to 4:15 p.m. on Tuesday.
Other AMS Activities

Council Meeting: Sunday, August 14, 9:00 a.m. to 6:30 p.m.
Business Meeting: Tuesday, 11:45 a.m. The Secretary notes the following resolution of the Council: Each person who attends a Business Meeting of the Society shall be willing and able to identify himself as a member of the Society. In further explanation, it is noted that each person who is to vote at a meeting is thereby identifying himself as and claiming to be a member of the American Mathematical Society.

The Society has a Committee on the Agenda for Business Meetings. The purpose is to make Business Meetings orderly and effective. The committee does not have legal or administrative power. It is intended that the committee consider what may be called “quasi-political” motions. The committee has several possible courses of action on a proposed motion, including but not restricted to
(a) doing nothing,
(b) conferring with supporters and opponents to arrive at a mutually accepted amended version to be circulated in advance of the meeting,
(c) recommending and planning a format for debate to suggest to a Business Meeting,
(d) recommending referral to a committee, and
(e) recommending debate followed by referral to a committee.

There is no mechanism that requires automatic submission of a motion to the committee. However, if a motion has not been submitted through the committee, it may be thought reasonable by a Business Meeting to refer it rather than to act on it without benefit of the advice of the committee.

In order that a motion for the Business Meeting of August 16, 1994, receive the service offered by the committee in the most effective manner, it should be in the hands of the secretary by July 16, 1994.

72nd Summer Meeting of the MAA
Hedrick Lectures: Ronald L. Graham, AT&T Bell Laboratories, Monday, Tuesday, and Wednesday at 9:35 a.m. Titles of the lectures are (I) Searching for the shortest network, (II) Some generalizations of $1 + 1 = 2$, and (III) Juggling drops and descents.

MAA-Mu Alpha Theta Lecture: Pamela J. Drummond, Kennesaw College, Monday, 1:40 p.m.

Minicourses: Complete course descriptions may be found on the Minicourse Advance Registration Form located at the back of this issue. MAA Minicourses are open only to persons who register for the Mathfest and pay the regular registration fee. Participants interested in attending should complete the MAA Minicourse Advance Registration Form and send it directly to the MAA office so as to arrive by June 11. The Mathfest Advance Registration/Housing Form should be sent to AMS. After the deadline, potential participants are encouraged to call the MAA headquarters at 800-331-1622 or 202-387-9200 to check on availability.

Titles, organizers and their affiliations, tentative times they will meet, enrollment limits, and costs are as follows:

Minicourse #1: Building discrete and continuous ecological models using the SLAM simulation language, James V. Caristi. Valparaiso University. Part A: Monday, 1:30 p.m.–3:30 p.m.; Part B: Tuesday, 4:00 p.m.–6:00 p.m. Enrollment limit: 30; registration fee: $65.

Minicourse #2: Calculus from graphical, numerical and symbolic points of view. Arnold M. Ostbee and Paul Zorn. Saint Olaf College. Part A: Monday, 1:30 p.m.–3:30 p.m.; Part B: Tuesday, 4:00 p.m.–6:00 p.m. Enrollment limit: 50; registration fee: $45.

Minicourse #3: Combinatorics via functional equations, Donald R. Snow. Brigham Young University. Part A: Monday, 1:30 p.m.–3:30 p.m.; Part B: Tuesday, 4:00 p.m.–6:00 p.m. Enrollment limit: 60; registration fee: $45.

Minicourse #4: Multivariable calculus using the Harvard Calculus Consortium materials, Thomas W. Tucker. Colgate University. Part A: Monday, 3:45 p.m.–5:45 p.m.; Part B: Wednesday, 1:45 p.m.–3:45 p.m. Enrollment limit: 50; registration fee: $45.

Minicourse #5: Mathematical models of epidemics, Sonja Sandberg. Framingham State College. Part A: Monday, 3:45 p.m.–5:45 p.m.; Part B: Wednesday, 1:45 p.m.–3:45 p.m. Enrollment limit: 80; registration fee: $45.

Minicourse #6: Unifying themes for discrete mathematics, Ralph P. Grimaldi. Rose-Hulman Institute of Technology. Part A: Monday, 3:45 p.m.–5:45 p.m.; Part B: Wednesday, 1:45 p.m.–3:45 p.m. Enrollment limit: 80; registration fee: $45.

Minicourse #7: Open problems in plane geometry, William O. J. Moser. McGill University; Janos Pach, City College of New York and Mathematical Institute of the Hungarian Academy of Sciences. Part A: Tuesday, 1:00 p.m.–3:00 p.m.; Part B: Wednesday, 4:00 p.m.–6:00 p.m. Enrollment limit: 80; registration fee: $45.

Minicourse #8: The Math Modeling/PreCalculus Reform Project: using discrete mathematical models to motivate mathematics, Sheldon P. Gordon. Suffolk Community College; B. A. Fusaro. Salisbury State University. Part A: Tuesday, 1:00 p.m.–3:00 p.m.; Part B: Wednesday, 4:00 p.m.–6:00 p.m. Enrollment limit: 40; registration fee: $45.

MAA Contributed Paper Sessions

Contributed papers are being accepted on several topics in collegiate mathematics for presentation at the meeting. The session titles, organizers, and tentative days they will meet are given below. Procedures and deadlines are given following the list of sessions.

- Environmental mathematics, Ben Fusaro*. Department of Mathematics and Computer Science, Salisbury State University, Salisbury, MD 21801; e-mail b03afusaro@saes.towson.edu; phone 410-543-6470; fax 410-548-5597; Monday afternoon.

Papers that deal with concepts or contents that can be used in introductory mathematics courses, such as precalculus, applied (“baby””) calculus, and mathematics in culture are especially welcome. However, all undergraduate applications of mathematics to the environment are welcome.
• Innovative projects in first-year courses, Howard Lewis Penn*, Mathematics Department, U.S. Naval Academy, 572 Holloway Road, Annapolis, MD 21402-5002; e-mail hlp@usna.navy.mil; phone 410-267-3892; and Aaron I. Stucker, Washburn University; Wednesday afternoon.

This session, sponsored by the MAA Committee on Computers in Mathematics Education, will focus on innovative teaching approaches in first-year mathematics courses such as college algebra, trigonometry, precalculus, and finite mathematics. Projects that use technology are especially encouraged; however, other projects are also welcome.

• Recreational mathematics and computing, Charles D. Ashbacher*, DecisionMark Corp., 300 Second Ave. SE, Suite 300, Cedar Rapids, IA 52401; e-mail 71603.5220@compuserve.com; phone 319-363-6235; fax 319-365-5694; Monday afternoon.

Mathematicians at all levels often engage in mathematical play, and the results are always interesting and occasionally encouraged; however, other projects are also welcome.

• Winning women into mathematics, Marcella Bessman*, 644 Geneva Place, Tampa, FL 33606; e-mail jjtaylor@madonna.coedu.usf.edu; Miriam P. Cooney, Saint Mary's College, Indiana; and Gerald J. Porter, University of Pennsylvania, Philadelphia; Wednesday afternoon.

Papers on successful programs to recruit and retain women in mathematics are solicited. Submissions should include a description of the program, documentation of its success, discussion of its transferability to other institutions or groups, and available materials and resources for implementation.

Submission Procedures for MAA Contributed Papers: Presentations are normally limited to ten minutes, although selected contributors may be given up to twenty minutes.

Individuals wishing to submit a paper for any of these sessions should note the following: The name(s) and address(es) of the author(s) and a one-page summary of the paper should be sent directly to the organizer of the session marked with an asterisk (*). The summary should enable the organizer(s) to evaluate the appropriateness of your paper for the selected session, so you should include as much detailed information as possible within the one-page limitation. Your summary should reach the designated organizer by Tuesday, April 26, 1994: the organizer will acknowledge receipt of all paper summaries. If the paper is accepted, you will receive an MAA abstract form and further instructions.

Other MAA Sessions

SUMMA Workshop: This workshop on Intervention projects for minority precollege students is scheduled from 2:00 p.m. to 3:50 p.m. on Monday. It is being organized and directed by William A. Hawkins, Director of SUMMA (Strengthening Underrepresented Minority Mathematics Achievement). There will be three presenters.

Exploring Mathematics on the Internet: This electronic poster session on Tuesday afternoon, 1:00 p.m. to 6:00 p.m., is sponsored jointly by the Committee on Computers in Mathematics Education (L. Carl Leinbach, chair) and the Committee on Electronic Services (Eugene A. Herman, chair). In this hands-on session, several presenters will demonstrate and encourage exploration of a variety of services on the Internet of interest to mathematicians. Among these will be the mathematics archives and "gophers" maintained by various professional societies in mathematics. Each presenter will give a short formal presentation and will be available throughout most of the session to help conference attendees explore Internet services. The organizers are Eugene A. Herman, Grinnell College, and Lawrence S. Husch, University of Tennessee, Knoxville.

Advising Undergraduate Mathematics Majors: The MAA ad hoc Committee on Advising is sponsoring this panel discussion, which will take place on Tuesday from 1:00 p.m. to 2:30 p.m. This committee was appointed to study the advising of mathematics majors. In this panel presentation, members of the committee and others will discuss advising methods that work at various colleges and universities. In addition, the session will include a discussion of career-related advising materials that are available to assist mathematics advisors. The organizer and moderator is David J. Lutzer, College of William and Mary. Possible participants include the moderator, Diane L. Herrmann, University of Chicago, and Andrew Sterrett, Jr., MAA.

Calculus Reform in Different Settings: This panel discussion is scheduled from 2:45 p.m. to 4:30 p.m. on Tuesday and is being organized by A. Wayne Roberts, Macalester College, and Sharon C. Ross, DeKalb College. “Different settings” is to be interpreted in two ways. “Different types of schools” (high schools without AP; high schools with AP, two-year colleges, private liberal arts colleges, state universities) and “different approaches” (formal labs, adoption of all new materials, use of standard text with supplements).

1994 International Olympiad Winners' Stories: There will be a panel discussion scheduled from 4:45 p.m. to 6:00 p.m. on Tuesday in which the USA International Mathematical Olympiad (IMO) team members will describe their experiences at the IMO held in Hong Kong, July 8–20, 1994. The organizer and moderator is Walter E. Mientka, University of Nebraska, Lincoln, and executive director of the American Mathematics Competitions.

Micro-inequities Skits: On Tuesday evening from 8:30 p.m. to 10:00 p.m., the Committee on the Participation of Women (Carol B. Lacampagne, chair) is presenting its ninth program of skits about the incidents that reveal the current relationship between the sexes within our mathematics community. The events to be dramatized were reported within the past year. Following the skits, discussion groups will consider how these incidents might have been resolved and related issues which may arise. The skits will be dramatized by David E. Bolivar, University of Central Oklahoma; Susan...
C. Geller, Texas A&M University; and David J. Pengelley, New Mexico State University. Additional contributions are desired. Brief descriptions of incidents which should be dramatized may be sent to David E. Bolivar, Department of Mathematics and Statistics, University of Central Oklahoma, 100 N. University Drive, Edmond, OK 73034-0197; or by e-mail to dbolivar@aix1.ucok.edu.

MAA Student Activities

Student Lecture: Gail S. Nelson, Carleton College, What's really in the Cantor set?, Wednesday, 1:40 p.m.

Student Workshop: The theory and practice of juggling, Wednesday, 2:45 p.m. to 4:45 p.m., organized by Joe P. Buhler, Reed College, and Ronald L. Graham, AT&T Bell Laboratories and president of AMS, who also will make presentations. Please check the appropriate box on the Advance Registration/Housing Form if you would like to register for this workshop. There is no extra charge.

Student Paper Sessions: Monday and Tuesday afternoons. Students are invited to present papers at the Mathfest. Papers should be sent to Ronald F. Barnes, Department of Mathematics, University of Houston Downtown Campus, 1 Main Street, Houston, TX 77002, prior to June 25.

MAA-IIME Student Reception: Monday, 5:00 p.m. to 6:00 p.m. All students welcome.

MAA Committee on Student Chapters Hospitality Center: Open during the same hours as registration. All students welcome.

Breakfast for MAA Student Chapter Advisors and Section Coordinators and IIME Advisors: Tuesday morning. Contact Aparna W. Higgins, chair, Committee on Student Chapters.

See also the activities of Pi Mu Epsilon in the Activities of Other Organizations section.

Other MAA Activities

Board of Governors: Sunday, August 14, 8:30 a.m. to 4:00 p.m. This meeting is open to all members of the Association.

Section Officers: Monday, 3:45 p.m. to 5:45 p.m.

Business Meeting: Wednesday, 12:25 p.m. This meeting is open to all members of the Association.

MAA Banquet for 25-Year Members: This traditional event will take place on Wednesday evening, 6:30 p.m. to 9:00 p.m. See Social Events.

Activities of Other Organizations

The Army High Performance Computer Research Center will sponsor an event during the Mathfest. Look for details in the next issue of the Notices.

Association of Women in Mathematics (AWM) Panel Discussion: Monday, 3:00 p.m. to 4:30 p.m.

AWM Open Reception: Monday, 9:30 p.m. to 11:00 p.m. See Social Events.

The Geometry Center, located at 1300 South Second Street, is an NSF science and technology research center whose mission is to foster research in geometry and related fields and the communication of mathematical ideas among mathematicians and to the public, using modern computation and visualization tools.

The Center is sponsoring several exciting activities, both at the Center and at the Mathfest:

- Interested participants should see the article on the August 13–14 workshop, Basic issues in computer-aided math visualization, which follows the Mathfest announcement.
- A poster and video session displaying aspects of the Center’s work, Monday, 2:00 p.m. to 4:00 p.m.
- Geometry Center participation in the AMS special session Computer graphics as a research tool in geometry and topology.

Participants should also see the Social Events section for details of the Center’s open house and reception.

Institute for Mathematics and its Applications (IMA)

Session: IMA was founded by the Mathematical Sciences Division of NSF in 1982. The mission of the IMA is to demonstrate the power of sophisticated mathematics to solve problems that arise in the other sciences, engineering, and industry, and to encourage mathematicians to work on these problems. IMA's presentation is Mathematical modeling for instructors conducted by Donald A. Drew, Rensselaer Polytechnic Institute; Patrick Hagan, Los Alamos National Laboratory; David Ross, Eastman Kodak; and Colin Please, Southampton University, England; Monday, 4:30 p.m. to 5:30 p.m., in IMA’s main offices in Vincent Hall on the East Bank campus.

The National Science Foundation (NSF) invites participants to meet informally with staff members from noon to 1:00 p.m. daily.

Pi Mu Epsilon (PiME) prepares their own detailed program for their sessions; ask for your copy at the Registration Desk.

PiME J. Sutherland Frame Lecture: Colin Adams, Williams College, Cheating your way to the knot merit badge, by Scoutmaster Mel Slugbate; Tuesday, 8:30 p.m.

Sessions for PiME Contributed Papers: Monday and Tuesday afternoons.

PiME Council: Monday, noon to 2:30 p.m.

Reception: Monday, 5:00 p.m., cosponsored by PiME and MAA.

PiME Banquet: See Social Events.

Other Events of Interest

Book Sales

Book Sales: Books published by the AMS and MAA will be sold at discounted prices somewhat below the cost for the same books purchased by mail. These discounts will be available only to registered participants wearing the official meetings badge. Visa and MasterCard will be accepted for book sale purchases at the meetings. The book sales will be open Monday and Tuesday from 9:00 a.m. to 5:00 p.m., and Wednesday from 9:00 a.m. to 2:00 p.m.
Information Booths: All meeting participants are invited to visit the AMS and MAA membership information booths during the meetings. A representative will be available at each booth to answer questions about membership, publication, and other programs. Complimentary coffee will be available at the AMS booth. These booths will be open the same days and hours as the book sales.

Joint Books, Journals, and Promotional Materials: This display will be open the same hours as the book sales and will afford participants the opportunity to order publications from various commercial publishers not represented at the meetings.

Other commercial publishers may be represented at the meeting, although not in the Mathfest Book Sales and Exhibits area. Look for announcements of these exhibits in the program or at the Mathfest.

Social Events
It is strongly recommended that tickets for events be purchased through advance registration, since only a very limited number of tickets will be available for sale on-site. Tickets purchased through advance registration will be mailed with your badge and program from Providence. Should participants wish to pick up their ticket(s) at the meeting at the same time as their badge and program, they must indicate this on the Advance Registration/Housing (ARH) form. To get a 50% refund, returned tickets must be received by the Mathematics Meetings Service Bureau by August 1.

After that date no refunds can be made. Special meals are available upon request at all banquets, including vegetarian and kosher (except the dinner cruise on Monday), but this must be indicated on the ARH form in advance.

Opening Banquet: The special feature of this banquet will be the awarding of AMS and MAA prizes. For AMS, recipients of three Leroy P. Steele Prizes; one for writing a truly fundamental paper, one for a work or sequence of works that has been shown to be of lasting value, and one for an outstanding career will be announced. For MAA, the recipients of awards for outstanding journal articles, namely the Carl B. Allendoerfer, Lester R. Ford, and George Pólya Awards will be announced. Diners will have the opportunity to meet with each of them on Sunday, August 14, at 7:30 p.m. The banquet will be preceded by a cash bar reception at 6:30 p.m. The entrée is roasted top sirloin of beef with wild mushroom sauce. Vegetarian and kosher meals are available upon advance request. Tickets are $25 per person, including gratuity and all taxes. This event will be canceled and full refunds issued. Children must be at least three years of age.

Dinner Cruise Aboard a Paddleboat and Barge: On Monday, August 15, from 6:30 p.m. to 9:00 p.m., participants may sample traditional Mississippi cruising and dining aboard the paddleboat Anson Northrup as she pushes the Betsey Northrup passenger barge down the Mississippi. This scenic cruise will show you Minneapolis from a decidedly different perspective as you learn about the area and people along the mighty Mississippi. One of the most fascinating aspects of your journey will take you through the system of locks so important to river navigation. You will go through the Upper St. Anthony Falls Lock to descend 50 feet to the next level of the river.

As if the cruise and scenery were not enough to make this an unforgettable event, extraspecial entertainment will be provided by The Medicine Show Music Co. This trio has been described as a living encyclopedia of vaudeville. So get ready for a little singing, some down-home humor, a touch of tap dancing, and a tweak of sleight-of-hand, tempered by the irresistible majestic Mississippi.

There will be a cash bar where participants can relax and mingle with their colleagues and guests. The dinner served on board features old-fashioned bratwurst. Tickets are $26 each for the cruise and dinner, including all taxes. Vegetarian meals are available with advance request; regretfully, no kosher meals are available. Buses will leave from Middlebrook and Comstock Halls promptly at 6:00 p.m.

AWM Reception: The AWM will top off the night on Monday at 9:30 p.m. with one of their spectacular parties. All participants are invited for camaraderie, music, and refreshments.

Geometry Center Open House and Reception: All participants are invited to an open house from 1:00 p.m. to 7:30 p.m. on Tuesday at the Center located at 1300 South Second Street. Demonstrations of software and videos produced at the Center, plus discussions with the developers of the software and with students, researchers, and staff will be available. Computers for reading e-mail will be available.

Participants are also cordially invited to a complimentary reception from 5:30 p.m. to 7:30 p.m. on Tuesday as part of the open house.
**IME Banquet:** This popular annual event will take place on Tuesday, August 16, at 6:45 p.m. at the H. H. Humphrey Center dining room. The buffet dinner features chicken and beef burgundy as entrees. Tickets are $17, which includes a donation to the university’s scholarship fund in lieu of a gratuity. Tickets for IME members are $10. Vegetarian and kosher meals are available through advance request.

**MAA 25-Year Member Banquet:** The MAA is planning its seventeenth annual banquet on Wednesday for those individuals who have been members of the Association for twenty-five years or more. After a reception beginning at 5:45 p.m., dinner will be served in the Humphrey Center dining room at 6:30 p.m. The entree is grilled swordfish. Tickets are $26 each, including a donation to the university’s scholarship fund in lieu of a gratuity. Alcoholic beverages will not be available. Vegetarian and kosher meals are available through advance request.

**Tours**

Because of its many attractions and marvelous climate, the Minneapolis area is a premier vacation destination. The following tours are recommended as typical of the area in the summer and are available exclusively to mathematicians and their families. Tickets should be purchased through advance registration, as seats are limited and many tours may sell out early. Please indicate preference for tour(s) on the ARH form and include applicable payments.

**NOTE:** Should these tours not meet a minimum of 30, they will be canceled and full refunds issued. All tours will take place as scheduled, rain or shine, and no refunds will be made because of weather.

No food is included in the prices of the tickets listed below unless specified. For those persons staying in residence halls, box lunches will be available as part of your room and board package, and will be distributed on the bus for all tours, even those which include lunch. Unfortunately, there is no reduction in price if one declines the tour-provided lunch.

**Pick up and drop off will be at Middlebrook Hall.**

**Take the Plunge!** Tube down the beautiful Apple River in Somerset, Wisconsin, to a beautiful waterpark filled with multiflume waterslides. A shuttle will take you back up to the drop-off point in the river to tube back down, or you may wish to stay in the waterpark zooming down the slides. This trip is wet and wild; a great day of family fun! Sunday, August 14, and Thursday, August 18, departs 10:00 a.m. and returns at 5:00 p.m. Cost is $32 per person and includes a box lunch.

**Fort Snelling and a Cruise on the Mighty Mississippi River:** First you will visit restored Fort Snelling and go back in time to the 1820s at this historic site set on a bluff high above the juncture of the Minnesota and Mississippi rivers. This is a living museum where you will see characters in the uniform of the era going through daily activities as they did more than 150 years ago. Then off to Harriet Island to recapture the thrill of a cruise on a sternwheeler—the Josiah Snelling, pride of the nineteenth century. Listen to the rhythmic swish of the paddlewheel and the deep-throated blast of the whistle. There is a snack bar aboard where you can purchase a light lunch. Sunday, August 14, departs at 9:15 a.m. and returns at 2:30 p.m. Cost is $26 per person ($23.50 for children 11 and under).

**A Tale of Two Cities:** See the fantastic diversity of two cities, Minneapolis and St. Paul, a comfortable blend of old and new with magnificent art deco and Victorian reminders of the past nestled next to gleaming skyscrapers. Your expert guide will narrate a tour of the two downtown areas, the Guthrie-Walker Complex, mansion-lined Summit Avenue, St. Paul’s Cathedral, and the mighty Mississippi River. Stop and enjoy the Minneapolis Sculpture Garden, Minnehaha Falls (the inspiration for Henry Wadsworth Longfellow’s “Song of Hiawatha”), and the State Capitol. Monday, August 15, departs at 9:00 a.m. returns at 1:00 p.m. Cost is $16 per person.

**A Walk on the Wild Side:** Your deluxe motorcoach will take you to the Raptor Center, located on the campus of the University of Minnesota-St. Paul campus to get a first-hand look at birds of prey. After a slide presentation, you can see the live eagles, hawks, owls, and falcons that make the center their home.

Next stop is the Minnesota Valley National Wildlife Refuge, which encompasses 7,500 acres and stretches for 34 miles. This is an area where over 300 species of wildlife continue to thrive within a short distance from the city. At the center you can enjoy a boxed lunch and any of the activities offered, such as nature hikes, bird watching, nature photography, and wildflower identification.

Lastly you will visit historic Murphy’s Landing overlooking the beautiful Minnesota River Valley. Here you will learn about the joys and hardships of Minnesota’s early settlers in this unique community of historic buildings. The authentic houses of this village were transported here and reflect life as it was from 1850–1880. Monday, August 15, departs 9:00 a.m. and returns at 4:00 p.m. Cost is $34 per person, including the box lunch.

**Wildlife at the Minnesota Zoo:** This zoo is Minnesota’s first without bars and is a 500-acre conservatory designed to duplicate natural habitats. There will be a brief orientation session when you arrive at the zoo. Then there are many wonderful exhibits for you to choose from, including a dolphin feeding and show, the tropics, children’s zoo, a koala exhibit, a coral reef exhibit, and the spectacular bird show in the outdoor amphitheatre. Ride the monorail for an overhead view (extra charge)! Tuesday and Wednesday, departs 9:00 a.m. and returns 1:00 p.m. Cost is $22 per person ($20 for children 12 and under).

**Shop ’til You Drop!** The Mall of America, largest mall in the United States, has hundreds of specialty stores and four major anchor stores—Bloomingdales, Macy’s, Nordstroms, and Sears. In the center of the mall is Camp Snoopy, a seven-acre family amusement park complete with 26 rides and attractions. Visit The LEGO Imagination Center, where young and old can make the LEGO castle of their dreams! Like golf? Enjoy the 18-hole Golf Mountain Adventure. Whatever you like for lunch is available in the dozens of restaurants.
Prefer to enjoy a movie? There are 14 cinemas to choose from. There will be an official greeting, a brief orientation to the mall, and you will receive a small gift bag with maps. A trip not to be missed. Tuesday, August 16, departs 9:30 a.m. and returns at 3:30 p.m. Cost is $13 per person.

**Gardens and Goodies:** The lovely University of Minnesota Landscape Arboretum is the first stop on this trip. The arboretum will provide a guided tour orienting you for further exploration of the grounds. You can pick up many ideas for your garden back home.

Next, off to a one-of-a-kind facility, the General Store. This multilevel rustic store features the work of over 300 local Minnesota artists.

End this tour with a unique shopping experience at Byerly’s, a SUPERmarket with 92,000 square feet of carpeted elegance housing millions of dollars of delectables and collectibles. Wednesday, August 17, departs 9:30 a.m. and returns at 3:00 p.m. Cost is $18 per person.

**Historic Stillwater:** Stillwater, located on the Saint Croix River, has all the charm of a New England town with its regal nineteenth-century mansions on residential hills, steepled churches, and a beautifully restored turn-of-the-century business and shopping district.

Your professional guide will tell you the story of this logging capitol, Tour an elegant private residence. Enjoy a delightful lunch at the Lowell Inn, Minnesota’s proud entry in Back Roads & Country Inns, named one of this country’s ten best inns. You’ll have time to shop at the restored Post Office Building, Grand Garage Gallery, and Staples Antique Mill. Thursday, August 18, departs at 9:15 a.m. and returns at 3:45 p.m. Cost is $34 per person, lunch included.

### How to Register in Advance

The importance of advance registration cannot be overemphasized. Those who register in advance pay fees considerably lower than those who register at the meeting (on-site registration fees will be 30% higher than the advance registration fees listed below). There are two separate advance registration deadlines, each with its own advantages and benefits.

- **ORDINARY advance registration**
  - (and housing) June 11

- **FINAL advance registration**
  - (no housing or tickets) July 14

**Ordinary Advance Registration:** Those who register by the ordinary deadline of June 11 may make housing reservations at special rates offered only through the MMSB. They will receive formal acknowledgments prior to the meetings as well as their badges, programs, and appropriate tickets by mail two to three weeks before the meeting (unless the appropriate box signaling the contrary was checked on the ARH form).

Because of possible delays in delivery of the U.S. mail to Canada, it is strongly suggested that advance registrants from Canada choose to pick up their registration material at the meeting as opposed to having it mailed. There will be a special Registration Assistance desk at the meeting to assist individuals who either do not receive this mailing or who have a problem with their registration. Please note that a **replacement fee** will be charged for programs and badges that are mailed but are not brought by participants to Minneapolis.

**Final Advance Registration:** Those who register by the final deadline of July 14 must pick up their badge and program at the meeting. Unfortunately, it is not possible to provide final advance registrants with housing or tickets to special events in advance. Please note that the July 14 deadline is firm and any forms received after that date will be returned!

It is essential that the ARH form (found at the back of this issue) be completed fully and clearly. Each person must complete a separate copy of the ARH form, but all registrations from one family may be covered by one payment. Please print or type the information requested, and be sure to complete all sections. Absence of information (missing credit card numbers, incomplete addresses, etc.) will cause a delay in processing.

If you wish to be included in a list of individuals sorted by mathematical interest, please provide the one Mathematical Reviews classification number of your major area of interest on the ARH form. (A list of these numbers appears on the back of the AMS and MAA abstract forms.) The master copy of this list will be posted on the meetings bulletin board near the registration area.

**Advance Registration Fees:** The AMS-MAA Joint Meetings Committee is responsible for maintaining a sound fiscal position for these meetings while still providing the very best meeting facilities and services to the participants. Registration fees only partially cover the expenses of holding meetings.

The **registration fees at the meeting will be 30% higher** than the advance registration fees listed below. One-day registration fees will also be available at the meeting (these fees are not payable through advance registration).

### Minneapolis Mathfest

<table>
<thead>
<tr>
<th>Category</th>
<th>Registration Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member of AMS, Canadian Mathematical Society, MAA, PIKE</td>
<td>$125</td>
</tr>
<tr>
<td>Emeritus Member of AMS or MAA Graduate Student, Unemployed, High School Teacher, Librarian</td>
<td>$194</td>
</tr>
<tr>
<td>Third-World Country Participant</td>
<td>35</td>
</tr>
<tr>
<td>Undergraduate Student</td>
<td>20</td>
</tr>
<tr>
<td>Nonmember</td>
<td>194</td>
</tr>
<tr>
<td>High School Student</td>
<td>2</td>
</tr>
</tbody>
</table>

**MAA Minicourses**

<table>
<thead>
<tr>
<th>Minicourses #2, 3, 4, 5, 6, 8, 9</th>
<th>$ 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minicourse #1</td>
<td>65</td>
</tr>
</tbody>
</table>

All mathematicians who wish to attend sessions are expected to register and should be prepared to show their badge, if so requested. Badges are required to obtain discounts at the AMS and MAA Book Sales and to cash a check with the meeting cashier. If advance registrants arrive too late in the day to pick up their badges, the acknowledgment of registration received from the MMSB acts as proof of registration.
**How to Get a Room**

**Participants** are required to register in advance in order to obtain residence hall and hotel accommodations through the Mathematics Meetings Service Bureau (MMSB). All reservation requests for the residence halls and the Holiday Inn Metrodome must be received in writing and processed through the MMSB to receive the rates listed below. Be sure to complete the Housing Section of the Advance Registration/Housing (ARH) Form (located at the end of this issue) completely to insure accurate housing arrangements. Reservations at other hotels listed can be made directly with the hotels. Mention of attending the Mathfest will insure the convention rates listed below.

### University Housing

<table>
<thead>
<tr>
<th>Rates:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(per day)</td>
<td></td>
</tr>
<tr>
<td>$33.50 single*</td>
<td></td>
</tr>
<tr>
<td>$29.50 (per person) double-two adults*</td>
<td></td>
</tr>
<tr>
<td>$13.60 (per person) children under 12 yrs. (in rollaway beds only)*</td>
<td></td>
</tr>
</tbody>
</table>

**Deadlines:**
- reservations thru MMSB – June 11**
- changes/cancellations thru MMSB – August 8
- 90% refund on Residence Hall Package – August 8

**Payments:**
- by personal checks or credit card (VISA, MC)
- all money collected by MMSB
- no refunds issued for missed meals

* All rates include room and board (no exceptions); no tax applicable. Daily meal packages include breakfast and lunch. A limited number of meals will be available for purchase directly at the dining halls on a first-come, first-serve basis. These meals can be purchased by meal card only. Meal cards can be purchased at the main desk of each hall at adult prices of $3.36 for breakfast, $4.85 for lunch, and $6.95 for dinner and at children (under 12) prices of $1.65 for breakfast, $2.40 for lunch, and $3.45 for dinner. Unlimited seconds are provided. A sufficient number of vegetable dishes will be offered. Sorry, kosher meals cannot be provided. The rates also include reserved parking spaces if prearranged with the MMSB via the ARH form.

**Please call the MMSB (800-321-4267, ext. 4143) after June 11 for information on and assistance with obtaining university accommodations. Only a LIMITED number of rooms will be available on-site for arrivals with no previous reservations.

**HOTEL HOUSING:** Participants desiring confirmed reservations at the Holiday Inn Metrodome must register in advance and send in the ARH Form prior to the June 11, 1994, deadline. Participants are required to guarantee their reservations at the Holiday Inn Metrodome with either a $50 deposit by check or a major credit card. The **Holiday Inn Metrodome will not take reservations directly.** Reservations at the other hotels listed must be reserved through the hotels directly prior to July 22, 1994 (July 8 for suite reservations at the Radisson); guarantees required. After this date, the MMSB cannot guarantee the availability of the special convention rates listed below. Rates listed are subject to a 12% sales/occupancy tax. Nonsmoking rooms and rooms accessible to the physically challenged (shing-bedded only at the Holiday Inn) are available at all properties. Suite rates listed are starting rates. Please call the MMSB for further information.

### Hotel Information

<table>
<thead>
<tr>
<th>Hotel</th>
<th>Address</th>
<th>Phone</th>
<th>Rates:</th>
<th>Meals:</th>
<th>Parking:</th>
<th>Windows:</th>
<th>Facilities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holiday Inn Metrodome (Headquarters) (West Bank)</td>
<td>1500 Washington Avenue South Minneapolis, MN 55454</td>
<td>(612) 333-4646</td>
<td>single-$77, double-$87, suites $109+</td>
<td>children under 17 yrs. free</td>
<td>$6.50 per day</td>
<td>Windows which open</td>
<td>Indoor pool, exercise room, computer modem hookups in rooms, check-in at 3:00 p.m. check-out at noon</td>
</tr>
<tr>
<td>Radisson Hotel Metrodome (East Bank)</td>
<td>615 Washington Avenue Minneapolis, MN 55414</td>
<td>(612) 579-8888</td>
<td>single-$80, double-$89, triple quad-$95</td>
<td>children under 18 yrs. free</td>
<td>$7.60 per day</td>
<td>Windows which open</td>
<td>Exercise room, computer modem hookups in rooms, check-in at 3:00 p.m. check-out at noon</td>
</tr>
<tr>
<td>Days Inn (East Bank)</td>
<td>2407 University Avenue SE Minneapolis, MN 55414</td>
<td>(612) 282-8888</td>
<td>single/$50, double-$65</td>
<td>children under 17 yrs. free</td>
<td>$10 per day</td>
<td>Windows which open</td>
<td>Free parking, exercise room, computer modem hookups in rooms, check-in at 3:00 p.m. check-out at 11:00 a.m.</td>
</tr>
<tr>
<td>Econolodge (East Bank)</td>
<td>2500 University Avenue SE Minneapolis, MN 55414</td>
<td>(612) 331-0000</td>
<td>single/double-$45</td>
<td>children under 18 yrs. free</td>
<td>$10 per day</td>
<td>Windows which open</td>
<td>Free parking, exercise room, computer modem hookups in rooms, check-in at 2:00 p.m. check-out at noon</td>
</tr>
</tbody>
</table>

**UNIVERSITY HOUSING:** Participants desiring confirmed reservations for on-campus housing must register in advance and send payment in full for housing to the MMSB prior to the June 11, 1994, deadline. All rooms on campus are offered through a room/board package only. Two residence halls will be used: Comstock Hall, which is located on the East Bank Campus, will be assigned for single accommodations, and Middlebrook Hall, which is a high-rise located on the West Bank Campus, will be assigned for double accommodations. Special sections or floors such as nonsmoking, family, or group can be arranged through the MMSB upon request. With the exception of locations, both halls are basically the same. The university will not accept direct reservations.

- **Other Information**
  - **dining hall:** located in each hall; meal cards accepted at either hall
  - **dining hours:** Mon.–Fri. – Breakfast 7:00–8:30 a.m., Lunch 11:30 a.m.–1:15 p.m., Dinner 5:00–6:15 p.m.; Weekends – Continental Breakfast 7:00–8:00 a.m., Brunch 11:00 a.m.–1:00 p.m., Dinner 5:00–6:00 p.m.
  - **check-in desks:** located in the lobby of each residence hall; fully staffed 7:00 a.m. to 11:00 p.m.; periodically staffed 11:00 p.m. to 7:00 a.m., number posted on door for assistance; participants check in at hall assigned to them; check out time: noon
  - **received at check-in:** key, meal card, parking permit, two towels, washcloth, and soap; clean linen; daily exchange of bath towels and washcloth
  - **each room contains:** desk with built-in light, closet, drawer space, and telephones (unrestricted for local use only); no carpeting; windows which open
  - **sleeping bags** are not allowed; cribs are not available; maximum of two adults and one child (not including infants) to a room
  - **shared bathroom facilities** located on each floor; no private bathroom facilities
  - **all halls air conditioned and accessible to physically challenged:** all halls contain: common living areas on each floor with refrigerator, sink, and microwave; change, ice, vending and amusement machines; coin-operated laundry room; computer room with stand-alone Macintoshes ($3 weekly charge for use of machines)
  - **penalties:** lost meal card – $20, lost meal card – $10
  - **mail/messages:** (Room Number), Middlebrook Hall, 412 22nd Avenue South, (Room Number), Comstock Hall, 210 Middle Street SE, Minneapolis, MN 55455-0307
  - **parking:** Middlebrook Hall – lots C58, C59, C85; Comstock Hall – lot C70

---

*NOTES OF THE AMERICAN MATHEMATICAL SOCIETY*
Advance registration forms accompanied by insufficient payment either will be returned, therefore delaying the processing of any hotel housing request, or a $5 charge will be assessed if an invoice must be prepared to collect the delinquent amount. Overpayments of less than $2 will not be refunded.

All full-time students currently working toward a degree or diploma qualify for the student registration fees, regardless of income.

The unemployed status refers to any person currently unemployed, actively seeking employment, and not a student. It is not intended to include any person who has voluntarily resigned or retired from his or her latest position.

Persons who qualify for emeritus membership in either the Society or the Association may register at the emeritus member rate. The emeritus status refers to any person who has been a member of the AMS or MAA for twenty years or more and who is retired on account of age or on account of long-term disability from his or her latest position. This rate is also extended to any CMS member who has retired from his or her position.

The high school teacher status refers to any person whose primary employment is teaching in any high school or secondary school.

The librarian status refers to any person who has a degree in library science and whose primary employment is working in a library.

Third-world country status refers to those participants from the third world where salary levels are radically noncommensurate with those in the U.S.

Nonmembers who register at the nonmember fee will receive mailings containing information about a special membership offer from AMS and MAA after the meeting is over.

There is no extra charge for members of the families of registered participants, except that all professional mathematicians who wish to attend sessions must register independently.

Participants should check with their tax preparers for applicable deductions for education expenses as they pertain to this meeting.

Electronic Advance Registration: This service is available for advance registration, and housing arrangements if desired, by requesting the forms via e-mail from meet@math.ams.org, or by telnetting to e-MATH, selecting [10] Gopher from the main menu, then selecting [11] Meetings and Conferences and following the instructions for the required forms. VISA or MasterCard is the ONLY method of payment which will be accepted for electronic advance registration, and charges to credit cards will be made in U.S. funds. These forms will be treated in the same manner as forms received through U.S. mail. Receipt of the completed form and payment will be acknowledged by the MMSB. Participants are advised to bring a copy of this acknowledgment with them to Minneapolis. The same deadlines apply as for advance registration by mail.

Miscellaneous Information

Audio-Visual Equipment: Standard equipment in all session rooms is one overhead projector and screen. (Invited 50-minute speakers are automatically provided with two overhead projectors.) Blackboards are available only in rooms where they currently exist and cannot be produced upon request.

Speakers in MAA sessions requiring additional equipment may make written requests for one additional overhead projector/screen, 35mm carousel slide projector, or VHS video cassette recorder with one color monitor. Such requests should be addressed to the MAA Associate Secretary (Kenneth A. Ross, Department of Mathematics, University of Oregon, Eugene, OR 97403). These requests should be received by June 1.

All other speakers requiring additional equipment should contact the Audio-Visual Coordinator for the meetings at the AMS office in Providence at 401-455-4140, or electronic mail to vad@math.ams.org by June 1.

Requests for equipment made at the meeting most likely will not be satisfied because of budgetary restrictions.

Camping and RV Facilities: There are several campgrounds, most with RV facilities, in the general area. Interested participants should contact the MMSB at 401-455-4143 or meet@math.ams.org for a list.

Car Rental: Alamo Rent A Car has been designated as the official car rental company for the Minneapolis Mathfest. To reserve a car at special rates, call 800-732-3232 and request group ID# 247733 and rate code GR. Also have the reservationist check Code 7G for additional convention discounts that may apply. Included in the rental fee is $3,000 maximum personal responsibility limit which covers damage to the rental car only. Taxes, Waiver Savers ($11.99/day or less), fuel, drop charges, additional driver fees, and other optional items are additional. These rates are applicable one week prior to and one week after the Mathfest and include unlimited mileage. Rates are higher for renters under age 25. Weekly rates require a five-day minimum rental or daily rates will apply. A 24-hour advance reservation is required. Availability of these rates is limited. Valid driver’s license and credit card are required. You may receive credit on your frequent flyer accounts on Delta, United, Hawaiian Airlines, Alaska Air, and USAir.

<table>
<thead>
<tr>
<th>Car Class</th>
<th>Daily</th>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy</td>
<td>$22</td>
<td>$105</td>
</tr>
<tr>
<td>Compact</td>
<td>$27</td>
<td>$119</td>
</tr>
<tr>
<td>Midsize</td>
<td>$29</td>
<td>$149</td>
</tr>
<tr>
<td>Full size</td>
<td>$34</td>
<td>$179</td>
</tr>
<tr>
<td>Luxury</td>
<td>$36</td>
<td>$199</td>
</tr>
</tbody>
</table>

Four-door models may be requested at the time of reservation for an additional charge of $2/day or $10/week for midsize or larger.

The Alamo counter at the Minneapolis/St. Paul International Airport is located near carousel #9 in the baggage claim area. Once the paperwork is completed at the counter, you must take a complimentary shuttle to the car rental building.

Children’s Activities: A parent-child lounge will be
furnished with casual furniture, a crib, and a changing area. Any child using this lounge must be accompanied by a parent (not simply an adult), who must be responsible for supervision of the child. This lounge will be unattended, and parents assume all responsibilities for their children. This lounge will be open only during the hours of registration, and all persons must leave the lounge at the close of registration each day.

Also, please see the Social Events and Tours sections for other children’s activities.

The City of Minneapolis offers summer programs for children up to sixth grade in city parks. Van Klee Park is six blocks from East Campus at 901 15th Ave., SE. For detailed information on these programs you may contact Candice or Bobbie at 612-348-8131.

E-mail: Computer terminals for contacting your university’s computer using the Internet will be available on campus at a location to be announced. Participants are advised to check with technicians at their own college or university to identify the numerical address of their machine, as well as its name, and bring this information with them. Not all locations can be contacted by name alone.

Employment Opportunities: There will be an opportunity for the posting of both applicant résumé forms and employers announcements of open positions in a designated area on the meetings bulletin board. No provisions will be made for holding interviews; while interviews are encouraged, arrangements will be the responsibility of each employer and applicant. Messages may be left on the meetings message board. A very limited number of rooms will be available for short periods for informal interviews. Interested participants should check with the Logistics Coordinator or the Meeting Manager at the Registration Desk.

Applicant and employer forms will be available at the transparencies section of the Registration Desk. There is no charge for this service. Please note that no printed lists of employers or applicants who fill out forms will be published.

Information Distribution: A table is set up in the registration area for dissemination of information of possible interest to participants.

A second table is set up in the book sale area for the dissemination of information of a mathematical nature not promoting a product or program for sale.

Those who wish to display information of a mathematical nature promoting a product or program for sale may do so in the book sale area at the Joint Books, Journals, and Promotional Materials display for a fee of $35 per item.

Those who would like to display material separate from the Joint Books table must reimburse the meeting for room rental and any extra furnishings requested (tables, chairs, easels, etc.) This latter display is also subject to space availability.

The administration of these tables is in the hands of the Exhibits Coordinator. To request a contract or more information, please contact Exhibits Coordinator, MMSB, PO Box 6887, Providence, RI 02940; 401-455-4143; meet@math.ams.org.

Mail: All mail and telegrams for persons attending the meeting should be addressed as follows: Participant’s name, Minneapolis Mathfest, c/o Lori Graven, Continuing Education and Conferences, University of Minnesota, 131 Nolte, Minneapolis, MN 55455. Those received will be posted on the message board near the registration area. Mail not picked up will be forwarded after the meeting to the mailing address given on the participant’s registration record.

Parking: Participants staying in hotels or residence halls should refer to the housing page for parking instructions. There are several public parking areas on campus; Mathfest participants may find the most convenient to the meetings is the West Bank Ramp near Middlebrook Hall. Cost is approximately $1.50/day with no in/out privileges.

AMS Petition Table: At the request of the AMS Committee on Human Rights of Mathematicians, a table will be made available in the registration area at which petitions on behalf of named individual mathematicians suffering from human rights violations may be displayed and signed by participants acting in their individual capacities. Those interested in displaying material should contact the Director of Meetings, hh@math.ams.org, 401-455-4137.

Registration Desk: This will be located in Middlebrook Hall. Those who did not want their badges, programs, and tickets mailed should pick them up here. A list of services provided by registration staff will be provided in the program.

Telephone Messages: A telephone message center will be located in the registration area to receive incoming calls for participants. The center will be open from August 14 through August 17 during the hours that the registration desk is open. Messages will be taken and posted on the meetings message board. In the case of a bona fide emergency, every attempt will be made to contact the participant as soon as possible; otherwise, each participant must take responsibility for checking the message board. Once the Mathfest Registration Desk has closed for the day, there is no mechanism for contacting participants other than calling them directly at their hotel or campus residence. Messages for participants staying in the residence halls may be left at the front desk. See the housing page for numbers and hours of operation.

Travel

The campus is located along the Mississippi River, which divides the East Bank Campus from the West. These are connected by a covered bridge over Washington Avenue. Bus #16 runs along this major avenue. Another main artery, University Avenue, is along the northern border of the West Campus; Washington Avenue intersects it slightly east of the campus.

Complimentary shuttle service is provided on the campus Monday through Friday. Service begins at 7:10 a.m. from Blegen Hall and runs every half hour until 5:30 p.m. Route details will be available at the meeting.

Continental and Northwest Airlines have been elected as the official airlines for the meeting for their generally convenient schedules to Minneapolis. We strongly urge
Meetings

participants to make use of these special deals if at all possible, since the AMS and MAA can earn complimentary tickets on these carriers. These tickets are used to send meetings' staff (not officers or other staff) to the Mathfest, thereby keeping the costs of the meeting (and registration fees) down. The following specially negotiated rates are available only for this meeting.

**Continental Airlines** is offering 40% off Full Coach or Full First-Class fares and 5% off restricted round-trip fares, applicable five days prior to and five days after the meeting. No discounts apply to Business First. These fares are based on travel within the continental U.S., including Alaska. For reservations call 800-468-7022 Monday–Friday from 7:30 a.m. to 8:00 p.m. and Saturday and Sunday from 8:00 a.m. to 6:00 p.m. Central Daylight Time. Refer to Easy Access Number ZM34. You may pay for your ticket at the time of reservation and the tickets will be sent to you, or you may purchase your tickets from your local travel agency, any Continental ticket office, or airport ticket counter.

**Northwest Airlines** is offering 5% off applicable published fares for travel within the domestic 48 states or travel to and from Canada, applicable August 12–20. For reservations call 800-328-1111 Monday–Friday from 7:30 a.m. to 7:30 p.m. Central Daylight Time. Refer to Worldfile Number NC79U. You may pay for your ticket at the time of reservation and the tickets will be sent to you, or you may purchase your tickets from your local travel agency, any Northwest ticket office, or airport ticket counter.

**Travel from the airport:** A taxi from the Minneapolis/St. Paul International Airport to the campus costs approximately $20–25 for the 10-mile ride. The Airport Express shuttle will take you to some of the major hotels near the campus for $7.50 one way or $10 round trip. (Comstock and Middlebrook Residence Halls are a five- to ten-minute walk from the Holiday Inn Metrodome.) Their office is located near baggage carousel #9.

Bus #7 runs from the airport to downtown every 20 to 30 minutes. You must transfer to the #16 bus to the campus area. Fare is $1.25, exact change required.

**AMTRAK:** The nearest AMTRAK station is located about three blocks north of University Avenue, a few miles east of the campus. Taxis are available to take you to your hotel. If you wish to take a public bus, walk south down Transfer Road to University Avenue. At the northeast corner of the intersection, take the #16 bus going west to the campus. Call 800-872-7245 for AMTRAK reservations.

**Weather:** During August, daytime is usually warm and humid. For evenings, sweaters or jackets may be needed.

---

**Corollary Conference**

**Basic Issues in Computer-aided Math Visualization**

**August 13–14, 1994**

This two-day workshop, organized by the Geometry Center and cosponsored by the AMS, will be held at the Geometry Center, University of Minnesota. Please see the article following this announcement.

---

**Contemporary Mathematics, Volume 142**

**Several Complex Variables in China**

Chung-Chun Yang and Sheng Gong, Editors

Among the topics covered in this volume are singular integrals, function spaces, differential operators, and factorization of meromorphic functions in several complex variables via analytic or geometric methods. Some of the results here are reported in English for the first time.

1991 Mathematics Subject Classification: 32
Individual member $22, List price $36, Institutional member $29
To order, please specify CONM/142NA

All prices subject to change. Free shipment by surface: for air delivery, please add $8.50 per title.
Prepayment required. Order from: American Mathematical Society, P.O. Box 9496, Boston, MA 02209-9496, or call toll free 800-321-4AMS in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.

---

344
NOTICES OF THE AMERICAN MATHEMATICAL SOCIETY
<table>
<thead>
<tr>
<th>American Mathematical Society</th>
<th>Mathematical Association of America</th>
<th>Other Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUNDAY, AUGUST 14</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.–6:30 p.m. COUNCIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8:30 a.m.–4:00 p.m. BOARD OF GOVERNORS</td>
<td></td>
</tr>
<tr>
<td>Noon–5:00 p.m. MATHFEST REGISTRATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:30 p.m.–7:30 p.m. CASH BAR RECEPTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:30 p.m.–10:00 p.m. CHILDREN'S SPECIAL EVENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:30 p.m.–10:00 p.m. OPENING BANQUET</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MONDAY, AUGUST 15</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8:00 a.m.–4:00 p.m. MATHFEST REGISTRATION</td>
<td></td>
</tr>
<tr>
<td>8:30 a.m.–9:20 a.m. AMS-MAA INVITED ADDRESS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reform in mathematics education: New or simply a variation on an old theme?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carole B. Lacampagne</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.–5:00 p.m. BOOK SALES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:35 a.m.–10:25 a.m. EARLE RAYMOND HEDRICK LECTURES: LECTURE I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Searching for the shortest network</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ronald L. Graham</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:40 a.m.–12:10 p.m. PROGRESS IN MATHEMATICS LECTURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Boltzmann's equation and its applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pierre Louis Lions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Mathematical Society</td>
<td>Mathematical Association of America</td>
<td>Other Organizations</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>MONDAY, AUGUST 15</strong> (cont'd)</td>
<td><strong>MONDAY, AUGUST 15</strong> (cont'd)</td>
<td>Noon–2:30 p.m.</td>
</tr>
<tr>
<td>1:30 p.m.–6:00 p.m. SPECIAL SESSIONS</td>
<td>1:30 p.m.–3:30 p.m. MINICOURSES</td>
<td>PI MU EPSILON COUNCIL</td>
</tr>
<tr>
<td>q-Series, I</td>
<td>#1A: Building discrete and continuous ecological models using the SLAM simulation language</td>
<td></td>
</tr>
<tr>
<td>History of mathematical logic and theoretical computer science, I</td>
<td>#2A: Calculus from graphical, numerical, and symbolic points of view.</td>
<td></td>
</tr>
<tr>
<td>Computer graphics as a research tool in geometry and topology, I</td>
<td>#3A: Combinatorics via functional equations</td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.–6:00 p.m. CONTRIBUTED PAPER SESSIONS</td>
<td>1:30 p.m.–6:00 p.m. CONTRIBUTED PAPER SESSIONS</td>
<td></td>
</tr>
<tr>
<td>Environmental mathematics</td>
<td>Environmental mathematics</td>
<td></td>
</tr>
<tr>
<td>Recreational mathematics and computing</td>
<td>Recreational mathematics and computing</td>
<td></td>
</tr>
<tr>
<td>1:40 p.m.–2:30 p.m. MAA-MU ALPHA THETA LECTURE</td>
<td>1:40 p.m.–2:30 p.m. MAA-MU ALPHA THETA LECTURE</td>
<td></td>
</tr>
<tr>
<td>Pamela J. Drummond</td>
<td>Pamela J. Drummond</td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.–3:30 p.m. COMMITTEE ON SCIENCE POLICY PANEL DISCUSSION</td>
<td>2:00 p.m.–3:50 p.m. SUMMA WORKSHOP</td>
<td></td>
</tr>
<tr>
<td>Intervention projects for minority precollege students</td>
<td>Intervention projects for minority precollege students</td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.–4:00 p.m. THE GEOMETRY CENTER POSTER AND VIDEO SESSION</td>
<td>2:00 p.m.–4:00 p.m. THE GEOMETRY CENTER POSTER AND VIDEO SESSION</td>
<td></td>
</tr>
<tr>
<td>2:45 p.m.–5:00 p.m. STUDENT PAPER SESSIONS</td>
<td>2:45 p.m.–5:00 p.m. PME CONTRIBUTED PAPER SESSION</td>
<td></td>
</tr>
<tr>
<td>3:45 p.m.–5:45 p.m. MINICOURSES</td>
<td>3:00 p.m.–4:30 p.m. ASSOCIATION FOR WOMEN IN MATHEMATICS PANEL DISCUSSION</td>
<td></td>
</tr>
<tr>
<td>#4A: Multivariable calculus using the Harvard Calculus Consortium materials</td>
<td>#4A: Multivariable calculus using the Harvard Calculus Consortium materials</td>
<td></td>
</tr>
<tr>
<td>#5A: Mathematical models of epidemics</td>
<td>#5A: Mathematical models of epidemics</td>
<td></td>
</tr>
</tbody>
</table>
MONDAY, AUGUST 15 (cont'd)

3:45 p.m.–5:45 p.m.
MINICOURSES (cont'd)

#6A: Unifying themes for discrete mathematics

3:45 p.m.–5:45 p.m.
SECTION OFFICERS' MEETING

4:30 p.m.–5:30 p.m.
INSTITUTE FOR MATHEMATICS AND ITS APPLICATIONS PRESENTATION
Mathematical modeling for instructors

5:00 p.m.–6:00 p.m.
MAA-PME RECEPTION

6:00 p.m.–9:30 p.m.
MISSISSIPPI DINNER CRUISE

9:30 p.m.–11:00 p.m.
AWM RECEPTION

TUESDAY, AUGUST 16

7:00 a.m.–8:15 a.m.
MAA AND PME STUDENT CHAPTER ADVISORS' BREAKFAST

8:00 a.m.–4:00 p.m.
MATHFEST REGISTRATION

8:30 a.m.–9:20 a.m.
AMS-MAA INVITED ADDRESS
Knots
Cameron McA. Gordon

9:00 a.m.–5:00 p.m.
BOOK SALES

9:35 a.m.–10:25 a.m.
EARLE RAYMOND HEDRICK LECTURES: LECTURE II
Some generalizations of 1+1=2
Ronald L. Graham
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:40 a.m.-11:30 a.m.</td>
<td>HISTORY OF MATHEMATICS LECTURE</td>
</tr>
<tr>
<td></td>
<td><em>The well-poised thread: Some amazing sums of Gauss, Kummer, Ramanujan, and others</em></td>
</tr>
<tr>
<td></td>
<td><strong>George E. Andrews</strong></td>
</tr>
<tr>
<td>11:45 a.m.-12:15 p.m.</td>
<td>BUSINESS MEETING</td>
</tr>
<tr>
<td>1:00 p.m.-6:00 p.m.</td>
<td>SPECIAL SESSIONS</td>
</tr>
<tr>
<td></td>
<td>q-Series, II</td>
</tr>
<tr>
<td></td>
<td>History of mathematical logic and theoretical computer science, II</td>
</tr>
<tr>
<td></td>
<td>Computer graphics as a research tool in geometry and topology, II</td>
</tr>
<tr>
<td>1:00 p.m.-6:00 p.m.</td>
<td>CONTRIBUTED PAPER SESSIONS</td>
</tr>
<tr>
<td>1:00 p.m.-3:00 p.m.</td>
<td>MINICOURSES</td>
</tr>
<tr>
<td></td>
<td>#7A: Open problems in plane geometry.</td>
</tr>
<tr>
<td></td>
<td>#8A: The Math Modeling/Precalculus Reform Project: Using discrete mathematical models to motivate mathematics</td>
</tr>
<tr>
<td>1:00 p.m.-6:00 p.m.</td>
<td>STUDENT PAPER SESSIONS</td>
</tr>
<tr>
<td>1:00 p.m.-2:30 p.m.</td>
<td>AD HOC COMMITTEE ON ADVISING PANEL DISCUSSION</td>
</tr>
<tr>
<td></td>
<td>Advising undergraduate mathematics majors</td>
</tr>
<tr>
<td>1:00 p.m.-6:00 p.m.</td>
<td>ELECTRONIC POSTER SESSION</td>
</tr>
<tr>
<td></td>
<td>Exploring mathematics on the Internet</td>
</tr>
<tr>
<td>2:45 p.m.-4:15 p.m.</td>
<td>COMMITTEE ON EDUCATION PANEL DISCUSSION</td>
</tr>
<tr>
<td></td>
<td>Calculus reform in different settings</td>
</tr>
<tr>
<td>2:45 p.m.-4:30 p.m.</td>
<td>PANEL DISCUSSION</td>
</tr>
</tbody>
</table>

---

**NOTICE OF THE AMERICAN MATHEMATICAL SOCIETY**
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TUESDAY, AUGUST 16 (cont'd)</strong></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.-6:00 p.m.</td>
<td>MINICOURSES</td>
</tr>
<tr>
<td>#1B: Building discrete and continuous ecological models using the SLAM simulation language</td>
<td></td>
</tr>
<tr>
<td>#2B: Calculus from graphical, numerical, and symbolic points of view</td>
<td></td>
</tr>
<tr>
<td>#3B: Combinatorics via functional equations</td>
<td></td>
</tr>
<tr>
<td>4:45 p.m.-6:00 p.m.</td>
<td>PANEL DISCUSSION</td>
</tr>
<tr>
<td>1994 International Olympiad winners' stories</td>
<td></td>
</tr>
<tr>
<td><strong>5:30 p.m.-7:30 p.m.</strong></td>
<td>THE GEOMETRY CENTER RECEPTION</td>
</tr>
<tr>
<td><strong>WEDNESDAY, AUGUST 17</strong></td>
<td></td>
</tr>
<tr>
<td>8:00 a.m.-2:00 p.m.</td>
<td>MATHFEST REGISTRATION</td>
</tr>
<tr>
<td>8:30 a.m.-9:20 a.m.</td>
<td>AMS-MAA INVITED ADDRESS</td>
</tr>
<tr>
<td>Mathematical simulation of flow in porous media</td>
<td></td>
</tr>
<tr>
<td>Todd J. Arbogast</td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.-2:00 p.m.</td>
<td>BOOK SALES</td>
</tr>
<tr>
<td>Time</td>
<td>American Mathematical Society</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------</td>
</tr>
</tbody>
</table>
| 9:35 a.m. - 10:25 a.m. | EARLE RAYMOND HEDRICK LECTURE: LECTURE III  
Juggling drops and descents  
Ronald L. Graham | 12:25 p.m. - 12:55 p.m. | BUSINESS MEETING |
| 10:40 a.m. - 12:10 p.m. | PROGRESS IN MATHEMATICS LECTURE  
Kenneth A. Ribet  
Galois representations and modular forms | 1:40 p.m. - 2:30 p.m. | STUDENT LECTURE  
What's really in the Cantor set?  
Gail S. Nelson |
| 1:40 p.m. - 5:40 p.m. | SPECIAL SESSIONS  
q-Series, III  
History of mathematical logic and theoretical computer science, III  
Computer graphics as a research tool in geometry and topology, III | 1:40 p.m. - 5:40 p.m. | CONTRIBUTED PAPER SESSIONS  
Innovative projects in first-year courses  
Winning women into mathematics |
| 1:40 p.m. - 5:40 p.m. | CONTRIBUTED PAPER SESSIONS | 1:45 p.m. - 3:45 p.m. | MINICOURSES  
#4B: Multivariable calculus using the Harvard Calculus Consortium materials  
#5B: Mathematical models of epidemics  
#6B: Unifying themes for discrete mathematics |
| 2:45 p.m. - 4:45 p.m. | STUDENT WORKSHOP  
The theory and practice of juggling | | |
| 4:00 p.m. - 6:00 p.m. | MINICOURSES  
#7B: Open problems in plane geometry | | |
WEDNESDAY, AUGUST 17
(cont’d)

4:00 p.m.–6:00 p.m.
MINICOURSES (cont’d)

#8B: The Math Modeling/Precalculus Reform Project: Using discrete mathematical models to motivate mathematics

5:45 p.m.–6:30 p.m.
RECEPTION

6:30 p.m.–9:00 p.m.
BANQUET FOR 25-YEAR MEMBERS
Workshop on Basic Issues in Computer-aided Math Visualization, Minneapolis, Minnesota

August 13–14, 1994

This two-day course will be held at the Geometry Center, University of Minnesota, Minneapolis. The Geometry Center is an NSF Science and Technology Research Center whose mission is to foster research in geometry and related fields and the communication of geometric ideas among mathematicians and to the public using modern computation and visualization tools. The course is cosponsored by the Geometry Center and the American Mathematical Society.

Computer visualization has become an important tool in several fields of mathematics, helping mathematic understanding and communication, the formulation of conjectures, and the development of proofs.

Basic issues in computer-aided math visualization is designed as an introduction to the subject for mathematicians. While standard references such as Computer Graphics, Principles and Practice [1, 14] provide a detailed background to computer graphics in general, we will concentrate on issues likely to be of particular interest to mathematicians. Here are some sample questions that we will try to address:

- How can I visualize surface $X$? or map $Y$? or the solutions of differential equation $Z$?
- How should I spend my hardware grant of $X$ thousand dollars?
- How can I get hard copy of this image? How much work is it to make a video?
- The focus will be on how to find out about, evaluate, and use existing software. A certain amount of basic material must be covered first before we address these specific issues. Also, we will make no attempt to cover the broad subject of volume visualization.

The course will include lectures, software demonstrations, a question and answer session, and supervised participant experimentation on graphics workstations.

It will be taught by Stuart Levy, Tamara Munzner, and Mark Phillips, three of the creators of Geomview [2]. The instructors, who have extensive experience in mathematical programming and graphics development, will be assisted by a team of skilled undergraduates.

Printed notes will be distributed, including a full bibliography.

Registration Procedures

The workshop will take place from 9:30 a.m. to 5:30 p.m. on Saturday and Sunday at the Geometry Center, 1300 South Second Street on the West Bank Campus (see map). Enrollment is limited to 60 participants on a first-come, first-served basis, due to the largely interactive nature of the course. The advance registration fee is $120 by June 18. The fee is $140 thereafter. Participants have the option to be wait-listed should the workshop become fully subscribed; payments for wait-listed persons will not be processed until a place in the workshop is secured. A 50% refund will be given for cancellations until July 14. After that date, 50% refunds will be given for cancellations only if the slot can be filled. A registration and dormitory housing form may be found at the back of this issue.

Preliminary Syllabus

Note: In some cases, a selection of topics will be made depending on the audience’s interest.

Going from the mathematics to helpful (or pretty) pictures. “I loved the picture on the cover of Scientific American [13]. How can I make pictures like that?”

Much depends on what you want a picture of, but there are some general principles. We distinguish two steps: going from the mathematical object to a low-level description in terms of “primitives”, and generating an image from that description. We will use the words modeling and rendering for these two steps. Using a number of software systems, both locally developed and commercial [8, 9, 10], we will exemplify the modeling process for specific problems:

- parametrically defined surfaces
- implicitly defined surfaces
- curves and tubing
- maps $C \rightarrow C$ and $\mathbb{R}^2 \rightarrow \mathbb{R}^2$
- vector fields (cf. [12])
- solutions of differential equations
- higher-dimensional objects (cf. [11, 12])

Basic 3-D graphics. We can give only a brief outline of the main ideas relevant to three-dimensional computer graphics. Many of these ideas will be illustrated using Geomview [2], the locally developed interactive 3-D viewer.

- modeling, animation, and rendering
- scene description: geometry, cameras, lighting, shading, shadows
- low-level geometric “primitives”: points, lines, polygons, meshes, Bézier patches; 3-D geometric data standards
- $4 \times 4$ matrix notation for 3-D transformations: application to non-Euclidean geometries [3, 4]
- interactive rendering versus photorealistic, offline rendering [7]
- three-component color theory; additive versus subtractive color; the color triangle [5]
Graphics Hardware. “What can I buy with my $3,000 grant?” (Or $10k, or $30k, or $100k.)
  • general overview of existing hardware as we know it; graphics versus general-purpose workstations
  • special-purpose hardware for graphics computation (hidden-surface elimination, projective transformations, shading)
  • buffering, color depth, other desirable characteristics

Still Pictures. Mathematicians can now use computers to generate pictures that would be tedious or impossible to generate by hand. However, the process of approximating a picture seen on a computer monitor, on a transparency, or in the pages of a journal is nontrivial. Whereas arranging for a VCR and monitor is usually easy.

• Video Animation. While video is less immersive than interactive software, it is much more portable. It can be prohibitively difficult or expensive to recreate the hardware and software environment necessary to show or use an interactive program, whereas arranging for a VCR and monitor is usually easy. The Center has produced many videos along a continuum of multiyear efforts aimed at a broad audience and distributed widely [15] to “video overheads” intended for use during a talk by the author, made in a matter of hours.

  • common pitfalls, predictable time sinks, useful caveats
  • real-time versus frame-by-frame recording
  • video recording hardware

References:
Invited Addresses, Special Sessions, and Contributed Papers

Invited Addresses at AMS Meetings
The individuals listed below have accepted invitations to address the Society at the times and places indicated. For some meetings the list of speakers is incomplete. For full announcements or programs of meetings occurring prior to the first meeting listed below, see the table of contents in this issue. Invited addresses at Sectional Meetings are selected by the Section Program Committee, usually twelve to eighteen months in advance of a meeting. Members wishing to nominate candidates for invited addresses should send relevant information to the associate secretary for the section, who will forward it to the Section Program Committee.

Stillwater, OK, October 1994
V. Lakshmibai
David E. Marker

Richmond, VA, November 1994
Loren D. Pitt
Cora S. Sadosky

Hartford, CT, March 1995
Ben F. Logan
Nina N. Uraltseva

Organizers and Topics of Special Sessions
The list below contains all the information about Special Sessions at meetings of the Society available at the time this issue of the Notices went to the printer.

October 1994 Meeting in Stillwater, Oklahoma
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: Expired
Deadline for consideration: July 13, 1994
Efraim Armendariz, D. J. Lewis, Andy R. Magid, and Robert J. Zimmer, New doctoral work in mathematics
Ara S. Basmajian and Robert R. Miner, Complex hyperbolic geometry and discrete groups
Edward T. Cline, Representations of algebraic groups
Brian Conrey and William D. Duke, Number theory
Bruce C. Crauder and Zhenbo Qin, Algebraic geometry
Edward G. Dunne and Roger C. Zierau, Geometry and representations of Lie groups
Alan R. Elcrat, Fluid dynamics
Benny D. Evans, The evolving undergraduate mathematics curriculum

November 1994 Meeting in Stillwater, Oklahoma
Southeastern Section
Deadline for organizers: Expired
Deadline for consideration: July 13, 1994
Joseph A. Ball and Cora S. Sadosky, Interpolation and dilation theory
Amer Beslagic, Set theoretic topology and set theory
Paul S. Bourdon and William T. Ross, Operators on Banach spaces of analytic functions
Douglas L. Costa and Gordon E. Keller, Groups, rings, and forms
James A. Davis and Harold N. Ward, Codes and designs
Ira W. Herbst, Quantum mechanics
Teresa Magnus, Nonassociative algebras
John P. Nolan, Stochastic processes
Rodica E. Simion and Doron Zeilberger, Identities and enumeration

January 1995 Meeting in San Francisco, California
Associate Secretary: Andy R. Magid
Deadline for organizers: April 2, 1994
Deadline for consideration: September 9, 1994

March 1995 Meeting in Hartford, Connecticut
Eastern Section
Deadline for organizers: June 3, 1994
Deadline for consideration: To be announced

Robert C. Brigham and Richard P. Vitvay, Combinatorics and graph theory
John R. Cannon, Inverse and ill-posed problems
S. Roy Choudhury, Nonlinear dynamical systems, chaos, and turbulence
S. Roy Choudhury and Lokenath Debhnath, Solitons and nonlinear waves
Xin Li and Ram N. Mohapatra, Approximation theory and special functions
Meetings

Piotr Mikusinski, *New trends in generalized functions*
Ahmed I. Zayed, *Sampling theory, wavelets, and signal processing*

**March 1995 Meeting in Chicago, Illinois**
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: June 24, 1994
Deadline for consideration: To be announced

**August 1995 Mathfest in Burlington, Vermont**
Associate Secretary: Robert J. Daverman
Deadline for organizers: November 4, 1994
Deadline for consideration: To be announced

**October 1995 Meeting in Boston, Massachusetts**
Eastern Section
Associate Secretary: Lesley M. Sibner
Deadline for organizers: January 6, 1995
Deadline for consideration: To be announced

**November 1995 Meeting in Kent, Ohio**
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: February 4, 1995
Deadline for consideration: To be announced

**November 1995 Meeting in Greensboro, North Carolina**
Southeastern Section
Associate Secretary: Robert J. Daverman
Deadline for organizers: February 17, 1995
Deadline for consideration: To be announced

**January 1996 Meeting in Orlando, Florida**
Associate Secretary: Lance W. Small
Deadline for organizers: April 12, 1995
Deadline for consideration: To be announced

**March 1996 Meeting in Iowa City, Iowa**
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: June 22, 1995
Deadline for consideration: To be announced

Daniel D. Anderson, *Commutative ring theory*
Tuong Ton-That, *Group representations and mathematical physics*

**April 1996 Meeting in Baton Rouge, Louisiana**
Southeastern Section
Associate Secretary: Robert J. Daverman
Deadline for organizers: July 19, 1995
Deadline for consideration: To be announced

**November 1996 Meeting in Columbia, Missouri**
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: February 1, 1996
Deadline for consideration: To be announced

Carmen C. Chicone and Yuri Latushkin, *Differential equations and dynamical systems*

Fritz Gesztesy, *Spectral theory and completely integrable systems*

**January 1997 Meeting in San Diego, California**
Associate Secretary: Lesley M. Sibner
Deadline for organizers: April 8, 1996
Deadline for consideration: To be announced

**January 1998 Meeting in Baltimore, Maryland**
Associate Secretary: Robert J. Daverman
Deadline for organizers: April 10, 1997
Deadline for consideration: To be announced

Information for Organizers

Potential organizers should refer to the January issue of the *Notices* for guidelines on organizing a session. Proposals for any of the meetings mentioned in the preceding section should be sent to the cognizant associate secretary by the deadline indicated. No Special Sessions can be approved too late to provide adequate advance notice to members who wish to participate.

Western Section
Lance W. Small, Associate Secretary
Department of Mathematics
University of California, San Diego
La Jolla, CA 92032
E-mail: g_small@math.ams.org
Telephone: 619-534-3590

Central Section
Andy R. Magid, Associate Secretary
Department of Mathematics
University of Oklahoma
601 Elm PHSC 423
Norman, OK 73019
E-mail: g_magid@math.ams.org
Telephone: 405-325-6711

Eastern Section
Lesley M. Sibner, Associate Secretary
Department of Mathematics
Polytechnic University
Brooklyn, NY 11201-2990
E-mail: g_sibner@math.ams.org
Telephone: 718-260-3505

Southeastern Section
Robert J. Daverman, Associate Secretary
Department of Mathematics
University of Tennessee
Knoxville, TN 37996-1300
E-mail: g_daverman@math.ams.org
Telephone: 615-974-6577

Other Information

General information for speakers and full instructions for submitting abstracts, as well as information on site selection for Sectional Meetings, can be found in the January issue of the *Notices*. 
The Legacy of Norbert Wiener: A Centennial Symposium

Massachusetts Institute of Technology, Cambridge, Massachusetts

October 8–15, 1994

A symposium cosponsored by the American Mathematical Society and the Massachusetts Institute of Technology on The legacy of Norbert Wiener: A centennial symposium, in honor of the 100th anniversary of the birth of Norbert Wiener, will take place at MIT, Cambridge, Massachusetts, from Saturday, October 8, to Saturday, October 15, 1994. The symposium will be supported by Henry Singleton, MIT, and the Sloan Foundation; and funding is anticipated from the National Science Foundation. Proceedings will be published by the AMS.

The AMS organizing committee for the symposium includes David Benney (MIT), Roger Brockett (Harvard University), Donald Burkholder (University of Illinois), David Jerison (chair, MIT), P. R. Masani (University of Pittsburgh), Henry P. McKean (Courant Institute), Daniel Stroock (MIT), Isadore M. Singer (MIT), Elias M. Stein (Princeton University). The AMS committee is working in conjunction with an MIT committee consisting of Jonathan Allen (MIT), David Benney (chair, MIT), Edward E. David (EED, Inc.), Peter Elias (MIT), Morris Halle (MIT), David Jerison (MIT), William Ted Martin (MIT), Sanjoy Mitter (MIT), Walter Rosenblith (cochair, MIT), Jerome Wiesner (cochair, MIT).

The symposium will begin with mathematical talks on current research directions in harmonic analysis, integration in function space, and potential theory—the areas of Norbert Wiener's fundamental contributions to mathematics. Wiener was remarkable for his ability to find deep connections between mathematics and other fields. Physics, electrical engineering, economics, and biology have strong and growing relationships to mathematics. We have asked speakers representing each of these disciplines to discuss the role of mathematics in their subject. Throughout the week there will be talks devoted to Wiener's intellectual development and his profound influence on his colleagues at MIT and elsewhere.

An important goal of the conference is to alert the mathematical, scientific, and engineering community to new opportunities for interactions between mathematics and other disciplines. Norbert Wiener's life work demonstrates the importance of advanced mathematics in applications.

A partial list of prospective speakers:

Mathematics (October 8-10)

J. Bourgain (IAS), L. Carleson (Royal Institute, Stockholm), C. Fefferman (Princeton University), V. Guillemin (MIT), P.W. Jones (Yale University), P. Malliavin (University of Paris, VI), R.R. Masani (University of Pittsburgh), Henry P. McKean (Courant Institute), Y. Meyer (University of Paris, IX), I.E. Segal (MIT), I.M. Singer (MIT), J. Sjostrand (University of Paris, XI), E.M. Stein (Princeton University), H. Widom (University of Santa Cruz).

Statistical Physics (October 11)

Boris Altshuler (MIT), Michael E. Fisher (University of Maryland), David Nelson (Harvard University), Yakov Sinai (Princeton University), Thomas Spencer (IAS).

Electrical Engineering & Computer Science (October 12)

Amar Bose (MIT and Bose Corporation), Robert Brayton (Berkeley), Robert Gallager (MIT), Tom Kailath (Stanford University), Sanjoy Mitter (MIT), Michael Rabin (Harvard University and Hebrew University).

Financial Economics (October 13)

Paul Samuelson (MIT), Robert Merton (Harvard University), Stephen Ross (Yale), Andrew Lo (MIT), Charles Sanford (chairman of the board, Banker's Trust).

Biology (October 14-15)

The biology program will be announced later.

There may also be an historical program on Saturday, October 15, at Tufts University, where Norbert Wiener matriculated in 1906.

Accommodations will be in area hotels, either a short walk from the MIT campus or a short subway ride away. Other accommodations will be in bed & breakfasts all over the city. MIT is conveniently reached by subway or taxi from the rail terminus, South Station, or Logan Airport in a matter of minutes. The meeting area will be close to the Institute Science Library, and nearby discussion/seminar rooms will be available.

A brochure of information will be mailed to all who are invited to attend the symposium. The brochure will include information on housing and meals, travel, and local information. Participants will be responsible for making their own housing and travel arrangements. It is expected that funding will be available for a limited number of participants. Limited support is expected to be available for graduate students.

Those interested in attending the symposium should send the following information to the Wiener Symposium Conference Coordinator, Meetings and Conferences Department, American Mathematical Society, P. O. Box 6887, Providence, RI 02940-6887; fax: 401-455-4004; e-mail: chh@math.ams.org.
Meetings

Please type or print the following:
1. Full name
2. Mailing address
3. Area code and telephone number for office and home, e-mail address, fax number
4. A short paragraph describing your scientific background relevant to the topic of the conference
5. Dates attending
6. Financial assistance requested; estimated cost of travel
7. Indicate if support is not required and if interested in attending even if support is not offered
8. Indicate if graduate student, undergraduate student, or Ph.D. received on or after 7/1/88

The deadline for receipt of requests for information is June 1, 1994. Requests to attend will be forwarded to the Organizing Committee for consideration after the deadline.

All applicants will receive a formal invitation, brochure of information, notification of financial assistance, and a tentative scientific program (if the cochairs have prepared one in advance; otherwise, programs will be distributed on-site). Funds available for the symposium are limited, and individuals who can obtain support from other sources should do so. The allocation of grant funds is administered by the AMS office, and the logistical planning for the conferences is also done by the AMS. However, it is the responsibility of the cochairs of the Organizing Committee to determine the amount of support participants will be awarded. Women and minorities are encouraged to apply and participate in this symposium.

Any questions concerning the scientific portion of the symposium should be directed to David Jerison, MIT, Room 2-180, Cambridge, MA 02139; telephone: 617-253-4394; e-mail: jerison@math.mit.edu.

LECTURES IN APPLIED MATHEMATICS

Exploiting Symmetry in Applied and Numerical Analysis
Eugene L. Allgower, Kurt Georg, and Rick Miranda, Editors
Volume 29

Symmetry plays an important role in theoretical physics, applied analysis, classical differential equations, and bifurcation theory. Although numerical analysis has incorporated aspects of symmetry on an ad hoc basis, there is now a growing collection of numerical analysts who are currently attempting to use symmetry groups and representation theory as fundamental tools in their work. This book contains the proceedings of an AMS-SIAM Summer Seminar in Applied Mathematics, held in 1992 at Colorado State University. The seminar, which drew about 100 scientists from around the world, was intended to stimulate the systematic incorporation of symmetry and group theoretical concepts into numerical methods. The papers in this volume have been refereed and will not be published elsewhere.

1991 Mathematics Subject Classification: 20, 35; 58, 65
ISBN 0-8218-1134-7, 459 pages (softcover), November 1993
Individual member $35, List price $58, Institutional member $46
To order, please specify LAM/29NA

All prices subject to change. Free shipment by surface; for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02205-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
Preamble
The Organizing Committee is pleased to invite you to attend the International Congress of Mathematicians in Zürich, Switzerland, 3–11 August 1994. The congress will be held under the auspices of the International Mathematical Union and under the sponsorship of the Swiss Mathematical Society, the Swiss Academy of Sciences, and the Swiss National Science Foundation.

This abbreviated announcement describes the congress and gives related information. It explains how to register and how to present a short communication; it also contains the necessary form for securing accommodation during the congress. For further details or a complete copy of the second announcement, the address of the congress is as follows:

ICM 94
International Congress of Mathematicians
ETH Zentrum
CH-8092 Zürich
Telephone: +41 1 632 52 30
Fax: +41 1 252 91 84
e-mail: icm94@math.ethz.ch

Important Deadlines
15 April 1994: Preregistration, if you want to present a short communication
15 April 1994: Abstracts of short communications
15 May 1994: Abstracts from Plenary and 45-minute Speakers
15 May 1994: Preregistration at reduced rate
30 June 1994: Cancellation with refund of registration fee
30 June 1994: Cancellation with refund of accommodation deposit
11 August 1994: Proceedings manuscripts from Plenary and 45-minute Speakers

A. Location of the congress

A.1. Venue
1994 will be the third time that the International Congress of Mathematicians has been held in Zürich. This is primarily due to the fact that Zürich is the home of two universities with a renowned mathematical tradition: the Eidgenössische Technische Hochschule (ETHZ), a federal establishment, and the University of Zürich, operated by the state (canton) of Zürich. Thus Zürich has the human and professional resources to launch such an event and carry it through.

But there is more to running a successful congress than scientific highlights and functioning logistics. What makes participants feel at ease is as much the general style of the place: its ambience, its surroundings, the friendliness of the people, culture, shopping facilities, easy access and getting around, etc.

If you have been to Zürich before, you will admit that our “little big city”, as it has recently been called, is a splendid place for a congress: effective as a centre of learning and, at the same time, abundant with things to please you. If you haven’t had the opportunity to visit Zürich, let this congress be a unique incentive to make the trip to Switzerland and combine serious academic activity with a few unforgettable days on the shores of Lake Zürich (Yes: Zürich is a lakeside town).

A.2. The congress
The activities of the congress will mainly take place at the Kongreßhaus of the City of Zürich and in large lecture halls at the Federal Institute of Technology (ETHZ) and at the University of Zürich. The morning sessions which feature plenary addresses will be held at the Kongreßhaus, located in the downtown area of Zürich. After lunch the congress will usually meet in sections. The section meetings are scheduled in ETHZ and University buildings situated immediately next to each other on a hill above (and close to) the downtown area.

B. Scientific program
The tentative program of the congress is summarized in the table on page 373. Some changes may become necessary depending on the number of speakers. A more definite and detailed program will appear in the Third Announcement, which will be mailed to those who preregister for ICM 94 with their confirmation of registration.

B.1. Opening and closing ceremonies
The opening ceremonies will be held in the “Kongreßsaal” at 9:30 a.m. on Wednesday, 3 August. As a part of the program
the Fields medals and the Nevanlinna prize will be awarded. The Kongreßsaal seats at most 2,200 people.

The closing ceremonies are scheduled to be held on Thursday, 11 August, at 3:30 p.m. in the Kongreßsaal.

B.2. Plenary addresses
On the recommendation of the Program Committee, appointed by the International Mathematical Union (IMU), the Organizing Committee has invited sixteen mathematicians to give one-hour plenary addresses. These addresses are intended to inform participants of major developments, problems, and trends in mathematics; and they are intended to be broad surveys of interest to a wide audience of nonspecialists. Plenary addresses will be given on 4–6 and 8–11 August at 9:30 a.m. and 11:00 a.m.; two more are scheduled on Wednesday, 3 August, at 4:30 p.m. and on Thursday, 11 August, at 2:00 p.m.

B.3. Lectures in sections
Also on the recommendation of the IMU Program Committee, 149 mathematicians have been invited to give 45-minute lectures in specified sections. These lectures are intended to be surveys of significant topics in the area of their respective section, but they should also be accessible to nonspecialists with closely related interests. The 45-minute lectures will take place in the afternoons of 4–6 and 8–10 August, beginning at 2:00 p.m.

B.4. Short communications (posters)
All Ordinary Members of the congress will have the opportunity to present their mathematical work in the form of a poster and to explain their work during scheduled poster sessions—provided that
—they have preregistered by 15 April,
—they have submitted an abstract by that date,
—their contribution has been accepted by the Scientific Committee.

Only one poster panel and abstract is allowed for each member. Authors are advised to bring the material of their poster with them when they come to the congress, since facilities for preparing posters on site will be limited. The size of the individual poster panels is as follows: width 180 cm, height 120 cm.

Poster sessions will be scheduled during times when there are no lectures in the same section. Each poster session lasts about two hours (depending on the number of communications submitted); during that period the respective authors should stand by their poster and be available for questions and discussion.

The abstract must include the appropriate section and AMS classification numbers so that the communications can be grouped in a coherent way for presentation. Abstracts may be submitted in English, French, German, or Russian. Abstracts of accepted short communications which are properly prepared and received by the deadline will be reproduced and distributed to all Ordinary Members when they pick up their registration package. Instructions on how to prepare an abstract appear on page 364. Abstracts which do not conform to the stipulated rules will be returned to the author for resubmission. Late papers will not be accepted.

B.5. Informal seminars
Participants who wish to organize spontaneous seminars are asked to make all arrangements among themselves, either in advance or during ICM 94, and to request a room for a specified period from the congress office. Such seminars may take place during the afternoons and evenings. If the congress office is notified of a seminar before 3:00 p.m. the previous day, an announcement of the seminar can be included in the daily newsletter to be distributed to all participants the following day.

B.6. ICMI lectures
The International Commission on Mathematical Instruction is planning five 45-minute invited talks during ICM 94. They will be scheduled using time slots at the end of the afternoon sessions.

C. Travel

C.1. Passports and Visas
As a rule of thumb, all foreign nationals coming to Switzerland should have a valid passport, and a great many of them will need a visa as well.

Visitors from many Western European countries may identify themselves when entering Switzerland either with their identity card or with a passport which has expired no more than three years ago.

Citizens of countries which have visa exemption arrangements with Switzerland are not required to have a visa to enter Switzerland for a short stay. This refers in particular to citizens of Japan and the USA. The list of countries whose citizens are exempt from the obligation to obtain a visa keeps changing; it is not reproduced here. We strongly advise you to check what the current situation is regarding your country at your nearest Swiss consular office.

Citizens of all countries without an exemption agreement must obtain a visa from a Swiss embassy or consulate prior to entering Switzerland. A visa cannot be issued upon arrival in Switzerland.

The Swiss Ministry of Foreign Affairs has issued a written statement to the effect that all participants of ICM 94 would obtain the necessary visa. (This statement was a necessary condition for choosing Switzerland as the site of ICM 94.)

If you need a visa, we advise you to apply for one at a Swiss consular office at least three months before the date on which you plan to leave for Switzerland. Mention that you will be attending ICM 94, a congress being held under the auspices of the International Council of Scientific Unions (ICSU), and show the officer the congress material you have obtained so far, including the envelope showing your name. Depending on circumstances, you may need a personal invitation. In this case, please check the appropriate box on the application form.
If you have not received a visa by one month before the beginning of ICM 94, contact us by fax, e-mail, or other rapid means. In order to help you, we need the following information: name, address, and date of birth of applicant; passport number, date, and place of visa application. Appropriate efforts will be made immediately to resolve your problem, and we hope to be able to communicate information about the status of your visa application within ten days.

C.2. Official carrier
Swissair has been appointed official carrier for the congress. Please contact your nearest Swissair office for assistance with your travel arrangements and the handling of group flights.

C.3. Agents
The agency MCI Travel in Zürich, a professional congress and tour organizer, has been appointed by the Organizing Committee to handle the following matters related to individual participants: hotel reservations, responding to requests for Announcements, preregistrations, collecting of fees and advance payments, excursions, etc.

We urge you to send all correspondence related to the congress (inquiries, requests, abstracts, etc.) to the official congress address on the first page of this Announcement. Nevertheless, there might be cases where you want to contact MCI directly. Their address is:

MCI Travel
Weinbergstrasse 11
CH-8001 Zürich
Telephone: +41 1 252 50 30
Fax: +41 1 251 31 49

Participants from Japan and the USA please contact the following agents who work in cooperation with MCI Travel:

Nikkei Culture Inc. Incentive International Ltd.
9-5, 1-Chome, Otemachi 182 Main Street
Chiyoda-ku Medford, MA 02155-4542
Tokyo 100, Japan USA
Tel: (03) 5259 2662 Tel: Toll Free 800-221-8747

Please do not call ICM 94 by phone if you have an urgent accommodation problem; call MCI or one of the above agents instead.

C.4. Arriving in Zürich
Most participants will come to Zürich either by air or by train. Zürich airport (Kloten) is located about 17 km northwest of the city; it is connected to Zürich’s main station (“Hauptbahnhof”) by a frequent train service. Of course, there are also taxis (very expensive!) and courtesy buses to some of the major hotels.

On Tuesday, 2 August, and Wednesday, 3 August, ICM 94 personnel will be available for information and help on the arrival level of Terminal B (behind the glass doors, after you clear Customs—look for the desk with the ICM sign). We plan to set up another such desk in the large hall of Zürich’s main station.

If you come to Zürich by car or rent one at the airport, we suggest you leave it at your hotel when coming to the congress locations, since there are no parking facilities available, either near the Kongresshaus or in the immediate vicinity of ETHZ and University main buildings.

C.5. Local transport
All preregistered members of the congress will obtain a pass entitling the holder to travel free of charge on all public transport (trams, buses, trains and even boats) in and around Zürich. The pass is valid from Tuesday, 2 August, to Friday, 12 August. The pass will be sent to you together with the confirmation of registration; if you arrive on 2 August or later, you may use it to ride the train from the airport to downtown Zürich or wherever your first destination (e.g. hotel) might be situated. Use it also for sightseeing in the wider Zürich area during the congress.

Note that the pass is not transferable to nonmembers of the congress, and it cannot be replaced free of charge if you lose it.

Participants who register on site obtain the pass at the time of registration. Before then, they have to pay their fare. Note that passengers who are caught riding without valid title of transport will have to pay a fine in the amount of sFr. 50.– on top of the price of the ticket.

D. Mail and messages

D.1. Mail
All mail, telegrams, and faxes for persons attending the congress should be addressed to:

Name of the Participant
C/o ICM 94
International Congress of Mathematicians
ETH Zentrum
CH-8092 Zürich, Switzerland

Incoming items will be put into the mailboxes (“pigeon holes”) in the welcome desk area. Participants are asked to check their boxes at least every other day.

D.2. Telephone messages
For urgent messages to a participant, call the congress office on floor E of ETHZ by telephone. The number is: +41 1 632 9021.

To avoid mistakes, only simple messages will be taken and will be put in the respective mailbox. Unless it is a matter of life and death, it will not be possible for our secretarial staff either to check the presence of a specific person or to check whether the message actually reaches the intended person.

In the welcome desk area at ETHZ, there will be public phones accepting telephone cards. Telephone cards will be sold at the information desk.

D.3. Personal messages
Participants wishing to exchange personal messages during ICM 94 should use the mailboxes. We regret that messages
International Congress of Mathematicians

left in the box after the congress is over cannot be forwarded to participants.

D.4. E-mail
For e-mail to a participant of ICM 94, a third party should use the e-mail address of ICM 94, icm94@math.ethz.ch and enter the name of the participant as "subject" of the message. Messages will be printed out and put into your mailbox.

Participants who want to send an e-mail should use one of the forms provided for that purpose at the information desk and hand it over to the ICM 94 staff for processing. Only short messages will be accepted.

E. Registration

E.1. Membership
A participant in ICM 94 may be either an Ordinary Member, an Accompanying Member, or a Child Member.

Ordinary Membership is open to anyone interested in mathematics. If you want to attend any congress sessions, you are requested to register as an Ordinary Member. Ordinary Members are entitled to participate in all Congress activities (to the extent that space permits) and will receive a registration package including a congress badge, the program, abstracts, and other material at the registration desk, as well as a complimentary copy of the Proceedings when published.

Accompanying Membership is available only to persons 16 years of age or older accompanying an Ordinary Member but not participating in the scientific activities of the congress. Accompanying Members are entitled to participate in all social events of the congress. Each Accompanying Member will receive a registration package for Accompanying Members, including a congress badge and information about social activities of the congress and about sightseeing in Zürich.

Child Membership is available for children under 16; it entitles them to participate in the buffet-banquet and perhaps other activities planned for Accompanying and Child Members. It is not necessary to register children if the only service requested for them is reservation of accommodation.

Participants should be aware that registration is not considered valid until full payment in Swiss francs has been made and cleared to the ICM 94 account.

Please do wear your congress badge at all congress activities or whenever you want to be recognized as a congress member; in any case, be prepared to show the badge when asked to do so. Badges are required at the Opening Ceremony, at all plenary addresses and 45-minute lectures, at the opening reception, and at the buffet-banquet.

E.2. Preregistration
It is essential that both sides of the preregistration form be completed clearly and sent to us as soon as possible. You may send in several forms together, covered by a single payment. Please take note of the following points:

- Each person preregistering as an Ordinary Member should complete a separate copy of the preregistration form.
- You are requested to attach to your preregistration form a copy of the remittance statement you receive from your bank or post office, so that your payment can be identified and confirmed.
- Registration at reduced rates is applicable if payment reaches MCI Travel/ICM 94 by 15 May 1994.
- If you wish to present a short communication, an abstract should be sent together with the preregistration form, and we must receive them by 15 April 1994.

E.3. Registration fees

<table>
<thead>
<tr>
<th>Membership</th>
<th>Until 15 May 1994</th>
<th>After 15 May 1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinary</td>
<td>sFr. 350.–</td>
<td>sFr. 500.–</td>
</tr>
<tr>
<td>Accompanying</td>
<td>sFr. 150.–</td>
<td>sFr. 200.–</td>
</tr>
<tr>
<td>Child</td>
<td>sFr. 80.–</td>
<td>sFr. 100.–</td>
</tr>
</tbody>
</table>

Note that, for all categories, the registration fee includes free public transport in and around Zürich from Tuesday, 2 August, until Friday, 12 August (see section C.5).

E.4. Methods of payment

All registration fees (and accommodation deposits, see below) must be paid in one of the following ways:

- In Swiss francs by bank remittance (ask for "mail transfer" at your bank) to the following account:
  - Name of the bank: Union Bank of Switzerland.
  - Address: Zürich-Central branch
  - Account holder: MCI Travel/ICM 94
  - Account number: 293.495.01E
  - Address of the bank: Postfach, CH-8035 Zürich

- In some countries payment can be made either by a postal money order or by postal giro transfer into the following Swiss postal account:
  - Addressee: UBS Zürich-Central
  - Credit to: MCI Travel/ICM 94
  - Account Nr. 293.495.01E
  - Postal account number: CH-80-2-2

Please note that bank fees must be paid by the participant since they are not included in the registration fee. For the same reason cash, personal checks, credit cards, and bank drafts cannot be accepted and will be returned to the sender.

E.5. Cancellation and additions

Cancellations and/or additions must be made in writing to ICM 94. In case of cancellation before 1 July 1994, the registration fee and accommodation deposit (less bank handling charges) will be refunded by bank remittance to the account specified in the cancellation letter. After 1 July, no refund of registration fees will be made.

E.6. Registration desk

On Tuesday, 2 August, and Wednesday, 3 August, the registration desk will be located in the large entrance hall of the ETHZ main building: from then on in the congress office E 32, just off the entrance hall. It will be open 10:00 a.m.–8:00 p.m. on 2 August and 8:30 a.m.–6:30 p.m. on all days of the congress.
except Sunday, 7 August. Preregistered members will obtain their registration package in exchange for the registration voucher sent to them with the letter of confirmation. It will also be possible to register on site, the registration fee being payable in cash (in Swiss francs) or with traveller’s checks.

In the large entrance hall, various other services will be available, e.g. general and tourist information, a bank window, telecommunication facilities and mailboxes ("pigeon holes") for the participants, etc.

F. Accommodation

Even if you are an experienced traveller, please do not count on finding inexpensive accommodation for yourself upon arrival in Zürich. We urgently recommend that you use the accommodation part of the preregistration form for securing accommodation during the congress.

F.1. Hotels

Participants will be housed primarily in a variety of hotels in Zürich and the vicinity; the necessary reservations have already been made by MCI Travel. The available categories and rates per night in Swiss francs are as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Hotel Category</th>
<th>Single</th>
<th>Double</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>“Five Stars”</td>
<td>220-360</td>
<td>340-480</td>
</tr>
<tr>
<td>B</td>
<td>“Four Stars”</td>
<td>170-220</td>
<td>230-340</td>
</tr>
<tr>
<td>C</td>
<td>“Three Stars”</td>
<td>140-170</td>
<td>190-230</td>
</tr>
<tr>
<td>D</td>
<td>“Two Stars”</td>
<td>90-140</td>
<td>130-190</td>
</tr>
</tbody>
</table>

The quoted rates include breakfast (continental or a breakfast buffet), service, and tax.

F.2. Accommodation deposit

To make a reservation of accommodation in one of the categories A–D effective, a deposit in the amount of sFr. 300.– per reservation must have been cleared to the MCI/ICM 94 account together with the registration fee. In case of cancellation before 1 July 1994, the registration fee and accommodation deposit (less bank handling charges) will be refunded by bank remittance to the account specified in the cancellation letter. After 1 July, no refund of accommodation deposits will be made.

F.3. Camping

Here is a list of campgrounds in the vicinity of Zürich (the distance from the city is shown in parentheses):

- Camping “Seebucht”, 8038 Zürich-Wollishofen, Tel. 01 482 16 12 (3.5 km)
- Camping “Züri-Leu”, 8135 Sihlwald, Tel. 01 720 04 98 (13 km)
- TCS-Camping “Maurholz”, 8124 Maur, Tel. 01 980 02 66 (13 km)
- Camping “Türlersee”, 8915 Hausen a.A., Tel. 01 764 03 28 (16 km)
- Camping “Reussbrücke”, 8913 Ottenbach, Tel. 01 761 20 22 (21 km)
- TCS-Camping “Kehlhof”, 8712 Stäfa, Tel. 01 926 43 34 (22 km)
- Camping “Am Schützenweier”, 8400 Winterthur, Tel. 052 212 52 60 or 052 37 32 37 (25 km)
- Camping “In der Weid”, 8321 Wildberg, Tel. 052 45 33 88 (28 km)
- Camping Auslikon, 8331 Auslikon, Tel. 01 950 13 29 (30 km)
- Camping Saland, 8493 Saland, Tel. 052 46 21 18 (32 km)

Since the congress is being held during the holiday season, campgrounds may be crowded. Call to inquire if there is space available before going to one of the campgrounds listed or, even better, make a reservation well ahead of your arrival. For calls from outside of Switzerland replace the first 0 by +41. Camping outside designated areas is not allowed anywhere near Zürich.

G. Other mathematical conferences

XIVth International Congress of Mathematical Physics, Paris, 18–23 July 1994

Topics: The congress will present about twelve invited plenary lectures and twelve topical sessions, with three to six invited speakers each, in domains such as quantum physics, relativity, field theory, statistical physics, disordered systems, condensed matter, dynamical systems, fluid mechanics, operator algebras, conformal and topological theories, integrable models, etc. It will be followed by several satellite colloquia (listed below and marked with an asterisk).

Place: Centre de Conférences de l’UNESCO, Paris (France)
For information contact: Service de Physique Théorique, CE-Saclay, F-91191 Gif-sur-Yvette Cedex, France; Fax: +33 1 69 08 81 20


Place: Institut Henri Poincaré, Paris (25–27 July) and Ecole Polytechnique, Palaiseau (28 July)
For information contact: e-mail bachas@orphee.polytechnique.fr, philippe@amoco.saclay.cea.fr, pasquier@amoco.saclay.cea.fr.


Place: probably the Sorbonne, Paris
For information contact: F. Koukiou, Centre de Physique Théorique, Ecole Polytechnique, F-91198 Palaiseau Cedex, France; e-mail: koukiou@orphee.polytechnique.fr


Place: probably the Sorbonne, Paris
For information contact: J. Bros, Service de Physique Théorique, CE-Saclay, F-91191 Gif-sur-Yvette Cedex, France; Tel: +33 1 69 08 80 74, Fax: +33 1 69 08 81 20
Topics: Linear and nonlinear differential equations, semigroups of operators, control theory, mathematical physics and related areas and applications
Place: University of Strathclyde, Glasgow (Scotland, United Kingdom)
For information contact: Prof. G.F. Roach, Dept. of Mathematics, University of Strathclyde, Glasgow G1 1XH, Scotland, United Kingdom; Fax: +44 41 552 8657, email: caas24@uk.ac.strath.vaxa

Topics: von Neumann algebras and C*-algebras
Place: Geneva University (Switzerland)
For information contact: P. de la Harpe, Section de Mathématiques, Université de Genève, C.P. 240, CH-1211 Genève 24, Switzerland; e-mail: alopa@cgeuge11.bitnet

Topics: Hyperbolic geometry and Kleinian groups, minimal surfaces and harmonic maps, geometry of groups and hyperbolic groups, geometric foliations and laminations
Place: Ecole Normale Supérieure de Lyon (France)
For information contact: Frédéric Paulin, Unité de Mathématiques, Ecole Normale Supérieure de Lyon, 46 allée d’Italie, F-69364 Lyon, France

Symposium on classical and quantum billiards, Ascona, 25–30 July 1994
Topics: Mathematical and physical aspects of billiard type dynamical systems
Place: Centro S. Franscini, Monte Verità, Ascona (Switzerland)
For information contact: Dr. M. Cibils. Institut de Physique Théorique EPFL, CH-1015 Lausanne, Switzerland; Fax: +41 21 693 44 44, e-mail: billiard@ldp.epfl.ch

Topics: Algebraic K-theory and its applications to algebra, algebraic geometry, topology and number theory; cyclic homology, homology of Liebniz algebras, MacLane homology, algebraic K-theory of spaces, “motivic” cohomologies, etc.
Place: Université de Paris VII, Paris (France)
For information contact: Algebraic K-theory Conference, URA212, U.F.R. de Mathématiques, Université de Paris VII, Case 7012, 2 place Jussieu, F-75251 Paris Cedex 05. France; e-mail: kthconf@frmap711.mathp7.jussieu.fr

International conference on commutative algebra, Vechta, 27 July – 1 August 1994
Topics: Commutative algebra
Place: University of Osnabrück (Germany), Vechta campus
For information contact: Prof. Dr. W. Bruns, Universität Osnabrück, Standort Vechta, Postfach 1553, D-49364 Vechta, Germany; Fax: +4441 15 444, e-mail: wbcomalg@dosuni1.rz.uni-osnabrueck.de

Harmonic maps and curvature properties of submanifolds, Leeds, 28 July – 1 August 1994
Topics: Workshop, topics as indicated in the title
Place: School of Mathematics, University of Leeds (United Kingdom)
For information contact: S. Carter / A. West / J.C. Wood, School of Mathematics, University of Leeds, Leeds LS2 9JT, United Kingdom; e-mail: s.carter@leeds.ac.uk

International conference on potential theory, Kouty, 13–19 August 1994
Topics: Various aspects of potential theory including its applications
Place: Kouty near Ledécn/S. (Czech Republic)
For information contact: ICPT 94, MFF UK, Sokolovská 83, 186 00 Prague 8, Czech Republic, email: icpt94@cspguk11.bitnet

Third international colloquium on numerical analysis, Plovdiv, 13–17 August 1994
Topics: Numerical analysis
Place: Plovdiv (Bulgaria)
For information contact: Stoyan Zlatev, Mathematical Faculty of the Plovdiv University, Tsar Assen Street 24, Plovdiv 4000, Bulgaria

Analysis colloquium, Berne, 14–21 August 1994
Topics: Real analysis, complex analysis (several variables), symmetric spaces, quasiconformal mappings, classical complex analysis
Place: University of Berne (Switzerland)
For information contact: Prof. H.M. Reimann, Institute of Mathematics, University of Berne, Sidlerstrasse 5, CH-3012 Berne, Switzerland; Fax: +41 31 631 85 10, e-mail: reimann@math-stat.unibe.ch

Colloquium on semigroups, Szeged, 15–19 August 1994
Topics: Semigroups and their applications in other branches of mathematics
Place: Bolyai Institute, Szeged (Hungary)
For information contact: Máriá B. Szendrei, József Attila University, Bolyai Institute, Aradi váránk tere 1, 6720 Szeged, Hungary; e-mail: h6178sze@huella.bitnet

Tenth summer conference on general topology and applications, Amsterdam, 15–18 August 1994
Topics: Continuum theory and dynamics, infinite dimensional and geometric topology. set theoretic topology, topology and descriptive set theory
International Congress of Mathematicians

Place: Amsterdam (The Netherlands)
For information contact: E. Coplakova, Faculty of Technical Mathematics and Informatics, TU Delft, P.O. Box 5031, 2600 GA Delft, The Netherlands; e-mail: top94@cs.vu.nl

Topics: Fluid dynamics, porous media flows, reactive flow problems, structural mechanics
Place: Charles University, Prague (Czech Republic)
For information contact: Prof. M. Feistauer, Faculty of Mathematics and Physics, Charles University, Sokolovská 83, 186 00 Prague 8, Czech Republic

H. Instructions for authors of abstracts
The abstracts of short communications should be prepared according to the following rules:
— The abstract must be typewritten (use a black ribbon) or be produced on a computer printer. When using a needle printer, choose “letter quality”. Use good quality, heavy white paper. If symbols or figures are added by hand, this should be done in black ink.
— The abstract should be in a form ready for photographic reproduction. The printed abstract will be reduced to 70% of the original size.
— The portion to appear in print must be within a rectangle 20 cm (8 in) wide and 10 cm (4 in) high.
— The abstract should begin with the following items, in the order specified: name (underlined), affiliation and country of the author, then a colon (:), followed by the title.
— Separate the head from the body of the abstract by a blank line.
— Use the full width of 20 cm for head and body of your abstract.
— A classification of the subject according to the 19 sections listed below as well as the pertinent AMS classification number (see the list below) must appear at the top of the page outside the 20 cm by 10 cm rectangle containing the abstract. In some cases, we might change the section of your communication so that related contributions are presented in the same poster session.


If an abstract does not conform to the above specifications, it will be returned to the author for resubmission.

An example of an acceptable abstract is given on the following page.
Koller, Clemenz A., University of Appenzell, Switzerland, and Isenegger, Virginia, Uri State College, Switzerland: On a new kind of function associated to a given function.

If \( y = f(x) \) is a function defined on the real axis then by forming difference quotients \( \frac{f(x+h)-f(x)}{h} \) and passing to the limit \( h \to 0 \) one obtains for each given \( x \) a number \( v \) which one may interpret as a kind of velocity associated to \( f \) and the chosen \( x \). It may be that this number has been investigated before, but we have found no reference. We have decided to call \( v \) the derivative of \( f \) at \( x \), since it somehow has been derived from the values of \( f \) around the point \( x \); the notation \( f'(x) \) for \( v \) has turned out to be convenient. If we let \( x \) vary, then \( f'(x) \) becomes the function of \( x \) referred to in the title. In our paper we present several formulas for easy computation of, say, the derivative of a product \( f(x)g(x) \) of two functions or the derivative of the square root of \( f(x) \).

Our main result is the following Theorem: If \( y = f(x) \) and \( z = g(y) \) are two given functions, then the derivative of the "composite function" \( g(f(x)) \) may be computed as \( g'(f(x)) \cdot f'(x) \), where the dot denotes ordinary multiplication. The proof is by induction on the degree, so strictly speaking we only have this for polynomials. In the general case the theorem remains a conjecture, albeit supported by numerous examples where it has been checked and proven to be correct on a computer (calculations courtesy of the "formula crunchee" system).

Possible applications of this new concept are discussed.
List of invited speakers follows:

Plenary Lectures

László Babai, University of Chicago / Eötvös University, Budapest, Hungary
   Transparent proofs and limits to approximation

J. Bourgain, Institute of Advanced Study, Princeton NJ
   Harmonic analysis and partial differential equations

John H. Conway, Princeton University, Princeton NJ
   no title given

Ingrid Daubechies, AT&T Bell Laboratories, Murray Hill NJ
   Phase space localization and applied mathematics

Jürg Fröhlich, Theoretical Physics, ETH Zürich, Switzerland
   Light and matter / New developments in quantum theory / Non-commutative geometry and physics

Joseph B. Keller, Stanford University, Stanford CA
   Wave propagation

Maxim Kontsevich, Max Planck-Institut, Bonn / University of California, Berkeley CA
   Homological algebra of mirror symmetry

Pierre-Louis Lions, CEREMADE, Université Paris-Dauphine, France
   On some recent methods in nonlinear partial differential equations

Marina Ratner, Stanford University, Stanford CA
   Interactions between ergodic theory, Lie groups and number theory

Paul Seymour, Bell Communications Research, Morristown NJ
   Hadwiger's conjecture and the four-colour theorem

Clifford H. Taubes, Harvard University, Cambridge MA
   Anti-self dual geometry

S.R.S. Varadhan, Courant Institute, New York NY
   Entropy methods in hydrodynamic scaling

Victor A. Vassiliev, Independent University and Research Institute for System Studies, Moscow, Russia
   Topology of discriminants and their complements

Dan Voiculescu, University of California, Berkeley CA
   Free noncommutative probability theory, random matrices and von Neumann algebras of free groups

Andrew Wiles, Princeton University, Princeton NJ
   no title given

J.C. Yoccoz, Université Paris-Sud, Orsay, France
   Hyperbolicity and quasiperiodicity

Section 1: Logic

James E. Baumgartner, Dartmouth College, Hanover NH
   New trends in partition calculus

Alain Louveau, CNRS and Université Paris 6, France
   Borel equivalence relations

Anand Pillay, University of Notre Dame, Notre Dame IN
   no title given

Pavel Pudlák, Academy of Sciences, Prague, Czech Republic
   Logic and complexity theory

Section 2: Algebra

Peter Littelmann, Universität Basel, Switzerland
   The path model of representations

Alexander Lubotzky, Hebrew University, Jerusalem, Israel
   Subgroup growth

Jean-François Mestre, U.F.R. de Mathématiques, Université de Paris 7, France
   Constructions polynomiales et théorie de Galois

R. Parimala, Tata Institute of Fundamental Research, Bombay, India
   Study of quadratic spaces over algebraic varieties, relevance in algebra and geometry

Gerald Schwarz, Brandeis University, Waltham MA
   Invariant differential operators

Andrei Suslin, Steklov Institute, St. Petesburg, Russia
   Algebraic K-theory and motivic cohomology

Michel Van den Bergh, Limburgs Universitair Centrum, Belgium
   Local cohomology of modules of covariants

Section 3: Number theory

Noam Elkies, Harvard University, Cambridge MA
   no title given

John Friedlander, University of Toronto, Canada
   Bounds for L-functions

Alexander Goncharov, MIT, Cambridge MA
   Polylogarithms in arithmetic and geometry

Andrew Granville, University of Georgia, Athens GA
   Unexpected deviations in the distribution of primes

Bernadette Perrin-Riou, Université Pierre et Marie Curie, Paris, France
   Fonctions L p-adiques

Carl Pomerance, University of Georgia, Athens GA
   Smooth numbers and their role in number theoretic algorithms

Michael Rapoport, Bergische Universität, Wuppertal, Deutschland
   Non-archimedean period domains

Richard Taylor, Cambridge University, Cambridge UK
   Representations of Galois groups related to modular forms
Section 4: Geometry

Michael T. Anderson, SUNY, Stony Brook NY
Convergence and degeneration of Riemannian metrics

Victor Bangert, Universität Freiburg, Germany
Minimal foliations and laminations

Kevin Corlette, University of Chicago, Chicago IL
Harmonic maps, rigidity and Hodge theory

Alexander B. Givental, University of California, Berkeley CA
On the mirror symmetry for some Fano manifolds

Nicolaos Kapouleas, Brown University, Providence RI
Constant mean curvature surfaces in euclidean spaces

F. Kirwan, Oxford University, UK
Residue formulas for intersection pairings on quotient spaces

Claude LeBrun, SUNY, Stony Brook NY
Scalar-flat Kaehler metrics on compact complex 2-manifolds

Jun Li, Stanford University and University of California, Los Angeles
The geometry of moduli of vector bundles over algebraic surfaces

Tomasz S. Mrowka, California Institute of Technology, Pasadena CA
Embedded surfaces and the structure of Donaldson's polynomial invariants

G. Perelman, Steklov Institute, St. Petersburg, Russia and University of California, Berkeley CA
Spaces with curvature bounded below

Dietmar A. Salamon, University of Warwick, Coventry UK
Lagrangian intersections, Floer homology and 3-manifolds with boundary

Claude Viterbo, Université de Paris-Sud, Orsay, France
no title given

Section 5: Topology

Robert Gompf, University of Texas, Austin TX
Recent developments in 4-manifold theory

Michael J. Hopkins, MIT, Cambridge MA
New directions in stable homotopy theory

Jean Lannes, U.F.R. de Mathématiques, Université de Paris 7, France
Maps from classifying spaces

H. Blaine Lawson, SUNY, Stony Brook NY
Spaces of algebraic cycles

John Luecke, University of Texas, Austin TX
Dehn surgery on knots in the 3-sphere

E. Rips, Hebrew University, Jerusalem, Israel
Small splittings of finitely presented groups

Joachim Hyam Rubinstein, Melbourne University, Australia
An algorithm to recognise the 3-sphere

Julius L. Shaneson, University of Pennsylvania, Philadelphia PA
Genera of algebraic varieties, lattice points, and Euler-MacLaurin expansions

Stephan Stolz, University of Notre Dame, Notre Dame IN
Manifolds of positive scalar curvature

Shmuel Weinberger, University of Chicago, Chicago IL
Nonlocally linear manifolds and orbifolds

Section 6: Algebraic geometry

Gerd Faltings, Princeton University, Princeton NJ
The ubiquity of stability in algebraic geometry

David Harbater, University of Pennsylvania, Philadelphia PA
Fundamental groups and curves in characteristic p

Uwe Jannsen, Universität Köln, Germany
Mixed motives, motivic cohomology, and Ext-groups

Yoichi Miyaoka, RIMS, Kyoto University
Rational curves on algebraic varieties

M. Nori, University of Chicago, Chicago IL
Topology of varieties

Alexey N. Rudakov, Institute of System Studies, Russian Academy of Science, Moscow, Russia
no title given

Claire Voisin, CNRS, Université d'Orsay, Orsay, France
Variations of Hodge structure and algebraic cycles

Section 7: Lie groups and representations

Jeffrey Adams, University of Maryland, College Park MD
Representations of real reductive groups

Henning Haahr Andersen, Aarhus University, Denmark
The irreducible characters for semi-simple algebraic groups and for quantum groups

Richard Borcherds, University of California, Berkeley CA
Automorphic forms on O(n,2) and generalized Kac-Moody algebras

Michel Brion, Institut Fourier – CNRS, Saint-Martin d'Hères, France
Spherical varieties and representation theory

Marc Burger, Université de Lausanne, Switzerland
no title given

C. J. Bushnell, Kings College, London UK
Smooth representations of p-adic groups — the role of compact open subgroups
International Congress of Mathematicians

S.G. Dani, Tata Institute of Fundamental Research, Bombay, India
Flows on homogeneous spaces and diophantine approximation

Jian-Shu Li, University of Maryland, College Park MD
Automorphic forms with degenerate Fourier coefficients

Wolfgang Soergel, Universität Freiburg, Germany
Gradings on categories of representations

Jean-Loup Waldspurger, CNRS, Université de Paris 7, France
Comparaison d'intégrales orbitales pour des groupes p-adiques

Section 8: Real and complex analysis

Jean-Pierre Demailly, Université de Grenoble 1, France
no title given

David Drasin, Purdue University, W. Lafayette IN
Meromorphic functions: Progress and problems

Howard Masur, University of Illinois, Chicago IL
Applications of Teichmüller theory to dynamical systems and probability

Ngaiming Mok, Université de Paris-Sud, Orsay, France
Meromorphic maps of compact Kaehler manifolds onto algebraic varieties of the general type

Duong H. Phong, Columbia University, New York NY
Regularity of Fourier integral operators

Stephen Semmes, Rice University, Houston TX
Analysis, geometry and topology with little smoothness, nontrivial structure, and infinite complexity

Mitsuhiro Shishikura, University of Tokyo, Japan
Topological, geometric and complex analytical properties of Julia sets

Christopher D. Sogge, University of California, Los Angeles CA
On Fourier integrals and classical analysis

Pekka Tukia, University of Helsinki, Finland
A survey of Möbius groups

Sidney M. Webster, University of Chicago, Chicago IL
Normal forms and dynamics of real submanifolds of complex space

Section 9: Operator algebras and functional analysis

George A. Elliott, University of Copenhagen, Denmark, and University of Toronto, Canada
The classification problem for amenable C*-algebras

W.T. Gowers, University College, London UK
no title given

Eberhard Kirchberg, Humboldt Universität, Berlin, Germany
Growth and tensor products of C*-algebras

Edward Odell, University of Texas, Austin TX
Distortion and stabilized structure in Banach spaces; new geometric phenomena for Banach and Hilbert spaces (with Th. Schlumprecht)

A.J. Wassermann, Dept. of Pure Mathematics and Mathematical Statistics, Cambridge UK
Operator algebras and conformal field theory

Mariusz Worodzicki, University of California, Berkeley CA
The algebra of functional analysis

Section 10: Probability and statistics

Richard Bass, University of Washington, Seattle WA
Boundary behavior of harmonic functions and Brownian motion

Donald Dawson, Carleton University, Ottawa, Canada
Interaction and hierarchy in measure-valued processes

David Donoho, University of California, Berkeley CA
no title given

Hans Föllmer, Universität Bonn, Germany
Probabilistic methods in finance

Jürgen Gärtner, Technische Universität Berlin, Germany
Parabolic systems in random media and aspects of intermittency

Zhi-Ming Ma, Chinese Academy of Sciences, Beijing, P.R. China
Quasi-regular Dirichlet forms and applications

Charles M. Newman, Courant Institute, New York NY
Fluctuations in first-passage percolation and related models

K.R. Parthasarathy, Indian Statistical Institute, New Delhi, India
Quantum stochastic calculus

Ed. Perkins, University of British Columbia, Vancouver, Canada
Measure-valued branching diffusions with interactions

Hiroshi Tanaka, Keio University, Japan
Diffusion processes in random environments

Section 11: Partial differential equations

J. Thomas Beale, Duke University, Durham NC
Analytical and numerical aspects of fluid interfaces

Kung Ching Chang, Peking University, Beijing, P.R. China
Morse theory and multiple solutions

Jean-Yves Chemin, Université de Paris 7, France
Vorticity in 2-D fluid mechanics and microlocal analysis
Peter Constantin, University of Chicago, Chicago IL
Some mathematical problems of fluid dynamics

Constantine M. Dafermos, Brown University, Providence RI
The theory of hyperbolic systems of conservation laws: Current trends and open problems

Manoussos Grillakis, University of Michigan, Ann Arbor, MI
Apriori estimates and regularity for nonlinear waves

David Jerison, MIT, Cambridge MA
Harmonic functions in convex and concave domains

Hiroshi Matano, University of Tokyo, Japan
Singularities of solutions of nonlinear parabolic and elliptic equations

Benoit Perthame, Université Pierre et Marie Curie, Paris, France
Hyperbolic systems of conservation laws and kinetic equations

Jalal Shatah, Courant Institute, New York NY
no title given

Panagiotis E. Souganidis, University of Wisconsin, Madison WI
Macroscopic limits of particle systems and generalized front propagation

Joel Spruck, Johns Hopkins University, Baltimore MD
Fully nonlinear elliptic equations and applications to geometry

Vladimir Šverák, University of Minnesota, Minneapolis MN
Lower-semicontinuity of variational integrals and compensated compactness

Section 12: Ordinary differential equations and dynamical systems

A.A. Bolibruch, Steklov Institute, Moscow, Russia
The Riemann-Hilbert problem and Fuchsian differential equations on the Riemann sphere

Sergey V. Bolotin, Moscow State University, Moscow, Russia
Invariant sets of Hamiltonian systems and variational methods

John Franks, Northwestern University, Evanston IL
Rotation vectors for surface diffeomorphisms

F. Ledrappier, Ecole Polytechnique, Palaiseau, France
Applications of dynamics to compact manifolds of negative curvature

Mikhail Lyubich, SUNY, Stony Brook NY
Geometry of quadratic polynomials

Ricardo Mañé, IMPA, Rio de Janeiro, Brazil
Global variational methods: New techniques and new problems

Marcelo Viana, IMPA, Rio de Janeiro, Brazil
Homoclinic bifurcations and persistent non-uniformly hyperbolic attractors

Lai-Sang Young, University of California, Los Angeles CA
Ergodic theory of attractors

Section 13: Mathematical Physics

Jean Bellissard, Université Paul Sabatier, Toulouse, France
The non-commutative geometry of the quantum Hall effect

Giovanni Felder, University of North Carolina, Chapel Hill NC
no title given

Edward Frenkel, Harvard University, Cambridge MA
Free field realizations in representation theory and conformal field theory

Eugene Ya. Khruslov, Institute for Low Temperature Physics, Kharkov, Ukraine
Averaged models of strongly inhomogeneous media

Elliott Lieb, Princeton University, Princeton NJ
no title given

Roberto Longo, Università di Roma “Tor Vergata”, Rome, Italy
Von Neumann algebras and quantum field theory

Gregory Moore, Yale University, New Haven CT
no title given

David R. Morrison, Duke University, Durham NC
Mirror symmetry and moduli spaces of conformal field theories

Gordon Slade, McMaster University, Hamilton, Ontario, Canada
The critical behaviour of random systems

Eugene Trubowitz, ETH Zürich, Switzerland
A rigorous renormalization group analysis of superconducting systems

Section 14: Combinatorics

Fan R.K. Chung, Bell Communications Research, Morristown NJ
Eigenvalues of graphs

Zoltan Furedi, University of Illinois, Urbana-Champaign IL
Extremal hypergraphs and combinatorial geometry

Jeff Kahn, Rutgers University, New Brunswick NJ
Asymptotics of hypergraph matching, covering and coloring problems

Gil Kalai, Hebrew University, Jerusalem, Israel
Combinatorics and convexity

Joel Spencer, Courant Institute, New York NY
Probabilistic methods in combinatorics
Anatoly Vershik, Russian Academy of Sciences, St. Petersburg, Russia
Asymptotic combinatorics and algebraic analysis

Section 15: Mathematical aspects of computer science
Oded Goldreich, Weizmann Institute, Rehovot, Israel
Randomness and computation

Mark Jerrum, University of Edinburgh, UK
The complexity of counting

Tom Leighton, MIT, Cambridge MA
On the use of randomness in the design of computer networks / Recent advances in multicommodity flow problems / Sorting circuits, tournament ranking, and fault tolerance

Leonid, Levin, Boston University, Boston MA
no title given

Noam Nisan, Hebrew University, Jerusalem, Israel
Pseudorandom generation and derandomization of algorithms

Section 16: Numerical analysis and scientific computing
Philippe G. Ciarlet, Universite Pierre et Marie Curie, Paris, France
Numerical analysis and modeling of plates and shells

Wolfgang Dahmen, RWTH Aachen, Germany
Multiscale methods — some concepts, applications and perspectives

Gene H. Golub, Stanford University, Stanford CA
Matrix computation and the theory of moments

Stanley Osher, University of California, Los Angeles CA
Subscale capturing in numerical analysis

Vladimir Rokhlin, Yale University, New Haven CT
no title given

J.M. Sanz-Serna, Universidad de Valladolid, Spain
The dynamics of numerical integrators

Section 17: Applications of mathematics in the sciences
Andrei A. Agrachev, Steklov Institute, Moscow, Russia
Applications of control theory to nonholonomic geometry

Marco Avellaneda, Courant Institute, New York NY
Homogenization, renormalization and the mathematics of inhomogeneous media

Phillip Colella, University of California, Berkeley CA
High-resolution computations of incompressible fluid flow

David W. McLaughlin, Princeton University, Princeton NJ
Whiskered tori and chaotic behavior in nonlinear waves

Joyce R. McLaughlin, Rensselaer Polytechnic Institute, Troy NY
A formula for finding the potential from nodal lines

George Oster, University of California, Berkeley CA
Mechanochemical energy conversion in biological systems

Etienne Pardoux, Universite de Provence, Marseille, France
Backward stochastic differential equations and applications

Jean Pierre Quadrat, INRIA, Le Chesnay, France
Max-plus algebra and applications to system theory and optimal control

Raoul Robert, CNRS, Universite de Lyon 1, France
Statistical mechanics and hydrodynamical turbulence

Eduardo D. Sontag, Rutgers University, New Brunswick NJ
Recent developments in nonlinear control

Section 18: Teaching and popularization of mathematics
Deborah Hughes Hallett, University of Arizona, Tucson AZ
no title given

Joel Schneider, Children's Television Workshop, New York NY
Popularization of mathematics: A survey

John Stillwell, Monash University, Clayton, Victoria, Australia
Number theory as a core mathematical discipline

Section 19: History of mathematics
Jan P. Hogendijk, Rijksuniversiteit Utrecht, The Netherlands
Mathematics in medieval Islamic Spain

Karen V.H. Parshall, University of Virginia, Charlottesville VA
no title given

Erhard Scholz, Bergische Universitaet, Wuppertal, Germany
Hermann Weyl's "purely infinitesimal" geometry and its philosophical motivations
ICM 94 Preregistration Form

MAIL to: ICM 94, International Congress of Mathematicians, ETH Zentrum, CH-8092 Zürich

Ordinary Member

Name and mailing address:

<table>
<thead>
<tr>
<th>last/family/surname</th>
<th>first/given name</th>
<th>middle name/initial</th>
</tr>
</thead>
</table>

institution or home address

<table>
<thead>
<tr>
<th>locality / street and number</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>postal code</th>
<th>city</th>
<th>country</th>
</tr>
</thead>
</table>

Nationality (Citizenship):

Telecommunications:

<table>
<thead>
<tr>
<th>Telephone</th>
<th>Fax</th>
<th>email</th>
</tr>
</thead>
</table>

If you have not yet done so, indicate here your major areas of mathematical interest, according to the classification of the 19 sections on page 364

<table>
<thead>
<tr>
<th>primary: section no.</th>
<th>secondary: section no.</th>
</tr>
</thead>
</table>

Desired text on second line of your congress badge (at most 30 characters, e.g. “Steklov Institute, Moscow” “New Zealand”, “ETH Zürich, Switzerland”, “Caltech USA”):

Short communication (poster)

☐ No, I do not wish to present a short communication.

☐ Yes, I wish to present a short communication. My abstract is enclosed.

☐ Yes, I wish to present a short communication. My abstract is not enclosed for the reason explained in the empty space below.

Special requests

☐ Please send me a personal invitation letter.

☐ I am handicapped and have the special needs explained in the empty space to the right.

Accompanying and Child Members

1. Accompanying Member ☐ Child Member ☐

Name:

<table>
<thead>
<tr>
<th>last/family/surname</th>
<th>first/given name</th>
<th>middle name/initial</th>
</tr>
</thead>
</table>

2. Accompanying Member ☐ Child Member ☐

Name:

<table>
<thead>
<tr>
<th>last/family/surname</th>
<th>first/given name</th>
<th>middle name/initial</th>
</tr>
</thead>
</table>

Use a separate sheet, if your party is larger than this.
Please repeat your name here: ____________________________

### Social events
Indicate the number in your party who wish to take part in the social events listed (at most one concert per person)

<table>
<thead>
<tr>
<th>Event</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reception on Wednesday, 3 August</td>
<td></td>
</tr>
<tr>
<td>Buffet-banquet on Friday, 5 August</td>
<td></td>
</tr>
<tr>
<td>Classical concert on Tuesday, 9 August</td>
<td></td>
</tr>
<tr>
<td>Folk music concert on Tuesday, 9 August</td>
<td></td>
</tr>
</tbody>
</table>

### Accommodation

- **No**: I do not require accommodation reserved through ICM 91 resp. MCJ Travel
- **Yes**: please make a reservation in my name as follows (check the appropriate box):

<table>
<thead>
<tr>
<th>Code</th>
<th>Category</th>
<th>Single</th>
<th>Double</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&quot;Five Stars&quot;</td>
<td>220-360</td>
<td>340-480</td>
</tr>
<tr>
<td>B</td>
<td>&quot;Four Stars&quot;</td>
<td>170-220</td>
<td>230-340</td>
</tr>
<tr>
<td>C</td>
<td>&quot;Three Stars&quot;</td>
<td>140-170</td>
<td>190-230</td>
</tr>
<tr>
<td>D</td>
<td>&quot;Two Stars&quot;</td>
<td>90-110</td>
<td>130-190</td>
</tr>
</tbody>
</table>

Day of arrival: __________ August, day of departure: __________ August, number of nights: __________

I would agree to sharing my room with another participant of the congress: **Yes** / **No**

**Accommodation deposit**: sFr. 300. per room = __________

### Excursions and tours

- **Morning tour to the Rhine Falls** (pref. date, if any: __________ August) __________ persons × sFr. 55. = __________
- **Afternoon tour to Mount Rigi** (pref. date, if any: __________ August) __________ persons × sFr. 70. = __________
- **All day Swiss tour** (pref. date, if any: __________ August) __________ persons × sFr. 62. = __________

**Post congress tour A: Montreux, Geneva...** basis double room: __________ persons × sFr. 710. = __________

- **Post congress tour A: Montreux, Geneva...** (11-14 August, 3 nights) supplement for single room: __________ persons × sFr. 130. = __________

**Post congress tour B: Davos, St Moritz...** basis double room: __________ persons × sFr. 690. = __________

- **Post congress tour B: Davos, St Moritz...** (11-14 August, 3 nights) supplement for single room: __________ persons × sFr. 115. = __________

**Post congress tour C (4 days “Swiss pass”)**

1. class: __________ persons × sFr. 300. = __________
2. class: __________ persons × sFr. 200. = __________

### Registration Fee

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinary Member</td>
<td>1</td>
<td>sFr. 350. / sFr. 500.</td>
</tr>
<tr>
<td>Accompanying Member(s)</td>
<td></td>
<td>sFr. 150. / sFr. 200.</td>
</tr>
<tr>
<td>Child Member(s)</td>
<td></td>
<td>sFr. 80. / sFr. 100.</td>
</tr>
</tbody>
</table>

Add up the last column in order to compute the total payment due to make your preregistration and reservation effective!

**Total**: sFr. __________

**Important**: See section E.4 on page 361 for the acceptable methods of payment!

- **Proof of payment** (copy of bank or postal statement) is enclosed.
- **Payment is withheld** for the reasons explained in detail below.

Date: __________ Signature: __________
### Outline of the program

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday</td>
<td>2 Aug</td>
<td>Registration</td>
</tr>
<tr>
<td>Wednesday</td>
<td>3 Aug</td>
<td>Opening Ceremony</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Works of Fields medalists and Nevanlinna prize winner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Opening Reception (Kongreßhaus)</td>
</tr>
<tr>
<td>Thursday</td>
<td>4 Aug</td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45-min Lectures in Sections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poster Sessions</td>
</tr>
<tr>
<td>Friday</td>
<td>5 Aug</td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45-min Lectures in Sections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poster Sessions</td>
</tr>
<tr>
<td>Sunday</td>
<td>7 Aug</td>
<td>Excursions</td>
</tr>
<tr>
<td>Monday</td>
<td>8 Aug</td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45-min Lectures in Sections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poster Sessions</td>
</tr>
<tr>
<td>Tuesday</td>
<td>9 Aug</td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45-min Lectures in Sections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poster Sessions</td>
</tr>
<tr>
<td>Wednesday</td>
<td>10 Aug</td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45-min Lectures in Sections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poster Sessions</td>
</tr>
<tr>
<td>Thursday</td>
<td>11 Aug</td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plenary Lecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45-min Lectures in Sections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poster Sessions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Closing Ceremony</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concerto (Kongreßhaus)</td>
</tr>
</tbody>
</table>
Mathematical Sciences
Meetings and Conferences

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 or symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. A complete listing of meetings of the Society, and of meetings sponsored by the Society, will be found inside the front cover.

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 each 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 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, care of the American Mathematical Society in Providence, or electronically to notices@ams.org.

Deadlines for entries in this section are listed on the inside front cover of each issue. 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.

Effective with the 1990 volume of the Notices, the complete list of Mathematical Sciences Meetings and Conferences will be published only in the September issue. In all other issues, only meetings and conferences for the twelve-month period following the month of that issue will appear. As new information is received for meetings and conferences that will occur later than the twelve-month period, it will be announced at the end of the listing in the next possible issue. That information will not be repeated until the date of the meeting or conference falls within the twelve-month period.

1994

April 1994
4-10. Colorado Conference on Iterative Methods, Breckenridge, CO. (Nov. 1993, p. 1254)
5-7. First Annual Meeting of the Saudi Association for Mathematical Sciences, King Saud University, Riyadh, Saudi Arabia. (Jan. 1994, p. 51)
5-8. Workshop on Proof Theory, Complexity, Metamathematics, University of Technology, Vienna, Austria. (Feb. 1994, p. 137)
7-8. The First Magnus Lectures, Courant Institute of Mathematical Sciences (NYU) and Polytechnic University, NY. (Feb. 1994, p. 137)
8-10. Eastern Section, Polytechnic University, Brooklyn, NY.

Information: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.


Program: Coffee will be served from 10 a.m., and the program will end at 5:30 p.m.
Speakers: L. Babai, M. Putcha, and others.
Information: J. L. Alperin, electronic mail: alperin@math.uchicago.edu.

11-22. Spring School and Workshop on String Theory, Gauge Theory, and Quantum Gravity, Trieste, Italy. (Jan. 1994, p. 52)
16. 42nd Algebra Day, Carleton University, University of Ottawa, Ottawa, Canada.

Organizer: The Centre for Research in Algebra and Number Theory.
Speakers: M. Putcha (North Carolina), Algebraic monoids and monoids of Lie type; A.J. Coleman (Queen’s), From Lie to Shapovalov, via Killing, Cartan, Weyl, and Chevalley; M. Dyer (Notre Dame), Algebras associated to Coxeter groups and polyhedral cones.

Information: V. Dlab, fax: 613-788-3536; e-mail: vdlab@ccs.carleton.ca.

1st Discrete Mathematics Day: Being held on the preceding day, Friday, April 15, 1995; the speakers are S. Cook (Toronto), D.-Z. Du (Minnesota), and P. Seymour (Bellcore). For information: B. Richter, e-mail: brichter@cca.carleton.ca.

17-22. International Conference on New
May 1994


2–6. IMA Workshop on Image Models (and Their Speech Model Cousins), Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 64)


2–6. Variété et Contrôle, CIRM, Marseille, France. (Feb. 1994, p. 138)

2–6. Wavelet Analysis as a Tool for Geometric Synthesis and Analysis, University of Minnesota, Minneapolis, MN. (Nov. 1993, p. 1255)


SPEAKER: R. R. Coifman, Yale University.

TITLE OF TALK: Computational Harmonic Analysis.

INFORMATION: E. Fabes, School of Math., Univ. of Minnesota, Minneapolis, MN 55455; tel: 612-625-5901.


5–8. MER Network Workshop, University of Texas at Austin, Austin, Texas.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.


7. Midwest Several Complex Variables Meeting, Purdue University, West Lafayette, IN. (Mar. 1994, p. 245)

7. Topics in Complex Analysis, Brown University, Providence, RI.

* 7. Topics in Complex Analysis, Brown University, Providence, RI.


TOPICS: ODEs, delay and integral equations, dynamical systems, evolutional PDEs, applications in other areas, chaos and fractals, control theory, stochastic equations and control algorithms and software.

INVITED SPEAKERS: K. Cooke (USA), L.H. Erbe (Canada), H.I. Freedman (Canada), T. Furumochi (Japan), J.R. Had­dock (USA), M.W. Hirsch (USA), Qichang Huang (China), V.B. Kolmanovskii (Russia), V. Lakshminar­than (USA), Xunjin Li (China), J. Mallet-Paret (USA), D.D. Siljak (USA), B.D. Sleeman (UK), H.L. Smith (USA), D.H. Terman (USA), G.F. Webb (USA), G.K. Wolkowicz (Canada), J. Wu (China), Qixiao Ye (China), Yan­qian Ye (China), Shuxiang Yu (China), and Z. Zhang (China). (*) to be confirmed.

INFORMATION: B. Hong, International Office, Huazhong Normal University, Wuhan 430070, P.R. China; tel: 86-27-715696; fax: 86-27-716070; e-mail: liuls@bcpc20.scs.sla.stanford.edu. Those in North America can also contact: S. Ruan, Dept. of Math. and Stat., McMaster Univ., Hamilton, Ontario, Canada LWS 4K1; tel: 905-525-9140 (ext. 27108); fax: 905-522-0935; e-mail: ruan@hydra.cis.mcmaster.ca.


15–21. Critical Phenomena in Spatial Sto-
1994, p. 245)
16–20.  IMA Workshop on Stochastic Models in Geosystems, Institute for Mathematics
and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 64)
16–20.  Géométrie Algébrique, CIRM, Marseille, France. (Jan. 1993, p. 64)
16–26.  NATO–Advanced Study Institute on the Recent Developments in Approximation
Theory, Wavelets, and Applications, Maratea, Italy. (Feb. 1994, p. 139)
16–27.  Workshop on Commutative Algebra and its Relation to Combinatorics and
Computer Algebra, International Centre for Theoretical Physics, Trieste, Italy. (Jul./Aug.
1993, p. 712)
22–25.  24th International Symposium for Multiple-Valued Logic, Boston, MA. (Feb.
1994, p. 139)
*22–26. NSF–CBMS Regional Research Conference on Controlled Topology and the
Characterization of Manifolds, University of Tennessee, Knoxville, Tennessee.

Program: S.C. Ferry will give approximately ten lectures on the conference topic.
There will be invited supplementary talks but no contributed papers. It is expected
that some partial support for participants will be available.
Information: R.J. Daverman, conference
director, Dept. of Math., Univ. of Ten-
nessee, Knoxville, TN 37996-1206; e-mail:
daverman@novell.math.utk.edu.

(Sep. 1993, p. 926)
287)
(September 1993, p. 926)
23–25.  The 1994 Scalable High Performance
Computing Conference, SHPCC94, Knoxville, TN. (Nov. 1993, p. 1255)
23–27.  Elliptic and Parabolic Methods in
Geometry, University of Minnesota, Minne-
apolis, MN. (Nov. 1993, p. 1255)
23–27.  Geometrie Algébrique, Marseille, France. (Jan. 1994, p. 53)
23–31.  Recent Mathematical Methods in
Nonlinear Wave Propagation, Villa La Quer-
139)
24–27.  Conference on Hermann G. Graß-
mann (1809–1877), Isle of Rügen, Germany.
(September 1992, p. 775)
24–28.  International Workshop on Mathem-
atical Methods and Tools in Computer
Simulation, St. Petersburg State University,
St. Petersburg, Russia. (Jan. 1994, p. 53)
24–28.  First International Conference on
Difference Equations and Applications, Trin-
ity University, San Antonio, TX. (Dec. 1993,
p. 1448)
25–28.  Second Conference on Function
Spaces, Southern Illinois University at Ed-
wardsville, Illinois. (Sep. 1993, p. 926)
26–27.  Sixteenth Symposium on Mathemat-
ical Programming with Data Perturbations,
George Washington University, Washing-
ton, DC. (Jan. 1994, p. 53)
26–28.  Spatial Stochastic Models in Bio-
yology, The University of Colorado at Colorado
Springs. (Nov. 1993, p. 1256)
26–29.  ICANN ’94–International Conference
on Artificial Neural Networks, Sorren
to Congress Center, near Naples, Italy. (Jul./Aug.
1993, p. 712)
29–June 3.  International Conference on
Real and Complex Algebraic Geometry,
Soestberg, The Netherlands. (Jul./Aug. 1993,
p. 712)
29–June 4.  Singulare Storungsrechnung,
Oberwolfach, Federal Republic of Germany.
(Mar. 1993, p. 287)
29–June 4.  Spring School on Potential
Theory and Analysis, Paseky, Czech Republic.
(Dec. 1993, p. 1448)
30–June 3.  Equations aux Derivées Partielles
Stochastiques, CIRM, Marseille, France. (Feb.
1994, p. 139)
*30–June 3.  International Conference on
Complex Analysis, Nanjing Normal Univer-
sity, Nanjing, China.

Program: The conference contains four
topics in complex analysis: complex dyna-
metics; value distribution theory; geometric
function theory; and quasiconformal
mappings and Teichmüller spaces.
Invited Speakers: To be announced.
Lecturers: Three parallel sessions will be
organized for 30– or 15– minute lectures by
participants. It is preferred that the lectures
be given in English. Those who wish to
give a lecture are requested to submit the
title of the talk on the registration form and
to submit a one-page abstract in English.
Registration Fee: A registration fee of
$100 (US) is due upon arrival at Nan-
ing Normal Univ. This fee will cover
transportation from the airport, a reception
dinner and a banquet, and a one-day tour in
Nanjing.
Information: H. Chen, Nanjing Normal Univer., tel: 253306428, fax: 253307448; or
of China; electronic mail: YAHLO%bepec20
SCS.SC.LAC.SRAM.EDU.

30–June 3.  Third Gokova Geometry/Topology
Conference: A meeting in Geometric PDE’s
and Gauge Theory, Gokova, Turkey.

Sponsor: TUBITAK (The Scientific and
Technical Research Council of Turkey).
Invited Speakers (confirmed): R. Fintu-
shel. P. L. Gi. M. Asbaum, T. Mrowka,
Information: T. Onder, Dept. of Math.,
Middle East Technical Univ., Ankara,
Turkey; electronic mail: MATTRGT@
vm.cc.metu.edu.tr, or S. Akbulut;
e-mail: akbuluts@math.msu.edu.

30–June 4.  Problemes en Homotopie Ration-
nelle, Marseille, France. (Jan. 1994, p. 54)
30–June 9.  Workshop on Group Representa-
tion Theory, Technion, Israel Institute of
Technology, Haifa, Israel. (Dec. 1992, p. 1284)
31–June 3.  IMA Minisymposium on Phase
Transitions in Catalytic Surface Reaction
Models, Institute for Mathematics and its
Applications, University of Minnesota,
Minneapolis, MN. (Jan. 1993, p. 64)
31–June 3.  Surfaces, Soap Bubbles, and
General Relativity, Frostburg State Univer-
sity, Frostburg, MD. (Jan. 1994, p. 54)

June 1994

First Workshop on Scientific Information
concerning Education, Camagüey, Cuba. (Mar.
1994, p. 246)
1–4.  International Conference on Differential
Equations and Applications to Biology
and to Industry, Harvey Mudd College, Clare-
mont, CA. (Dec. 1993, p. 1448)
1–7.  1994 Barcelona Conference on Alge-
braic Topology, Sant Feliu de Guixols (near
Barcelona, Spain). (Nov. 1993, p. 1256)
2–5.  Colloque Pierre Eyraud, Colloque
tournant d’Analyse Harmonique, Université
de Nancy, France. (Mar. 1994, p. 246)
2–19.  Constructivist Methods in Under-
graduate Math Teaching: Calculus, Purdue
University, West Lafayette, Indiana. (Decem-
ber (1993, p. 1448)
3–4. Praha-Chemnitz-Torun Algebra Symposium. Charles University, Faculty of Mathematics and Physics, Prague, Czech Republic. (Jan. 1994, p. 54)


6–10. Formes Quadratiques et Groupes Algébraiques Lineaires, Marseille, France. (Jan. 1994, p. 54)


7–11. AMS Symposium in Research Mathematics on Quantization and Nonlinear Wave Equations, Massachusetts Institute of Technology, Cambridge, MA.

INFORMATION: W.S. Drady, American Mathematical Society, P.O. Box 6887, Providence, RI 02940.


13–17. Advanced Topics in Applied Mathematics and Theoretical Physics, CIRM, Marseille, France. (Feb. 1994, p. 140)

13–18. International Conference on Logic Planning, Santa Margherita Ligure, Italy. (Feb. 1994, p. 140)


Summer 1994. Summer Regional Centers–TRANSIT. Ohio State University, Columbus, OH. (Oct. 1992, p. 951)

13–17. IMA Workshop on Classical & Modern Branching Processes, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 64)

13–18. Thirty Years after Sharkovskii’s Theorem–New Perspectives, Murcia, Spain. (Dec. 1993, p. 1449)


SUPPORT: Travel support may be available for graduate students.

INFORMATION: C. McCrory, Math. Dept., Univ. of Georgia, Athens, GA 30602; tel: 706-542-2576; e-mail: clint@joe.math.uga.edu.


16–18. Western Section, University of Oregon, Eugene, Oregon.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

17–18. Conference in Honor of L.D. Berkovitz, Purdue University, West Lafayette, IN. (Feb. 1994, p. 140)

18–19. IMS Workshop on Directions in Sequential Analysis, Chapel Hill, NC. (Jan. 1994, p. 55)


20–24. Probabilités Quantiques, CIRM, Marseille, France. (Jan. 1993, p. 64)

20–24. IMA Workshop on Mathematics in Manufacturing Logistics, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Sep. 1993, p. 927)

20–24. Probabilités Quantiques, Marseille, France. (Jan. 1994, p. 55)

20–24. Les journées mathématiques de Cergy-Pontoise, Université de Cergy-Pontoise, France.

INFORMATION: E. Hebey, Université de Cergy-Pontoise, Avenue du Parc - 8, le campus, 95033 Cergy-Pontoise cedex, France; tel: 34 25 49 17; fax: 34 25 49 04.


INFORMATION: Donna Salter, American Mathematical Society, P.O. Box 6887, Providence, RI 02940.


22–26. Eighteenth Symposium on Real Analysis, University of Virginia, Charlottesville, VA. (Dec. 1993, p. 1450)


PROGRAM: The conference will feature six invited one-hour lectures. There will also
be sessions for twenty-minute contributed papers. A refereed conference proceedings is planned.

**ORGANIZING COMMITTEE:** H. Niederreiter (Austrian Acad. of Sciences), G. Mullen (Penn. State Univ.), and P. Shiue (Univ. of Nevada, Las Vegas).

**INFORMATION:** H. Niederreiter, Inst. for Information Processing, Austrian Acad. of Sciences, Sonnenfelsgasse 19, A-1010 Vienna, Austria; electronic mail: nied@qiinfo.oeaw.ac.at; G. Mullen, Math. Dept., Penn. State Univ., University Park, PA 16802; tel: 814-865-9413; e-mail: mullen@math.psu.edu; or P. Shiue, Dept. of Math. Sci., Univ. of Nevada, Las Vegas, NV 89154; tel: 702-895-3748; fax: 702-895-4343; e-mail: shiue@nevada.edu.

---

**23-July 1. International Conference on Abelian Groups and Modules,** University of Padova, Padova, Italy. (Dec. 1993, p. 378)


**25-July 2. Logique et Informatique, CIRM, Marseille, France.** (Feb. 1994, p. 141)

**27-July 1. Logique et Informatique, CIRM, Marseille, France.** (Feb. 1994, p. 141)

**27-July 2. Convex and Discrete Geometry, Bydgoszcz, Poland.** (Dec. 1993, p. 1450)

---

**July 1994**


**CONFERENCE TOPICS:** The program consists of invited and contributed lectures, minisymposia, poster presentations, and an exhibition. Presentations are solicited in all areas of applied mathematics; computer science; applied probability and statistics; problems computing and applications in science, medicine, engineering, economics, and other related fields.

**INVITED SPEAKERS:** H. Akaike (Japan), V.I. Arnold (Russia), F. Baccelli (France), M.V. Berry (UK), H. Brezis (France), C. Cercignani (Italy), L. Daubechies (USA), P. De- gond (France), H. Foeller (Germany), K. Hasselmann (Germany), E.J. Hinch (UK), R. James (USA), W. Kahan (USA), J.B. Keller (USA), J.-L. Lions (France), J. Marsden (USA), G. Meyer (USA), D. Mumford (USA), K. Murota (Japan), H. Neunzert (Germany), L.G. Nilsson (Sweden), A. Perelson (USA), C. Peskin (USA), F. Pfeiffer (Germany), A. Quarteroni (Italy), R. Ramacher (Germany), G. Sivashinsky (Israel), A. Teyler (UK), L. Trefethen (USA), P. Van Dooren (USA), and M. Ward (Canada).

**CALL FOR PAPERS:** Persons who would like to present a paper (lecture or poster format) or would like to organize a minisymposium are encouraged to submit a proposal on an appropriate ICIAM 95 form by the deadline of August 31, 1994. Authors will have approximately 15 minutes for the lecture, with an additional 5 minutes for discussion. The alternative poster presentations will allow interactive discussions throughout the presentation. A minisymposium is a session of speakers focusing on a single topic. The organizer of a minisymposium invites the speakers and decides on the topic they are to deliver.

**INFORMATION:** GAMM-Office, Univ. Regensburg, NWF I-Mathematik, D-93053 Regensburg, Germany; tel: +49-941-943-4918; fax: +49-941-943-4005; e-mail: iciam95@vax1.rz.uni-regensburg.de.


**CONFERENCE TOPICS:** The program consists of invited and contributed lectures, minisymposia, poster presentations, and an exhibition. Presentations are solicited in all areas of applied mathematics; computer science; applied probability and statistics; scientific computing; and applications in science, medicine, engineering, economics, and other related fields.

**INVITED SPEAKERS:** H. Akaike (Japan), V.I. Arnold (Russia), F. Baccelli (France), M.V. Berry (UK), H. Brezis (France), C. Cercignani (Italy), L. Daubechies (USA), P. Degond (France), H. Foeller (Germany), K. Hasselmann (Germany), E.J. Hinch (UK), R. James (USA), W. Kahan (USA), J.B. Keller (USA), J.-L. Lions (France), J. Marsden (USA), G. Meyer (USA), D. Mumford (USA), K. Murota (Japan), H. Neunzert (Germany), L.G. Nilsson (Sweden), A. Perelson (USA), C. Peskin (USA), F. Pfeiffer (Germany), A. Quarteroni (Italy), R. Ramacher (Germany), G. Sivashinsky (Israel), A. Teyler (UK), L. Trefethen (USA), P. Van Dooren (USA), and M. Ward (Canada).

**CALL FOR PAPERS:** Persons who would like to present a paper (lecture or poster format) or would like to organize a minisymposium are encouraged to submit a proposal on an appropriate ICIAM 95 form by the deadline of August 31, 1994. Authors will have approximately 15 minutes for the lecture, with an additional 5 minutes for discussion. The alternative poster presentations will allow interactive discussions throughout the presentation. A minisymposium is a session of speakers focusing on a single topic. The organizer of a minisymposium invites the speakers and decides on the topic they are to deliver.

**INFORMATION:** GAMM-Office, Univ. Regensburg, NWF I-Mathematik, D-93053 Regensburg, Germany; tel: +49-941-943-4918; fax: +49-941-943-4005; e-mail: iciam95@vax1.rz.uni-regensburg.de.


4-8. Arrangements d'Hyperplans, CIRM, Marseille, France. (Feb. 1994, p. 141)


4-8. Thirty-eighth Annual Meeting of the Australian Mathematical Society, University
Meetings and Conferences


Topics: The topic of this year's school is Automated Deduction. The lectures will deal with proof search in predicate logic (which includes resolution method, connection method, inverse method, and higher order logic) and various approaches to automatization of induction (which include the use of rewriting techniques, proof plans, and formalization in type theory). Several systems will also be presented.

LECTURERS: D. Basin (Saarbrucken), H. Comon (Paris), T. Coquand (Goteborg), G. Dowek (Paris), A. Leitsch (Vienna), G. Mints (Stanford), J.S. Moore (Austin), and L. Wallen (Oxford).

INFORMATION AND APPLICATION FORMS: M. Parigot, School LCS, Laboratoire de Logique, UFR de Mathématiques, Université Paris 7, 2 place Jussieu, 75251 Paris Cedex 05, France; fax: 33 1 44 27 61 48; e-mail: schoo10logic.ejussieu.fr. Deadline for grant applications is April 15.


INVITED SPEAKERS (REVISED): M. Dobrushin (Russia), M. Groenbeek (Pays-Bas), and M. Ledoux (Toulouse III).


10–30. The Park City/Institute for Advanced Study Mathematics Institute, Park City, Utah. (Jan. 1994, p. 56)


11–14. First International Conference on Temporal Logic, Gustav Stresemann Institut, Bonn, Germany. (Feb. 1994, p. 142)


11–15. Fourteenth IMACS World Congress on Computational and Applied Mathematics, Georgia Institute of Technology, Atlanta, GA. (Oct. 1992, p. 951)


11–22. SMS-NATO ASI: Topological Methods in Differential Equations and Inclusions, Université de Montréal, Montréal, Canada. (Dec. 1993, p. 1451)


SPONSOR: Mills College.

PROGRAM: Supported by NSF, the conference will bring together people interested in developing projects to increase the flow of women into graduate programs in the mathematical sciences. Some funds are available to help defray travel costs for eight to ten conference participants.

INFORMATION: L. Henkin, tel: 510-430-2227, e-mail kathyg@mil1s.edu for information on this conference or developing a related project at another institution (with NSF funding).

14–18. LFCS’94: Logic at St. Petersburg, a Symposium on Logical Foundations of Computer Science, St. Petersburg, Russia. (Jul./Aug. 1993, p. 714)


17–23. Conference Internationale de Topologie, CIRM, Marseille, France. (Jan. 1993, p. 64)


18–22. CIMNS International Colloquium on Nonstandard Mathematics in Memory of Abraham Robinson, Universities of Aveiro and Beira Interior, Portugal. (Feb. 1994, p. 142)

18–22. Sixth International Conference on Fibonacci Numbers and Their Applications, Washington State University, Pullman, WA. (Jul./Aug. 1993, p. 714)

18–22. Conference Internationale de Topologie, Marseille, France. (Jan. 1994, p. 56)

*18–22. Was There Really a Big Bang? A Case Study in Scientific Methodology, Massachusetts Institute of Technology, Cambridge, MA.

INFORMATION: F.J. Mccarthy (director), Office of the Summer Session, Room E19-356, MIT, Cambridge, MA 02139; tel: 617-253-2101; fax: 617-253-8042; e-mail summer-professional-­programs@mit.edu.

*18–23. XIfth International Congress of Mathematical Physics (ICMP), Centre de Conférences of UNESCO and the Sorbonne, Paris, France.

NOTE: This congress, under the auspices of the International Association of Mathematical Physics, meets every three years. As the 1994 conference coincides with the ICMP, the ICMP has been scheduled to make it possible for mathematicians to attend both congresses.

TOPICS: The congress will present about twelve invited plenary lectures and twelve topical sessions, with three to six invited speakers in each, in domains such as quantum physics, relativistic field theory, statistical physics, disordered systems, condensed matter, dynamical systems, fluid mechanics, operator algebras, conformal and topological theories, and integral models. It will be followed by several satellite conferences.

PLENARY LECTURES: I. Affleck (Vancouver), M. Atiyah (Cambridge, UK), A. Connes (Paris and IHES-Bures), T. Damour (IHES-Bures), L. Kadonoff (Chicago), M. Kontsevich (Bonn), A. Kupiainen (Helsinki), J. Magnen (Palaisc), M. Viana (Rio de Janeiro), J. Wisdom (MIT), E. Witten (IAS-Princeton), S.-T. Yau (Harvard), J. Yngvason (Reykjavik), and A.B. Zamolodchikov (Rutgers).

SESSIONS (AND SESSION ORGANIZERS): Dynamical Systems (Y.-G. Sinai, Moscow and Princeton), Operator Algebras and
Meetings and Conferences


ROUND TABLE: Physics and Mathematics: Close Partners or Not? (contributions of physics to mathematics and conversely, are mathematics essential or dangerous for physics and conversely…) There will be short talks by scientific personalities, including M. Atiyah, A. Jaffe, D. Ruelle, and others, and a general discussion with the participation of the audience. Moderator: J. Lebowitz.

SATELLITE CONFERENCES: Four satellite conferences are scheduled in and near Paris during the week of July 25.

F. Iagnolzner, Service de Physique Theoryque, CE Saclay, F91191 Gif-sur-Yvette, France; fax: +33(1)69.08.81.20; electronic mail: ICP@AMO@SACLAY.CEA.FR.


21–30. 1994 ASL European Summer Meeting (Logic Colloquium '94), Universite d'Auvergne, Clermont-Ferrand, France. (Feb. 1994, p. 142)


PROGRAM: Workshop/conference, attendance open to all, talks only by invitation, poster session for contributed material.


INFORMATION: M. Haiman, U.C. San Diego; e-mail taormina@macaulay.ucsd.edu.


PROGRAM: To establish the mathematical backgrounds for inverse problems and to attempt further development, we require interdisciplinary researches involving mathematics, applied mathematics, and engineering. The aim of this symposium is to provide the opportunity for presentations of research and interdisciplinary discussion for inverse problems connected with engineering science.

TOPICS INCLUDE:Inverse scattering problems, identification of unknown coefficients, determination of boundaries and domains, tomography, parameter estimation, numerical analysis for these problems, regularization methods, signal recovery, moment problems, and mathematical treatment of ill-posed problems.

KEYNOTE SPEAKERS: H.D. Bui (France), M. Kawa (Japan), S.I. Kabanikhin (Russia).

CALL FOR ABSTRACTS: Those interested in giving an oral presentation should submit an extended abstract (not more than two pages on 81/2' x 11' paper) by June 15, 1994.

SATELLITE CONFERENCES: Japan-Novosibirsk Joint Seminar on Inverse and Ill-posed Problems (July 19–July 25, Kyoto) and Numerical Analysis for Elasticity and Related Topics (June 19–July 25, Kyoto).

INFORMATION: M. Yamamoto (General Secretary), Dept. of Math. Sciences, Univ. of Tokyo, 3-8-1 Komaba Meguro, 153 Japan; fax:+81-3-3481-5464 (International); electronic mail: ipes@uanty.u-tokyo-u.ac.jp.

27–August 1. International Conference on Commutative Algebra (A Satellite Conference of ICM 94, Zürich), Universität Osnabrück, Standort Vechta, Germany. (Dec. 1993, p. 1451)

August 1994

1-5. Third World Congress on Computational Mechanics (WCCM III), Chiba, Japan. (May/Jun. 1992, p. 497)

1-19. IMA Course on Mathematical Modelling for Teachers, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Dec. 1993, p. 1451)


14-27. NATO Advanced Study Institute on "Finite and Locally Finite Groups", Bosphorous University, Istanbul, Turkey. (Nov. 1993, p. 1257)

15-17. Mathfest, University of Minnesota, Minneapolis, MN (including the summer meetings of the AMS, AWM, MAIA, and PME).

INFORMATION: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

15–19. **Fifteenth International Symposium on Mathematical Programming.** University of Michigan, Ann Arbor, MI. (May/June, 1993, p. 515)


15–26. **Advanced Workshop on Algebraic Geometry.** International Centre for Theoretical Physics, Trieste, Italy. (Jul./Aug. 1993, p. 714)


18–23. **Fifth Colloquium on Differential Equations.** Plovdiv, Bulgaria. (Apr. 1993, p. 416)


**ORGANIZERS:** Bulgarian Academy of Sciences, University of Sofia, and Technical University of Sofia.

**PROGRAM:** The conference aims at providing a forum for presentations and discussions of recent research in numerical methods and their applications. Applications. The subject of the conference will range from basic research to applications in physics, engineering, environmental sciences, and other areas, including but not limited to the following topics: finite difference and finite element methods, boundary element method and other dimension reduction methods, numerical methods of approximation theory, Monte Carlo methods, preconditioning methods, parallel algorithms, and applications of numerical methods.


**CALL FOR PAPERS:** Authors should send three copies of a camera-ready full-length paper (eight pages) by surface mail and the corresponding LaTeX file by e-mail (or on a diskette) by April 20, 1994.

**CONFERENCE FEE:** The conference fee will be $130 (free of bank transfer charges) until May 31, 1994, and $150 thereafter ($30 for accompanying persons). The fee is to be transferred to Bulgarian Foreign Trade Bank, 425 236 500-KZIT-BG-NMA.


**INFORMATION:** Authors should send titles and abstracts of contributed papers (including posters and software exhibitions) must be received by May 15, 1994. The abstracts may be submitted in either Spanish or English, typed double-spaced, not to exceed one page, preferably by e-mail to best@bestsd.sdsu.edu; either with or without special editing or in LaTeX.

**INFORMATION:** Organizing Committee CMEI-2, Facultad de Ciencias UASLP, Zona Universitaria, Lateral Diagonal Sur S/N, 78290: tel: (52) (48) 175251; fax/tel: (52) (48) 130871; e-mail: best@bestsd.sdsu.edu.


29–September 2. **L’arithmetique des Cours de Genre Deux.** CIRM, Marseille, France. (Feb. 1994, p. 144)

29–September 2. **Mathematical Modelling...**
and Computational Methods “Modelling 94”, Prague, Czech Republic. (Mar. 1994, p. 250)

---

**September 1994**


Fall 1994. Workshop on Geometry of Non-compact Manifolds, Centre de Recherches Mathématiques, Université de Montréal. (Jan. 1994, p. 57)


* 5-8. 4th European Workshop on Logics in AI (JELIA '94), York, UK.

Topics: Foundations of logic programming, knowledge-based systems, automated theorem proving, knowledge representation, modal, epistemic and temporal logics, constructive and many-valued logics, non-monotonic reasoning and belief revision, abductive and inductive reasoning, partial and dynamic logics, hybrid reasoning systems, applications of logic-based systems.


Information: C. MacNish, Dept. of Computer Science, Univ. of York, York YO1 5DD, UK; fax: (+44) 904 432767; e-mail: craig@minster.york.ac.uk.


5-9. IX Brazilian Meeting of Topology, Universidade Federal Fluminense, Instituto de Matemática, Niterói, Rio de Janeiro, Brazil. (Jan. 1994, p. 57)

5-10. Analyse Numérique des Polynômes Orthogonaux, CIRM, Marseille, France. (Feb. 1994, p. 144)


6-10. 8th International Conference of the European Consortium for Mathematics in Industry, University of Kaiserslautern, Germany.

Program: The objective of the conference is to provide a forum for the presentation of work on the applications of mathematical methods to industrial problems. It will provide a forum for academics and industrialists to meet and discuss mathematical problems of mutual interest. It should also give advanced students a first-hand impression of the challenges and opportunities for mathematicians in European industry. The scientific program will focus mainly on seven topics, namely mathematical methods in: aerospace industry, automotive industry, chemical industry, chip production, construction industry, finance, and metalurgical processes. The core of each topic is a special session consisting of one invited lecture and four selected lectures. Contributed talks related to these topics will take place on the afternoon following the respective special session. Contributed papers and minisymposia in other areas of industrial mathematics are also welcome. Deadline for submission of abstracts is April 10, 1994.

Information: H. Neunzert, Fachbereich Mathematik, Universität, P.O. Box 3049, D-67653 Kaiserslautern, Germany; fax: +49-631-2053052; e-mail: ecm94@mathematik.uni-kl.de.


19-23. IMA Workshop on Computational Wave Propagation, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Feb. 1994, p. 144)


Chairman: W. Decker.


Scientific Committee: D. Eisenbud, L. Gruson, J. Harris, J. Kollar.


Information: R.M. Miro-Roig, Facultat de Matematiques, Universitat de Barcelona, Gran Via 585, 08007 Barcelona, Spain; e-mail: europroj@cerber.ub.es.


26-29. Second International Conference on Theorem Provers in Circuit Design: Theory, Practice, and Experience, Bad Herrenalb (Blacksfont), Germany. (Feb. 1994, p. 144)

26-30. Annual Conference of the European Association for Computer Science Logic (CSL '94), Kazimierz, Poland. (Feb. 1994, p. 144)

* 26-October 1. 4th International Conference on Evolution Equations and Semigroups, Scuola Normale Superiore, Pisa, Italy.

Sponsors: Italian National Research Council (C.N.R.) and Scuola Normale Superiore.

Organizers: G. DaPrato (Scuola Normale Superiore), E. Obrecht (Univ. of Bologna), and E. Sinestrari (Univ. of Rome “La Sapienza”).

Program: Invited lectures only.


Information: C. D'Elia, Scuola Normale Superiore, Piazza di Cavalieri 7, 56100 Pisa, Italy; tel: 39-50-509 203; fax: 39-50-509 045/563 513; e-mail: delia@vaxans.Sns.it.

26-October 1. First International Workshop on Functional Analysis, Trier University, near Luxembourg, Germany. (Oct. 1993, p. 1088)
Meetings and Conferences

October 1994


Principal Speakers: M.E. Rudin and W. Rudin (Univ. of Wisconsin–Madison) and G. Bennett (Indiana Univ.).

Call for Papers: Abstracts for papers should be sent by June 20, 1994, to Z. Balogh or P. Dowling, Dept. of Mathematics and Statistics, Miami Univ., Oxford, Ohio 45065; tel: 513-529-5818.

Information: Conference programs with information concerning preregistration and housing will be available after July 15, 1994, from the above address.

17–21. IMA Workshop on Wavelets, Multigrid and Other Fast Algorithms (Multipole, FFT), and Their Use in Wave Propagation, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Feb. 1994, p. 145)


Invited Speakers: L.P. Cook (Delaware), F.W.J. Olver (Maryland), J.B. Serrin (Minnesota).

Call for Papers: Deadline for submitting abstracts for twenty-minute talks is September 15, 1994.

Information: P.W. Schaefer, Dept. of Math., Univ. of Tennessee, Knoxville, TN 37996-1300, 615-974-6874; schaefer@novell.math.utk.edu.

24–November 11. Fourth Autumn Course on Mathematical Ecology, Trieste, Italy. (Jan. 1994, p. 58)

* 25–27. Thirteenth Symposium on Reliable Distributed Systems, Near Irvine, California.


Theme: The theme of the symposium is reliability of distributed and parallel systems, including distributed applications, distributed operating systems, and distributed databases.

Information: R.D. Schlichting, Dept. of Computer Science, Gould-Simpson Bldg., Univ. of Arizona, Tucson, AZ 85721; tel: 602-621-4324; electronic mail: rick@cs.arizona.edu.

26–29. Sixth IEEE Symposium on Parallel and Distributed Processing, Dallas, Texas. (Mar. 1994, p. 251)

November 1994

7–18. 2nd Workshop on Three-dimensional Modelling of Seismic Waves Generation, Propagation, and Their Inversion, Trieste, Italy. (Feb. 1994, p. 145)


Program: The theme of the 1994 colloquium is “Shaping a New Contract with the University and with Society”. The keynote address will be given by N.F. Lane, director of the National Science Foundation. The colloquium will include three workshop sessions on Friday morning, including the popular workshop for new and future chairs. On Friday afternoon and all day Saturday, there will be sessions on enhanced productivity in mid-career, the JPBM Project on Professional Recognition and Rewards, federal research and education programs, the current employment situation, and many more topics in research and education management of bottom-line interest to department chairs.

Registration Fee: For the fifth year in a row, the registration fee has been kept at $160.

Information: Information is available on request by e-mail, fax, and hard-copy mail from Board on Mathematical Sciences, National Research Council, NAS 315, 2101 Constitution Ave., N.W., Washington, DC 20418-0001; tel: 202-334-2421; fax: 202-334-1597; INTERNET: bms@nas.edu; BITNET: bms@nas.bitnet.

28–29. Central Section, Oklahoma State University, Stillwater, Oklahoma.

Information: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.


*31–November 4. International Conference of the Chilean Computer Science Society, Concepcion, Chile.


Information: Carlos Isaac, conference@ing.puc.cl.
Meetings and Conferences

December 1994


Information: P. Gibbons, Dept. of Computer Science, Univ. of Auckland, Private Bag 92019, Auckland, New Zealand, e-mail: p.gibbons@cs.auckland.ac.nz.


January 1995

4–7. Joint Mathematics Meetings, San Francisco, CA (including the annual meetings of the AMS, AWM, MAA, and NAM).

Information: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

16–19. First Asian Computational Fluid Dynamics Conference, Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong. (Jan. 1994, p. 58)


March 1995


Information: W.S. Drady, American Mathematical Society, P.O. Box 6887, Providence, RI 02940.

*6–17. IMA Workshop on Inverse Problems in Wave Propagation, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN.

Information: Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church St., SE, Minneapolis, MN 55455.
Meetings and Conferences

17–18. **Southeastern Section**, Orlando, Florida.
Information: W.S. Drady, American Mathematical Society, P.O. Box 6887, Providence, RI 02940.

24–25. **Central Section**, DePaul University, Chicago, IL.
Information: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

**April 1995**

4–6. IMA Tutorial on Singularities and Oscillations, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Mar. 1994, p. 252)


The following new announcements will not be repeated until the criteria in the last paragraph in the box at the beginning of this section are met.

**May 1995**


16–18. IMA Tutorial on Quasiclassical Methods, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Mar. 1994, p. 252)


**June 1995**

*7–8. IMA Tutorial on Multiparticle Quantum Scattering with Applications to Nuclear, Atomic, and Molecular Physics, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN.*

*12–16. IMA Workshop on Multiparticle Quantum Scattering with Applications to Nuclear, Atomic, and Molecular Physics, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN.*

*22–26. IMA Workshop on Multiparticle Quantum Scattering with Applications to Nuclear, Atomic, and Molecular Physics, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN.*

**August 1995**

*6–8. MATHFEST, University of Vermont, Burlington, Vermont (including the summer meetings of the AMS, AWM, MAA, and PME).*

Information: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

**September 1995**

*18–23. Conference on Different Aspects of Differentiability II, Warsaw, Poland.*

Topics: Algebraic analysis; operational calculus; generalized functions; related convergence problems; structures with derivation; subdifferentials, their generalizations and applications to optimization.

Organizing Committee: P. Antosik, D. Przeworska-Rolewicz, and K. Skórnik (secretary).

Location: Institute of Mathematics, Polish Academy of Sciences, Śniadeckich 8, 00-950 Warszawa, Poland.

Registration: Conference registration fee is $80 (US). Deadline for submitting registration is June 1, 1995. Preliminary registration deadline is January 31, 1995.

Information: K. Skórnik, Institute of Mathematics, Polish Academy of Sciences, Katowice Branch, Staromiejska 8/6, 40-013 Katowice, Poland; fax: 0048-22-29 39 97; e-mail: rolewicz@impan.impan.gov.pl.

**October 1995**

7–8. **Eastern Section**, Northeastern University, Boston, Massachusetts.

Information: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

**November 1995**

3–4. **Central Section**, Kent State University, Kent, Ohio.

Information: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

17–18. **Southeastern Section**, University of North Carolina, Greensboro, NC.

Information: W.S. Drady, AMS P.O. Box 6887, Providence, RI 02940.

**January 1996**


Information: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

**March 1996**

22–23. **Central Section**, University of Iowa, Iowa City, Iowa.

Information: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

**April 1996**

19–21. **Southeastern Section**, Baton Rouge, Louisiana.

Information: W.S. Drady, American Mathematical Society, P.O. Box 6887, Providence, RI 02940.

**November 1996**

1–3. **Central Section**, University of Missouri at Columbia, Columbia, Missouri.

Information: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

**January 1997**

10–13. **Joint Mathematics Meetings**, San Diego, California (including the annual meetings of the AMS, AWM, MAA, and NAM).

Information: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

**January 1998**

*10–13 Joint Mathematics Meetings Baltimore, Maryland (including the annual meetings of the AMS, AWM, MAA, and NAM).*

Information: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.
New Publications Offered by the AMS

Differential Topology, Foliations, and Group Actions
Paul A. Schweitzer, S. J., Steven Hurder, Nathan Moreira dos Santos, and José Luis Arraut, Editors
Volume 161

This volume contains the proceedings of the Workshop on Topology held at the Pontificia Universidade Católica in Rio de Janeiro in January 1992. Bringing together about one hundred mathematicians from Brazil and around the world, the workshop covered a variety of topics in differential and algebraic topology, including group actions, foliations, low-dimensional topology, and connections to differential geometry. The main concentration was on foliation theory, but there was a lively exchange on other current topics in topology. The volume contains an excellent list of open problems in foliation research, prepared with the participation of some of the top world experts in this area. Also presented here are two surveys on group actions—finite group actions and rigidity theory for Anosov actions—as well as an elementary survey of Thurston’s geometric topology in dimensions 2 and 3 that would be accessible to advanced undergraduates and graduate students.

Contents
- Foliations: J. Cantwell and L. Conlon, Topological obstructions to smoothing proper foliations; O. Calvo-Andrade, Deformations of holomorphic foliations; S. Hurder and Y. Mitsumatsu, Transverse Euler classes of foliations on non-atomic foliation cycles; N. M. dos Santos, Holomorphic foliations and characteristic classes; R. Langevin, A list of questions about foliations; De Rham theory and singularities: A. G. Aleksandrov, Dualities and De Rham complex on singular varieties; J.-P. Brasselet, De Rham theories for singular varieties; M. A. S. Ruas, On the equisingularity of families of corank 1 generic germs; Two surveys on actions: A. Adem, Cohomology and actions of finite groups; S. Hurder, A survey of rigidity theory for Anosov actions; Low-dimensional topology: N. C. Saldanha, An introduction to geometric topology; Geometric structures on manifolds of dimensions 2 and 3; D. Randall, On 4-dimensional bundle theories; D. Randall and P. A. Schweitzer, S. J., On foliations, concordance spaces, and the Smale conjectures; J. J. Nuño Ballesteros and M. C. Romero Fuster, Generic 1-parameter families of closed space curves: Characteristic classes: J. L. Dupont and F. W. Kamber, Dependence relations for Cheeger-Chern-Simons invariants of locally symmetric spaces; N. F. Barufatti, Obstructions to immersions of projective Stiefel manifolds.

Classification of Algebraic Varieties
Ciro Ciliberto, E. Laura Livorni, and Andrew J. Sommese, Editors
Volume 162

This volume contains the proceedings of the Algebraic Geometry Conference on Classification of Algebraic Varieties, held in May 1992 at the University of L’Aquila in Italy. The papers discuss a wide variety of problems that illustrate interactions between algebraic geometry and other branches of mathematics. Among the topics covered are algebraic curve theory, algebraic surface theory, the theory of minimal models, braid groups and the topology of algebraic varieties, toric varieties, Calabi-Yau three-folds, enumerative formulas, and generalizations of Kahler differential geometry. In addition to algebraic geometers, theoretical physicists in some areas will find this book useful. The book is also suitable for an advanced graduate course in algebraic geometry, as it provides an overview of some areas of current research.

Contents
- A. Alzati and G. Pirola, On curves in C^3 generating proper abelian subvarieties of I(C); L. Badescu, Lefschetz type results for proper intersections; M. C. Beltrametti and A. J. Sommese, Some effects of the spectral values on reductions; G. Bolondi, Surfaces in P^n and deficiency modules; F. Campana, The class C is not stable by small deformations II; F. Catanese, P. Cigrandini, and P. Oliverio, Surfaces with K^2 = c = 2 and special nets of quadrics in 3-space; C. Ciliberto and G. van der Geer, Non-isomorphic curves of genus four with isomorphic (non-polarized) jacobians; B. Fantechi, Deformations of symmetric products of curves; H. Flenner and M. Zaidenberg, Q-acyclic surfaces and their deformations; A. Grassi, On a question of J. Kollár; P. Ionescu and M. Toma, Boundedness for some special families of embedded manifolds; K. Jaczewski, Generalized Euler sequence and toric varieties; S. L. Kleiman, A generalized Teissier-Plücker formula; J. Kollár, Log surfaces of general type: some conjectures; A. Lanteri, M. Palleschi, and A. J. Sommese, On triple covers of P^3 as very ample divisors; R. Miranda, Component numbers for torsion sections of semistable elliptic surfaces; B. Moishezon and M. Teicher, Braid group techniques in complex geometry III: Projective spaces;
Dynamical Zeta Functions for Piecewise Monotone Maps of the Interval

David Ruelle

Volume 4

Consider a space $M$, a map $f : M \to M$, and a function $g : M \to \mathbb{C}$. The formal power series
$z(\varepsilon) = \exp \sum_{m=1}^{\infty} \frac{\varepsilon^m}{m} \sum_{x \in \text{Fix } f^m} g(f^m x)$
yields an example of a dynamical zeta function. Such functions have unexpected analytic properties and interesting relations to the theory of dynamical systems, statistical mechanics, and the spectral theory of certain operators (transfer operators). The first part of this monograph presents a general introduction to this subject. The second part is a detailed study of the zeta functions associated with piecewise monotone maps of the interval $[0, 1]$. In particular, Ruelle gives a proof of a generalized form of the Baladi-Keller theorem relating the poles of $z(\varepsilon)$ and the eigenvalues of the transfer operator. He also proves a theorem expressing the largest eigenvalue of the transfer operator in terms of the ergodic properties of $(M, f, g)$.

This series is published by the AMS for the Centre de Recherches Mathématiques.

**Contents**

An introduction to dynamical zeta functions; Piecewise monotone maps.

1991 *Mathematics Subject Classification*: 58F20, 58F03; 58F11
ISBN 0-8218-6991-4, LC ???, ISSN 1065-8599
62 pages (hardcover), April 1994

*Individual member $23, List price $38, Institutional member $30
To order, please specify CRMM/4N*
Lectures on Mathematics in the Life Sciences

The Evolution of Haploid-Diploid Life Cycles
Mark Kirkpatrick, Editor

The haploid-diploid alternation of generation is among the most fundamental features of eukaryotic life. Until recently, however, little research had been done on the origin and evolution of this genetic system. Bringing together for the first time emerging empirical and theoretical perspectives on this topic, this volume contains the proceedings of the 1993 Symposium on Some Mathematical Questions in Biology: The Evolution of Haploid-Diploid Life Cycles, held in June 1993 in Snowbird, Utah. The volume opens with a broad survey of life forms which reveals a wide diversity of life cycles, including predominantly haploid cycles, predominantly diploid cycles, and mixed cycles. Mathematical models attempt to explain this diversity in terms of evolutionary forces that include deleterious mutation, advantageous mutation, and ecological selection. A review of the first experimental studies shows how the hypotheses suggested by the models may eventually be resolved. The book introduces biologists to mathematical approaches to these problems and introduces mathematical biologists to comparative and experimental approaches. Opportunities for future research are highlighted throughout.

Contents

1991 Mathematics Subject Classification: 92-06, 92D10, 92D15
ISBN 0-8218-1176-2, LC 94-6316, ISSN 0075-8523
134 pages (softcover), April 1994

Individual member $18, List price $30, Institutional member $24

To order, please specify LLSCI/25N

Algebraic Groups and Their Generalizations
William J. Haboush and Brian J. Parshall, Editors

These volumes contain papers based on lectures presented at the conference, "Algebraic Groups and Their Generalizations", held at Pennsylvania State University in July 1991. An outgrowth of the remarkable proliferation of Lie theory in the last fifteen years, this conference reflected both the diversification of techniques in the classical theory and the beginnings of the study of new objects. These new objects include quantum groups and vertex operator algebras, as well as various kinds of infinite-dimensional groups and algebras inspired by new work in mathematical physics and quantum field theory. The first volume focuses on classical methods, while the second centers on quantum and infinite-dimensional methods. Each section begins with expositions and then turns to new results. This collection provides readers with an excellent introduction to these astonishing new mathematical worlds.

Contents
Part I. Classical methods: C. Chevalley, Sur les décompositions cellulaires des espaces G/B; A. Borel, Introduction to middle intersection cohomology and perverse sheaves; J. B. Carrell, The Bruhat graph of a Coxeter group, a conjecture of Deodhar, and rational smoothness of Schubert varieties; E. Cline, B. Parshall, and L. Scott, Simulating perverse sheaves in modular representation theory; V. Deodhar, A brief survey of Kazhdan-Lusztig theory and related topics; R. Dipper, Green theory for Hecke algebras and Harish-Chandra philosophy; M. Schaps, Liftable deformations and Hecke algebras; E. A. Siegel, A Hecke algebra of the symmetric group; B. Srinivasan, Character sheaves: Applications to finite groups; R. J. Bremigan, Real algebraic quotients; M. Brion and S. P. Inamdar, Frobenius splitting of spherical varieties; R. Dabrowski, Generalized Kloosterman sums; A. G. Helminck, Symmetric k-varieties; A. R. Magid, Identities for pronilpotent groups; C. Wenzel, On the structure of nonreduced parabolic subgroup-schemes; A. J. Coleman, Weight modules without highest weight; J. E. Humphreys, Extremal composition factors for groups of Lie type; K. Kazuhiko, Relative invariants of the polynomial rings over the finite and tame type quivers; B. Broer, Hilbert series for modules of covariants; R. E. Howe, The first fundamental theorem of invariant theory and spherical subgroups; M. Masuda and T. Petrie, Algebraic families of O(2)-actions on affine space C^n; L. Moser-Jauslin, Algebraic equivariant vector bundles and the linearity problem; G. F. Seelinger, Equivariant matrix valued functions; D. L. Wehlau, Constructive invariant theory; Part 2. Quantum and infinite-dimensional methods: H. H. Andersen, Finite dimensional representations of quantum groups; P. Cartier, An introduction to quantum groups; B. Enriquez, Examples of compact matrix pseudogroups arising from Drinfeld's twisting operation; T. Hayashi, Face algebras and their Drinfeld doubles; G. Letzter, Representation theory for quantized enveloping algebras; Z. Lin, Rational representations of Hopf algebras; J. Paradowski, Filtrations of modules over the quantum algebra; A. Sudbery, Quantum groups as invariance groups; M. Takeuchi, The quantum hyperalgebra of SL_q(2); J. Du, IC bases and quantum linear groups; V. Lakshmibai, Bases for quantum Demazure modules. II; G. Lusztig, Problems on canonical bases; M. Kapranov and V. A. Voevodsky, 2-categories and Zamolodchikov tetrahedra equations; C. Dong and J. Lepowsky, Abelian intertwining algebras—A generalization of vertex operator algebras; C. Dong, G. Mason, and Y. Zhu, Discrete series of

1991 Mathematics Subject Classification: 14M15, 14L17, 14L30, 20G05, 20C33, 53N33, 17B37, 16W30, 17B67, 17B68
ISBN (Set) 0-8218-1497-4, (Part 1) 0-8218-1540-7, (Part 2) 0-8218-1541-5
LC Classification: G-equivariant cohomology

Part Wolf, PSPUM/56.2N (Part 2)

Manifolds and objects, such as the algebra H(J(M), where G is a real Lie group acting on a manifold M. It became necessary to consider more general cohomological objects, such as the algebra H(J(M) of equivariant cohomology with $C^\infty$-coefficients, and the algebra $H_G^\infty(M)$ of equivariant cohomology with $C^\infty$-coefficients. The first of the two articles in this volume studies a generalization of the cohomology $H_G^0(M)$. The second undertakes a systematic study of the spaces $H_G^\infty(M)$. The two articles have common motivations, but may be read independently.

Titles in this series are published by the Société Mathématique de France and distributed by the AMS in the United States, Canada, and Mexico. Orders from other countries should be sent to the SMF, Maison de la SMF, Case 916-Luminy, F-13 288 Marseille Cedex 9, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris Cedex 05, France.

Contents

I. M. Duflo et M. Vergne. Cohomologie équivariante et descente: Introduction; Cohomologie équivariante; Méthode de descente; Bottes de classes de cohomologie; Groupe métalinéaire et orientations; Bottes de cohomologie équivariante torique; Images directes; Bibliographie; II. S. Kumar and M. Vergne. Equivariant cohomology with generalized coefficients: Introduction; Notation; G-equivariant cohomology with generalized coefficients; Koszul complexes; Induction of equivariant differential complexes; Equivariant cohomology of homogeneous spaces; Künneth formula and applications; Equivariant cohomology subgroups; Reduction to the maximal torus; The case of a free action; A spectral sequence for T-equivariant cohomology; Localization formula; Appendix—A splitting for dg $\mathcal{L}$; References; Summary.

1991 Mathematics Subject Classification: 19L47, 22E45, 57R91
ISSN 0303-1179
205 pages (softcover), 1993
AMS or SMF member $22, List price $31,
To order, please specify AST/215N

SOCIÉTÉ MATHÉMATIQUE DE FRANCE, ASTÉRISQUE

Sur la Cohomologie Équivariante des Variétés Différentiables
M. Duflo, S. Kumar, and M. Vergne
Number 215

H. Cartan introduced the equivariant de Rham complex and its cohomology $H^*_G(M)$, where G is a real Lie group acting on a manifold M. It became necessary to consider more general cohomological objects, such as the algebra $H_G^\infty(M)$ of equivariant cohomology with $C^\infty$-coefficients, and the algebra $H_G^\infty(M)$ of equivariant cohomology

Contemporary Mathematics, Volume 143

A Tribute to Emil Grosswald: Number Theory and Related Analysis

Marvin Knopf and Mark Sheingorn, Editors

With contributions by some of the leading contemporary researchers in number theory, modular functions, combinatorics, and related analysis, this book will be of interest to graduate students and specialists in these fields. The high quality of the articles and their close connection to current research trends make this volume a must for any mathematics library.

1991 Mathematics Subject Classification: 05, 11, 14, 33
ISBN 0-8218-5155-1, 612 pages (softcover), March 1993
Individual member $47, List price $79, Institutional member $63
To order, please specify CONM/143N

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5800, Boston, MA 02159-5800, or call toll free 800-321-4AMS in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
Publications of Continuing Interest

Following are some of our more popular books as well as books with similar topics to those appearing in the New Publications section of this issue.

<table>
<thead>
<tr>
<th>Title</th>
<th>Author(s)</th>
<th>Pages (Edition)</th>
<th>Price (List)</th>
<th>Price (Inst. mem.)</th>
<th>Price (Indiv. mem.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebraic Geometry for Scientists and Engineers</td>
<td>Shreeram S. Abhyankar</td>
<td>295 pages (hardcover)</td>
<td>$90</td>
<td>$72</td>
<td>$54</td>
</tr>
<tr>
<td>Cell Biology</td>
<td>Byron Goldstein and Carla Wofsy</td>
<td>135 pages (softcover)</td>
<td>38</td>
<td>30</td>
<td>23</td>
</tr>
<tr>
<td>Chaos and Fractals: The Mathematics Behind the Computer Graphics</td>
<td>Robert L. Devaney and Linda Keen</td>
<td>208 pages (hardcover)</td>
<td>36</td>
<td>29</td>
<td>22</td>
</tr>
<tr>
<td>Cryptology and Computational Number Theory</td>
<td>Carl Pomerance</td>
<td>171 pages (hardcover)</td>
<td>59</td>
<td>47</td>
<td>35</td>
</tr>
<tr>
<td>Fixed Points</td>
<td>Yu. A. Shashkin</td>
<td>77 pages (softcover)</td>
<td>24</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Fluid Dynamics in Biology</td>
<td>A. Y. Cheer and C. P. van Dam</td>
<td>586 pages (softcover)</td>
<td>73</td>
<td>58</td>
<td>44</td>
</tr>
<tr>
<td>How to Teach Mathematics: a personal perspective</td>
<td>Steven G. Krantz</td>
<td>76 pages (softcover)</td>
<td>21</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>How to Write Mathematics</td>
<td>N. E. Steenrod, P. R. Halmos, M. M. Schiffer, and J. E. Dieudonné</td>
<td>64 pages (softcover)</td>
<td>17</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>The Joy of TeX, A Gourmet Guide to Typesetting with the \LaTeX Macro Package</td>
<td>M. D. Spivak</td>
<td>309 pages (softcover)</td>
<td>40</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td>Mathematical Impressions</td>
<td>Anatolii T. Fomenko</td>
<td>184 pages (hardcover)</td>
<td>47</td>
<td>47</td>
<td>38</td>
</tr>
<tr>
<td>Mathematics into Type</td>
<td>Ellin E. Swanson</td>
<td>90 pages (softcover)</td>
<td>22</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>New Scientific Applications of Geometry and Topology</td>
<td>De Witt L. Summers</td>
<td>250 pages (hardcover)</td>
<td>49</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>Spectral Theory of Operators</td>
<td>S. G. Gindikin</td>
<td>176 pages (hardcover)</td>
<td>112</td>
<td>90</td>
<td>67</td>
</tr>
<tr>
<td>Statistical Analysis of Measurement Error Models and Applications</td>
<td>Philip J. Brown and Wayne A. Fuller</td>
<td>248 pages (softcover)</td>
<td>55</td>
<td>44</td>
<td>33</td>
</tr>
<tr>
<td>Stories About Maxima and Minima</td>
<td>V. M. Tikhomirov</td>
<td>187 pages (softcover)</td>
<td>23</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Theta Functions</td>
<td>M. Ram Murty</td>
<td>174 pages (softcover)</td>
<td>58</td>
<td>46</td>
<td>35</td>
</tr>
<tr>
<td>Topology of Foliations: An Introduction</td>
<td>Itiro Tamura</td>
<td>193 pages (hardcover)</td>
<td>89</td>
<td>71</td>
<td>53</td>
</tr>
<tr>
<td>The Unreasonable Effectiveness of Number Theory</td>
<td>Stefan A. Burr</td>
<td>125 pages (hardcover)</td>
<td>37</td>
<td>30</td>
<td>22</td>
</tr>
</tbody>
</table>


Upon recommendation of the Editorial Boards Committee, the Council has elected the following:


M. Susan Montgomery was appointed by then chair of the Board of Trustees, John C. Polking, to the Appeals Committee on Discounted Subscriptions. Continuing members of the committee are Carol-Ann Blackwood, consultant, Philip J. Hanlon, consultant, William H. Jaco (ex officio), Morton Lowengrub, chair, and Franklin P. Peterson.

Douglas A. Lind (1996) was appointed by then chair of the Board of Trustees, John C. Polking, to the Visiting Committee on Computer Operations and Facilities. Jill P. Mesirov (1994) was appointed chair. Continuing members of the committee are Maria M. Klawe (ex officio) and Richard S. Palais (1995).

Eric M. Friedlander (1996), M. Susan Montgomery (ex officio), and David Morrison (1996) were appointed, and B. A. Taylor (1996) was reappointed to the Publication Program Committee by then chair of the Board of Trustees, John C. Polking. Paul J. Sally, Jr. was appointed chair. Other members of the committee are Roy L. Adler (ex officio), Robert M. Fossum (ex officio), William H. Jaco (ex officio), Elliott H. Lieb (1994), and John C. Polking (ex officio).

Roy L. Adler (ex officio) was appointed to the Committee on Staff and Services by then chair of the Board of Trustees, John C. Polking. Continuing members of the committee are Franklin P. Peterson (ex officio) and B. A. Taylor (ex officio), chair.

Robert M. Fossum, Ramesh A. Gangolli, Ronald L. Graham, Maria M. Klawe, M. Susan Montgomery, and Franklin P. Peterson were appointed to the Search Committee for Executive Director by John C. Polking, then chair of the Board of Trustees. Professor Gangolli was appointed chair.


Jeffrey C. Lagarias (1996) and Joel H. Spencer (1996) have been appointed by President Ronald L. Graham to the Program Committee for National Meetings. H. W. Lenstra (1994) has been appointed chair. Continuing members of the committee are Hermann Flaschka (1994), Robert M. Fossum (ex officio),


President Ronald L. Graham has appointed John Erik Fornaess (1995) and Mary Ellen Rudin (1995) to the Central Section Program Committee. Karl Rubin (1994) has been appointed chair. Continuing members of the committee are Andy Roy Magid (ex officio) and Christel Rotthaus (1994).

Stephen S. Kudla (1995) and Bernd Sturmfels (1995) have been appointed to the Eastern Section Program Committee by President Ronald L. Graham. Lawrence A. Shepp (1994) has been appointed chair. Continuing members of the committee are Lesley M. Sibner (ex officio) and Birgit Sph (1994).

Jon F. Carlson (1995) and Michelle L. Wachs (1995) have been appointed to the Southeastern Section Program Committee by President Ronald L. Graham. Steven L. Batterson (1994) has been appointed chair. Continuing members of the committee are Robert J. Daverman (ex officio) and Matthew Miller (1994).

President Ronald L. Graham has appointed William G. McCallum (1995) and John Sylvester (1995) to the Western Section Program Committee. Ruth J. Williams (1994) has been appointed chair. Continuing members of the committee are Josefin Alvarez (1994) and Lance W. Small (ex officio).

President Ronald L. Graham has appointed Joseph B. Keller, Andrew M. Odlyzko, and Edward Witten to the Committee to Select Gibbs Lecturer for 1995 and 1996. Professor Whitten will serve as chair.

Mary Ellen Rudin (1996) has been appointed to the Progress in Mathematics Committee by President Ronald L. Graham. James B. Serrin (1994) has been appointed chair. Other members of the committee are Michael G. Crandall (1995) and John B. Friedlander (1994).

President Ronald L. Graham has appointed Frank C. Hoppensteadt, Steven George Krantz, Brian J. Parshall, B. A. Taylor, Philip D. Wagreich, and Carla Wofsy to the Task Force on AMS Conferences. Robert M. Fossum and Sylvia Weigand will serve (ex officio). Consultants are H. Hope Daly, Timothy J. Goggins, James W. Maxwell, and Samuel M. Rankin III. Professor Hoppensteadt will serve as chair.


David Eisenbud (1996) and Claude L. Schochet (1996) have been appointed by President Ronald L. Graham to the Committee on Professional Ethics. Albert Marden (1994) has been appointed chair. Continuing members of the committee are Simon Hellerstein (1995) and Donald J. Lewis (1994).

President Ronald L. Graham has appointed Carlos E. Kenig (1996), Peter W. K. Li (1996), and Horacio A. Porta (1996) to the Committee on Accessibility for the Handicapped. Professor Li will serve as chair.

Isadore M. Singer (1998) has been appointed to the Committee to Select the Winner of the Award for Public Service by President Ronald L. Graham. Continuing members of the committee are William Browder (1995), chair, Kenneth M. Hoffman (1996), Harvey B. Keynes (1997), and John C. Polking (1994).

Frederick W. Oehring (1995) and Gian-Carlo Rota (1995) have been appointed by President Ronald L. Graham to the Committee on National Awards and Public Representation. Continuing members of the committee are Robert M. Fossum (ex officio), Ronald L. Graham (ex officio), chair, and Cathleen S. Morawetz (ex officio).

William P. Thurston (1995) and Lai-Sang Young (1995) have been appointed to the Committee to Select the Winner of the Satter Prize for 1995 by President Ronald L. Graham. Cathleen S. Morawetz (1994) has been appointed chair.

Barry Mazur, Shigefumi Mori, and Jean-Pierre Serre have been appointed to the Committee to Select the Winner of the Cole Prize for 1995 by President Ronald L. Graham. Professor Serre will serve as chair.

President Ronald L. Graham has appointed Margaret Cheney (1995) and Joel H. Spencer (1995) to the Liaison Committee with AAAS. Charles Radin (1995) has been appointed chair. Ex officio members of the committee are Efrem P. Armendariz, Jerry L. Bona, Ronald L. Graham, Deborah Tepper Haimo, Raymond L. Johnson, Warren Page, V. Frederick Rickey, Chih-Han Sah, and Melvin Thornton.

President Ronald L. Graham has appointed Robert D. MacPherson (1996)


Amy Cohen (AMS, 1996) and Daniel L. Goroff (AMS, 1996) have been appointed to the joint AMS-MAA Committee on Research in Undergraduate Mathematics Education (CRUME) by President Ronald L. Graham. Continuing members of the committee are Ed Dubinsky (MAA, 1995), chair, Joan Ferrini-Mundy (NCTM, 1995), James J. Kaput (MAA, 1996), George S. Monk (MAA, 1994), Warren Page (MATYC, 1995), Alan H. Schoenfeld (AMS, 1995), John Selden (AMS, 1994), and Robert S. Smith (MAA, 1994).


Gert Almkvist (AMS, 1996) and R. Keith Dennis (AMS, 1996) have been appointed by President Ronald L. Graham to the AMS-MAA Joint Archives Committee. Continuing members of the committee are Albert C. Lewis (MAA, 1996), Karen Parshall (MAA, 1995), Everett Pitcher (AMS, 1994), and Sanford L. Segal (MAA, 1994), chair.

Eugene Fabes, Paul Humke, Walter Littman, William Miller, Marian B. Pour-El, Karen Saxe, and Monika Stumpf have been appointed to the joint AMS-MAA Local Arrangements Committee for the Minneapolis Mathfest by Presidents Donald L. Kreider (MAA) and Ronald L. Graham (AMS). Professor Pour-El will serve as chair. Ex officio members of the committee are William H. Jaco, Kenneth A. Ross, Lesley M. Sibner, and Marcia P. Sward.

James W. Bond (AMS, 1996) has been appointed to the AMS-MAA-SIAM Joint Committee on Employment Opportunities by President Ronald L. Graham. Continuing members of the committee are Duane E. Anderson, consultant, Stanley Benkoski (MAA, 1996), Annalisa Crannell, consultant, Frank R. De-meyer (AMS, 1994), James W. Maxwell (ex officio), S. Brent Morris (MAA, 1994), chair, Leon H. Seltiman (SIAM, 1994), and Ivar Stakgold (SIAM, 1995).


Michael C. Mackey (1996) and John M. Rinzel (1996) have been appointed by Presidents Avner Friedman (SIAM), Alan Perelson (SMB), and Ronald L. Graham (AMS) to the joint AMS-SIAM-SMB Committee on Mathematics in the Life Sciences. Continuing members of the committee are Jack D. Cowan (1994), chair, Leah Edelstein-Keshet (1994), Michael S. Waterman (1995), and Carla Wofsy (1995).

Theodore Shifrin (1996) and Dorothy Wallace (1996) have been appointed as the Society’s representatives to the MAA Committee on Undergraduate Program in Mathematics by President Ronald L. Graham.
Group Characters, Symmetric Functions, and the Hecke Algebra

David Goldschmidt

Volume 4

The book is made up of lecture notes from a course taught by Goldschmidt at the University of California at Berkeley in 1989. The course was organized in three parts. Part I covers, among other things, Burnside's Theorem that groups of order \(p^aq^b\) are solvable, Frobenius's Theorem on the existence of Frobenius kernels, and Brauer's characterization of characters. Part II covers the classical character theory of the symmetric group and includes an algorithm for computing the character table of \(S^n\}; a construction of the Specht modules; the “determinant form” for the irreducible characters; the hook-length formula of Frame, Robinson, and Thrall; and the Murnaghan-Nakayama formula. Part III covers the ordinary representation theory of the Hecke algebra, the construction of the two-variable Jones polynomial, and a derivation of Ocneanu’s “weights” due to T. A. Springer.

1991 Mathematics Subject Classification: 20, 37
ISBN 0-8218-7003-3; 73 pages (softcover), June 1993
Individual member $42, List price $70, Institutional member $56
To order, please specify ULECT/4NA

394 NOTICES OF THE AMERICAN MATHEMATICAL SOCIETY
Backlog of Mathematics Research Journals

Backlog. Information on the backlog of papers for research journals, primarily those published in North America, is reported to the Providence office by those editorial boards which elect to participate. The figures are an estimate of the number of printed pages which have been accepted, but are in excess of the number required to maintain copy editing and printing schedules.

Observed Waiting Time. The quartiles give a measure of normal dispersion. They do not include extremes which may be misleading. Waiting times are measured in months from receipt of manuscript in final form to publication of the issue. When a paper is revised, the waiting time between an editor’s receipt of the final revision and its publication may be much shorter than is the case otherwise, so these figures are low to that extent.

The observations are made from the latest issue published, before the deadline for this issue of Notices, from journals that have actually been received by a subscriber in the Providence, Rhode Island area; in some cases this may be two months later than publication abroad. If the waiting time as defined above is not given in the journal, if no new issue has been received since the last survey, or if the latest issue is for some reason obviously not typical, no times are given in this report and such cases are marked NA (not available or not applicable).

<table>
<thead>
<tr>
<th>Journal</th>
<th>Number of Issues per Year</th>
<th>Approximate Number of Pages per Year</th>
<th>Backlog of Printed Pages 12/31/93</th>
<th>Backlog of Printed Pages 12/31/92</th>
<th>Editor’s Estimate of Waiting Time for Paper Submitted Currently to be Published (in Months)</th>
<th>Observed Waiting Time in Latest Published Issue (in Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acta Inform.</td>
<td>8</td>
<td>792</td>
<td>0</td>
<td>192</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Aequationes Math.</td>
<td>6</td>
<td>640</td>
<td>214</td>
<td>510</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Algebras Groups Geom.</td>
<td>4</td>
<td>450</td>
<td>200</td>
<td>120</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Algorithmica</td>
<td>12</td>
<td>1152</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>23</td>
</tr>
<tr>
<td>Amer. J. Math.</td>
<td>6</td>
<td>1400</td>
<td>1628</td>
<td>2400</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>Ann. Appl. Probab.</td>
<td>4</td>
<td>1600</td>
<td>0</td>
<td>NR</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Ann. of Math.</td>
<td>6</td>
<td>840</td>
<td>805</td>
<td>1770</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>Ann. Probab.</td>
<td>4</td>
<td>2000</td>
<td>250</td>
<td>600</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Ann. Sci. École Norm. Sup.</td>
<td>6</td>
<td>750</td>
<td>800</td>
<td>536</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>Ann. Statist.</td>
<td>4</td>
<td>2100</td>
<td>250</td>
<td>500</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Appl. Math. Lett.</td>
<td>6</td>
<td>600</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Appl. Math. Optim.</td>
<td>6</td>
<td>672</td>
<td>NR</td>
<td>224</td>
<td>NR</td>
<td>11</td>
</tr>
<tr>
<td>Arch. Hist. Exact Scis.</td>
<td>8</td>
<td>800</td>
<td>NR</td>
<td>0</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Arch. Math. Logic</td>
<td>6</td>
<td>456</td>
<td>76</td>
<td>0</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Arch. Rational Mech. Anal.</td>
<td>16</td>
<td>1600</td>
<td>NR</td>
<td>0</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Bull. Austral. Math. Soc.</td>
<td>6</td>
<td>1000</td>
<td>900</td>
<td>NR</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Bull. Soc. Math. France</td>
<td>4</td>
<td>980</td>
<td>300</td>
<td>280</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>Canad. J. Math.</td>
<td>8</td>
<td>1344</td>
<td>800</td>
<td>682</td>
<td>16–20</td>
<td>17</td>
</tr>
<tr>
<td>Circuits Systems Signal Proc.</td>
<td>6</td>
<td>720</td>
<td>750</td>
<td>272</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Comm. Algebra</td>
<td>15</td>
<td>5500</td>
<td>1540</td>
<td>2450</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Comm. Math. Phys.</td>
<td>22</td>
<td>4752</td>
<td>NR</td>
<td>NR</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Comm. Partial Diff. Equations</td>
<td>6</td>
<td>2100</td>
<td>0</td>
<td>200</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Math. Appl.</td>
<td>24</td>
<td>2800</td>
<td>700</td>
<td>600</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Computing</td>
<td>8</td>
<td>768</td>
<td>NR</td>
<td>NR</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Constr. Approx.</td>
<td>4</td>
<td>544</td>
<td>NR</td>
<td>136</td>
<td>NR</td>
<td>12</td>
</tr>
<tr>
<td>Discrete Comput. Geom.</td>
<td>8</td>
<td>900</td>
<td>200</td>
<td>300</td>
<td>14</td>
<td>6</td>
</tr>
</tbody>
</table>

APRIL 1994, VOLUME 41, NUMBER 4
<table>
<thead>
<tr>
<th>Journal</th>
<th>Number Issues per Year</th>
<th>Approximate Number Pages per Year</th>
<th>Backlog of Printed Pages 12/31/93</th>
<th>Backlog of Printed Pages 12/31/92</th>
<th>Editor's Estimate of Waiting Time for Paper Submitted Currently to be Published (in Months)</th>
<th>Q</th>
<th>M</th>
<th>Q₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duke Math. J.</td>
<td>12</td>
<td>3000</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Houston J. Math.</td>
<td>4</td>
<td>700</td>
<td>200</td>
<td>300</td>
<td>8</td>
<td>12</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Illinois J. Math.</td>
<td>4</td>
<td>704</td>
<td>962</td>
<td>717</td>
<td>16-22</td>
<td>22</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>IMA J. Appl. Math.</td>
<td>6</td>
<td>624</td>
<td>NR</td>
<td>NR</td>
<td>13</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>IMA J. Math. Control Inform.</td>
<td>4</td>
<td>400</td>
<td>50</td>
<td>0</td>
<td>6-8</td>
<td>15</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>IMA J. Numer. Anal.</td>
<td>4</td>
<td>600</td>
<td>100</td>
<td>300</td>
<td>18</td>
<td>15</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Indiana Univ. Math. J.</td>
<td>4</td>
<td>1200</td>
<td>153</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Internat. J. Math. Sci.</td>
<td>4</td>
<td>832</td>
<td>200</td>
<td>200</td>
<td>6-8</td>
<td>13</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Invent. Math.</td>
<td>12</td>
<td>2436</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Israel J. Math.</td>
<td>12</td>
<td>1728</td>
<td>1000</td>
<td>900</td>
<td>16</td>
<td>9</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>J. Algebraic Geom.</td>
<td>4</td>
<td>684</td>
<td>400</td>
<td>170</td>
<td>9</td>
<td>10</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>J. Algorithms</td>
<td>6</td>
<td>990</td>
<td>7</td>
<td>NR</td>
<td>30</td>
<td>8</td>
<td>9*</td>
<td>11</td>
</tr>
<tr>
<td>J. Amer. Math. Soc.</td>
<td>4</td>
<td>1000</td>
<td>250</td>
<td>250</td>
<td>12</td>
<td>9</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>J. Amer. Statist. Assoc.</td>
<td>4</td>
<td>1200</td>
<td>480</td>
<td>0</td>
<td>18</td>
<td>10</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>J. Appl. Math. Stochastic Anal.</td>
<td>4</td>
<td>400</td>
<td>380</td>
<td>350</td>
<td>7</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. Classification</td>
<td>2</td>
<td>300</td>
<td>420</td>
<td>200</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. Complexity</td>
<td>4</td>
<td>500</td>
<td>375</td>
<td>275</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. Comput. System Sci.</td>
<td>6</td>
<td>1500</td>
<td>1000</td>
<td>500</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. Differential Geom.</td>
<td>6</td>
<td>1500</td>
<td>1400</td>
<td>1200</td>
<td>11</td>
<td>14</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>J. Geom. Anal.</td>
<td>6</td>
<td>640</td>
<td>995</td>
<td>427</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. Integral Equations Appl.</td>
<td>4</td>
<td>700</td>
<td>0</td>
<td>100</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>J. London Math. Soc.</td>
<td>6</td>
<td>1248</td>
<td>1250</td>
<td>NA</td>
<td>18</td>
<td>20</td>
<td>23</td>
<td>27</td>
</tr>
<tr>
<td>J. Math. Biol.</td>
<td>8</td>
<td>864</td>
<td>0</td>
<td>0</td>
<td>10-11</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>J. Math. Phys.</td>
<td>12</td>
<td>3500</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>4</td>
<td>5*</td>
<td>6</td>
</tr>
<tr>
<td>J. Operator Theory</td>
<td>4</td>
<td>800</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>37</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td>J. Symbolic Logic</td>
<td>4</td>
<td>1552</td>
<td>0</td>
<td>400</td>
<td>15</td>
<td>13</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Linear Algebra Appl.</td>
<td>18</td>
<td>5400</td>
<td>900</td>
<td>800</td>
<td>15</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Manuscripta Math.</td>
<td>16</td>
<td>1792</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Math. Ann.</td>
<td>12</td>
<td>2304</td>
<td>0</td>
<td>0</td>
<td>10-12</td>
<td>8</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Math. Biosci.</td>
<td>12</td>
<td>1800</td>
<td>50</td>
<td>400</td>
<td>7-8</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Math. Comp.</td>
<td>4</td>
<td>1700</td>
<td>0</td>
<td>180</td>
<td>14</td>
<td>12</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Math. Control Signals Sys.</td>
<td>4</td>
<td>460</td>
<td>200</td>
<td>100</td>
<td>18</td>
<td>13</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Math. Oper. Res.</td>
<td>4</td>
<td>1024</td>
<td>940</td>
<td>600</td>
<td>28</td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Math. Social Sci.</td>
<td>6</td>
<td>600</td>
<td>0</td>
<td>200</td>
<td>NR</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Math. Systems Theory</td>
<td>4</td>
<td>400</td>
<td>NR</td>
<td>400</td>
<td>NR</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math. Z.</td>
<td>12</td>
<td>2016</td>
<td>0</td>
<td>0</td>
<td>10-11</td>
<td>11</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Mem. Amer. Math. Soc.</td>
<td>6</td>
<td>3200</td>
<td>2667</td>
<td>3733</td>
<td>24</td>
<td>18</td>
<td>30</td>
<td>44</td>
</tr>
<tr>
<td>Michigan Math. J.</td>
<td>3</td>
<td>624</td>
<td>200</td>
<td>200</td>
<td>19</td>
<td>11</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Monatsl. Math.</td>
<td>8</td>
<td>704</td>
<td>NR</td>
<td>NR</td>
<td>6</td>
<td>11</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Nonlinear Anal.</td>
<td>24</td>
<td>2500</td>
<td>2500</td>
<td>NA</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Numer. Funct. Anal. Optim.</td>
<td>8</td>
<td>1000</td>
<td>0</td>
<td>100</td>
<td>9</td>
<td>9</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Numer. Math.</td>
<td>11</td>
<td>1496</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Oper. Res.</td>
<td>6</td>
<td>1152</td>
<td>565</td>
<td>655</td>
<td>13</td>
<td>12</td>
<td>16</td>
<td>21</td>
</tr>
</tbody>
</table>
Research Journals Backlog

<table>
<thead>
<tr>
<th>Journal</th>
<th>Number Issues per Year</th>
<th>Approximate Number Pages per Year</th>
<th>Backlog of Printed Pages</th>
<th>Editor's Estimate of Time in Latest Issue (in Months)</th>
<th>Observed Waiting Time in Latest Published Issue (in Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Q1</td>
<td>M</td>
</tr>
<tr>
<td>Probab. Theor. Relat. Fields</td>
<td>14</td>
<td>1992</td>
<td>0</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Proc. Amer. Math. Soc.</td>
<td>12</td>
<td>3645</td>
<td>3341</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Proc. London Math. Soc.</td>
<td>6</td>
<td>1344</td>
<td>250</td>
<td>NR</td>
<td>14</td>
</tr>
<tr>
<td>Quart. Appl. Math.</td>
<td>4</td>
<td>800</td>
<td>1000</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Quart. J. Mech. Appl. Math.</td>
<td>4</td>
<td>660</td>
<td>120</td>
<td>300</td>
<td>15</td>
</tr>
<tr>
<td>Results Math.</td>
<td>4</td>
<td>800</td>
<td>NR</td>
<td>NR</td>
<td>8</td>
</tr>
<tr>
<td>Rocky Mountain J. Math.</td>
<td>4</td>
<td>1600</td>
<td>1050</td>
<td>400</td>
<td>18</td>
</tr>
<tr>
<td>Semigroup Forum</td>
<td>6</td>
<td>816</td>
<td>NR</td>
<td>0</td>
<td>NR</td>
</tr>
<tr>
<td>SIAM J. Appl. Math.</td>
<td>6</td>
<td>1800</td>
<td>261</td>
<td>750</td>
<td>9</td>
</tr>
<tr>
<td>SIAM J. Comput.</td>
<td>6</td>
<td>1350</td>
<td>1133</td>
<td>900</td>
<td>17*</td>
</tr>
<tr>
<td>SIAM J. Control Optim.</td>
<td>6</td>
<td>1800</td>
<td>855</td>
<td>962</td>
<td>14*</td>
</tr>
<tr>
<td>SIAM J. Discrete Math.</td>
<td>4</td>
<td>680</td>
<td>142</td>
<td>255</td>
<td>9*</td>
</tr>
<tr>
<td>SIAM J. Math. Anal.</td>
<td>6</td>
<td>1650</td>
<td>1257</td>
<td>0</td>
<td>18*</td>
</tr>
<tr>
<td>SIAM J. Matrix Anal. Appl.</td>
<td>4</td>
<td>1400</td>
<td>750</td>
<td>1500</td>
<td>15*</td>
</tr>
<tr>
<td>SIAM J. Numer. Anal.</td>
<td>6</td>
<td>1800</td>
<td>1189</td>
<td>250</td>
<td>17*</td>
</tr>
<tr>
<td>SIAM J. Optimization</td>
<td>4</td>
<td>920</td>
<td>447</td>
<td>560</td>
<td>16*</td>
</tr>
<tr>
<td>SIAM Rev.</td>
<td>4</td>
<td>680</td>
<td>0</td>
<td>0</td>
<td>8*</td>
</tr>
<tr>
<td>Topology</td>
<td>4</td>
<td>800</td>
<td>600</td>
<td>NA</td>
<td>14</td>
</tr>
<tr>
<td>Topology Appl.</td>
<td>18</td>
<td>1980</td>
<td>1034</td>
<td>440</td>
<td>10</td>
</tr>
<tr>
<td>Trans. Amer. Math. Soc.</td>
<td>12</td>
<td>5505</td>
<td>1376</td>
<td>4125</td>
<td>17</td>
</tr>
</tbody>
</table>

NR means no response received.
NA means not available or not applicable.
* From date accepted.
** Date of receipt of manuscript not given in this journal.

ADVANCES IN SOVIET MATHEMATICS

Unconventional Lie Algebras

Dmitry Fuchs, Editor

Volume 17

This book contains eight papers on representations and cohomology of Lie algebras. The Lie algebras here are either infinite-dimensional, are defined over fields of finite characteristic, or are actually Lie superalgebras or quantum groups. Among the topics covered here are generalizations of the Virasoro algebra, representation theory of the Virasoro algebra and of Kac-Moody algebras, cohomology of Lie algebras of vector fields on the line, and Lie superalgebras of vector fields.

1991 Mathematics Subject Classification: 17
ISBN 0-8218-4121-1, 216 pages (hardcover), December 1993
Individual member $63, List price $105, Institutional member $84
To order, please specify ADVSOV17/NA

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required.
Order from: American Mathematical Society, P.O. Box 5904, Boston MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
Classified Advertisements

**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 1994 RATE IS** $70 per inch on a single column (one-inch minimum), calculated from the top of the type; $40 for each additional ½ inch or fraction thereof. 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. Advertisements in other sections of the classified pages will be set according to the advertisement insertion. Headlines will be centered in boldface at no extra charge. Classified rates are calculated from top of type in headline to bottom of type in body copy, including lines and spaces within. Any fractional text will be charged at the next ½ inch rate. Ads will appear in the language in which they are submitted.

Prepayment is required of individuals but not of institutions. There are no member discounts for classified ads. Dictation over the telephone will not be accepted for classified advertising.

**DEADLINES** are listed on the inside front cover or may be obtained from the AMS Advertising Department.

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 near the Classified Advertisements in the January and July/August issues of the Notices.

**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.

**SEND AD AND CHECK TO:** Advertising Department, AMS, P. O. Box 6248, Providence, Rhode Island 02940. AMS location for express delivery packages is 201 Charles Street, Providence, Rhode Island 02904. Individuals are requested to pay in advance, institutions are not required to do so. AMS FAX 401-455-4094.

---

**FLORIDA**

**UNIVERSITY OF MIAMI**

Assistant/Associate Professor

The Department of Mathematics and Computer Science of the University of Miami may have two tenure-track positions in mathematics available for the fall of 1994. Candidates should have Ph.D.s in mathematics and should be outstanding in both teaching and research. Although these positions will probably be at the junior level, we will seriously consider any well-qualified applicants. To apply, please send your vita and three letters of recommendation to:

Alan M. Zame, chairman

Mathematics and Computer Science
P.O. Box 249065
University of Miami
Coral Gables, FL 33124-4250

The University of Miami is an equal opportunity affirmative action employer and a smoke/drug free workplace.

---

**UNIVERSITY OF MIAMI**

Lecturers

The Department of Mathematics and Computer Science of the University of Miami in Coral Gables, Florida, may have several full-time lecturer position openings available for fall 1994. Candidates must have a Master’s degree in the mathematical sciences and outstanding teaching credentials or potential. Candidates will be responsible for teaching introductory mathematics courses. Salary will be competitive. The University of Miami is an equal opportunity affirmative action employer and a smoke/drug free workplace.

---

**GEORGIA**

**UNIVERSITY OF GEORGIA**

Athens, Georgia

Postdoctoral position in microencapsulation available immediately for chemist, biochemist, biochemical engineer, chemical engineer, pharmacist, or equivalent, to microencapsulate enzymes. M.S. with excellent background will also be considered. Salary is negotiable. Send CV and list of references to Dr. David Whitmire, Driftmier Engineering Center, The University of Georgia, Athens, GA 30602-4435. Voice 706-542-0862, FAX 706-542-8806, whitma@uga.bitnet.

---

**ILLINOIS**

Temporary Positions

1994–1995

**SOUTHERN ILLINOIS UNIVERSITY AT CARBONDALE**

Department of Mathematics

Temporary positions are anticipated starting on August 16, 1994, as lecturer, Master’s degree in mathematics or admission to candidacy required; Ph.D. preferred. Applicants should provide evidence of excellence in teaching, and foreign applicants must provide evidence of ability to teach in English effectively. Preference given to applicants with research interests compatible with those of the faculty. The duties will consist of 12 hours of undergraduate mathematics instruction each semester. Closing date May 15, 1994 or until positions are filled. Send applications (including transcripts) to:

Temporary Positions

c/o Ronald Kirk, chair

Department of Mathematics

Southern Illinois University at Carbondale

Carbondale, Illinois 62901

SIUC is an Equal Opportunity/Affirmative Action Employer.

---

**NEVADA**

**THE UNIVERSITY OF NEVADA**

Las Vegas

The Department of Mathematical Sciences has one tenure-track position in Pure Mathematics for assistant associate professor, starting fall 1994. Candidates in all areas of pure mathematics are invited to apply. Preference may be given to applicants in mathematical logic, recursion theory, and set theory. A Ph.D. in mathematics and a serious commitment to research and teaching are required. Rank and salary will be commensurate with the candidate’s experience and qualifications.

UNLV is a growing urban university with an enrollment of over 19,000 students. Submit a letter of application, a current resume, photocopies of transcripts, at least three letters of reference, and an abstract of current research to:

Search Committee

Department of Mathematical Sciences

University of Nevada, Las Vegas

4505 Maryland Parkway, Box 454020

Las Vegas, NV 89154-4020

Fax: 702-895-4343

Include an e-mail address if available. Application materials may be submitted through e-mail to shue@nevada.edu or dubose@nevada.edu.

The processing of applications will begin April 10, 1994.

Proof of eligibility for U.S. employment (under the Immigration Reform and Control Act of 1986) will be required prior to employment. Women and minorities are especially encouraged to apply. The University of Nevada, Las
NEW JERSEY

RICHARD STOCKTON
COLLEGE OF NEW JERSEY

MATHEMATICS, Two half-time positions at the instructor/assistant professor level, September, 1994. 1) Teach numerical analysis and other appropriate courses. 2) Teach calculus and/or precalculus with emphasis on innovative approaches to mathematics teaching. Ph.D. required for assistant professor. A.B.D. required for instructor. Ph.D. preferred. We seek an excellent, versatile teacher to be part of a strong mathematics department in a young liberal arts college in rural South Jersey. Salary $14,400–18,301, may be higher depending on qualifications, experience, and increases in the New Jersey Higher Education Compensation Plan. Screening will begin immediately. Send resume, documentation of completion of degree or expected date of completion, and three letters of reference to Dr. Barbara Byrne, dean of Natural Sciences and Mathematics, Richard Stockton College of New Jersey, AA75, Pomona, NJ. Stockton is an AA/EOE. Women and minorities are encouraged to apply. R403403

SOUTH CAROLINA

COASTAL CAROLINA UNIVERSITY
Department of Mathematics

The Mathematics Department of Coastal Carolina University is accepting applications for a tenure-track position beginning fall 1994. Coastal Carolina University is a liberal arts university with 4,000 students, located near Myrtle Beach. Applicants should be committed to excellence in undergraduate classroom instruction and be active scholars. Successful candidates must have a Ph.D. in mathematics or statistics. The department is seeking a person to teach both statistics and mathematics courses, with fifteen contact hours each semester. The position is pending available funding. Salary is negotiable. Review of applications will begin April 15, and continue until the position is filled. Applicants should send a letter of application, a complete resume, and the names, addresses and telephone numbers of three references to: Deborah A. Vrooman Mathematics Department Coastal Carolina University P. O. Box 1954 Conway, S.C. 29526 An Affirmative Action/EEO Employer.

UTAH

BRIGHAM YOUNG UNIVERSITY
Department of Mathematics
Visiting Position in PDEs

A one-year visiting assistant professorship is available for 1994–95. Responsibilities include teaching two classes each semester and contributing to the research effort of the department. Only candidates with published work in PDE’s or dynamical systems will be considered. To apply for this position, please send a letter of interest and a CV, and arrange for three letters of reference to be sent by 11 April 1994 to: Recruitment Committee Dept. of Mathematics, 292 TMCB Brigham Young University Provo, UT 84602

MAIL ORDER

TECHNICAL & SCIENTIFIC BOOKS
- Immediate shipment worldwide
- Overnight Fedex or UPS available
- Expert service • Fast delivery on Special Orders
- VISA/MASTER CARD accepted
- 10% Off for orders $100 or more
- 5% Off for orders $99 or less

Fuller particulars and an application form are available from the Staffing Office (Academic Appointments), University of Leicester, University Road, Leicester, LE1 7RH, UK; telephone (0533) 522758. The closing date for applications is 22 April 1994.

CANADA

McMASTER UNIVERSITY
Department of Mathematics & Statistics

The Department of Mathematics & Statistics, McMaster University, invites applications for a tenure track assistant professorship starting July 1, 1994. Candidates should have a Ph.D. and proven research ability in some area of partial differential equations or differential geometry, as well as capability in teaching. Salary based on qualifications and experience. This position is subject to final budgetary approval. McMaster is committed to employment equality and encourages applications from all qualified candidates, including aboriginal peoples, persons with disabilities, members of visible minorities, and women.

In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents. Please send curriculum vitae and arrange for letters of reference to: E. Sawyer, Chair Mathematics & Statistics McMaster University Hamilton, Ontario Canada, L8S 4K1

UNIVERSITY OF LEICESTER
Department of Mathematics and Computer Science

Lectureship (Grad A) in Pure Mathematics

Following the recent appointment of Professor R. Robinson to a Chair in Mathematics, applications are invited for a newly established Lectureship (Grad A) in Pure Mathematics in the Department of Mathematics and Computer Science. The appointment is tenable from 1 September 1994 or such other date as may be agreed.

Applicants should have a strong research record in pure mathematics. Preference may be given to candidates whose field of research intersects with areas currently represented within the department.

Initial salary, dependent on qualifications and experience, will be on the Lecturer Grade A Scale – £13,601 to £18,855 p.a. Further particulars and an application form are available from the Staffing Office (Academic Appointments), University of Leicester, University Road, Leicester, LE1 7RH, UK; telephone (0533) 522758. The closing date for applications is 22 April 1994.

VEGAS, is an Affirmative Action/Equal Opportunity Employer.
PUBLICATIONS FOR SALE


CONTEMPORARY MATHEMATICS

Linear Algebraic Groups and Their Representations

Richard S. Elman, Murray M. Schacher, and V. S. Varadarajan, Editors

Volume 153

This book contains the proceedings of the Conference on Linear Algebraic Groups and Their Representations, held at UCLA in March 1992. Collected here are both surveys and original contributions by eminent specialists, reflecting current developments in the subject. This book is one of the few available sources that brings together such a wide variety of themes under a single unifying perspective.

1991 Mathematics Subject Classification: 20; 14
ISBN 0-8218-5161-6, 200 pages (softcover), October 1993
Individual member $25, List price $42, Institutional member $34
To order, please specify CONM/153NA

The Penrose Transform and Analytic Cohomology in Representation Theory

Michael Eastwood, Joseph Wolf, and Roger Zierau, Editors

Volume 154

This book contains refereed papers presented at an AMS-IMS-SIAM Summer Research Conference held in the summer of 1992 at Mount Holyoke College. The conference brought together some of the top experts in representation theory and differential geometry. One of the issues explored at the conference was the fact that various integral transforms from representation theory, complex integral geometry, and mathematical physics appear to be instances of the same general construction, which is sometimes called the "Penrose transform". There is considerable scope for further research in this area, and this book serves as an excellent introduction.

1991 Mathematics Subject Classification: 22; 32, 14, 53
ISBN 0-8218-5176-4, 259 pages (softcover), October 1993
Individual member $28, List price $47, Institutional member $38
To order, please specify CONM/154NA

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5004, Boston, MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
MATHEMATICAL REVIEWS
ASSOCIATE EDITOR—HALF-TIME

Applications and recommendations are invited for a one- or two-year half-time appointment as an Associate Editor of Mathematical Reviews (MR), to commence in September 1994. In particular applications will be welcome from persons taking a sabbatical leave. The salary is negotiable and will be commensurate with the experience the applicant brings to the position.

The MR office of the American Mathematical Society is located in Ann Arbor, Michigan, close to the campus of the University of Michigan. The editors, although employees of the AMS, enjoy many privileges at the University. At present MR employs twelve mathematical editors, several consultants, and over sixty nonmathematicians. It produces Mathematical Reviews, Current Mathematical Publications, various indexes, the on-line service MathSci, and MathSci Disc. The responsibilities of an Associate Editor fall primarily in the day-to-day operations of selecting articles and books suitable for review, classifying these items, assigning them to reviewers, editing the reviews when they are returned, and correcting the galley proof. An individual with considerable breadth in pure or applied mathematics is sought, and preference will be given to those applicants with expertise in partial differential equations and/or numerical analysis. The ability to write good English is essential and the ability to read mathematics in major foreign languages is important.

Applications including curriculum vitae, bibliography, and names and addresses of at least three references should be sent to

Dr. D. G. Babbitt
Executive Editor
Mathematical Reviews
P. O. Box 8604
Ann Arbor, MI 48107-8604
FAX: 313-996-2916
INTERNET: DGB@MATH.AMS.ORG

Interested applicants are urged to inquire without delay.

The American Mathematical Society is an equal opportunity employer.
H. S. M. Coxeter on the Zometool

"The Zometool considerably simplifies the procedure of construction and unifies the study of space frame structures into one coherent system, of great educational value in the teaching of solid geometry, science, art, engineering and architecture."

H. S. M. Coxeter

Zometool

The unique 31 zone construction kit for rapidly creating and visualizing:

- Penrose tiles and quasi-crystals
- N-Dimensional fractal geometries
- Regular polytopes up to 31 dimensions
- 2, 3, and 4D Golden Section geometries

---

Élie Cartan (1869–1951)

M. A. Akivis and B. A. Rosenfeld

This book describes the life and achievements of the great French mathematician, Élie Cartan. Here readers will find detailed descriptions of Cartan’s discoveries in Lie groups and algebras, associative algebras, differential equations, and differential geometry, as well as later developments stemming from his ideas. The volume includes a biographical sketch of Cartan’s life. A monumental tribute to a towering figure in the history of mathematics, this book will appeal to mathematicians and historians alike.

1991 Mathematics Subject Classification: 01
Indiv. member $92, List $153, Inst. member $122
To order, please specify MMONO/123NA

All prices subject to change. Free shipment by surface; for air delivery, please add $6.50 per title. Prepayment required.

---

Are you looking for a job? Do you have an open position to fill?

Employment Information in the Mathematical Sciences

Employers: Published five times per year (October, November, December, January, and March), EIMS gives you access to a wide pool of qualified candidates for your open positions.

Three summer flyers (May, June, and July/August) designed to announce late-breaking opportunities for the 1994/1995 academic year will be mailed to all subscribers.

To announce your open positions in one of the summer flyers or upcoming issues, call Mike Saitas at 800-321-4AMS (321-4267), ext. 4190 (in the United States and Canada), or 401-455-4190 (worldwide). You can submit by fax (401-331-3842), by e-mail on the Internet (eims-info@e-math.ams.org), electronically by e-MATH, or by mailing to EIMS, American Mathematical Society, P. O. Box 6248, Providence, RI 02940-6248.

Electronic bonus! All job announcements in EIMS issues and flyers are also listed automatically on e-MATH, the AMS electronic resource, at no extra charge. To access e-MATH, type telnet e-math.ams.org or telnet 130.44.1.100. Login and password are both e-math (lower case).
ANNOUNCES A NEW SECTION ENTITLED
"SHORT REPORTS AND COMMUNICATIONS IN APPLIED
MATHEMATICS AND STOCHASTIC ANALYSIS."

This section will include abstracts of solid work in various forms. Abstracts may include summaries of monographs, of text books, of recently published research articles, of technical reports and even of unpublished work (including papers submitted for publication) which authors may wish to announce in advance. In addition, the journal will accept statements of open problems and announcements of work in progress in all areas of applied mathematics and stochastic analysis. A submitted abstract will be reviewed by qualified editorial board members for its relevance and rigor. However, the original, complete work will not be refereed, in fact it need not even be seen by JAMSA editors. If accepted, the abstract will appear in an upcoming issue. Thus, this section will provide a vehicle for rapid and timely announcement of problems, work in progress and dissemination of research results. The main body of an abstract may not exceed 250 words, excluding author address (e-mail may be included if available). There is no restriction on the style of abstract submitted to this section. In particular, abstracts may contain technical terms, mathematical expressions and even references normally prohibited in conventional abstracts. Each submission should be in the following format: title, author(s) name(s) and address(es), publisher or journal of publication (if available), and then the text of the abstract; the word "Abstracts" should be omitted. Abstracts can be faxed or e-mailed; in the latter case as ASCII or TEX files.

Other research papers should be sent (in triplicate) by regular mail or e-mailed (in TEX format) to: J.H. Dshalalow, Principal Editor, JAMSA, Department of Applied Mathematics, Florida Tech, Melbourne, FL 32901, U.S.A. Fax (407) 726-8200, Ph. (407) 951-8306, e-mail: DSHALAL@ZACH.FIT.EDU peer review is mandatory.

The Journal of Applied Mathematics and Stochastic Analysis (ISSN 1048-9533) is published four times a year. Volume 7 (1994). Institutional rates: US $125.00 for US/Canada, $135.00 elsewhere, $60.00 for developing countries. Individual rates: US $50.00 for US/Canada, $60.00 elsewhere. Send mail orders to: North Atlantic Science Publishing Company, Subscription Department, P.O. Box 1017, Melbourne, FL 32902-1017, U.S.A.


ADVANCES IN SOVIET MATHEMATICS

Nonlinear Stokes Phenomena
Yu. S. Il'yashenko, Editor

Volume 14

The nonlinear Stokes phenomenon occurs in the local theory of differential equations (or, more concisely, local dynamics) and finds application in singularity theory. This book contains a number of papers on this subject, including a survey that begins with Stokes' pioneering works on linear theory and discusses the work of Voronin.

1991 Mathematics Subject Classification: 32, 34, 35, 58; 43
Individual member $70, List price $116, Institutional member $93
To order, please specify ADVSOV/14NA

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 939, Providence, RI 02940, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
AN INTRODUCTION TO NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS

J. David Logan, University of Nebraska, Lincoln

Uses an analytical and techniques-oriented approach to present a concise introduction to the subject, focusing on time-evolution problems. Emphasizes hyperbolic and parabolic problems and includes a range of applications—chemistry, porous media, biological problems, traffic flow, reactors, heat transfer and detonation. Packed with exercises, examples and illustrations.

April 1994 • 442 pp. • 0-471-59916-6 • $69.95 (tent.)

FUNDAMENTAL STRUCTURES OF ALGEBRA AND DISCRETE MATHEMATICS

Stephan J. Foldes

Introduces the basic theories of 12 structural concepts, offering a fundamental theory of groups, rings and other algebraic structures. Identifies essentials and describes interrelationships between particular theories. Selected classical theorems and results relevant to current research are proved rigorously within the theory of each structure. Throughout the text the reader is frequently prompted to perform integrated exercises of verification and to explore examples.

March 1994 • 362 pp. • 0-471-57180-6 • $64.95

ANNOUNCING THE RELEASE OF AN EAGERLY AWAITED PUBLICATION . . .

LIE ALGEBRAS WITH TRIANGULAR DECOMPOSITIONS

R.V. Moody and A. Pianzola, University of Edmonton, Alberta, Canada

Provides a graduate-level study of Kac-Moody algebras and their representations. This book carefully develops the subject, using as models the classical Lie algebras of mathematics and physics. Highlights include a general theory of Lie algebras with triangular decompositions (including Virasoro, Heisenberg, and Kac-Moody algebras), the character formulas, the theory of finite and infinite root systems, the Shapovalov determinant formula, and the conjugacy theorems for Cartan subalgebras, much of which has never appeared before in book form. Numerous examples and exercises are also included.

May 1994 • 624 pp. • 0-471-63304-6 • $79.95 (tent.)

PRESENTING A VOLUME FROM THE WILEY CLASSICS LIBRARY . . .

APPLIED COMPUTATIONAL COMPLEX ANALYSIS

VOLUME 3

Discrete Fourier Analysis—Cauchy Integrals—Construction of Conformal Maps—Univalent Functions

Peter Henrici, Eidgenossische Technische Hochschule, Zurich, Switzerland

The third volume of a work aimed at presenting computational aspects and applications of complex analysis. This book covers complex analysis as a tool for modeling phenomena of the physical world, and as a source of algorithms for the efficient use of these models. The author does not consider a problem solved unless there is an algorithm for constructing the solution, and this algorithm should not only be efficient, but implementable on computing equipment that is available today.

1986 • 637 pp. • 0-471-58986-1 • $39.95 softcover Wiley Classics Library Edition Published 1993

ALSO AVAILABLE . . .

VOLUME 2

Special Functions—Integral Transforms—Asymptotics—Continued Fractions

1977 • 661 pp. • 0-471-54289-X • $49.95 softcover Wiley Classics Library Edition Published 1991

VOLUME 1

Power Series—Integration—Conformal Mapping—Location of Zeros

1974 • 682 pp. • 0-471-60841-6 • $39.95 softcover Wiley Classics Library Edition Published 1988

3 Volume Set • 0-471-59892-5 • $110.00

AN INTRODUCTION TO THE FRACTIONAL CALCULUS AND FRACTIONAL DIFFERENTIAL EQUATIONS

Kenneth S. Miller, formerly Professor of Mathematics, New York University, NY, and Bertram Ross, University of New Haven, Connecticut

This book serves as an introduction to fractional calculus and fractional differential equations. The authors have taken a chronological approach as the basis of their discussion of these two topics. This allows the reader to build on skills as they proceed throughout the volume. The material is aimed at individuals with some mathematical background who are interested in a new way to solve practical scientific problems.

1993 • 356 pp. • 0-471-58884-9 • $64.95
OPTIMIZATION IN INDUSTRY
Mathematical Programming and Modelling Techniques in Practice
Edited by Tito A. Ciriani, IBM Scientific & Technical Solutions, Rome, Italy, and
Robert C. Leachman, University of California at Berkeley

An overview of the latest developments in mathematical programming and its implications for optimization technology. Describes innovative strategies which allow model formulation and optimization methods to provide solutions to problems that were previously beyond the scope of mathematical programming.

PRACTICAL NUMERICAL INTEGRATION
Gwynne Evans, Loughborough University of Technology, UK

Gives comprehensive coverage of the subject which not only includes classical undergraduate work but also the special areas of oscillatory and singular quadratures. These areas have been the subject of considerable research over the past decade as such integrals arise frequently in practical applications. Throughout the book the emphasis is on practical methods, with their performance illustrated by a wide range of examples. These methods are carefully assessed and a range of exercises is provided to allow the reader to experiment.

THE MOLLIFICATION METHOD AND THE NUMERICAL SOLUTION OF ILL-POSED PROBLEMS
Diego A. Murio, University of Cincinnati, Ohio

Over the past twenty years, the subject of applied inverse theory (ill-posed problems) has expanded from a collection of individual techniques to a rich, highly developed branch of applied mathematics. This book offers a self-contained introduction to some of the most important practical computational methods that have been successfully applied to a wide range of ill-posed problems. Murio examines the mollification method and its multiple applications when used as a space-matching method. These computations are compared with various other methods used to arrive at the same numerical results.

Journals that serve the information needs of today's mathematician...
Helmut Wielandt
Mathematische Werke / Mathematical Works
Editors: Bertram Huppert (Mainz, Germany) and Hans Schneider (Madison, Wisconsin)

Volume 1: Group Theory
1994. xix + 802 pages · With 95 figures · Cloth $198.00 · ISBN 3-11-012452-1

Contents of Volume 1:
Permuation Groups (Introduction by Peter M. Neumann)
Subnormality (Introduction by I. Martin Isaacs)
Factorised Groups (Introduction by Otto H. Kegel)
11-Structure of Finite Groups (Introduction by Brian Hartley)
Near Rings (Introduction by Gerhard Betsch)
Miscellania

In preparation:
Volume 2
Linear Algebra and Analysis

Empirico-Statistical Analysis of Narrative Material and its Applications to Historical Dating
Volume 1: The Development of the Statistical Tools
Volume 2: The Analysis of Ancient and Medieval Records
by A.T. Fomenko, Moscow State University, Russia

These two volumes contain a comprehensive set of mathematical and statistical techniques presented for the analysis of chronological data. These include, as main tool, the means to compare texts and other sequential data and the ability to judge them in terms of similarity and closeness.

2 Volume Set
ISBN 0-7923-2606-7
ISBN 0-7923-2604-0

1994
1994
1994

$282.00/Dfl.465.00/£186.00
$103.00/Dfl.170.00/£68.00
$218.00/Dfl.360.00/£144.00

228 pp.
472 pp.

Kluwer Academic Publishers offers a 25% discount on prepaid book orders to members of the American Mathematical Society. Orders must be prepaid, sent directly to the publisher and include the signed statement "I am a member of the AMS, this purchase is for my personal use."
An optional extra!

Electronic access to a leading journal in numerical analysis:
Numerische Mathematik Electronic Edition

Editors-in-Chief: P.G. Ciarlet, Paris; R.S. Varga, Kent
Managing Editor: C. Zenger, München

Starting with a full text file as of volume 67, issue 1, due in February 1994, the printed journal Numerische Mathematik is also available in an electronic version.

Your advantages at a glance:

- full information on your personal workstation or other computer
- the data is available in TeX and LaTeX files
- the electronic journal will arrive 10 days prior to publication of the printed version
- the Numerische Mathematik Electronic Edition will be delivered automatically to the subscriber's e-mail address enabling campus-wide access to the information.
- the tables of contents and biblioabstracts are additionally available via the Springer Journals Preview Service (e-mail: svjps@vax.ntp.springer.de)

For further information please contact
Springer-Verlag
Electronic Media Dept.
Postfach 10 52 80
D-69042 Heidelberg
Germany

Demo version available - please ask for details

Springer electronic media
The principal object of this book is to provide, in a self-contained manner, comprehensive coverage of the mainstream of group representation theory. The audience for these books consists of aspiring graduate students and mature mathematicians working in the field of group representations.

Volume 3
North-Holland Mathematics Studies
Volume 180

SINGULAR PERTURBATIONS I
Spaces and Singular Perturbations on Manifolds Without Boundary
by L.S. Frank
Studies in Mathematics and its Applications
Volume 23
1990 xxiv + 556 pages Hardbound
Price: Dfl. 193.00 (US$ 110.25)
ISBN 0-444-88134-4

Singular perturbations, one of the central topics in asymptotic analysis, also play a special role in describing physical phenomena such as the propagation of waves in media in the presence of small energy dissipations or dispersions, the appearance of boundary or interior layers in fluid and gas dynamics, as well as in elasticity theory, semi-classical asymptotic approximations in quantum mechanics etc.

* 25% discount is not applicable to orders from libraries, institutions, or companies. This discount applies only to orders prepaid from personal funds.
- US$ prices are valid only in the USA and Canada. In all other countries, the Dutch Guilder (Dfl.) price is definitive. No postage will be added to prepaid book orders. All prices are subject to change without notice.
ESSENTIAL MATHEMATICS FROM CAMBRIDGE

**Metaphysical Myths, Mathematical Practice**
*Jody Azzouni*
Analyzes the linguistic pitfalls and misperceptions philosophers in this field are often prone to, and explores the misapplications of epistemic principles from the empirical sciences to the exact sciences.
1994 258 pp. 44223-0 Hardcover $54.95

**Normal Forms and Bifurcation of Planar Vector Fields**
*Shui-Nee Chow, Chengzhi Li, and Duo Wang*
Introduces two systematic methods of simplifying equations: center manifold theory and normal form theory, by which one may reduce the dimension of equations and change forms of equations to be as simple as possible.
1994 434 pp. 37226-7 Hardcover $69.95

**Directions in General Relativity: Proceedings of the 1993 International Symposium, Maryland**
*Volume 1: Papers in Honor of Charles Misner*  
*Edited by B. L. Hu, M. P. Ryan Jr., and C. V. Vishveshwara*
Volume 2: Papers in Honor of Dieter Brill  
*Edited by B. L. Hu and T. A. Jacobson*
The volumes cover classical general relativity, quantum gravity and quantum cosmology, canonical formulation and the initial value problem, topology and geometry of spacetime and fields, mathematical and physical cosmology, and black hole physics and astrophysics.
Vol 1: 1993 448 pp. 45266-X Hardcover $69.95  
Vol 2: 1993 384 pp. 45267-8 Hardcover $59.95

**Computational Geometry in C**
*Joseph O'Rourke*
Covers the basic techniques used in computational geometry—polygon triangulations, convex hulls, Voronoi diagrams, and arrangements used in the design of geometry algorithms.
1994 320 pp. 44034-3 Hardcover $59.95  
44592-2 Paper $24.95

**An Introduction to Homological Algebra**
*Charles A. Weibel*
Paints a portrait of the subject of homological algebra as it exists today. It helps break down the barrier between experts and casual users of homological algebra.
*Cambridge Studies in Advanced Mathematics 38*
1994 350 pp. 43500-5 Hardcover $74.95

**Creating Modern Probability**
*Its Mathematics, Physics and Philosophy in Historical Perspective*  
*Jan Von Plato*
Charts the history and development of modern probability theory. It traces the development of probabilistic concepts and theories in statistical and quantum physics.
*Cambridge Studies in Probability, Induction and Decision Theory*
1994 333 pp. 44403-9 Hardcover $59.95

**Computational Algebraic Geometry and Commutative Algebra**
*Edited by David Eisenbud and Lorenzo Robbiano*
Represents the state of the art in computational algebraic geometry and encapsulates many of the most interesting trends and developments in the field.
1993 309 pp. 44218-4 Hardcover $49.95

Available in bookstores or from

CAMBRIDGE UNIVERSITY PRESS

40 West 20th Street, New York, NY 10011-4211  
Call toll-free 800-872-7423  
MasterCard/VISA accepted.  
Prices subject to change.
**Generating Knowledge with Academic Press**

**The History of Mathematics**

**Volume III**

**Eberhard Knobloch and David E. Rowe**

This volume addresses the historiographical and philosophical issues involved in determining the meaning of mathematical history. It also traces the convoluted development of the ideas of differential geometry and analysis, and discusses the structure and interaction of mathematical communities through studies of the social fabric of the mathematical communities of the U.S. and China.

April 1994, c. 453 pp., $55.00 (tentative)/ISBN: 0-12-599663-2

**Generating Functionology**

**SECOND EDITION**

**Herbert S. Wilf**

This Second Edition includes several new areas of application, including the cycle index of the symmetric group, permutations and square roots, counting polyominoes, and exact covering sequences. The book provides a clear, unified introduction to the basic enumerative applications of generating functions, and includes exercises and solutions, many new, at the end of each chapter. An appendix on using the computer algebra programs MAPLE® and Mathematica® to generate functions is also included.

January 1994, 228 pp., $39.95/ISBN: 0-12-751956-4

Mathematica® is a registered trademark of Wolfram Research, Inc.

MAPLE® is a registered trademark of Waterloo Maple Software

---

**Finite Elements for Analysis and Design**

**J.E. Akin**

A Volume in the COMPUTATIONAL MATHEMATICS AND APPLICATIONS Series

The finite element method (FEM) is an analysis tool for problemsolving used throughout applied mathematics, engineering, and scientific computing. **Finite Elements for Analysis and Design** provides a thoroughly revised and up-to-date account of this important tool and its numerous applications, with added emphasis on basic theory. Numerous worked examples are included to illustrate the material.

Paperback: $39.95/ISBN: 0-12-047654-1

Casebound: $79.00/ISBN: 0-12-047653-9


Includes a disk with FORTRAN code for the programs cited in the text.

**Catalan’s Conjecture**

**Are 8 and 9 the Only Consecutive Powers**

**Paulo Ribenboim**

This fully accessible and self-contained text provides a thorough historical study of the efforts of mathematicians to solve Catalan’s problem. Topics covered include divisibility conditions and analytical methods. This book features a comprehensive bibliography and an appendix on Catalan’s equation and powerful numbers, and includes many beautiful results of classical number theory not found in any other book.

February 1994, 384 pp., $64.95/ISBN: 0-12-587170-8

**Stochastic Orders and Their Applications**

**Moshe Shaked and J. George Shanthikumar**

A Volume in the PROBABILITY AND MATHEMATICAL STATISTICS Series

Stochastic orders and inequalities are being used at an accelerated rate in many diverse areas of probability and statistics. This book provides the first unified, systematic, and accessible treatment of stochastic orders, addressing the growing importance of these orders with the presentation of numerous results that illustrate their usefulness and applicability. Eleven insightful chapters emphasize the applications by specialists in probability and statistics, economics, operations research, and reliability theory. Applications include multivariate variability, epidemics, comparisons of risk and risk aversion, scheduling, and systems reliability theory.

February 1994, c. 512 pp., $79.95/ISBN: 0-12-638160-7
Recent Advances in Real Algebraic Geometry and Quadratic Forms

William B. Jacob, Tsit-Yuen Lam, and Robert O. Robson, Editors

Volume 155

The papers in this volume grew out of a year-long program in “Real Algebraic Geometry and Quadratic Forms”, held at the University of California at Berkeley during the 1990–1991 academic year. This valuable collection of research articles by top workers serves as a record of current developments in these areas and as a tribute to the fruitful interaction between them. Students and researchers alike will find this book a useful reference, with articles ranging from the technical to the expository. Also included are summaries of the current developments in several subdisciplines and indications of new research directions.

1991 Mathematics Subject Classification: 00, 11, 14
Individual member $34, List price $57, Institutional member $46
To order, please specify CONM155/NA

The Structure of Relation Algebras Generated by Relativizations

Steven R. Givant

Volume 156

This book aims to analyze the structure of relation algebras that are generated by relativized subalgebras. As examples of their potential for applications, the main results are used to establish representation theorems for classes of relation algebras and to prove existence and uniqueness theorems for simple closures. This book is well written and accessible to those who are not specialists in this area. In particular, it contains two introductory chapters on the arithmetic and the algebraic theory of relation algebras. This book is suitable for use in graduate courses on algebras of binary relations or algebraic logic.

1991 Mathematics Subject Classification: 03, 08
Individual member $20, List price $34, Institutional member $27
To order, please specify CONM156/NA

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5904, Boston MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
Elliptic Curves and Related Topics

Hershy Kisilevsky and M. Ram Murty, Editors
Volume 4

This book represents the proceedings of a workshop on elliptic curves held in St. Adele, Quebec, in February 1992. Containing both expository and research articles on the theory of elliptic curves, this collection covers a range of topics, from Langlands’ theory to the algebraic geometry of elliptic curves, from Iwasawa theory to computational aspects of elliptic curves. This book is especially significant in that it covers topics comprising the main ingredients in Andrew Wiles’s recent result on Fermat’s Last Theorem.

1991 Mathematics Subject Classification: 11
Individual member $33, List price $55, Institutional member $44
To order, please specify CRMP/4NA

Measure-Valued Processes, Stochastic Partial Differential Equations, and Interacting Systems

D. A. Dawson, Editor
Volume 5

Several papers are devoted to different aspects of measure-valued branching processes (also called superprocesses). Some new classes of these processes are described, including branching in catalytic media, branching with change of mass, and multilevel branching. Sample path and spatial clumping properties of superprocesses are also studied. Several papers are also devoted to particle systems studied in statistical physics and to stochastic partial differential equations which arise as hydrodynamic limits of such systems. With overview articles on some of the important new developments in these areas, this book would be an ideal source for an advanced graduate course on superprocesses.

1991 Mathematics Subject Classification: 60
Individual member $35, List price $59, Institutional member $47
To order, please specify CRMP/5NA

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
AMERICAN MATHEMATICAL SOCIETY

Please read the reverse side of this form to determine what membership category you are eligible for. Then fill out this application and return it as soon as possible.

Family Name First Middle

Place of Birth ..........................................................

Date of Birth ..........................................................

Day Month Year

If formerly a member of AMS, please indicate dates ..................................

Check here if you are now a member of either MAA □ or SIAM □

Degrees, with institutions and dates ..................................

Present position ..................................................

Firm or institution ..................................................

City State Zip/Country

Primary Fields of Interest (choose five from the list at right)

Secondary Fields of Interest (choose from the list at right)

Address for all mail ..................................................

Telephone number(s) ..................................................

Electronic address ..................................................

Signature

Prepayment Methods and Mailing Addresses

All payments must be in U.S. Funds.

Send checks, money orders, UNESCO coupons to American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904

To use VISA or MasterCard, fill in information requested and mail to American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248 or call (401) 455-4000 or 1-800-321-4AMS.

For Foreign Bank Transfers: The name and address of the AMS bank is State Street Bank and Trust Company, 22 Franklin St., ABA #011000028, Account #0125-262-3, Boston, MA 02110.

VISA □ MasterCard □ ............................................. Account number Expiration date

Application for Membership 1994

(January–December)

Date .................. 19 ...........................

Fields of Interest

If you wish to be on the mailing lists to receive information about publications in fields of mathematics in which you have an interest, please consult the list of major headings below. These categories will be added to your computer record so that you will be informed of new publications or special sales in the fields you have indicated.

EME Education/Mathematics Education

00 General

01 History and biography

03 Mathematical logic and foundations

04 Set theory

05 Combinatorics

06 Order, lattices, ordered algebraic structures

08 General algebraic systems

11 Number theory

12 Field theory and polynomials

13 Commutative rings and algebras

14 Algebraic geometry

15 Linear and multilinear algebra; matrix theory

16 Associative rings and algebras

17 Nonassociative rings and algebras

18 Category theory, homological algebra

19 K-theory

20 Group theory and generalizations

22 Topological groups, Lie groups

26 Real functions

28 Measure and integration

30 Functions of a complex variable

31 Potential theory

32 Several complex variables and analytic spaces

33 Special functions

34 Ordinary differential equations

35 Partial differential equations

36 Finite differences and functional equations

37 Sequences, series, summability

38 Approximations and expansions

42 Fourier analysis

43 Abstract harmonic analysis

44 Integral transforms, operational calculus

45 Integral equations

46 Functional analysis

47 Operator theory

49 Calculus of variations and optimal control; optimization

50 Geometry

51 Convex and discrete geometry

52 Topological groups, Lie groups

54 General topology

55 Algebraic topology

57 Manifolds and cell complexes

58 Global analysis, analysis on manifolds

60 Probability theory and stochastic processes

62 Statistics

65 Numerical analysis

68 Computer science

70 Mechanics of particles and systems

73 Mechanics of solids

76 Fluid mechanics

78 Optics, electromagnetic theory

80 Classical thermodynamics, heat transfer

81 Quantum theory

82 Statistical mechanics, structure of matter

83 Relativity and gravitational theory

85 Astronomy and astrophysics

88 Geophysics

90 Economics, operations research, programming, games

92 Biology and other natural sciences, behavioral sciences

93 Systems theory, control

94 Information and communication, circuits

M4NO
Membership Categories

Please read the following to determine what membership category you are eligible for, and then indicate below the category for which you are applying.

For ordinary members whose annual professional income is below $45,000, the dues are $84; for those whose annual professional income is $45,000 or more, the dues are $112.

The CMS cooperative rate applies to ordinary members of the AMS who are also members of the Canadian Mathematical Society and reside outside of the U.S. For members whose annual professional income is $45,000 or less, the dues are $71; for those whose annual professional income is above $45,000, the dues are $95.

For a joint family membership, one member pays ordinary dues, based on his or her income; the other pays ordinary dues based on his or her income, less $20. (Only the member paying full dues will receive the Notices and the Bulletin as a privilege of membership, but both members will be accorded all other privileges of membership.)

Minimum dues for contributing members are $168.

For either students or unemployed individuals, dues are $28, and annual verification is required.

The annual dues for reciprocity members who reside outside the U.S. and Canada are $56. To be eligible for this classification, members must belong to one of those foreign societies with which the AMS has established a reciprocity agreement, and annual verification is required. Reciprocity members who reside in the U.S. or Canada must pay ordinary member dues ($84 or $112).

The annual dues for category-S members, those who reside in developing countries, are $16. Members can choose only one privilege journal. Please indicate your choice below.

Members can purchase a multi-year membership by prepaying their current dues rate for either two, three, four or five years. This option is not available to category-S, unemployed, or student members.

1994 Dues Schedule (January through December)

For any category of membership where more than one dues level is given, see the above for descriptions of Members’ Categories.

Ordinary member ........................................... $84 $112

CMS Cooperative rate ................................... $71 $95

Joint family member (full rate) ............................... $84 $112

Joint family member (reduced rate) ......................... $64 $92

Contributing member (minimum $168) ....... $168

Student member (please verify) ............................... $28

Unreciprocity member (please verify) .............. $28

Reciprocity member (please verify) ....................... $56 $84 $112

Category-S member ................................. $64 $84 $112

Multi-year membership ................................. $ ....... for ........ years

1 Student Verification (sign below)

I am a full-time student at ......................................................... currently working toward a degree.

2 Unemployed Verification (sign below) I am currently unemployed and actively seeking employment. My unemployment status is not a result of voluntary resignation or of retirement from my last position.

3 Reciprocity Membership Verification (sign below) I am currently a member of the society indicated on the right and am therefore eligible for reciprocity membership.

4 □ send NOTICES □ send BULLETIN

Reciprocating Societies

□ Allahabad Mathematical Society
□ Asociación Matemática Española
□ Australian Mathematical Society
□ Berliner Mathematische Gesellschaft e.V.
□ Calcutta Mathematical Society
□ Croatian Mathematical Society
□ Danish Mathematical Society
□ Deutsche Mathematiker-Vereinigung e.V.
□ Edinburgh Mathematical Society
□ Egyptian Mathematical Society
□ Gesellschaft für Angewandte Mathematik und Mechanik
□ Glasgow Mathematical Association
□ Indian Mathematical Society
□ Iranian Mathematical Society
□ Irish Mathematical Society
□ Islenzka Staraiofærfelagið
□ Israel Mathematical Union
□ János Bolyai Mathematical Society
□ Korean Mathematical Society
□ London Mathematical Society
□ Malaysian Mathematical Society
□ Mathematical Society of Japan
□ Mathematical Society of the Philippines
□ Mathematical Society of the Republic of China
□ Nepal Mathematical Society
□ New Zealand Mathematical Society
□ Nigerian Mathematical Society
□ Norwegian Mathematical Society
□ Österreichische Mathematische Gesellschaft
□ Polskie Towarzystwo Matematycznne
□ Punjab Mathematical Society
□ Ramanujan Mathematical Society
□ Real Sociedad Matemática Española
□ Sociedad Colombiana de Matemática
□ Sociedad de Matemática de Chile
□ Sociedad Matemática de la Republica Dominicana
□ Sociedad Matemática Mexicana
□ Sociedade Brasileira de Matemática
□ Sociedade Brasileira de Matemática Aplicada e Computacional
□ Sociedade Panameña de Matemática
□ Sociedade Portuguesa de Matemática
□ Societat Catalana de Matemàtiques
□ Société de Mathématiques Appliquées et Industrielles
□ Société Mathématique de Belgique
□ Société Mathématique de France
□ Société Mathématique Suisse
□ Southeast Asian Mathematical Society
□ Slovenian Mathematical Society
□ Svenska Matematikersamfundet
□ Union Mathematica Argentina
□ Union of Bulgarian Mathematicians
□ Union of Czechoslovak Mathematicians and Physicists
□ Unione Matematica Italiana
□ Vijnana Parishad of India
□ Wiskundig Genootschap

Signature
Order Form

Ordered by:
Name
Address

Mail to (if different):
Name
Address

City State Zip
Country
Code

City State Zip
Country
Code

For orders with remittances:
American Mathematical Society
P. O. Box 5904
Boston, MA 02206-5904
401-455-4000

For VISA or MasterCard orders:
American Mathematical Society
P. O. Box 6248
Providence, Rhode Island 02940-6248
800-321-4AMS (321-4267)

<table>
<thead>
<tr>
<th>Qty</th>
<th>Code</th>
<th>Title</th>
<th>Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optional delivery by air to foreign addresses, add $6.50 per copy.

Residents of Canada, please include 7% GST. Total due $

___ Check or Money Order ___ VISA ___ MasterCard

Card Number_________________________ Expiration Date_________________

Signature__________________________

CHARGE BY PHONE IN THE UNITED STATES AND CANADA 800-321-4AMS (321-4267)

Customers in these areas should request price information and order directly from the indicated distributors: EUROPE, MIDDLE EAST, AFRICA: Oxford University Press, Walton Street, Oxford OX2 6DP England. Tel: 0865 56767, Telefax 0865 56646, Telex 837330 OXPRESG; exclusive distributor of AMS books. INDIA: International Book Agency, Flat No. 2, Nirala Market, Nirala Nagar, Lucknow, 226-020, India. Tel: 70506, Fax Nos: 79079, 242061, 230376; exclusive distributor of AMS books. JAPAN: Maruzen Co. Ltd., P. O. Box 5050, Tokyo International 100-31, Japan. Tel. Tokyo: 03-3272-7211, Telex J26516; exclusive distributor of AMS books and journals.

Please send me information about AMS membership
___ individual membership
___ institutional membership
___ corporate membership
___ institutional associate

Publications, videotapes, and miscellaneous items are sent via UPS to U.S. residential addresses, RPS or UPS to U.S. business addresses, and as printed matter elsewhere unless another delivery method is requested. Charges for surface delivery are paid by the AMS. For air delivery outside the U.S., please include an additional $6.50 per item. Software is sent via UPS Second Day Air to U.S. addresses and via U.S. Postal Service air parcel post to addresses outside the United States. Add shipping and handling for software: $8 per order in the U.S. and Canada; outside the U.S. and Canada $35 per order ($15 per order for AMS-TeX and/or AMSFonts only). Journal back numbers, Mathematical Reviews indexes, and review volumes are sent via surface mail to any destination unless air delivery is requested. Postage for surface mail is paid by the AMS. Air delivery rates, which will be quoted upon request, must be paid by the purchaser.
Change of Address

Members of the Society who move or who change positions are urged to notify the Providence Office as soon as possible.

Journal mailing lists must be printed four to six weeks before the issue date. Therefore, in order to avoid disruption of service, members are requested to provide the required notice well in advance.

Besides mailing addresses for members, the Society’s records contain information about members’ positions and their employers (for publication in the Combined Membership List). In addition, the AMS maintains records of members’ honors, awards, and information on Society service. Information of the latter kind appears regularly in Notices.

When changing their addresses, members are urged to cooperate by supplying the information requested below. The Society’s records are of value only to the extent that they are current and accurate.

If your address has changed or will change within the next two or three months, please fill out this form, supply any other information appropriate for the AMS records, and mail to the address given below.

Name: _________________________________________ Customer code: ________________________________________

Change effective as of: ________________________________________________________________________________

Old mailing address: __________________________________________

NEW mailing address: ________________________________________

New position: __________________________________________________

If mailing address is not that of your employer, please supply the following information:

New employer: __________________________________________

Location of employer: ________________________________________

City State/Province Country Zip Code

Telephone number(s): ________________________________________

Electronic address(es): _______________________________________

Recent honors and awards: ______________________________________

Personal items for publication in Notices: _____________________________________________________________

Mail completed form to:
Customer Services, AMS, P.O. Box 6248, Providence, RI 02940
or send the above information by e-mail to:
amsmem@math.ams.org or cust-serv@math.ams.org
An Introduction to
Sato’s Hyperfunctions
Mitsuo Morimoto

Volume 129

This book is a translation, with corrections and an updated bibliography, of Morimoto’s 1976 book on the theory of hyperfunctions originally written in Japanese. Since the time that Sato established the theory of hyperfunctions, there have been many important applications to such areas as pseudodifferential operators and S-matrices. Assuming as little background as possible on the part of the reader, Morimoto covers the basic notions of the theory, from hyperfunctions of one variable to Sato’s fundamental theorem. This book provides an excellent introduction to this important field of research.

1991 Mathematics Subject Classification: 46; 32, 58
Individual member $52, List price $87, Institutional member $70
To order, please specify MMONO/129NA

Cobordisms and
Spectral Sequences
V. V. Vershinin

Volume 130

Cobordism is one of the most basic notions of algebraic topology. This book is devoted to spectral sequences related to cobordism theory: the spectral sequence of a singularity, the Adams-Novikov spectral sequence, and applications of these and other sequences to the investigation of cobordism rings.

1991 Mathematics Subject Classification: 55
ISBN 0-8218-4582-9, 97 pages (hardcover), October 1993
Individual member $37, List price $62, Institutional member $50
To order, please specify MMONO/130NA

All prices subject to change. Free shipment by surface; for air delivery, please add $6.50 per title. Prepayment required. Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02205-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.
**Advance Registration/Housing Form**

Please complete this form and return it with your payment to:
Mathematics Meetings Service Bureau
P. O. Box 6887
Providence, RI 02940
Tel: (401) 455-4143

**DEADLINES:**
- Ordinary advance registration: Residence Hall Reservations: June 18
- Final advance registration (no housing): July 14
  (Registration on-site; please call for availability: (401) 455-4143.)
- Residence Hall Changes & Cancellations: August 8
- 90% Refund on Residence Hall Package: August 8
- 50% Refund on Advance Registration: August 11

---

Name
Surname
First
Middle Initial

Mailing Address ______________________________________________________________________________________ __
City----------------------------State------------------Zip--------Country ---------------------------
Telephone _________________________ e-mail address-------------------------------------------------------

Name Badge Information (affiliation):
________________________________________________________________________________________

**REGISTRATION:** before June 18: $120 after June 18: $140

Amount enclosed for registration $ ____________

**ACCOMMODATIONS:** (Participants interested in hotel housing are advised to make their own arrangements.)

**Middlebrook Hall, University of Minnesota, August 12, 13 and 14:** Purchase of a room and board package is required by the University of Minnesota, and the price of the meals (breakfast and lunch) is included in the rates below. Full prepayment is required. Please make checks payable to AMS; VISA and MasterCard will also be accepted. Acknowledgment of your residence hall reservations will be sent to address indicated above. Participants who wish to reserve accommodations for the Mathfest should fill out the Advance Registration/Housing Form also located in this issue. Note: There is a maximum of two adults or two adults and one child (not including infants in arms) per room. All children must reside in a room with a parent.

<table>
<thead>
<tr>
<th>Rates: (per day)</th>
<th>Adults:</th>
<th>$33.50 single</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Children:</td>
<td>$13.60 (per person) in rollaway beds only</td>
</tr>
<tr>
<td></td>
<td>$29.50 (per person) double-two adults</td>
<td></td>
</tr>
</tbody>
</table>

Special housing requests: such as physically challenged needs, etc.: __________________________________________________ 

I am female __ male __ and will arrive on (date) ___________ at ___ a.m./p.m. and depart on ___________ at ___ a.m./p.m.
Shareer's full name: ____________________________ arr. _____ dep. _____ female/male ____ child (age) ____ spouse __
I will need a parking permit □

Amount enclosed for housing $ ____________
Total amount enclosed: $ ____________

**METHOD OF PAYMENT:**

□ Check (payable to AMS; Canadian and foreign checks must be marked "In US Funds")

______________________________________________________________

Signature

□ If workshop is fully subscribed, please place my name on the waiting list, pending a cancellation. I understand that my payment will not be processed until a place for me has been secured.

---

For office use only:

<table>
<thead>
<tr>
<th>Codes:</th>
<th>Options:</th>
<th>Residence:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dates:</th>
<th>Room Deposit</th>
<th>Amount Paid:</th>
</tr>
</thead>
</table>

---
MAA Minicourse Advance Registration Form
Minneapolis, Minnesota
August 14–17, 1994

To register for MAA Minicourse(s), please complete THIS FORM or a PHOTOCOPY OF THIS FORM and return it with your payment to:

Minicourse Coordinator
Mathematical Association of America
1529 Eighteenth Street, N.W.
Washington, DC 20036
Telephone: 202-387-5200

(Please print) Surname First Middle Telephone: _______________________
Street address City State Zip

• Deadline for MAA Minicourse advance registration: June 11, 1994. (After this date, potential participants are encouraged to call the MAA headquarters at 800-331-1622 for availability of Minicourses.)

• Deadline for cancellation in order to receive a 50% refund: August 11, 1994*.

• Each participant must fill out a separate Minicourse Advance Registration Form.

• Enrollment is limited to two Minicourses, subject to availability.

• Please complete the following and send both form and payment to the Minicourse Coordinator at the above address:

   I would like to attend ☐ 1 Minicourse ☐ 2 Minicourses
   Please enroll me in MAA Minicourse(s): #____ and #____
   In order of preference, my alternatives are: #____ and #____

• PAYMENT

   Check enclosed: $_______ Credit card type: ☐ MasterCard ☐ Visa
   Credit card #: ___________________________ Expiration date: ____________

   Your Employing Institution Signature (as it appears on credit card)

* ☐ I plan on registering in advance for the Minneapolis Mathfest meetings ONLY in order to attend the MAA Minicourse(s) indicated above. It is my understanding that should the course(s) of my choice be fully subscribed, a full refund of the Mathfest meetings advance registration fee will be made.

* If the box above is not checked off, the Mathfest advance registration fee will be processed and the 50% refund rule will apply. Your intention regarding the Mathfest registration should be made clear when cancelling a Minicourse registration. If no instruction is given, the Mathfest registration will also be cancelled. Advance Registration/Housing forms for the Mathfest should be mailed to the Mathematics Meetings Service Bureau in Providence.

See course descriptions, enrollment limits, and registration fees on the reverse.
Minicourse #1: Building discrete and continuous ecological models using the SLAM simulation language. James V. Caristi, Valparaiso University. Part A: Monday, 1:30 p.m.-3:30 p.m.; Part B: Tuesday, 4:00 p.m.-6:00 p.m. Enrollment limit: 50; registration fee: $45.

This minicourse will provide a crash course in using the simulation language SLAM for environmental modeling. SLAM supports discrete and/or continuous modeling, automatically and easily generates appropriate statistics, and can produce animations. We will develop a model of a leaf surface ecosystem involving competing microorganisms, arrivals and departures, temperature changes, moisture presence and absence, and acid rain. This is a basis for a project-oriented junior-senior level course for science majors. Prerequisite: proficiency with a mouse.

Minicourse #2: Calculus from graphical, numerical and symbolic points of view. Arnold M. Ostebee and Paul Zorn, St. Olaf College. Part A: Monday, 1:30 p.m.-3:30 p.m.; Part B: Tuesday, 4:00 p.m.-6:00 p.m. Enrollment limit: 50; registration fee: $45.

This minicourse introduces Calculus from Graphical, Numerical and Symbolic Points of View, a calculus text developed at St. Olaf College with support from the NSF and FIPSE. This text complements the standard symbolic/algebraic approach to the calculus with pervasive and systematic treatment of geometric and numerical points of view. Technology is used to foster and facilitate graphical and numerical thinking. This minicourse will include brief overviews of philosophy, pedagogy, and mathematical content, hands-on work on textbook problems; group discussion and critique; practical advice; and reports from experienced field-testers. Participants will be supplied copies of the text. Graphing calculators will be available on site; participants are encouraged to bring their own.

Minicourse #3: Combinatorics via functional equations. Donald R. Snow, Brigham Young University. Part A: Monday, 1:30 p.m.-3:30 p.m.; Part B: Tuesday, 4:00 p.m.-6:00 p.m. Enrollment limit: 60; registration fee: $45.

We will show that many of the ad hoc methods of combinatorics can be unified by a simple functional equations approach. This approach yields the sums of the powers of the integers (and many generalizations), combinations and permutations (with many types of repetitions), and other standard combinatorial functions, as well as many new results. The method uses the combinatorial description to find a functional equation and then finds the function from that. It gives a means of getting many of the identities, properties, and generating functions, and shows how the functions are related to each other. Spinoffs from the basic approach include the Bernoulli and Euler polynomials, orthogonal polynomials, and other special functions. An understanding of basic combinatorics, calculus, and power series is sufficient background for this minicourse. The small amount of material on functional equations needed will be developed in the course.

Minicourse #4: Multivariable calculus using the Harvard Calculus Consortium materials. Thomas W. Tucker, Colgate University. Part A: Monday, 3:45 p.m.-5:45 p.m.; Part B: Wednesday, 1:45 p.m.-3:45 p.m. Enrollment limit: 50; registration fee: $45.

The NSF-supported Harvard Calculus Consortium has completed a textbook in single variable calculus and is working on materials for a multivariable course. These materials have been used at a number of institutions. The presenters will give the participants an overview of those materials and their implementation, as well as direct experience with selected portions of the course. Participants will have the opportunity to work in groups on exercises from the text and discuss the pedagogical implications. The presenters will be Daniel Flath, University of South Alabama, Deborah Hughes Hallett, Harvard University, Patti Frazer Lock, St. Lawrence University; John Lucas, University of Wisconsin-Oshkosh; and the organizer.

Minicourse #5: Mathematical models of epidemics. Sonja Sandberg, Framingham State College. Part A: Monday, 3:45 p.m.-5:45 p.m.; Part B: Wednesday, 1:45 p.m.-3:45 p.m. Enrollment limit: 80; registration fee: $45.

This minicourse will discuss the many ways that mathematics has been and can be used to describe the behavior of epidemics or infectious diseases. Examples of models appropriate for undergraduate mathematics courses, such as probability and statistics, differential equations, finite mathematics, and mathematical modeling will be presented. The history of quantitative descriptions of epidemic trends will be covered using malaria as an example. Focusing on AIDS, models for risk to an individual, population models for predicting future trends and the utility of mandatory premartial screening for the AIDS virus will be discussed. Homework will be assigned between the two sessions.


As discrete mathematics courses impact the college curricula, some students express concern about the apparent fragmented nature of the concepts. To dispel this feeling of fragmentation, certain unifying themes are (1) the function—with its role in enumeration, the analysis of algorithms, finite state machines, and the preservation of discrete structures; and (2) enumeration—as it reinforces the study of partial orders, equivalence relations, graph theory, and summation formulas.

Minicourse #7: Open problems in plane geometry. William O. J. Moser, McGill University; Janos Pach, City College of New York and Mathematical Institute of the Hungarian Academy of Sciences. Part A: Tuesday, 1:00 p.m.-3:00 p.m.; Part B: Wednesday, 4:00 p.m.-6:00 p.m. Enrollment limit: 80; registration fee: $45.

Drawing figures (graphs) in the plane is one of the oldest human activities. Yet, conventional graph theory and geometry often break down at the simplest possible questions about graph drawings. The course will survey some classical questions of this kind in recreational geometry (e.g. Turan's brick factory problem and Conway's thrackle conjecture) some of which have important practical applications. We shall also suggest some promising new approaches to these problems (using elementary results from combinatorics and topology), but in all of the results discussed there will be plenty of room for improvement. The non-specialist is just as likely to make progress in this field as the organizers! Participants can expect to leave with an understanding of many problems which they and their students can investigate in the future.

Minicourse #8: The Math Modeling/PreCalculus Reform Project: using discrete mathematical models to motivate mathematics. Sheldon P. Gordon, Suffolk Community College; B. A. Fusaro, Salisbury State University. Part A: Tuesday, 1:00 p.m.-3:00 p.m.; Part B: Wednesday, 4:00 p.m.-6:00 p.m. Enrollment limit: 40; registration fee: $45.

The Math Modeling/PreCalculus Reform Project, under support from the NSF, is developing an alternative to precalculus courses which emphasizes the broad applicability of mathematics using mathematical modeling based on methods such as difference equations, data analysis, probability, and matrix algebra. The ideas and skills needed for calculus are developed in the context of solving interesting and important problems. This minicourse will provide an overview of the project and its goals as well as illustrations and hands-on experience with some specific models. Copies of the project materials will be provided to all participants.
Advance Registration/Housing Form  
Minneapolis Mathfest  
August 15-17, 1994

Please complete this form and return to:  
Mathematics Meetings Service Bureau (MMSB)  
P. O. Box 6887  
Providence, Rhode Island 02940 U.S.A.  
401-455-4143; 1-800-321-4267, Ext. 4143

DEADLINES
Ordinary Advance Registration (including tickets)  
June 11, 1994
Hotel/Residence Hall Reservations through MMSB  
June 11, 1994
Final Advance Registration (no housing or tickets)  
July 14, 1994
Hotel Changes/Cancellations through MMSB  
July 5, 1994
Residence Hall Changes/Cancellations through MMSB  
August 8, 1994
90% Refund on Residence Hall Package  
August 8, 1994 (no refunds after this date)
50% Refund on Banquets & Tours*  
August 1, 1994 (no refunds after this date)
50% Refund on Mathfest Advance Registration*  
August 11, 1994 (no refunds after this date)

REGISTRATION FEES
Advance Registration by  
July 14, 1994

MINNEAPOLIS MATHFEST
Member of AMS, CMS, MAA, IIME $ 125
* Emeritus Member of AMS or MAA 35
* Nonmember 194
* Students:
  High School 2
  Undergraduate 20
  Graduate 35
* High School Teachers or Librarians 35
* Third World Country Participants 35
* Unemployed 35

(N.B.: A separate form appears in this issue for advance registration for MAA Minicourses)

* See the section on "How to Register in Advance".

ADVANCE REGISTRATION SECTION:

1) (Please print) Surname First Middle Telephone

2) (Mailing address)  
(e-mail address)

☐ I do not wish my badge and program to be mailed; however, the mailing address for my acknowledgment is given above.

3) Badge information: Affiliation  
MR Classification #

Names for Guest Badges:  

4) Member of AMS ☐ CMS ☐ MAA ☐ IIME ☐ Nonmember ☐ Member of other organizations: AWM ☐ NAM ☐

5) Students: Grad ☐ Undergrad ☐ High School ☐ 6) Emeritus ☐ Third World ☐ Unemployed ☐ Librarian ☐ HS Teacher ☐

7) Mathfest fee $  8) Hotel Deposit (if applicable) $  9) Dormitory Payment $

10) Subtotal of Payments for Social Events (see reverse) $  11) Total amount enclosed for 7 through 10 $

Method of Payment: ☐ Credit Card (Visa or MasterCard only) ☐ Purchase Order (original institutional PO attached)

☐ Check (payable to AMS). Canadian checks must be marked "U.S. Funds".
Credit card type:  
Card number  
Expiration date  
If this is your credit card, please print your name as it appears on the credit card on the line below and sign your name.
If this is not your credit card, please print card holder's name as it appears on the credit card on the line below and have the card holder sign:

☐ I plan to attend the MAA Student Workshop on Wednesday, August 17, 1994.

See reverse for registration for social events and reservations for hotel and residence halls.

For office use only:

<table>
<thead>
<tr>
<th>Codes:</th>
<th>Options:</th>
<th>Hotel:</th>
<th>Dorm:</th>
<th>Room type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates:</td>
<td>Hotel Deposit</td>
<td>Total Amt. Paid:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Special Remarks:
SOCIAL EVENTS SECTION:

<table>
<thead>
<tr>
<th>Event</th>
<th>Tickets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening Banquet:</td>
<td>$25 each</td>
</tr>
<tr>
<td>Children’s Special Event:</td>
<td>$20 each</td>
</tr>
<tr>
<td>MAA 25-Year Banquet:</td>
<td>$26 each</td>
</tr>
<tr>
<td>HME Banquet:</td>
<td>$17 each</td>
</tr>
<tr>
<td>Mississippi Dinner Cruise:</td>
<td>$26 each</td>
</tr>
<tr>
<td>Take the Plunge:</td>
<td>$32 each</td>
</tr>
<tr>
<td>Fort Snelling and Cruise:</td>
<td>$26 each</td>
</tr>
<tr>
<td>A Tale of Two Cities:</td>
<td>$16 each</td>
</tr>
<tr>
<td>A Walk on the Wildside:</td>
<td>$34 each</td>
</tr>
<tr>
<td>Wildlife at the Minnesota Zoo:</td>
<td>$22 each</td>
</tr>
<tr>
<td>Shop 'til You Drop:</td>
<td>$13 each</td>
</tr>
<tr>
<td>Gardens and Goodies:</td>
<td>$18 each</td>
</tr>
<tr>
<td>Historic Stillwater:</td>
<td>$34 each</td>
</tr>
</tbody>
</table>

Total enclosed for social events: $__________

* Children prices: Fort Snelling and Cruise - 11 yrs. and younger; Wildlife at the Minnesota Zoo - 12 yrs. and younger

ACCOMMODATION SECTION: Where applicable, please check off one of the following:

- [ ] I will make reservations at a local hotel/motel directly. Name of hotel/motel: ____________________________
- [ ] I live in the area or will be staying privately with family or friends in the area.
- [ ] I plan to share a room with ____________________________ who is making reservations at the Holiday Inn Metrodome.

University of Minnesota

NOTE: Full prepayment for room and board is required. Purchase of a room and board package (breakfast and lunch) is required by the University of Minnesota, and the price of meals is included in the rates below. All rates are per person. Mathfest participants may occupy the residence hall rooms from Saturday, August 13 to Thursday, August 18, 1994 only. Acknowledgment of your residence hall reservations will be sent to address indicated on reverse. Please circle applicable rates listed below and enter the totals, where applicable. A maximum of two adults or two adults and one child (not including infants) is allowed to a room. All children under 12 years will be given rollaway beds and must reside in a room with a parent. All children 12 years and over pay adult rates. There is no charge for infants in arms. The grand total amount should be inserted in #9 on the reverse.

- [ ] (number of) Adults - $33.50 (single), $29.50 (double-two adults) × _______ (nights) = $_______
- [ ] (number of) Children (under 12) - $13.60 × _______ (nights) = $_______
- [ ] (number of) Computer room usage - $3.00 per week = $_______

Grand total cost of residence hall package = $_______

[ ] I am part of the HME student group and wish to be housed with others in the group.
[ ] I will need a parking permit.

Special housing requests, physically challenged needs, etc.:

I am female ___ male ___ and will arrive on (date) ______ at ______ a.m./p.m., and depart on (date) ______ at ______ a.m./p.m.

SHARER(S)’ FULL NAME(S) | ARRIVAL DATE(S) | DEPARTURE DATE(S)
--------------------------|-----------------|------------------
_________________________ | _________________ | ________________
_________________________ | _________________ | ________________

Holiday Inn Metrodome

GUARANTEE REQUIREMENTS: $50 by check, or supply your VISA, MasterCard, or American Express number on the reverse side of this form, together with mailing address for confirmation of room reservation. Group rates quoted are subject to a 12% sales/occupancy tax.

Please circle room type/rate requested: (NOTE: Added rollaways are $10 each per night.)

- Single: $77
- Double(one/ two beds): $87
- Triple: $97
- Quad: $107
- Suites: $109.50 (s/d) $119.50 (t/q) + Rollaway

I will arrive on (date) ______ at ______ a.m./p.m., and depart on (date) ______ at ______ a.m./p.m.

SHARER(S)’ FULL NAME(S) | ARRIVAL DATE(S) | DEPARTURE DATE(S)
--------------------------|-----------------|------------------
_________________________ | _________________ | ________________
_________________________ | _________________ | ________________

Please list any special requests below:
THE COLLECTED PAPERS OF RAOUl BOTT

R.D. MacPherson, MIT, Cambridge, MA

The four volumes of the collected works of Raoul Bott attest to the extraordinary breadth of contributions to mathematics made by this world-renowned mathematician from Harvard. His work is especially significant in that it has brought topology to bear on so many different fields - Lie groups, differential geometry, foliations, analysis of partial differential equations, and mathematical physics. Each time he courageously embarked upon a new field, he left it significantly changed and deepened. In addition to his collected works, the author has written some “Autobiographical Fragments”, reflecting his personal charm, his forceful spirit, and his buoyant enthusiasm for life and for mathematics.

Now Available!

Volume 1: Topology and Lie Groups (the 1950’s)
1993 584 pp. Hardcover
$95.00 ISBN 0-8176-3613-7

Volume 2: Differential Operators (the 1960’s)
1994 Approx 450 pp. Hardcover
$95.00 ISBN 0-8176-3646-3

Forthcoming!

Volume 3: Foliations (the 1970’s)
Volume 4: Mathematics related to Physics (the 1980’s)
Contemporary Mathematicians

THEORETICAL METHODS IN THE PHYSICAL SCIENCES

An Introduction to Problem Solving Using MAPLE V

W. Baylis, University of Windsor, Canada

The way in which students in all fields of study learn mathematical skills is being fundamentally changed through the advent of inexpensive computers and the creation of powerful mathematical packages for symbolic manipulation, numerical approximation, and graphical representation. Teachers of mathematics through the entire calculus and applied mathematics sequence now have at their disposal a number of these tools, among which MAPLE V has become an acclaimed leader. Theoretical Methods in the Physical Sciences is a textbook that takes advantage of this technological development to teach a wider variety of more complex and realistic problems than was ever before possible.

1994 Approx. 200 pp. Softcover
$34.50 ISBN 0-8176-3715-X

ALGEBRAIC METHODS IN OPERATOR THEORY

R. Curto & P.E.T. Jorgensen, both at University of Iowa, Iowa City

This book emphasizes the use of algebraic methods and techniques in the study of operators and their applications. It includes carefully selected articles aimed at bridging different but related areas of mathematics which have only recently displayed unexpected interconnections, as well as new and exciting cross-fertilizations.

1994 Approx. 376 pp. Hardcover
$84.50 ISBN 0-8176-3745-1

SYMMETRY ORBITS

H.F. Verheyen, Antwerp, Belgium

Symmetry groups are of intense interest to mathematicians, physicists, chemists, and designers, as well as to the “philomorphs” who are attracted to the ideas of Design Science. The author of this book has beautifully illustrated active symmetry through the observations of the orbit of a plain cube as it creates an arrangement of cube replicas with overall symmetry under such a specific group. For the general reader, the beauty and utility of the resulting pictures is evident. The mathematician, scientific investigator or student will further welcome a full description of all finite symmetry groups with relevant drawings, calculations, and data.

1994 Approx. 200 pp. 207 illus. Hardcover
$75.00 (tent.) ISBN 0-8176-3661-7

Design Science Collection
A Genetic Introduction to Algebraic Number Theory

H.M. Edwards, Courant Institute, New York University, NY

FERMAT'S LAST THEOREM

A Genetic Introduction to Algebraic Number Theory

"A very interesting introduction to algebraic number theory...Using Fermat's Last Theorem as a guide, the author first leads us through the work of some of the early number theorists: Fermat, Euler, Sophie Germain, Dirichlet, and Legendre...There is an excellent set of exercises, many of them interesting and difficult."

-J.H. Silverman, Brown University, Providence, RI

Second Printing, 1993

THE ARITHMETIC OF ELLIPTIC CURVES

The theory of elliptic curves is distinguished by its long history and the diversity of methods used in its study. This book treats the arithmetic theory of elliptic curves in its modern formulation, through the use of basic algebraic number theory and algebraic geometry.

CONTENTS: Algebraic Varieties The Geometry of Elliptic Curves The Formal Group of an Elliptic Curve Elliptic Curves over Finite Fields Elliptic Curves over 

C Elliptic Curves over Local Fields Elliptic Curves over Global Fields Integral Points on Elliptic Curves Computing the Mordell-Weil Group Appendices

1986/400 PP., 13 ILLUS./HARDCOVER/$49.00/ISBN 0-387-96311-1

GRADUATE TEXTS IN MATHEMATICS, VOLUME 106

G. Cornell, University of Connecticut, Storrs, CT and J.H. Silverman, Boston University, Boston, MA

ARITHMETIC GEOMETRY

This book is the result of a conference on arithmetic geometry, held July 30 - August 10, 1984 at the University of Connecticut, the purpose of which was to provide a coherent overview of the subject. This subject has enjoyed a resurgence in popularity due in part to Faltings' proof of Mordell's conjecture. Included are extended versions of almost all of the instructional lectures and a translation into English of Faltings' ground-breaking paper.


W. Scharlau and H. Opolka, both of Universitat Munster, Germany

FROM FERMAT TO MINKOWSKI

Lectures on the Theory of Numbers and Its Historical Development

A genealogical introduction to number theory, tracing its growth from Fermat to Minkowski. By following the historical development, the student acquires a familiarity with many of the classical questions of number theory, and is made aware of how one question, through increasing knowledge of the subject and refinement of the techniques, leads to new questions and new answers.

The discussion of the historical background and the lives of several eminent number theorists - Fermat, Euler, Lagrange, Legendre, Gauss, Fourier, Dirichlet, Hermite, Minkowski complement the mathematical exposition and sensitize the student to the interplay between abstract, "objective" developments and personal contributions.


UNDERGRADUATE TEXTS IN MATHEMATICS