

Notices

of the American Mathematical Society

January 1996

Volume 43, Number 1

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Lake Eola, Orlando, Florida

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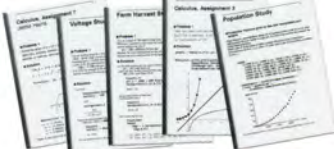
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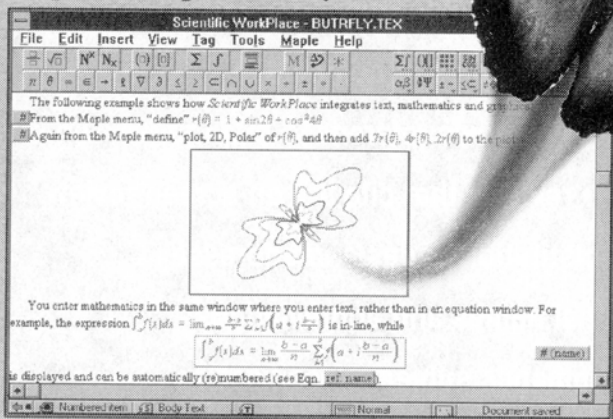
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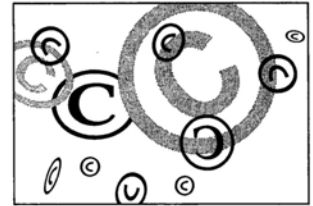
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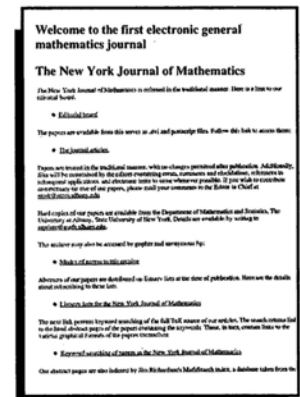
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Notices

of the American Mathematical Society

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ABOUT THE COVER

Orlando, Florida, with Lake Eola in the foreground. Orlando is the site of the 1996 Joint Mathematics Meetings, January 10-13, 1996. Photo by Richard Elliott for Tony Stone Images.

Meetings

Although the revenue and expense of the AMS program of Meetings and Conferences makes up only 3% of the Society's budget compared to the 75% portion of revenue due to publications and the 6.7% portion of revenue from individual dues, the Meetings and Conferences program touches over 14% of the 29,000 members and plays an important role in satisfying the mission of the Society (figures based on the 1994 budget).

Planning for an Annual Meeting, which is held jointly with MAA, starts many years in advance. The Joint Meetings Committee (JMC), consisting of the AMS and MAA executive directors, the secretary of the AMS and the associate secretary of the MAA, considers the mix of available sites and dates at least seven years out. The very able staff in the AMS Meetings and Conferences (M&C) Department visit sites, together with representatives of the AMS and MAA, to determine, among other things, whether the local facilities are adequate and affordable and whether there are ample hotel rooms within walking distance of the meeting location. If the JMC is satisfied that all requirements are met, it recommends that the governing bodies of AMS and MAA approve the site and dates, and they are announced in *Notices* and *Focus*.

The planning, organization, and logistics for meetings are carried out by the associate secretaries in concert with the M&C staff and in consultation with the members of the Program Committee and begin about two years before the meeting itself. The associate secretaries, who volunteer their time, work exceedingly hard to insure that the scientific program answers the demands of the members. After identifying the various components of the scientific program, the associate secretary has to consult with the Program Committee for Invited Speakers and Special Sessions. He or she also receives information from other Society organizations, such as the policy committees, which have dedicated time to the program. After accumulating all this information, (s)he spends countless hours shoe-horning the many sessions into the space and time available, being careful to insure that a Special Session on commutative algebra does not conflict with a session of contributed papers on commutative algebra or algebraic geometry. Then (s)he must find presidors for each session, including the plenary lectures and the sessions for contributed papers. I have never asked an associate secretary how many total hours is spent on such a meeting, but, based on my own experience, it is probably over one month of work when totaled.

Meanwhile, M&C staff are finalizing arrangements for registration, housing, exhibits, audio-visual equipment, room setups, catering, computers, office machines, telephones, etc. A local arrangements committee is appointed, and its members begin communicating with the staff in Providence about peculiarities of the local site. M&C staff prepare the announcements for publication in *Notices* and *Focus*. As the meeting approaches, staff receive and process requests for registration, housing, event tickets, and exhibit booths, as well as abstracts from all speakers on the program. They track all sessions on a room chart to insure there is space available and that two sessions do not get assigned to the same room at the same time. They produce the meeting program booklet and mail it out to advance registrants with their badges. Finally, they must insure that all materials needed at the meeting get shipped to the meeting site in time. Total staff time spent on this meeting exceeds 3,000 hours.

The meetings themselves would be meaningless, however, without the participation of the members who deliver papers, either as Invited Speakers, speakers at Special Sessions or sessions for contributed papers, or other sessions of the meetings. I take this opportunity to thank the participants who make the meetings possible. Even more, I thank the staff from the AMS Meetings and Conferences Department who make it their life to insure that the meetings of the Society are the best possible. Finally, I thank the associate secretaries who give freely of their time and energy to the Society and mathematics in order that the quality of the meetings are as high as possible. This thanks extends in particular to Andy Magid and Lance Small, each of whom contributed eight years to the Society and whose terms will end after the Orlando meeting.

—Robert Fossum

Letters to the Editor

On Articles in the October Issue

I am wondering if your juxtaposition of "Mathematics at Göttingen under the Nazis" by Saunders Mac Lane and "The Physical Sciences in a Changing Environment" by William C. Harris in your October 1995 issue was intentional. Read in order, they provide utterly opposing statements on the relationship of mathematics and the sciences in general to society.

On the one hand, we have Saunders Mac Lane, who argues that the greatness of the Göttingen institute was undermined by the Nazi insistence that mathematics done *in* Germany must finally be done *for* Germany. He cites Edward Tornier, a Nazi mathematician and exemplar of this attitude:

Every theory of pure mathematics has the right to exist if it is really in a position to answer concrete questions which concern real objects.... Otherwise it is...a document of Jewish-liberal confusion, born from the brains of rootless artists who by juggling with object-less definitions mislead themselves and their thoughtless public.... In the future, we shall have German mathematics.

Of course, as Mac Lane skillfully relates, having only German mathematics meant ruining the best mathematics in Germany. Göttingen's professors spent more time on a "purity" that was spontaneous and artistic (math-

ematics) than on a political purity both forced and disingenuous. So they were dismissed—a phenomenon which, according to Mac Lane, was "...a decisive demonstration of the damage done to academic and mathematical life by any subordination to populism, political pressure and proposed political principles."

Immediately following on the next page, we have words from the Swedish Natural Science Research Council regarding their symposium "Natural Sciences in Society": "After the breakdown of the cold war, it is clear that the situation for natural science has changed.... Research that before was taken for granted must be motivated in a context that the society of course understands.... It is important...[to] formulate as clearly as possible...how [natural science] relates to various aspects of society and mankind."

Following this, we have William C. Harris, who argues that we must "...reestablish the rationale for public support of the sciences as we approach the twenty-first century." Beside bar charts of the national deficit and its corresponding net interest charges, he defends the sciences by saying that they "...continue to be an essential fuel for a successful free-market economy." He calls them an "investment" and says that they offer the "economic leadership" important in the post-cold war world. Furthermore, now that "Each country can...place greater emphasis on economic growth" it is all the more important that "...a number of independent economic studies demonstrate research is essential to

wealth generation...". And that makes U. S. research universities, according to Harris, not just "unique assets" but "treasures".

A certain metaphorical consistency can be noticed here.

In Nazi Germany, the populist political principle was the ascension of the German *Volk* by means of the utter centralization of German culture and the immediate social vehicle of that centralization, the Party. Argued the Nazis: Science should drive the Party, and the Party should create new opportunities for science.

In Harris's essay, the populist political principle is the ascension of "mankind" by means of the utter dispersal of human culture (technology) and the immediate social vehicle of that dispersal, industry. Argues Harris: "...science drives technology and technology creates new opportunities for science."

And just as mathematicians in Nazi Germany were encouraged to cooperate with the Party, so too are scientists in the post-cold war age encouraged by Harris to cooperate with industry—encouraged to "place a premium" (again, that metaphor!) on "developing new approaches to research and education that work to the mutual benefit of government, industry, and universities." Those who do not "cooperate" (to use Harris's term) will be cut off; there will only continue to be "significant" research opportunities for those "prepared to address the current challenges responsibly."

This is, to borrow Mac Lane's words, "...rather hard on mathemat-

ics, and we have but the cold comfort that it is the best thing for the *Volk*.”

A cold comfort, indeed. Only slightly more disturbing than Harris’s assumption that more technology will enhance the quality of life is his identification of quality of life with wealth. And only slightly more disturbing than that is his acceptance of the question, *What’s it good for?* as the starting point for social validation of the sciences. By asking this question, he not only misunderstands the sciences but also the very mechanisms of wealth creation and social validation.

That which is valued in society is never finally the means to the end, but the end itself. To determine the value of something on the basis of what it’s good *for* is merely to subordinate it to something which neither requires nor even allows that question to be asked of it. For instance, the kiss of a lover, the smile of a child, a walk in the autumn: none of these moments even allow for such an inane question as, *What’s it good for?* precisely because they are just that, good. To make their value reliant on some future goal would be to utterly devalue them.

Mathematics is like these things. For years, speaking of it as Harris does would have been considered petty and rude. Unfortunately, it now exists in a society which is ruled by people devoid of spontaneity or art, people who view life merely as something to be gotten over and through, a means to some never-present future goal. Wealth is now “created” by a constant wheeling and dealing in “futures” (What is the *future* of science? What is the *future* of mathematics? We must prepare for the *future!*), where everything is merely worth something else and finally is worth nothing more than promissory notes. Which are worth nothing, because they, like technology, are merely promises of a future that never comes, promises that capitalize on the uprooting of the kiss, the smile, the theorem.

Perhaps the reason that Harris must address the issue of the wealth of the academic sciences is not because they have made themselves socially irrelevant but because they are all too relevant to social, political, and economic pressures and populisms. More than

any other sector of the academy, the sciences (including mathematics) have been willing to give up their own internal beauty and strength to answer the call of the For What: *for* technology, *for* state and country, *for* the Eternal Bliss and Elevated Standard of Living of all (hu)Mankind.

And this has made them poor. The wealth of the sciences comes not from what they can do for state or industry, but from what they know and the way they can think. The more the sciences demand social validation, the less socially valid they become. To wit: The current crisis in the teaching of mathematics— which comes not from mathematics losing its relevancy, but from its own increasing prostitution to that relevance, looking away from itself (towards industry, in shame) even as it teaches itself.

Students know this. They have known it in primary and secondary schools for years; they are beginning to learn it in undergraduate classrooms; they will soon know it in graduate seminars. Mathematics is losing its soul. Its priests are pawning it off to a different god. The faces which once radiated a joy and satisfaction with the beauty of their profession increasingly radiate a cold knowledge of what this or that theorem is “good for”. And students are not stupid; they can tell when a discipline does not respect itself.

Craig Greenman
Brooklyn, MI

(Received October 5, 1995)

Editor’s Note

The preceding author has missed the most significant point of the comparison he makes: attention to national interest in Germany in the 1930s was the criterion for employment, and ultimately for life itself; in the U. S. today, it is advanced as a secondary criterion for external support of one’s research. Since the government exists to promote the national interest, this is not, in itself, unreasonable. The comparison of the destruction of the free exchange of scientific ideas at Nazi Germany’s universities with the present attempt to direct funded research

to the health of the nation falls far short of reality.

On Krantz’s Editorial

Most of us, in a bad mood, have only our friends to snarl at; Steven Krantz, as an associate editor of the *Notices* of the AMS, has the entire mathematical community. And was he ever in a bad mood! First, peevish resentment at the NSF; then a personal attack on an unnamed fellow mathematician (concluding laughably with “I am not passing judgement”); more self-pity (my favorite: “the world will watch us sink into the tar pits with hardly a passing tear”); finally, a call to arms invoking 3,000 years of history (“It is time for pure mathematicians to close ranks and stand up for the integrity of our discipline”). What fun! Where’s my sword?

But before we set off to recapture the Holy Land, perhaps we should figure out what we are fighting for. I’d hate to find out that I myself, as an active research mathematician who has worked for a major calculus reform project, am the enemy. Much of Krantz’s editorial (entitled “Math for Sale”) seethes with resentment at funding for teaching projects, although Krantz refrains from attacking such funding directly; rather, he attempts to tie it to another change in funding, the shift towards goal-oriented funding in research.

I agree that goal-oriented research funding is a bad idea. By contrast, experience shows that funding for teaching projects is well worth the money spent. Since the NSF started funding calculus reform in 1989, there has been a renaissance in mathematics instruction around the country, resulting in a flowering of new ideas about the curriculum, about using technology, and about pedagogy. Apparently, it enrages Krantz that research mathematicians like me have played a major role in this renaissance. I think it is a healthy development and is our best defense against a fate Krantz professes to fear, the swallowing of mathematics departments by engineering departments. It is also invigorating and stimulating; I highly recommend

it as a tonic against the jaded bitterness displayed by Krantz.

Krantz is right about one thing: the academic mathematical community is in danger of having many of its responsibilities taken away from it, particularly its teaching responsibilities. But he only increases that danger by publicly sneering at those who have decided to work on education. It horrifies me that the *Notices* would publish an editorial so harmful to our profession. Krantz invokes "the intellectual standard and values of pure mathematics". One intellectual standard I value above all is a commitment to rational debate. Krantz fails that standard miserably.

William G. McCallum
University of Arizona

(Received October 5, 1995)

Errata

The November 1995 issue of the *Notices* contained an announcement of two grants received by the AMS Task Force (page 1315). Readers were referred to the November/December 1995 (pages 1170-1171) issue of the *Notices* for further information on the Task Force. The issue cited should have been November/December 1994.


The listing for the Institute for Mathematics and its Applications (IMA) in the "Stipends for Study and Travel" section of the December issue of the *Notices* (page 1348) included two different titles for the IMA academic-year program. The correct title is Mathematics in High Performance Computing.

Editor's Note

Due to an editorial oversight, two tables relating to faculty salaries (for Groups V and M) were omitted from the 1995 Annual AMS-IMS-MAA Survey article in the December 1995 issue (page 1504) of the *Notices*. The two tables will appear in the February 1996 issue. In the meantime, anyone wishing a copy of these tables should contact Elizabeth Foulkes, Survey Department, AMS, e-mail: edf@ams.org.

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Sinai's Moscow Seminar on Dynamical Systems

Editors: L. A. Bunimovich, *Georgia Institute of Technology, Atlanta*, B. M. Gurevich, *Moscow State University, Russia*, and Yakov B. Pesin, *Pennsylvania State University, University Park*

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Huaxin Lin and N. Christopher Phillips,
University of Oregon, Eugene

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Whose Article Is It Anyway?

Copyright and Intellectual Property Issues for Researchers in the 90s

Ann Okerson

Copyright Is a Hot Topic

Copyright has been a vexing topic throughout the centuries. Michael Giesecke in his book entitled *Der Buchdruck in der freuhen Neuzeit*, published in Germany in 1991, writes: "From the beginning, printing was accompanied by complaints over the effects of illegal reprinting which God will surely punish and which is seemly for no honorable Christian man." He is writing about the dawn of the age of printing. But before that St. Columba, in the sixth century in Ireland, copied a Psalter and was told by the arbiter to give it up. The king who was hearing the case said, "As the calf belongs to the cow, so the copy belongs to the book." Columba went on to fight a war about this. He left Ireland and moved to Scotland, where he is thought to have discovered the Loch Ness monster, a story that shows that copyright can have numerous unanticipated social consequences.

What I want to discuss here are not so much the technical and legal aspects of copyright; these you can read and hear about in many places. I want to focus more on the social and political aspects of copyright, why it is impor-

Ann Okerson is associate university librarian at the Sterling Library, Yale University. Her e-mail address is ann.okerson@yale.edu.

This article is based on a talk given at the Conference on the Future of Mathematical Communication held at MSRI, November 30 to December 2, 1994.

tant, and who cares about it these days, for a great many people do. One used to be able to go to copyright sessions in a meeting in 1990 or 1991 and be lucky if twelve people showed up. Now every society and library organization sponsors such sessions, and they have standing room only. We will also consider why you might want to take an interest in copyright and how you can do so.

Litigation = Negative Awareness

So, copyright is a particularly hot topic these days. Mostly we hear about it in ways that don't relate to our work. We hear about it, for instance, when Viacom tries to buy Paramount at huge prices for the content; these are the "Wall Street" kinds of issues. We hear about it through reports of litigation. There have been a couple of recently settled cases that have certainly taught academics and researchers a great deal about copyright. And for the most part it seems to have been a negative awareness that makes us all say, "I think I don't like copyright; I think I don't like the publishers who enforce it." The two most celebrated cases that relate directly to copying of articles are *Kinko's* and *Texaco*.

The *Kinko's* case was a coursepack campus copy shop case settled in 1991. The court decision affirmed that copy shops must pay a royalty for articles produced in coursepacks; that is, they must pay a royalty to publishers with fees as set by the publisher (in this case the Copy-

course, it leaves creators open to all kinds of uses of their work that they might not anticipate or approve of.

U.S. Copyright Law: Balance for Owners and Users

Copyright owners, whether they were the initial creators or whether they are owners to whom rights have been transferred, through the copyright law obtain five basic rights: 1) to reproduce copies, 2) to prepare derivative works, 3) to distribute the work, 4) to perform the work, 5) to display the work. All in all, they may provide economical benefit "for the progress of science and useful arts," as the U.S. Constitution says.

U.S. law is pretty careful about balancing owners' rights with the rights of users. Thus, users also have a number of rights in the copyright law, even though the owners do have the exclusive rights above. Users can do personal copying under the provisions of fair use, Section 107 of the Act. Libraries have certain privileges for making backup or archival copies via Section 108. In Section 105, works of government employees on government time are defined as being in the public domain. Thus works of the Bureau of the Census, Fisheries, the U.S. Geological Survey, etc., are actually owned by all of us, and you will probably find that you can get them from the GPO or government departments rather inexpensively. If they have been through a value-adding process through an intermediary, what you are paying that publisher is the value added to them by that process.

When copyright expires, works become public property, and so you can probably be sure that any work published before 1920 is in the public domain (that's why the copyrighted materials converted in so many digital pilot projects are that old). To find out who owns copyrighted work and to get the permissions to digitize, let alone copy, can be time consuming and expensive.

Copyright Pro-Activists

U.S. Government

Who are the players interested in copyright? There are at least three categories. One is the U.S. Government. During the Clinton administration, we have seen the hastening of the concept of the NII (the National Information Infrastructure); several working groups at the national level are addressing issues that need to be resolved in order for the NII to go forward. I am not sure precisely how many NII task forces there are, but the administration has charged groups in areas such as privacy and security, interoperability, and standards. One of the NII working groups that has received a lot of press is the Working Group on Copyright. This is a group of twenty-five government agency representatives, chaired by Bruce Lehman, the commissioner of patents in the De-

partment of Commerce. This task force released a report in July 1994 affectionately dubbed the "Green Paper". (It has a green cover but the rest of it is white!) The Green Paper has received a great deal of coverage in this country, and its authors have traveled and discussed the report with a number of societies, organizations, and publishing groups and have made representations at a number of intellectual property and copyright venues overseas. Let us discuss some of the key recommendations of this Green Paper to get a sense of who thinks what about its main recommendations.

Although the NII working group proposes "tweaking of the law" and argues the law does not need major changes at this time, critics think that some of the proposed changes go beyond tweaking. The first thing that the Green Paper states is that electronic works are subject to copyright because they are in their own way "fixed". They are tangible expressions of ideas. I don't think that this disagrees with anything that most of us believe. Most of us accept that works presented in electronic format are created and so they are certainly owned. The Green Paper is interesting in that it makes arguments that do not address the spirit of the law or the spirit of "ownership" but rather the technical business of what happens to pixels. The fact that pixels are trapped in some kind of a hard disk or a RAM, however briefly, means at that point that they are fixed, argues the report, and this equals a copy.

Another recommendation in the report is that the United States has to work with other countries, as we are all part of the GII (Global Information Infrastructure). Now, it is not too hard (although not easy) for us to work with other countries on copyright because there is an overarching agreement, the Berne convention, which the United States joined in 1989. Being signatory to Berne means that when a work created in one country is deployed in another country, it is subject to the laws of the country in which it is being used. This is a sensible practice, and it allows creators to have appropriate protection in countries where the work is used. However, in issues of communications (satellite communications, telecommunications, and so forth) there isn't such an explicit overarching international accord. The laws in different nations are very different in this area.

The Green Paper also advocates a new right, the right of transmission.¹ The Green Paper advocates the abolition of the "Doctrine of First Sale".²

A controversial portion of the Green Paper is the recommendation of severe penalties for those who break encryption codes and violate intellectual property. I have more concerns about that recommendation than, perhaps, many of my colleagues. Some of the presumptions of guilt

right Clearance Center was prime intermediary in the collection of these fees). *Kinko's* made all of us, at least in the academy, much more concerned about the copying we do and much more cautious. I am not sure what the results for the classroom were, but I believe a great deal more care is being exercised by a lot of faculty in order to comply with the ruling.

The *Texaco* case is slightly different. In the *Texaco* decision, scientists at a for-profit corporation were deemed to have to pay royalties to publishers registered with the Copyright Clearance Center for each article copied for use in their research work. This was in spite of the fact that the *Texaco* company itself, in the case of Dr. Donald Chickering (around whose copying the case was constructed), already took three subscriptions at institutional prices to the *Journal of Catalysis*, one of the journals used in the case. The appeal by *Texaco, Inc.*, was supported by a number of library organizations. The appeal briefs argued that this is a case of "fair use" and that the "for-profitness" of the company should not be at issue. It is the research and the contribution to building science that makes the use "fair". The appeal decision was handed down on October 31, 1994, in the Second Circuit of New York, which had upheld the first decision. Whether the decision is a good one or a bad one, it is clearly a marker telling us that increasingly the article is going to be treated as an entire work. It can be unbundled from the journal; it can be sold as a separate piece—and some courts believe payment can be made for the article unit.

Technology Raises New Situations and Questions

Such questions are: Are electronic formats protected? What about collaborative works that have been created by a number of people at a number of institutions over time? Who has the rights to such a work? Who can assign what rights? Who owns what? What are the transborder implications for copyright over a world which is electronically globally linked? In the area of telecommunications, different nations have laws which are quite different from each other. What is the liability of conduit providers? (In a recent case, *Playboy* sued a carrier saying, "on your bulletin board system there is material from *Playboy* that one of the people in your group has uploaded. Such uploading is a copyright in-

fringement.") How does one keep track of rights in a time of rights segmentation? At what point does a "morph" become a brand new work? What can one hyperlink to? What about including others' electronic works in one's own electronic work? Recently, a session of copyright lawyers analyzed the point at which six seconds of green grass from a Wisconsin dairy association was allowable in a video without permission of the rights holder: When would one have to seek permission, and would the user have to pay the dairy association?

The U.S. Copyright Act (1976) is a legal construct that ascribes ownership to a particular kind of intellectual form: any expression of an idea in a "fixed" form on paper, canvas, tape, or pixels or other formats. Copyright governs ownership of that kind of material, while patents govern inventions. Because the law says that a work is owned, it makes it possible to treat that work as property. Owning an artifact or "expression" makes it possible to sell it and do whatever the purchaser likes with it.

During your lifetime you will probably create many works in some fixed tangible form: articles, books, videos, code, CDs. According to U.S. copyright law, you will be the creator and thus the original owner of your work. You will have the initial power then to decide how to deploy your work and who is going to deploy it for you. The way the system currently works is roughly this: Authors have

the initial rights to their work as creators, and they can keep the rights or transfer them to publishers (this has been the prevailing model in science journal publishing). Most science journal copyright transfer forms say (more or less), "I hereby attest that this work is mine, and I hereby assign and transfer my rights to the publisher for the duration of copyright in any and all media which exist or which may be created." The length of copyright is currently fifty years beyond the lifetime of the author, so transfer is a legal transaction binding for quite a long time. Authors can divide or segment their rights. Creators can, for example, transfer the first print rights to one owner, transfer the video rights to another owner, transfer the translation rights to another owner. Segmentation tends to be the practice more in trade and popular publishing than in science journal publishing. Or, creators can place their works in the public domain; in other words, anybody else can use the works in any way they want. There are some authors who do this, but it is a little bit risky because, of

Copyright:

"The exclusive legal right to publish and sell the matter and form."

before trial, some of the fines, and some of the measures that will be taken against infringers could be a violation of basic rights that we Americans have as citizens.

Universities

Another group of players very interested in copyright are universities. In July 1993 the Triangle Research Library Network, a group of North Carolina universities, published a model copyright policy. It recommended that academic authors publish in reasonably priced journals (generally from societies and university presses), that when they transfer rights to publishers, they retain rights to use the work for themselves as well as to permit any research or educational uses of the work. That model policy is not too long and is quite well argued. It is worth reading.

A task force of the Association of American Universities met for a year and a half and produced an intellectual property report for university presidents in the spring of 1994. I had the opportunity to serve on that group with about sixteen people representing administrators, faculty, librarians and legal scholars of the universities. We were charged by the presidents to tell universities what they might do to more effectively deploy copyrights in an electronic era. This group agreed that copyright was a much more complicated issue than we had all realized. Various participants in universities have different interests at different times. As teachers, faculty members want the use of copyrighted works in the widest possible form for their classrooms and their students. As authors, academics generally want their work widely read, so their material interests are limited. However, if they are going to receive income for a copyrighted work such as a textbook or a popular work or a multimedia teaching aid, their interests become

¹This would form another kind of exclusive right for owners. That is, any information electronically transmitted would constitute a copy, and thus it would be governed by copyright. Some of the respondents to the Green Paper have liked the new right, but there have also been a number of objections from many library groups questioning the need for such a transmission right.

²"First Sale" (Section 109) in the Copyright Act says that when one buys a piece of intellectual property, one is the owner of it. So if you buy a copy of *Scientific American*, say, containing the article on scientific communications which appeared in the December 1994 issue, you are the owner of that artifact. You can read it, donate it to someone, sell it on the street, burn it, do whatever you want to. You are the owner and that magazine is yours. The Green Paper argues that First Sale does not apply to electronic information, because if you sell or give away an electronic work, in addition to transmitting a copy, you, the transmitter, have a copy in your hard disk or memory, even if for a short time. That is really making two copies, not one.

Copyright Pro-Activists

U.S. Government

NII Working Group on Copyright "Green Paper", July 1994
Conferences on Fair Use, 1995+
Final Report due September 1995
<http://www.uspto.gov/niiip.html>

Universities

Triangle Research Libraries Network Model Policy, July 1993
<http://ccat.sas.upenn.edu/jod/trln.html>
Association of American Universities IP Task Force, April 1994
<http://arl.cni.org/aaui/Frontmatter.html>
General Resource
<http://arl.cmi.org/scomm/copyright/UniCipy.html>

Authors

National Writers Union
Lawsuit, December 1993, Position Paper, September 1994
<http://ccat.sas.upenn.edu/jod/nwu.html>
Researchers and faculty-wide copying and access on the Internet for scholarly works and scientific research

quite different. Their interests shift to appreciating controls over the copies of material. Also, universities as publishers (that is, presses) need the revenue that copyrights generate.

We examined copying and copyright ownership policies at many universities and found that faculty and researchers were rarely part of the policy creation process, they rarely knew what policies were in place, they did not necessarily understand them very well, and a lot of copyright policies were indeed very hard to understand.

There are generally no identified sources on campus for help or questions in this complicated area.

We recommended that authors and universities consider copyright agreements different from the types that are currently signed. We recommend either ownership retention by authors or some kind of shared ownership of copyrights between faculty and universities, provided the university in turn offered incentives for such sharing (e.g., copyright management services, or publishing sites). As a result of, or contiguous with our recommendations, a number of campuses have begun reviewing intellectual property management and copyright policies (see box).

Authors

One more group with an interest are authors. The National Writers Union launched a lawsuit in December 1993 against a number of major publishers. Basically, they argue that publishers add less value in the electronic environment than in paper, and therefore authors are entitled to the maximum economic benefit from their work, more than they are getting now in print media. Obviously, researchers and faculty also have an interest in changing the status quo. How do we

know that? We know it because authors and researchers have started retaining more rights to their works, they have started segmenting their rights, and they have started creating e-journals and preprints that feature a new kind of copyright policy, one that allows wide deployment and copying of their work. Unlike members of the National Writers Union, who earn their living from their copyrighted works and seek those economic benefits, scholarly authors are showing that, at least in many instances, they place a higher priority on dissemination than on economic rights.

Copyright Turmoils

Let us speculate on conclusions of these copyright discussions. (I don't think there will be a simple conclusion.) Copyright will continue to evolve as it has been evolving since the days of Columba in the sixth century. But, to what extent will the copyright law be changed? John Perry Barlow argues in a well-written article in the March 1994 issue of *Wired* that copyright as we have known it has no conceivable future. It is irrelevant to a network environment. His view, of course, is quite different from that of the NII Green Paper and from the mainstream of legal scholars and lawmakers. Who is right? We don't know. Time will tell. And likely a long time will be required.

The certainty is that the ways we in research and academia are now using the copyright law, that is, the social and economic practices and relationships, are changing. Authors are making different choices. They are segmenting rights, which makes for a much more complicated world. Knowing who owns what rights is very tricky, but it is key if you intend a use for which you may need the copyright holder's permission. Of course, knowing who owns what copyrights has been tricky all along in the paper environment because most of the signed permissions and contracts reside in publishers' filing cabinets and so one cannot absolutely know what they say. Another certainty is that so far authors like increasing the new kinds of options for copyright deployment. They feel a sense of greater control over what happens to their work.

The shifts that we are experiencing are by and large positive, and I am pretty sure that in spite of all the rational arguments that can be made about how useful it is to have a publisher manage all the rights associated with a work, we will never go back to the total transfer of copyrights from authors to publishers of scientific articles.

My advice about copyright is to inform yourself. Know what you want to have happen to your work. Learn the policies of your institution, read the contracts publishers give you before signing them, know what they mean. Join the national copyright conversation. The NII copyright process is open to everyone. The Department of Commerce and Bruce Lehman are collecting hundreds and hundreds of responses to the Green Paper and are paying attention to them before putting out a final version as a White Paper³ in summer 1995. Join the conversation directly or join it through the way that you act to manage your own intellectual property.

What to do?

- Work towards new models of sharing ownership
- Use value-adding talents of publishers for works that benefit from it; redefine the values
- Develop good mechanisms to identify owners of works in the electronic environment
- Experiment to find what works
- Embrace change—things will never be quite the same again; authors and research institutions will never be as compliant as they used to be!

What next?

- Authors' rights gain momentum—academic and popular authors pay attention to transfers
- More authors' rights retention, segmentation
- Research works widely available on servers as preprints
- Value adding, final products by formal publishers continues
- Some confusion about who owns what and of whom to ask permission
- Maybe John Perry Barlow is right...???

³The White Paper was released on September 9, 1995. Unlike the Green Paper, it does not propose a separate new transmission right. However, it does recommend that transmission be included within the rights of reproduction, distribution, and performance or display, as appropriate.

The White Paper does not specifically recommend the end of "first sale" for e-publications. However, it argues strongly that networked transmission and first sale are incompatible. E-transmission technically keeps a copy in the sender's machine even as it sends a copy to the recipient. Thus a complete copy is made, even if the sender's is discarded momentarily.

Electronic Mathematics Journals

Mark Steinberger

John Franks, in the November 1993 Forum section of the *Notices of the American Mathematical Society* [1], stressed the advantages of nonprofit electronic journals as a vehicle for mathematical research. Since then, we have begun publication of the *New York Journal of Mathematics*, the first electronic general mathematics journal. We agree with John Franks.

The primary advantage for most mathematicians is ease of access. Without leaving one's desk, one may browse the articles and print out any articles deserving of more detailed consideration.

From the standpoint of the author, the delays in publication can be confined to the refereeing process, with approved articles appearing shortly after the peer-reviewing process is complete.

From an institutional point of view, there is a big financial advantage in promoting nonprofit electronic publications. The cost of producing, distributing, and archiving an electronic journal is smaller than that for a print journal (cf. [2, 3]. The amount of savings available through electronic publishing has been debated, but all commentators seem to agree the costs are significantly lower.) In a time of declining resources and escalating prices for print journals, this is an important advantage.

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There are also additional capabilities available with electronic media. (See section "Electronic Features and Enhancements" for details, including information regarding the implementation of these capabilities in the *New York Journal of Mathematics*.) For instance, abstracts may be distributed over mailing lists, notifying the reader of the availability of the articles. Electronic links may be made to past and future papers, reviews, comments, and elucidations of the work in question. And keyword searches may be made to identify articles of interest to researchers. These capabilities vastly increase the ability of the author and the journal to provide information to the reader.

At the *New York Journal of Mathematics*, we are in the process of working out the practical side of the issues surrounding electronic publication. We understand that the formats and functions of electronic journals will evolve over time. We feel it is essential that this evolution take place in a manner that will maximize quality and work to the maximum benefit of the mathematical community.

Editorial Issues

We feel the quality of the mathematics in our articles is of utmost importance. We have implemented the traditional peer-review process in its full rigor. Papers are blind-refereed for quality and correctness, as is done for high-quality print journals.

From the standpoint of the issues surrounding electronic publication, we have taken the following considerations to be fundamental.

- The appearance of every paper printed out from our journal should be uniform and appealing.

Thus, we decided not to distribute ASCII source files but to distribute our papers in graphical formats only. The papers are typeset in a traditional format, in accordance with the journal's style sheet, and with the logo, the statement of copyright, ISSN, and pagination given on the first page.

- The standards for succinctness in writing should be consonant with those applied by the other journals in the field.

Some proponents of electronic publication have urged changes in style, citing the low price of disk space as a rationale for publishing articles more loquacious than those commonly acceptable in a print medium. We decided to eschew this route, on the grounds that the perceived quality of our publications would be reduced. We feel it is important to follow the standards of consensus in the field. If these standards change in the future, we will change with them.

Authors who wish to expand on the material in greater detail than the editor feels is appropriate for a journal article are welcome to submit additional material for inclusion in hypertext comment files (see below).

- The written record must be maintained intact in perpetuity.

The University at Albany, State University of New York, has endorsed this commitment, agreeing to insure the integrity of the journal's archive in perpetuity. Our articles are fixed at time of publication, with their pages numbered consecutively throughout each volume in the traditional manner.

These decisions have affected some of our further options while leaving others open.

Most prominently, the decision not to distribute ASCII source files has made distribution by e-mail impractical. Our papers are available through Internet tools such as FTP, Gopher, and the World Wide Web (WWW).

Electronic Features and Enhancements

Client and Server Technologies

As is indicated by the variety of the Internet tools in use, Internet technology is a moving target, and electronic journals must move with it. In particular, the journals must provide service to accommodate the technologies used by the various users.

FTP and Gopher were developed earlier than WWW, and software for accessing materials served by FTP and Gopher is still more common (but not by much) than software for accessing materials over the World Wide Web. However, the capabilities of the Web are greater, as its servers and clients can communicate via *hypertext*, a system in which access to files is controlled by electronic links embedded in text files.

This provides a distinct advantage over the preexisting technologies, which basically provide access to directories of files. With hypertext, one may offer the reader a direct link to another resource anywhere on the Internet from any point in the file currently being accessed. By activating the link, the reader is given immediate access to the resource in question and may return to precisely the same location in the preceding document with a keystroke or the click of a button. This makes cross-referencing very flexible and effective, increasing considerably the efficiency of searching out information.

It is also useful to be able to decouple the presentation of information from a hierarchical, tree-like structure and to allow authors and publishers to connect material as dictated by its internal logic.

Hypertext Features Useful in Electronic Journals

Hypertext is particularly well adapted to cross-references between papers or between papers and reviews and other discussions. And those journals offered via the World Wide Web can take advantage of this.

At the simplest level of implementation, each paper can have a bibliography file containing links to any item in the paper's bibliography available on the Net. And comment files are especially suited to hypertext format.

Comment files are an important innovation available to electronic journals. Maintained by the editor, they may include links to reviews, to subsequent articles in which the results are extended or applied, to errata, to elucidations by the author of material in the paper, etc. Using hypertext, such files can be structured as narratives together with links to the resources they reference.

Note that the involvement of the editor in screening the material to be placed in the comment file is a useful filter against clutter in the literature. Indeed, while the *New York Journal* has advertised its intention to provide such files, we have not yet received submissions for them.

An additional level of connectedness is given by the advent of reviewing journals on the World Wide Web. Both *Math Reviews* and *Zentralblatt* are soon to be offered on the Web. In the case of *Math Reviews*, the reviews will include direct

links to papers offered by electronic journals as well as numerous internal links to other reviews. Hopefully, it will also be possible to make links from comment files in electronic journals to reviews in the reviewing journals.

This opens up a very interesting prospect, whereby it is possible to follow an idea through several different papers and reviews via seamless, near-instantaneous linkages without ever getting up from one's desk. This is likely to be a great boon for scholarship.

Embedding Hypertext Links Directly in Journal Articles

Just as hypertext itself is more flexible and useful than offering simple directories of files, it is much more useful to be able to embed hypertext links directly in the graphical formats of the papers themselves rather than restricting them to auxiliary files associated to the papers.

The technology to do this in $\text{T}_\text{E}_\text{X}$ documents is now becoming available through the Hyper $\text{T}_\text{E}_\text{X}$ project, an offshoot of Paul Ginsparg's e-print server project at Los Alamos National Labs.

Hyper $\text{T}_\text{E}_\text{X}$ provides a method of embedding hypertext links directly in DVI files, PostScript files, or Acrobat's PDF files. These links can be followed if you make use of a viewer programmed to recognize and follow them. Such viewers are either available or about to become available on all major computing platforms. The interested reader may find out more about this project from the following locations on the World Wide Web:

<http://nyjm.albany.edu:8000/hyper.html>
<http://math.albany.edu:8800/hm/ht/>

Hyper $\text{T}_\text{E}_\text{X}$ links have another benefit: internal cross-references. Links for the internal cross-references in a paper allow the reader to quickly flip to the statement of a theorem when it is invoked, supplying the information needed to understand an argument. Then, with a keystroke, the reader may flip back to the argument and continue reading. The process is much faster than flipping pages in a paper copy of the article, giving a real advantage to reading with a $\text{T}_\text{E}_\text{X}$ viewer.

And a table of contents for the article, including links to the various sections, is quite useful for browsing.

The *New York Journal of Mathematics* offers Hyper $\text{T}_\text{E}_\text{X}$ DVI files for all papers published since March 1995.

Keyword Searching

Through a technique called WAIS indexing, it is possible to build databases of text from Internet sites and to run keyword searches of those databases. This can be set up to produce elec-

tronic links to those documents that match the keywords.

It is also possible to index the full $\text{T}_\text{E}_\text{X}$ source of articles and then pass links either to graphical formats or to a "home page" for the paper when a match occurs. The home page can contain links to various graphical formats. Such a schema has been implemented for the *New York Journal of Mathematics* at

<http://nyjm.albany.edu:8000/SF/nyjmsearch.html>

In the *New York Journal*, a paper's home page is a WWW page containing the paper's abstract, keywords, and subject classification along with various links.

While WAIS technology is useful for searching a particular Internet site, it can be even more useful to search an index of many different sites. Such an index exists in Australia: Jim Richardson's MathSearch index, at

<http://ms.maths.usyd.edu.au:8000/MathSearch.html>

It indexes all the major mathematical sites on the Web worldwide. A keyword search on this database can turn up links to resources at sites one didn't even know existed.

Direct Communication to the Readers

Electronic communication permits direct distribution of abstracts through electronic mail to interested readers. This notifies the reader of the existence of a paper and permits him or her to fetch the full paper if interested.

The *New York Journal of Mathematics* maintains four listserv lists for this purpose, running on listserv@albany.edu. One list, *nyjmath-a*, distributes abstracts for all papers. The other three are specialty lists distributing abstracts in algebra, analysis, and geometry/topology. Their list names are *nyjm-alg*, *nyjm-an*, and *nyjm-top*, respectively.

In future, it should be possible to design systems tailored more precisely to the specific interests of the readers. For instance, readers could be sent abstracts of all papers containing reader-specified subject classification numbers in the author's list of primary and secondary subject classifications.

The New York Journal of Mathematics

The *New York Journal of Mathematics* was launched with the support and assistance of the Office of Information Systems and Technology of the University at Albany, State University of New York. We also have ongoing support from the Office of the Vice President for Research and the Department of Mathematics and Statistics.

The Office of Information Systems and Technology includes both the University Libraries

and Computing and Network Services. These two units have collaborated in sponsoring the University's Electronic Library Initiative. The journal itself is part of this initiative.

The journal is integrated with the library system, and professional librarians have been active in every phase of the journal's development, including the provisions for the preservation of the data and the maintenance of the integrity of the archive. Indeed, the *New York Journal* complies with the recommendations given in [4].

The *New York Journal of Mathematics* is available by WWW, Gopher, and FTP. WWW access is given by

<http://nyjm.albany.edu:8000/nyjm.html>

while Gopher access is given by the command
gopher nyjm.albany.edu 1070

The same archive is accessible by anonymous FTP on nyjm.albany.edu in the directory /pub/nyjm.

Papers should be submitted by electronic mail directly to the editor whose field is closest to the

work in question. Our editorial board is listed at

<http://nyjm.albany.edu:8000/Edboard.html>

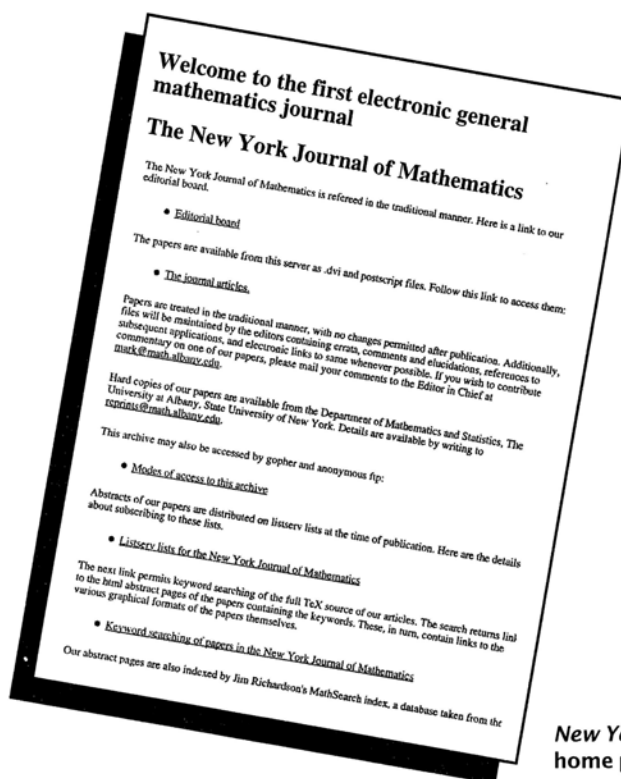
Instructions for the preparation of articles may be found at

<http://nyjm.albany.edu:8000/Instr.html>

Our papers are provided over the Internet free of charge. Printed copies may be obtained for a fee from the Department of Mathematics and Statistics of the University at Albany, State University of New York.

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New York Journal of Mathematics
home page

Meyer Jerison 1922–1995

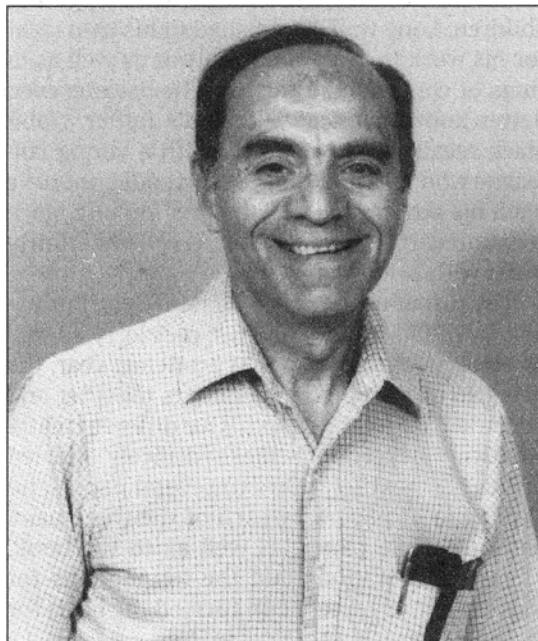
Leonard Gillman and Melvin Henriksen

Meyer Jerison, our close friend for forty-some years and long-time collaborator, died on March 13, 1995, after battling cancer for several years.

Jerry, as he was known to almost everyone, including his wife, was born in Bialystok, Poland, on November 28, 1922, but came to the U.S. in 1929 and was naturalized in 1933. His early education was in Jewish parochial schools in New York City, where he mastered Hebrew and the Torah along with the standard academic subjects. He earned a bachelor's degree and Phi Beta Kappa key at City College in 1943; a master's in applied mathematics from Brown in 1947; and in 1950 his Ph.D. in Mathematics at Michigan, under the direction of Sumner Myers. Along the way, he worked as a physicist at NACA (now NASA) in Cleveland (1944–1946) and as a research engineer at Lockheed Aircraft (1952) and taught at Case Institute (1945–1946) and later as a research associate at Illinois (1949–1951). While in Cleveland he met Miriam Schwartz, whom he married in 1945. (He died just before their fiftieth wedding anniversary.) In 1951 he joined the faculty of Purdue University, where he remained until his retirement in 1991. He was chair of the Division of Mathematical Sciences from 1969 to 1975. Over the years, he was an active member of AMS and MAA, notably as Book Reviews edi-

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tor of the *Bulletin of the AMS*, 1980–1985; governor of the Indiana Section of MAA, 1981–1984; and more recently as a member of the MAA Publications Committee. In addition he served MAA as a member of CUPM and its panels and as an MAA Lecturer. At Purdue he coached the Putnam team both before and after retiring. He was respected by every person he interacted with and was loved by many.

Jerry was an author or coauthor of twenty-odd research papers and at least four times as many reviews, but his memory will live on longest for his collaboration with Leonard Gillman on the

book *Rings of continuous functions*. (I was initially a coauthor, but foolishly dropped out.—MH)

Jerry had nine Ph.D. students. One of them, John Mack, now at Kentucky, singles out Jerry's demands for excellence in exposition as initially frustrating for him, though later he came to appreciate Jerry's concern that his students be properly trained in writing mathematics. Mack also describes Jerry's genuine interest in his doctoral students as people: "At mathematics meetings and conferences, he always took time to chat and to catch up on the personal details of my life, often over dinner." Joe Kist, another of Jerry's students, now at New Mexico State, expected to be handed a thesis problem and was taken aback when Jerry insisted he find his own. Later he realized that Jerry had introduced him to mathematical independence, for which he remained forever grateful.

Meyer Jerison is survived by his wife; two sons, Michael (professor of economics at SUNY Albany), and David (professor of mathematics at MIT); a brother, Harry (professor of psychology at UCLA); a sister, Jean Blum; and three grandchildren. Long well established in his own right for his work in functional analysis as well as in rings of continuous functions, he became even better known as David Jerison's father. (John Mack recalls a conversation with a young colleague who told him that Jerison could not have been his advisor because he was too old. Mack recounted the exchange to Jerry, who "fairly burst with pride".)

The two of us (LG and MH) joined the Purdue faculty in fall 1952, where we met Jerry as well as one another. During that academic year, the new trio participated in seminars together and embarked on joint research. Our different mathematical backgrounds meshed nicely and led during the next few years to several papers, including joint papers by each of the three pairs and one triple paper, as well as to the book. These collaborations laid the foundations for the rest of our careers and formed the basis for lifelong friendships.

Meyer Jerison was an exemplary citizen of the mathematical world: a superb lecturer and a dedicated and enthusiastic teacher, revered by his students. His commitment to excellence was inspiring. He was a calm, steadying influence, and a bundle of good judgment. He stood up for important matters of principle without letting annoyances distract him. His passing leaves a void in the mathematical community and especially in the lives of the authors of this article.

There is no more appropriate way to close this account than with the following eloquent letter from David Jerison:

My father loved mathematics; he was a mathematics maven. He liked a good math lecture the way one might enjoy a good concert or sports event. He took pleasure in those performances largely because he liked mathematical people, and he liked to watch them succeed. He also complimented mathematicians behind their backs, a welcome inversion of the usual gossip.

Mathematical parents might be interested to know that I don't remember him as ever intervening in my mathematical training. He did not encourage me to become a mathematician. In particular, I got the message that doing well in school, at least through college, gave no guarantee that one could be creative in mathematics. Nevertheless, his enthusiasm for mathematics was hard to disguise. He reminded me much later that he did intervene once when he discovered that after one year of algebra in 8th grade, I only knew how to solve quadratic equations using the quadratic formula, rather than by factorization or completing the square. He gave me an old "college algebra" text that summer, and I worked a few hundred problems. That summer I also found some MAA contest problem books on his bookshelf.

My brother remarked at the funeral that my father taught us almost exclusively by example. His example was one of energetic devotion to work and professional service and to our family. The command "Be careful" was banished by my father as redundant or absurd. In retrospect, as a parent, I am amazed at my parents' forbearance concerning this and many other injunctions.

Should Doctoral Education Change?

Ever since the mathematics job market started to sour, there has been talk of revamping doctoral education in mathematics. Various reports have addressed this issue, one of the first being "Educating Mathematical Scientists", produced in 1992 by the Board on Mathematical Sciences (BMS) of the National Research Council (NRC) and written by a committee chaired by Ronald G. Douglas of the State University of New York at Stony Brook. More recently, the NRC Committee on Science, Engineering, and Public Policy, chaired by Phillip A. Griffiths of the Institute for Advanced Study, released a report recommending changes in graduate education in all areas of science and engineering. A report based on a workshop on graduate education, organized by the National Science Foundation, is due to be released soon.

Does doctoral education in mathematics need to change? Interviews with nearly twenty mathematics faculty in institutions across the country show that while there is a great deal of concern about the employment difficulties new doctorates face, there is little consensus about exactly what kinds of changes should be made in doctoral programs in order to address this problem. Generally it appears that few departments are making radical changes in their doctoral programs.

The discussion about doctoral education in mathematics has generated a wide variety of suggestions for change. They range from requiring a course outside the mathematics de-

partment to requiring a minor in a different subject, from taking a course in computing to learning a computer language, from developing the ability to communicate with researchers in other areas to offering hands-on industrial internships. There has been talk of revamping the structure of the mathematics doctorate to get students started more quickly in research. For example, the preliminary examination, commonly taken in the second year of graduate study, could be eliminated. Instead of preparing for the exam, students would start working on a problem right away to accumulate the background they need to work on the problem.

None of the faculty interviewed for this article indicated that their departments were considering such dramatic changes, and most believe that attempting to institute such changes on a uniform basis is neither feasible nor desirable. In fact, rather than calling for major changes in doctoral programs, most reaffirmed the importance of providing Ph.D. students with a solid background in pure mathematics.

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George Papanicolaou of Stanford University notes that although his department is rather small, there is on the Stanford campus a wide variety of mathematical activity, from the business school to the electrical engineering department. "The mathematics department, being small, sees its role as maintaining the core areas"—analysis, algebra, geometry, and topology. "You can't fool around with that," he says. Across the country, at North Carolina State University in a very different kind of mathematics department with a booming program of industrial linkages, R. H. Martin, chair of the department of mathematics, expresses much the same view: "We need to keep a focus on the basic principles of mathematics."

Worries about the Job Market

Most departments are confident that they provide high-quality education in mathematics. But, shaken in recent years by their students' employment troubles, they have been forced to ask hard questions about whether they are producing doctorates who are able to navigate successfully the changing seas of today's job market. To what degree should the job market drive changes in doctoral programs? On the one hand, slavish following of job market trends is probably unwise. "If you are doing job training and there are no jobs, then it is appropriate to change your program in response," remarks Douglas Kurtz, head of the mathematics department at New Mexico State University.

"But if the goal is to provide education and intellectual development, then why would you change the best system of graduate education in the world?" On the other hand, ignoring the job market is not a solution either. As Ronald Douglas puts it, "A doctoral program is not a vocational program, but people need to be able to use what they learn to get jobs."

In one way or another, the job market is affecting just about every doctoral program in the country. Papanicolaou says that Stanford graduate students are very "employment-conscious" and, even without encouragement from faculty, will "buy insurance" against unemployment by taking courses outside of the mathematics department. The Stanford department is not contemplating any changes to its doctoral program, except to "teach students how to benefit from the environment" at Stanford. "I think that not so many changes are needed as people perceive,"

Papanicolaou remarks. "Most of the graduate programs I know of work fairly well. But we should be concerned that we produce students that can get jobs."

The reports on graduate education often speak of "broadening" doctoral training. Without more specifics, this recommendation comes under the heading of motherhood and apple pie. "How can one disagree with more and wider knowledge?" asks Robert Zimmer, associate provost for research and education and former mathematics department chair at the University of Chicago. "It's a question of how you do it—specifically what you gain, and specifically what you give up." Those interviewed for this article said they would never discourage students from taking courses outside their area of specialization. But many expressed views similar to that of David Vogan of the Massachusetts Institute of Technology. "What we ask people to do

in the four years or so of getting a Ph.D. in mathematics is extraordinarily difficult," he notes. "I don't think we can ask people to become mathematicians in a reasonable amount of time and at the same time give a lot of attention to things outside of mathematics."

Many different ideas have been proposed under the rubric of "broadening" doctoral education, from, for example, having students specializing in geometry take a course in algebraic topology, to offering a minor in a subject to which mathematics can be applied, such as computer science, physics, or electrical engineering.

But rather than planning a "perfect set of courses," argues William James Lewis, chair of the mathematics department at the University of Nebraska at Lincoln, departments should aim to educate students as scholars who can learn what they need when they need it. Departments should cultivate in students "the ability to learn and the interest in being a research scholar, so that when they need to know some algebraic topology they learn some algebraic topology—but they don't necessarily have to have taken a course in it." By emphasizing this approach, doctoral programs could also get students into working on research problems sooner.

Doctoral Programs Evolve

Doctoral programs in mathematics are always evolving, in many different ways and for many different reasons. Some departments are energetically exploring ways to offer their students,

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as the NRC report puts it, "a broader range of academic options". "We're taking the report very seriously," says Ronald Anderson, chair of the mathematics department at Texas Tech University. The department, which has a strong applied flavor, has initiated a dialogue with chairs of science and engineering departments and the deans of engineering and of the graduate school to see what can be done to broaden doctoral education in mathematics. "I believe graduate education is very good in this country, and I don't think we need to make wholesale changes," Anderson explains. But he believes graduate education can be strengthened and job opportunities widened. Some of the mechanisms his department is exploring include joint teaching with other departments, training grants in cooperation with other departments, and cross-listing of courses.

At North Carolina State, the mathematics department is making changes partly to give doctoral students wider career opportunities and partly in response to a new intellectual stimulus: the influx of high-tech firms into the Raleigh area. Largely through the efforts of H. Tom Banks, who heads the NCSU Center for Research in Scientific Computing, the department has built a burgeoning program of linkages between the mathematics department and local industry. They have established contacts with a materials manufacturer, a toxicology institute, the computer giant IBM, the North Carolina Department of Insurance, and other organizations. Graduate students take part in research projects in which they work in groups with faculty and industry researchers. Chair Martin reports that the department has recently seen an increase in the quality of students applying to their doctoral program.

Other departments are contemplating few changes. J. J. Kohn of Princeton University points to the establishment of an applied mathematics group in the Princeton mathematics department some fifteen years ago as "a new direction for us", motivated by the increasing connections of mathematics to other areas. But as for the basic core program in mathematics at Princeton, "I don't think there will be drastic changes but we will continue to adjust our program as required by the new environment." And few would argue that Princeton, which attracts excellent students and is highly successful in educating them, ought to undergo major changes. Similarly, Wilfried

Schmid of Harvard University says that the system of graduate education in mathematics in the U.S. is working "quite well", and he does not see Harvard making any big changes in what it does.

Highly selective programs like those at Harvard and Princeton have an advantage in that they have been largely insulated from the worst vagaries of the job market. In fact, Schmid reports that recently a number of Harvard mathematics doctorates have taken positions outside academia, even when they had good academic prospects. "It was perfectly clear that those who hired these people knew what a Ph.D. in pure mathematics is, and they wanted people with this background," he points out. "I very much doubt that these employers would prefer students trained more broadly but less deeply."

Teaching a Priority

In at least one respect there has been widespread change in doctoral programs in mathematics: Just about all of them are paying much more attention to developing the teaching skills of graduate students. "Teaching is all-important at the moment," declares Papanicolaou. "Everyone knows it, from the deans to the graduate students. Our students earn their keep by teaching. The department monitors their teaching extremely carefully—we tutor them on it. The students are extremely concerned that they do well at it and get good evaluations.... If you can't teach, the chair of the department will be on your back."

Departments across the country are establishing mechanisms to insure that their graduate students become good teachers. The mechanisms vary in emphasis and style, from orientation workshops, to seminars on educational issues, to mentoring programs, to videotaping of classroom lectures. But all are aimed at responding to two pressures: demands from administrators, teachers, and parents that faculty not compromise teaching to focus on research and demands from academic employers that new doctorates have a sound background in teaching. Attention to teaching also helps those aiming for industrial jobs, where the ability to communicate is critical.

Some also believe that it is essential for mathematics Ph.D.s to acquire computing skills. In today's world, says Douglas, "it's crazy for anybody to get a Ph.D. in mathematics and not have some understanding of computers." Industrial

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positions often require computer programming skills. In addition, with the widespread use of computers and calculators in introductory mathematics courses, new Ph.D.s taking academic jobs are increasingly expected to have some facility with this technology. Although many students pick up such skills in graduate school, Douglas believes that if one looked carefully, one would find “a substantial minority, and even a majority in some places, who know very little beyond e-mail or typing a paper.”

Foreign Students

One of the most sensitive issues associated with graduate education is that of foreign students. For the past several years, the percentage of Ph.D.s in mathematics going to non-U.S. citizens has been over 50%. The increase in Ph.D. production can be largely attributed to foreign students; between 1986 and 1994, the number of doctorates going to U.S. citizens increased 30%, while the number going to foreigners increased 56%.

Foreign students tend to be especially talented and well prepared, and they make important contributions to the mathematical life in departments. And, had the numbers of foreign students leveled off or dropped, the mathematical community may well have had too few doctorates to fill the available positions. But what seems at first glance to be a win-win situation for foreign students and U.S. mathematics departments is not so simple. For one thing, some departments worry about spending U.S. taxpayer money to support foreign students on teaching assistantships. Some foreign students come to this country with funding from their home countries, but a great many do not.

This financial concern points to a larger question: Have mathematics departments abdicated their responsibilities toward U.S. students? Some say they have. “You can bring students from abroad with all the skills you want,” says Raymond Johnson, chair of the mathematics department at the University of Maryland at College Park. “You don’t have to think about what changes need to be made to attract American students. We’ve turned off so many American students to mathematics, minorities and women in particular.” Reaching out to such students would necessitate changes in graduate programs, says Johnson, especially in providing an environment in which students can work well and thrive.

“I don’t have any enthusiasm for formal limits” on foreign students, says Lewis. “But I think that one should realize that it’s not in the best interest of the country that as we approach the end of the decade a majority of Ph.D.s in mathematics—hovering around 55%—are going to

foreign citizens.” One argument says that if foreign Ph.D.s stay in the U.S. and contribute to the nation, then the investment in them is warranted. Another argument says that if they stay here, they worsen the job market for Americans. And yet another says that if they return home, then they work for the economic competitors of the U.S. Lewis believes these arguments miss the mark. “It’s the failure to encourage enough of our own students that’s the problem.”

In fact, the problem has roots below the graduate level. “If you look at why American universities are so good, and why the research infrastructure is so good it’s because we’ve recruited the best people from all over the world,” remarks Myron Allen, chair of the mathematics department at the University of Wyoming. “So I’m not sure that it’s important for us to insist on U.S. graduate students. Where we have to cultivate U.S. talent is in the high schools and undergraduate programs. By the time they’re entering graduate school, it’s too late.”

Will the Elite Departments Lead the Way?

One thing that would improve doctoral education is greater diversity across the landscape of all doctoral programs. Zimmer says that, at least until recently, there has not been much diversity in doctoral programs in mathematics. “Some are better or more prestigious, but there has been a lot of drive for everyone to do the same thing,” he notes. That the system needs to change does not negate the value of the model for graduate education that has been common to many institutions—in fact, in many places it has been very successful, and it is important that this type of program continue. “However, it would be better if there were greater diversity, particularly if institutions really could articulate directions for themselves in which they would make real, positive educational contributions,” he points out. “The specifics need to be reflective of the different programs—they shouldn’t all look like a pale version of one model.”

“There is a lot of uniformity, and even greater uniformity in the sense of aspirations of departments,” agrees Douglas. During the site visits for the BMS report, his committee found that many departments had a vision of themselves as preparing students only for positions in research institutions—and they held onto this vision even in the face of evidence that their students were not getting such jobs. Indeed, the 1995 AMS-IMS-MAA Annual Survey shows that, among last year’s new doctorates who took jobs in academia, less than half went to doctoral degree granting departments. “Departments need to be clear on what the program is about, what its goals are,” he says, and they need to have re-

alistic expectations about where the majority of their students will find jobs.

One reason for the uniformity is the tendency of departments to try to emulate the elite departments. Does this mean that there will be few changes in graduate education in mathematics unless the elite departments change? Views on this question differ. Says Johnson, "If we depend on the top departments to change, then nothing will happen. I think things are working quite well for them, so they won't change." Glenn Hopkins, chair of the mathematics department at the University of Mississippi, is not sure all departments would follow suit if the elite departments decided to change. But, he says, "It's hard for institutions like ours to lead the way... We need that moral weight behind us, or we'd be afraid that we would be accused of simply weakening the Ph.D."

What could help is for Ph.D. programs to develop clear goals that make sense given their faculties and local environments. Those that do not could be vulnerable to the grim calculus of university economics. "There will be fewer graduate programs" in mathematics in the years to come, says Douglas. "This will happen as universities look at where their strengths are and where they want to invest their resources. And in some cases it is the mathematics graduate programs that are too small or uneconomical." The recent NRC ranking of doctoral programs is certainly being scrutinized by university administrators who want to save money by weeding out ineffective programs. "No doubt some places should stop giving Ph.D.s," says Schmid. "But who is to choose which places?"

The tendency to try to emulate the elite departments points to a broader question of values in the mathematical community. Often students pick up an "informal curriculum" which says that getting a job outside of academia equals failure. Opinions differ on how strong this attitude is within the community. Some argue that students come to graduate school aiming to be professors, and if they fall short of that goal, inevitably there is disappointment. Considering that only about a quarter of new doctorates get jobs outside academia—and they are clustered in such areas as statistics and applied mathematics—it is natural that most graduate students expect to be employed in academia. Still, some believe that unless attitudes about nonacademic employment change, departments will never adequately address the need to prepare their students for a range of employment possibilities.

Everyone agrees that negative attitudes about nonacademic employment are counterproductive and should change. But in trying to bring about such changes in the culture of mathematics,

some say, it is important not to throw out wholesale the existing values in the profession. Roger Howe of Yale University believes that some part of the culture will have to change, but it must be done carefully. "Although it seems that research in pure mathematics has been the dominant value in the mathematical community and it seems that perhaps it's been overemphasized, I think it's really a rather fragile situation," he says. Probably it could be destroyed much more easily than people realize, and it could be difficult to reinstate. The pressure against that kind of value is very strong in America."

In the end, doctoral education in mathematics may change not so much by a concerted effort to institute this or that reform, but rather by mathematics faculty responding to students in their programs. Amid all the talk of change, it is important to remember that the students are the *raison d'être* for any doctoral program. David Vogan says he is "continually amazed" at the students that keep coming into mathematics, even given the difficult job market. "They show amazing talent and dedication," he remarks. "It's a challenge for us to make a system that lives up to the students in it."

—Allyn Jackson

Doctoral Degrees Conferred

1994-1995

ALABAMA

Auburn University (6)

DISCRETE AND STATISTICAL SCIENCES

Cox, Beverly Ann, *Cycle systems of the line graph of the complete graph.*

Kennedy, Janie Ailor, *2-perfect maximum packings and minimum coverings of K_n with hexagons.*

LeVan, Jerome Michael, *Designs and codes.*

Spicer, Erin, *Graph designs: With and without subsystems.*

Taunton, Rena Denise, *Boundary value problems by matching and functional differential equations.*

MATHEMATICS

Doheny, Kevin, *A higher lower bound on packing density of convex bodies in the plane.*

University of Alabama at Birmingham (2)

BIOSTATISTICS

Davis, Margaret, *An investigation of the generalized species-abundance distribution as a model for species-abundance data.*

Hsu, Chuanchieh, *Contributions to statistical methods for the mammary cancer chemoprevention experiments.*

University of Alabama in Huntsville (1)

MATHEMATICAL SCIENCES

Pendergrass, Marcus, *Complexity of set-valued maps.*

University of Alabama, Tuscaloosa (7)

APPLIED STATISTICS

Barrett, J. Douglas, *A probabilistic alternative to fuzzy logic controllers.*

Davis, Robert Eugene, *A Markov chain representation of the Shiriyayev-Roberts procedure.*

Kao, Li-Hua, *Some nonparametric procedures for testing against the simple-tree alternatives in a two-way layout.*

Lin, Show-Wen (Winnie), *The use of combined control charts with forecast-based quality monitoring schemes.*

Pappanastos, Edward A., *A comparison of robust control charts.*

Redden, David Tillman, *A comparison of fuzzy linear regression methods and statistical regression models.*

Tseng, Iou-Tsyr (Sarah), *Robustness of forecast-based SPC schemes.*

ALASKA

University of Alaska (1)

MATHEMATICS

Sarnowski, Krzysztof, *Homology and cohomology of diagrams of topological spaces.*

ARIZONA

Arizona State University (6)

MATHEMATICS

Feng, Zhilan, *Childhood diseases under the impact of isolation.*

Kolossa, Katalin, *On-line coloring graphs.*

Lee, Duk-Hyung, *Lax-Phillips scattering theory of Axiom A diffeomorphisms.*

Palacios, Jose, *The dynamics of cellular flames.*

Qian, Weijie, *The dynamics of one dimensional nonlinear viscoelasticity equations.*

Tang, Baorong, *The analysis of predator-prey systems with distributed delay.*

University of Arizona (19)

APPLIED MATHEMATICS

Bevan, Edward, *Inversion of Fredholm integral equations of the Mellin convolution type arising in atmospheric remote sensing.*

Calini, Annalisa, *Knots: Dynamics and geometry.*

Cui, Haiyan, *Robustness and Bayesian analysis for spatial interpolation.*

Durazo-Arvizu, Ramon, *Bias adjusted estimates of survival following group sequential hypothesis testing.*

Elfendahl, Michael, *Investigation of the convergence properties of an iterative image restoration algorithm.*

Geddes, John, *Patterns in nonlinear optics.*

Hagberg, Aric, *Fronts and patterns in reaction-diffusion equations.*

Hays, Mark IV, *Classical and quantum mechanical studies of nonlinear lattices.*

Hunke, Elizabeth, *The time-dependent transformed Eliassen balanced vortex model of a tropical cyclone.*

Long, Andrew, *Cokriging, kernels, and the SVD: Toward better geostatistical analysis.*

MacEvoy, Warren Jr., *Numerical and analytical studies of instabilities in $1+1$ and $2+1$ dimensional periodic fully integrable partial differential equations: Methods and results.*

McGee, Daniel Jr., *Applications of neural networks to partial differential equations.*

Miller, Peter, *Macroscopic lattice dynamics.*

Ritchie, Justine, *Methods for statistical analysis of colonic crypt labelling.*

Sehnert, William, *Properties of the incomplete Abel transform and some of its generalizations.*

Soares, Edward, *Attenuation, noise, and image quality in single photon emission computed tomography.*

Sochos, Georgios, *Theoretical and numerical study of some problems related to turbulence and electromagnetic wave propagation.*

Wolfson, Michael, *Investigation of the semi-classical limit of a stochastic linear Schrödinger equation and its connection to ray chaos.*

Xu, Bing, *A discrete nonlinear model of age-structured populations.*

The above list contains the names and thesis titles of recipients of doctoral degrees in the mathematical sciences (July 1, 1994, to June 30, 1995) reported in the 1995 Annual AMS-IMS-MAA Survey by 200 departments in 142 universities in the United States. 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 listed for that university. A supplementary list, containing names received since compilation of this list, will appear in a spring 1996 issue of the *Notices*.

ARKANSAS

University of Arkansas (1)

MATHEMATICAL SCIENCES

Rai, Sanjay, *Analysis of a nonlinear functional differential equation for an age-structured population.*

CALIFORNIA

California Institute of Technology (10)

MATHEMATICS

Biyarov, Andrey Yurevich, *Evolution equations and semigroups of operators with the disjoint support property.*

Broughton, Wayne Jeremy, *Symmetric designs, difference sets, and autocorrelations of finite binary sequences.*

Ji, Shujuan, *Arithmetic and geometry on triangular Shimura curves.*

Jin, Yonggang, *Box codes and convolutional coding of block codes.*

Khare, Chandrashekhar, *Congruences between cusp forms.*

Ki, Haseo, *Topic in descriptive set theory related to number theory and analysis.*

Leung, Hoi Ming, *Conformal laminations on the circle.*

McGuire, Gary M., *Absolutely irreducible curves with applications to combinatorics and coding theory.*

Poltoratski, Alexei G., *Boundary behavior of Cauchy integrals and rank one perturbations of operators.*

Solecki, Slawomir, *Applications of descriptive set theory to topology and analysis.*

Claremont Graduate School (7)

MATHEMATICS

Babai, Dariouch, *A deterministic/continuous approach to the interaction between HIV and the immune system: The dynamics of antigenic variation and diversity.*

Crowley, Mary Susan, *Three-sided assignment games.*

Frantz, Michael E., *On the interaction of a cold front with a mountain ridge.*

Li, Liming, *Quasi-Monte Carlo methods for transport equations.*

Luo, Haisheng, *Curve estimation and graduation.*

Nguyen, Tien, *Mathematical modeling and digital signal processing techniques for modern digital communication systems.*

Purcell, Jerry, *Allpass filters.*

Stanford University (39)

ENGINEERING-ECONOMIC SYSTEMS

Chu, Pin-Yu, *Cognitive conflict resolution: Mediation analysis and strategies.*

Davidson, Ron, *Action representation for planning under certainty.*

Jo, Dae-Chul, *Substitution dynamic modeling with system theoretic approach.*

Johnson, Blake Eliot, *The optimal growth portfolio as pricing portfolio for dynamically traded assets.*

Johnson, Eric Richard, *Automated verbal summary for decision analysis.*

Korver, Clinton Douglas, *The role and value of information in negotiation.*

Leu, Keh-Shiou, *Representing symmetry in decision diagrams with restrictive arrows.*

McKeon, Scott M., *A benefit function approach to Pareto efficiency in the presence of consumption externalities.*

Reid, Clifford Allen, *Representing and analyzing the strategic position of the firm: A resource-based approach.*

Saito, Richard, *Quality regulation of durable goods in the presence of externalities.*

Sit, Ming Fai, *Bidding evaluation and strategies: An application in the competitive electric power industry.*

MATHEMATICS

Banks, William David, *Exceptional representations on the metaplectic group.*

Chan, Claire C., *Structure of the singular set in energy-minimizing partitions and area-minimizing surfaces in R^n .*

Drachman, Jordan Allen, *Soap films bounded by non-closed curves.*

Fraser, Maia Judith, *Classifying Legendrian knots in tight contact 3-manifolds.*

Kallel, Sadok, *The geometry of divisors and holomorphic maps on Riemann surfaces.*

Karagueuzian, Dikran Bernard, *Homology of complexes of degree one graphs.*

Kra, Bryna Rebekah, *Commutative groups of diffeomorphisms of the circle.*

Makar-Limanov, Sergei, *Tight contact structures on solid tori.*

McCuan, John Edward, *Symmetry via spherical reflection and spanning drops in a wedge.*

Minicozzi, William Philip II, *Geometric variational problems related to symplectic geometry.*

Nishibata, Shinya, *Hyperbolic conservation laws with relaxation.*

Norbury, Paul Timothy, *Magnetic monopoles and the loop group.*

Sanders, Marc David, *Classifying spaces and Dirac operators coupled to instantons.*

Vo, San Cao, *The spin L-function on the symplectic group $GSp(6)$.*

Yu, Shih-Hsien, *Existence of discrete shock profiles for the Lax-Wendroff scheme.*

Zeisel, Eric Bruce, *Maps of Stein manifolds without triple points.*

OPERATIONS RESEARCH

Ait-Sahlia, Farid, *Optimal stopping and weak convergence methods for some problems in financial economics.*

Lennon, Tava Maryanne, *Response time approximations for multi-server polling models with manufacturing applications.*

Loh, Wing Wah, *On the method of control variates.*

Luenberger, Robert Alden, *Contractive transformation image compression via mathematical programming.*

Olsen, Timothy Robert, *Greenhouse gas abatement—Joint maximization under uncertainty.*

Ward, Julie Ann, *Minimum concave cost flows in series parallel networks.*

Yang, Tzu-Hui, *Efficient simulation techniques with application to ATM switches.*

STATISTICS

Hull, David Alexander, *Information retrieval using statistical classification.*

Ip, Hak-Sing (Eddie), *A stochastic EM estimated in presence of missing data—theory and applications.*

Kim, Chul-Ki, *Nonparametric regression for censored and truncated data.*

Land, Stephanie Ruth, *Adaptive signal regression.*

Shan, Zhaolin, *Sequential detection of parameter changes in linear dynamic systems and regression models.*

University of California, Berkeley (50)

BIOSTATISTICS

Lu, Biao, *The expectation-smoothing approach with applications to ill-posed statistical inverse problems.*

INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH

Bailey, Diane Elizabeth, *Manufacturing work organization in the semiconductor industry: An empirical investigation of the structure, functioning and performance of production work groups and improvement teams.*

Carmon, Tali Fried, *Production planning and scheduling for semiconductor device testing.*

Chick, Stephen Eric, *Product and process design with engineering-based statistical models.*

Cunningham, Sean Patrick, *The development and use of in-line yield estimates in semiconductor manufacturing.*

Ghajarrahimi, Bahram, *Multi-family, multi-item lot scheduling on non-homogeneous machines.*

Pekoz, Erol A., *Improving Poisson approximations and bounds.*

Sattler, Linda, *Empirical techniques for analyzing organizations: An examination of the semiconductor industry.*

Tsai, Pei-Sung, *Probability applications in engineering.*

Wang, Chia-Li, *Light traffic approximations for regenerative queueing processes.*

MATHEMATICS

Adalsteinsson, David, *Etching, deposition and lithography using level set techniques.*

- Alevras, Alexander, *Continuous semi-groups of $*$ -endomorphisms of factors of Type I_∞ and of Type II_1* .
- Avigad, Jeremy, *Proof-theoretic investigations of subsystems of second-order arithmetic*.
- Bernstein, Daniel J., *Detecting perfect powers in essentially linear time, and other studies in computational number theory*.
- Carey, John Corning, *On Beurling's approach to the Riemann hypothesis*.
- Concordel, Marie Christine, *Periodic homogenization of Hamilton-Jacobi equations*.
- Cortez, Ricardo, *Impulse-based particle methods for fluid flow*.
- Drisko, Arthur A., *Loops, latin squares, and the Alon-Tarsi conjecture*.
- Egilsson, Agust Sverrir, *On embedding a stratified symplectic space in a smooth Poisson manifold*.
- Elston, Gillian Zoe, *Semigroup expansions using the derived category, kernel, and Malcev products*.
- Filippini, Robert James, *The symplectic geometry of the theorems of Borel-Weil and Peter-Weyl*.
- Kahn, Jeremy Adam, *Holomorphic removability of quadratic polynomial Julia sets*.
- Kim, Yonghoan, *New values in domineering and loopy games in Go*.
- Kohel, David R., *Endomorphism rings of elliptic curves over finite fields*.
- Li, Ren-Cang, *Numerical solutions of ODE's*.
- Liang, Hong, *Subfactors and spin models*.
- Ligocki, Terry, *Minimizing knot energies using simulated annealing*.
- Lippincott, Tom, *A complete system of proof for diagrammatic languages*.
- Marchant, Simon, *On the hypercyclicity and invariant subspaces of invertible composition operators*.
- Mattes, Josef, *Applications of quantum groups*.
- Moulton, David Petrie, *Number theory and groups*.
- Nunes, Marc DaCosta, *Cohomological results in monoid and category theory via classifying spaces*.
- Park, Hyungju, *A computational theory of Laurent polynomial rings and multidimensional FIR systems*.
- Parks, Michael, *Algorithms to compute the matrix exponential*.
- Powell, Corey, *Two problems from elementary number theory involving the Euler phi-function*.
- Pyle, Elisabeth, *Abelian varieties over Q with large endomorphism algebras and their simple components over Q* .
- Rojas, Joseph Maurice, *Cohomology, combinatorics, and complexity arising from solving polynomial systems*.
- Saint John, Rose, *Theory of computation for the real numbers and sub-rings of the real numbers following Blum/Shub/Smale*.

- Schlatter, Mark Douglas, *Extensions of results of Morley and Shelah to permutation groups*.
- Schreiber, Sebastian, *Asymptotically hyperbolic dynamics*.
- Shapiro, Jonathan Edward, *Relative angular derivatives*.
- Simic, Slobodan, *Anosov flows of codimension one*.
- Taylor, Graham Andrew, *On the existence of $SO(n)$ -irreducible anti-self-dual connections on 4-manifolds*.
- Teti, Fred, *Simple and natural E-rings*.
- Tong, Deyu, *Quantum invariants from $UQ(SP(4,C))$* .
- Tzermias, Pavlos, *Torsion in Mordell-Weil groups of Fermat Jacobians*.
- Wilkinson, Anne Marie, *Stable ergodicity of the time-one map of a geodesic flow*.
- Won, Dae Yeon, *On the complex Finsler manifolds*.
- Yan, Dong, *Yang-Mills theory on symplectic manifolds*.
- Yu, Baozhen, *Some computations of Donaldson's invariants via flat connections*.

University of California, Davis (8)

MATHEMATICS

- Bagh, Adib, *Epigraphical analysis and set convergence*.
- Beatty, Morris Lee, *Green function for the Dirac operator with monodromy on the Poincaré disk*.
- Brunzie, Marion, *Generalized dual billiards*.
- Groah, Jeffrey Marvin, *Solution of the relativistic Euler equations on non-flat spacetimes*.
- Penkava, Michael Robert, *Cohomology of graded algebraic structures and the homology of graph complexes*.
- Simcik, Luke Jacob, *Resolving non-smooth solutions to discretized ill-posed problems*.

STATISTICS

- Cai, Zong-wu, *Statistical inference under dependence*.
- McQuarrie, Allan, *Small-sample model selection in regressive and autoregressive models: A signal-to-noise approach*.

University of California, Irvine (4)

MATHEMATICS

- Belenkiy, Andrey (Ari), *Convergence of Fourier-Jacobi series*.
- Burns, William Charles, Jr., *On regularities of the minimal solutions to the Cauchy Riemann equations in the polydisk of C^2* .
- Hauk, Shandy, *Analytic and computational investigations of the Stommel-Charney model of the Gulf Stream*.
- Lin, Ing-Jer, *Factorization and duality in the Hardy spaces of the polydisc*.

University of California, Los Angeles (24)

MATHEMATICS

- Allman, Elizabeth Spencer, *Polynomials without roots in division algebras*.
- Angelini, Flavio, *Two theorems on linear series*.
- Bays, Timothy, *Multi-cardinal phenomena in stable theories*.
- Bihari, Barna L., *Multiresolution schemes for the numerical solution of conservation laws*.
- Ghalayini, Bassem, *Singularly perturbed optimal control problems with time-delay*.
- Girnius, Zara, *K-admissibility of finite groups over quadratic and cyclotomic fields*.
- Hamilton, Emily, *Geometrical finiteness for hyperbolic orbifolds*.
- Hilden-Minton, James Andrew, *Multilevel diagnostics for mixed and hierarchical linear models*.
- Lue, Heng-Hui, *Principle Hessian direction based regression trees*.
- McArthur, Monica, *Aspects of convergence laws for infinitary logic on classes of finite models with arbitrary measures*.
- Ng, Chi-Wah, *Fixed point sets of maps and pairs*.
- Nolan, Jeanine Kay, *Fixed points of boundary-preserving maps of punctured discs*.
- O'Neill, Michael Davlin, *Some results on H^∞ and the Bloch space*.
- Paik, Meegyeong, *Finite difference approximations for hyperbolic systems with two boundaries*.
- Senouf, David, *Complex singularities for Burgers' equation with complex viscosity and asymptotic approximations of the zeros of Fourier integrals*.
- Soares, Marcus Vinicius Araújo, *Multiplicity one results for unitary groups*.
- St. John, Katherine, *Logics of recursion*.
- Wagner, Joyce, *An algorithm for calculating the Nielsen numbers on surfaces with boundary*.
- Wang, Tachun, *Shape from shading with interreflections*.
- Whitney, Glen, *Models of recursion for non-determinism and concurrency*.
- Wolfenden, Peter, *Fixed points of deformations of polyhedra with local cut points*.
- Yu, Ching-Chau, *Nonlinear eigenvalues and analytic-hypoellipticity*.
- Yuan, Ke-Hai, *Asymptotics for nonlinear regression models with applications*.
- Zeitew, Michael, *Numerical methods for nonlinear ordinary differential equations with different time scales*.

University of California, Riverside (4)

MATHEMATICS

- Green, Michael Lawson, *Multiparameter semimartingale integrals and boundedness principles*.

STATISTICS

Ferryman, Thomas, *A comparison of nine image reconstruction algorithms and the development of two contextual algorithms for binay.*

Lai, Ching-Lin, *Determining the parameter settings and measuring the influence of observations in response surface experiments.*

Lee, Sang Eun, *The robustness of Bayesian factor analysis estimates.*

University of California, San Diego (10)

MATHEMATICS

Carini, Luisa, *Combinatorial methods for computing plethysms of Schur functions.*

Casey, Michael Patrick, *Computation in discrete-time dynamical systems.*

Foskey, Mark Stephen, *Higher projective planes and the cohomology of n -fold loop spaces.*

Huang, Wei, *Some results in formal knot theory.*

Lee, Shang-Min, *Markov processes whose hitting distributions are absolutely continuous with respect to those of a given process.*

Myers, Perla Lahana, *Euclidean and Heisenberg graphs: Spectral properties and applications.*

Nowak, Joseph Edward, *Biholomorphic equivalence for a class of generic manifolds.*

Weening, Frederick John, *Existence and uniqueness of non-parallel slit maps.*

Woesler, Ulrich, *Projective modules and extensions in the category \mathcal{O} for rank two Kac-Moody Lie-algebras.*

van Wamelen, Paul, *The CM character of a hyperelliptic curve.*

University of California, Santa Barbara (5)

MATHEMATICS

Freedman, Walden, *Alternative Dunford-Pettis properties.*

Friedman, Kurt Aaron, *Pfizer's lemma and boundedness in C^* -algebras.*

STATISTICS AND APPLIED PROBABILITY

Cheng, Benny Ngo, *Some techniques in modelling multivariate stable assets.*

Iyer, Srikanth, *Limit theorems for functionals of superprocess.*

Machiraju, Rajasri, *Some contributions to spatial statistical modeling.*

University of California, Santa Cruz (4)

MATHEMATICS

Koebbe, Matthew, *A model of pulse propagation and interaction within FitzHugh-Nagumo nerve axiom bundles.*

Popp, Octavian, *Double bracket periodic Toda lattice and the projection of limit invariant tori.*

Record, Ronald, *The method of critical curves for discrete dynamical systems in two dimensions.*

Shao, Bin, *Second order asymptotics for the discrete analogue of a class of pseudodifferential operators.*

University of Southern California (10)

MATHEMATICS

Aygen-Satik, Yegan, *Optimal bounds of asymptotic regularity.*

Hamdan, Kamal, *The linear quadratic regulator problem for thermoelastic systems with boundary control and unbounded observations.*

Kazimir, Joseph Raymond, *Adaptive parameter estimation for evolution equations in Hilbert space.*

Luk, Ho-Ming, *Stein's method for the Gamma distribution and related statistical applications.*

Martin, Daniela Renate, *Combinatorial problems from mapping and reading DNA sequences.*

Owens, Kenneth Dewane, Jr., *Modelling and inverse problems for ocean surface drifters.*

Port, Ethan, *Stochastic analysis of DNA physical maps and restriction clone libraries.*

Raghu, Poornima, *Approximation in the identification of second order degenerate distributed parameter systems.*

Smazenska, Robert Louis, *Nonlinear stochastic differential equations and the exponential formula of Crandall and Liggett.*

Sun, Fengzhu, *The polymerase chain reaction and branching processes.*

COLORADO

Colorado School of Mines (8)

MATHEMATICS AND COMPUTER SCIENCE

Bertanzetti, Arthur D., *Solution of the axle weight distribution problem for piggyback trailers using a mixed integer, two algorithm method.*

Bond, Gary D., *A mathematical analysis of the Lerchs and Grossmann algorithm and the nested Lerchs and Grossmann algorithm.*

Fei, Tong, *Elimination of numerical dispersion in finite-difference modeling and migration by flux-corrected transport.*

Greening, Doran R., *A modified simplex method for the (AXIAL) multi-index assignment problem.*

Ince, Erdem, *A parallel balanced polynomial unconstrained geometric programming algorithm.*

Jackson, Jack A., Jr., *A mathematical experiment in dual geometric programming.*

Liu, Zhenyue, *Migration velocity analysis.*

Nuseir, Ameina Sari, *Symbolic computation of exact solutions of nonlinear partial differential equations using direct methods.*

Colorado State University (4)

MATHEMATICS

Tausch, Johannes, *Equivariant preconditioners for boundary element methods.*

Werner, Caryn, *Moduli for a surface of general type.*

STATISTICS

Biggerstaff, Bradley, *Random effects methods in meta-analysis with application in epidemiology.*

Wang, Yong Cheng, *Non-additivity of row-column designs with industrial applications.*

University of Colorado at Denver (1)

MATHEMATICS

Ressel, Klaus, *Least-squares finite-element solution of the neutron transport equation in diffusive regimes.*

University of Colorado, Boulder (8)

APPLIED MATHEMATICS

Bollt, Erik, *Controlling chaos, targeting and transport.*

Herod, Scott, *Computer assisted determination of Lie point symmetries.*

Keiser, James, *On I. Wavelet based approach to numerical solution of nonlinear partial differential equations II. Nonlinear waves in fully discrete dynamical systems.*

MATHEMATICS

Arledge, Jane, *5-units attached to hyperelliptic curves of genus 3.*

Bonan-Hamada, Catherine May, *Orthogonal Laurent polynomials and indeterminate strong Stieltjes moment problems.*

Larue, David, *Left distributive and left distributive idempotent algebras.*

Liu, Faan, *Hausdorff dimension of the support of singular measures.*

McArthur, John, *Operator splitting in hovering mode computation.*

University of Denver (1)

MATHEMATICS AND COMPUTER SCIENCE

Liu, Guoping, *Time and wavelength division multiplexed optical interconnections.*

CONNECTICUT

University of Connecticut (7)

MATHEMATICS

Humphreys, Lisa D., *Numerical and theoretical results on large amplitude periodic solutions of a suspension bridge equation.*

- Kim, Euhee, *Long-time behavior of solutions of a multi-dimensional electrophoretic model with a single reaction.*
- Li, Yuanqian, *Limit theorems in reflected Brownian motions and in Markov chains associated with iterated function systems.*
- Wang, Chunying, *Numerical and theoretical result for the real Monge-Ampère equation.*

STATISTICS

- Mallick, Bani K., *Bayesian semiparametric modeling using mixtures.*
- Pai, Jeffrey Shyh-Chang, *Bayesian analysis of ARIMA processes.*
- Yang, Tae Young, *Computational approach to Bayesian inference for software reliability.*

Wesleyan University (5)

MATHEMATICS

- Campagna, Matthew J., *Single-relation almost completely decomposable groups.*
- Feng, Li, *Zero entropy circle maps.*
- Hubner, Kristin I., *Sarkovskii types of patterns.*
- Loth, Peter, *Warfield groups and their Pontrjagin duals.*
- Masaveu, Oscar, *Dense subsets of some topological groups.*

Yale University (9)

MATHEMATICS

- Baruch, Ehud Moshe, *Local factors attached to representations of p -adic groups and strong multiplicity one.*
- Ding, Jintai, *Spinor and oscillator representations of quantum groups.*
- Kirillov, Alexander A., *Traces of intertwining operators and MacDonal's polynomials.*
- Knight, Harold K., Jr., *Piecewise linear minimization formulas and Lagrangian varieties for quivers.*
- Saito, Naoki, *Local feature extraction and its applications using a library of bases.*
- Thiele, Christoph Martin, *Time-frequency analysis in the discrete phase plane.*
- Wong, Yui Kwan, *The first fundamental theorem of covariants for G_2 and $Spin_7$.*

STATISTICS

- Kelleher, Thomas, *Admissibility of test-based estimators.*
- Kiuchi, Amy S., *Predicting progression to AIDS using change points in the series of T4 counts.*

DELAWARE**University of Delaware (4)**

MATHEMATICAL SCIENCES

- Allers, Andrew A., *2.5-dimensional electrical impedance tomography.*
- Fatnani, Sangita Shanker, *Statistical assessment of hazardous waste sites.*

- Khashanah, Khaldoun M., *Boundary-transmission problems for acoustics in mixed media.*
- Liu, Fengshan, *Ill-posed nonlinear operator equations and monotone variational inequalities.*

DISTRICT OF COLUMBIA**American University (3)**

MATHEMATICS AND STATISTICS

- Maida, Paula, *The effects of reading and note-taking assignments in a university finite mathematics course.*
- Tascione, Carol, *The effects of student self-assessment on students' attitudes and academic performance in a college mathematics course.*
- Xiao, Weizheng, *Robustness of bioequivalence procedures under Box-Cox alternatives.*

George Washington University (3)

STATISTICS

- Lew, William, *A probabilistic analysis of elastic buckets in m -ary and digital search trees.*
- Sinclair, Michael, *Measurement error in interview-reinterview or test-retest studies.*
- Younes, Naji, *A family of event-time models with smooth baseline hazard.*

Howard University (1)

MATHEMATICS

- Al-Hoori, Amatelawa, *The linear three dimensional shallow water theory.*

FLORIDA**Florida Institute of Technology (2)**

APPLIED MATHEMATICS

- Drici, Zahia, *Stability at large scale nonlinear dynamical systems.*
- Shaw, Michael, *Contributions to the theory of matrix differential equations.*

Florida State University (6)

MATHEMATICS

- Cai, Yihong, *Domain decomposition algorithms and parallel computation techniques for the numerical solution of PDEs with applications to the finite element shallow water flow modeling.*
- Sun, Biansheng, *Doubly-null-cobordant links.*
- Thies, Andrew T., *A computational study of turbulent jet flows and their instability waves.*

STATISTICS

- Gomatam, Shanti, *On nonparametric regression for current status data.*
- Lawson, Kevin L., *Bayesian nonparametric estimation via Gibbs sampling for coherent systems with redundancy.*
- Wu, Hulin, *Regression models for spatial binary data with application to the distribution of plant species.*

University of Florida (7)

MATHEMATICS

- Crosby, Frank Jamerson, *Maxpolynomials and morphological template decomposition.*
- Daniels, Frank Emmett, *The rank parity function of Srinivasa Ramanujan.*
- Jamieson, Michael Warren, *Set theory with a universal set.*
- Li, Lin, *Integration in locally convex spaces.*
- Reti, Zoltan, *Five problems in combinatorial number theory.*
- Shih, Chun-Liang, *Active set strategy in optimization.*
- Valaristos, Antonios, *Period doubling patterns and equicontinuity of iterate in one dimensional dynamics.*

University of South Florida (3)

MATHEMATICS

- Albrecht, William George, *On the minimum discriminant of algebraic number fields.*
- Cao, Jun, *Global dynamics of dissipative generalized KdV equations and Boussinesq equations.*
- Wing, Philip Lewis, *Stability and control analysis of stochastic bilinear systems.*

GEORGIA**Emory University (4)**

MATHEMATICS AND COMPUTER SCIENCE

- Acree, Franklin Glenn, *Hamiltonian problems and the forbidden subgraph method.*
- Gunderson, David Shane, *Extremal problems on Boolean algebras, sum-sets and hypergraphs.*
- Sun, Quicuu, *Relativistic theories in f -atlas.*
- Yang, Xiufa, *On Backlund transformations for nonlinear differential equations.*

Georgia Institute of Technology (6)

MATHEMATICS

- Banaszuk, Andrzej, *Approximate feedback linearization at nonlinear control systems.*
- Donovan, George Cassinis, *Fractal functions, splines, and wavelets.*
- Gedeon, Tomas, *Cyclic feedback systems.*
- Howard, Timothy G., *Predicting the asymptotic behavior for differential equations with a quadratic nonlinearity.*

Pinto, Joao Teixeira, *Slow motion manifolds for a class of evolutionary equations.*

Young, Todd Ray, *Saddle-node bifurcations with homoclinic orbits.*

University of Georgia (7)

MATHEMATICS

Burthe, Ronald, *The average witness is 2.*

Hebda, Beata, *Curvature and singularities of projections.*

Sherman, Deborah, *The Mod 2 cohomology ring of $Sz(8)$, the smallest Suzuki group.*

STATISTICS

Dai, Yu-Qing, *Statistical inference on space time bilinear models.*

Dutta, Harinarayan, *Inference for conditionally heteroscedastic time series models.*

Sajjan, Shivayogi G., *Inference and prediction for a class of linear and nonlinear models with dependent observation.*

Wu, Shu-Fei, *Multiple comparison procedures with the average.*

HAWAII

University of Hawaii (2)

PUBLIC HEALTH SCIENCES

Li, Lei, *Mixed models for analysis of survival data: Estimation, simulation, and application.*

Sanguanprasit, Boosaba, *Maternal education and infant mortality in Thailand: Comparison between the proportional hazards models with multiplicative and additive functions.*

IDAHO

Idaho State University (5)

MATHEMATICS

Gifford, David L., *Best L_p approximations by convex functions.*

Hardy, Timothy L., *Effective parameters of composite materials.*

Libis, Carl A., *Minimal interpolation and pre-orthogonal polynomials.*

Oxley, Harry S., *Genetics in terms of dynamical systems.*

Searcy, Scott S., *Representation theory of the general linear group on tensor spaces.*

University of Idaho (1)

MATHEMATICS AND STATISTICS

Brennan, Michael, *A study of the existence of solutions to some initial value problems for impulsive differential equations.*

ILLINOIS

Illinois Institute of Technology (1)

MATHEMATICS

Lin, Biqian, *Wavelet phase filter for denoising in tomographic image reconstruction.*

Illinois State University (4)

MATHEMATICS

Mogill, Alex, *Assessing the pedagogical content a knowledge and teaching/learning paradigms of potential candidates for alternative certification in Illinois.*

Stiles, Nancy, *Graphing calculators and calculus.*

Van Zoest, Laura, *The impact of small-group discussion on preservice secondary mathematics teachers' classroom observations.*

Wilson, Boyd, *The development and evaluation of an instructional program in statistical literacy for use in post-secondary education.*

Northern Illinois University (7)

MATHEMATICAL SCIENCES

Boardman, John P., *Quasi-measures on completely regular spaces.*

Choudhary, Samar, *On numerical solutions of large sparse linear systems and applications.*

Cinemre, Haskiz, *Topics in the theory of periodic differential equations.*

Coskun, Erhan, *Numerical analysis of Ginzburg-Landau models for superconductivity.*

Hao, Wenge, *Long time behavior of bipolar fluid flows.*

Rosenbloom, Elaine, *The asymptotic solutions of linear differential equations.*

Wills, Sheryl L., *Instability and regularity results for the solution of the bipolar fluid flow equations in polygonal domains.*

Northwestern University (12)

MATHEMATICS

Byers, Miriam, *Topological transitivity of a class of piecewise monotone expanding maps of the interval with a single discontinuity.*

Cheng, Wai Yan, *Asymptotics of exit density of Brownian motion.*

Constapel, Petra, *Length of tor and torsion in tensor products.*

Doeff, Hendrik Erik, *Rotation vectors for torus homeomorphisms not homotopic to the identity.*

Flannery, Christopher, *Spaces of algebraic cycles and correspondence homomorphisms.*

Gately, John, *Rees valuations of monomial ideals.*

Kassof, Jordan, *A new decomposition structure for Smale diffeomorphisms of surfaces.*

Lin, Mi, *On the solvability of some curvature quotient equations.*

O'Leary, Michael P., *Conduction convection problems with change of phase.*

Sorensen, Jody, *Representations and averaged equations for systems of weakly coupled limit cycle oscillators.*

Yan, Zhiming, *The restrictions on the charged and the regular Newtonian systems.*

STATISTICS

Hall, Daniel Blair, *Extended generalized estimating equations for longitudinal data.*

Southern Illinois University at Carbondale (2)

MATHEMATICS

He, Min, *Semigroups dependent on parameters.*

Khosravani, Azar, *Integers represented by positive definite binary Hermitian forms.*

University of Chicago (14)

MATHEMATICS

Chase, David, *Homologically non-trivial group actions on manifolds.*

Cheah, Jan, *The cohomology of smooth nested Hilbert schemes of points.*

Choi, Youngsoo, *Well-posedness and scattering results for fifth order evolution equations.*

Fakhruddin, Najmuddin, *Algebraic cycles on generic Abelian varieties.*

Gong, Xianghong, *Real analytic submanifolds under unimodular transformations.*

Howell, Gregory, *Kähler-Einstein metric on products.*

Kowalsky, Nadine, *Actions of non-compact simple groups on Lorentz manifolds and other geometric manifolds.*

Politis, Anastasios, *Sharp results on the relation between weight spaces and BMO.*

Quiroga, Raul, *The stretch of a foliation and geometric superrigidity for locally symmetric leafwise Riemannian metrics.*

Sage, Daniel, *The geometry of fixed-point varieties on affine flag manifolds.*

Sottile, Francesco G., *Real enumerative geometry for the Grassmannian of lines in projective space.*

Srinivasan, Balaji, *Families of filtered Higgs bundles.*

Staffilani, Gigliola, *The initial value problem for some dispersive differential equations.*

Weiner, Matthew, *Hallucinations, symmetry, and the structure of primary visual cortex: A bifurcation theory approach.*

University of Illinois at Chicago (11)

MATHEMATICS, STATISTICS AND
COMPUTER SCIENCE

- Burke, Douglas, *Computations over $F_q(T)$ with modular symbols.*
- Fe Serapio, Evangelista, *Equilibrium in bimatrix games and in repeated games with reward and transition.*
- Isaacs, Andrew, *Whole number concepts and operations in grades 1 and 2: Curriculum and rationale.*
- Jia, Lixing, *Modified sum methods for constrained optimization.*
- Kaminski, Marek, *Sums of dependent random variables.*
- Pohl, Gerhard, *Contributions to the theory of D -optimal designs.*
- Raghib, M. Abu-Saris, *Filtering of a Weiner-Poisson driven stochastic process.*
- Sa'ar, David Hersonsky, *Universal constraints in discrete groups.*
- Tang, Chunyu, *Nonparametric regression analysis for repeated measured data using wavelets.*
- Yan, Bo, *Modeling and identifying optimum design for fitting dose-response and estimating ED_p based on raw optical density data.*
- Yang, Qi, *A parallel scheme using the divide and conquer method.*

University of Illinois, Urbana-Champaign (24)

MATHEMATICS

- Alacon, Eberth, *Convex lattice polygons.*
- Bialek, Paul Richard, *Ramanujan's formulas for the coefficients in the power series expansions of certain modular forms.*
- Bradley, David, *A sieve auxiliary function.*
- Brown, Scott, *Enumeration and classification of ribbon knots.*
- Carpenter, Bruce, *State transformers and modes of computation.*
- Chan, Heng Huat, *Contributions to Ramanujan's continued fractions, class invariants, partition identities and modular equations.*
- Chang, Yi-Wu, *Graph representations using stars, trees, intervals and boxes.*
- Faber, Richard, *Operators and subspaces of L_0 .*
- Holdener, Judy, *Automorphisms and symbols in K_2 .*
- Iovino, Jose, *Stable theories in functional analysis.*
- Kang, Jeongheung, *Complemented subspaces of weak L_1 .*
- Kline, Bradford, *A global Boettcher's theorem.*
- Lampe, Richard Elliot, *Discrete multiple valued dynamical systems.*
- Lewenberg, Adam Henry, *On elementary pairs of 0-minimal structures.*
- Malouf, Janice, *Integer sequences.*
- Miller, Christopher Lee, *Polynomially bounded 0-minimal structures.*

- Petrulin, Anton, *Quasigeodesics in multi-dimensional Alexandrov spaces.*
- Reed, Mary Lynn, *The Frobenius direct image of line bundles and the structure of representations.*

Zimmer, G. Beate, *Nonstandard vector integrals and vector measures.*

STATISTICS

- Kim, Hae Rim, *Some consideration to test dimensionality in item response theory.*
- Li, Hsin-Hung, *New nonparametric statistical procedures for analyzing bias/DIF and dimensionality in item response data.*
- Shen, Liji, *Some topics on nonparametric regression and regression quantiles.*
- Xu, Yi, *Sequential confidence bands for density.*
- Zhou, Kenneth Qing, *Quantile regression and survival analysis.*

INDIANA

Indiana University (5)

MATHEMATICS

- Dabrowski, Andrew, *Set theoretic representation of form systems and elementary universes.*
- Lau, Ko-Hin, *Property w -A, and reflexivity of an Abelian algebra of operators.*
- Pata, Vittorino, *Limit theorems for sums of free random variables.*
- Smotzer, Thomas, *Quasisimilarity of invariant subspaces for uniform Jordan operators of infinite multiplicity.*
- Zucchi, Adela, *Operators of class C_0 with spectrum in multiply connected regions.*

Purdue University (21)

INDUSTRIAL ENGINEERING

- Chen, Huifen, *Stochastic root finding in system design.*
- Cho, Geon, *Limited column generation and related methods for local access telecommunication network design & expansion-formulation, algorithm, and implementation.*
- Parker, Stephen Richard, *Military force structure and realignment through dynamic simulation.*
- Wang, Jin, *Contributions to Monte Carlo analysis: Variance reduction, random search, and Bayesian robustness.*

MATHEMATICS

- Bennethum, Lynn, *Multiscale, hybrid mixture theory for swelling systems with interfaces.*
- Delfino, Donatella, *Cofiniteness and vanishing of local cohomology modules, and colength of conductor ideals.*
- Kim, Dai-Gyoung, *Wavelet decomposition and function spaces on the unit cube.*
- Lai, Shanzhong, *Weighted norm inequalities for general operators.*
- Leong, Ieng-Tak, *Lefschetz Riemann Roch theorem.*

Liu, Nianzheng, *Geometric theory of valued fields.*

Tang, Pugi, *Quasiconformal homeomorphisms on CR manifolds.*

Xu, Changsheng, *The existence and uniqueness of simply connected compact groups with Weyl groups W such that the order of W is not divisible by the square of p .*

Yeh, Li-Ming, *On the hydrodynamic model for semiconductor devices.*

Yie, Ikkwon, *Unramified coverings of the affine line in small positive characteristic.*

Zhang, Biao, *Lifetimes and occupation times of conditional Brownian motion.*

STATISTICS

- Ahn, Hyungsok, *Semimartingale representation and the Wong-Zakai problem.*
- Chen, Yung-Pin, *A study of the trade-offs between balance and randomness in various sequential sampling procedures.*
- Evans, Bradley P., *Some improvements to Taguchi analysis.*
- Lu, Michael Guoqing, *Weighted wavelet filter and its application in function estimation.*
- Tang, Xianglian, *Convergence rates of multivariate deconvolution and compound Poisson estimation.*
- Yang, Ruoyong, *Development of noninformative priors for Bayesian analysis.*

University of Notre Dame (3)

MATHEMATICS

- Ashline, George, *The defect relation of meromorphic maps on parabolic manifolds.*
- Kobal, Damjan, *Karoubi tower and K theory invariants of Hermitian forms.*
- Wu, Deyun, *Estimates for $\bar{\delta}$ and $\bar{\delta}_b$ on bounded convex domains in C^2 .*

IOWA

Iowa State University (16)

MATHEMATICS

- Diesslin, Brenda Ann Wolfe, *Study of directionally solidified eutectics with emphasis on oscillatory instabilities.*
- Kang, Hye-Jeong, *Limit theorems for branching Markov processes.*
- O'Donnell, Brian, *Nonlinear filtering in stochastic dynamical systems.*
- Palasinska, Katarzyna M., *Deductive systems and finite basis properties.*
- Vidyashankar, Anand, *Large deviation rates for branching processes in fixed and random environments.*

STATISTICS

- Atuncar, Gregorio Saravia, *Statistical inference for real-valued Markov chains and some applications.*
- Dunnigan, Geri Marie, *Sampling strategies for an optimal control problem.*

Fukuchi, Jun-ichiro, *Bootstrapping extremes of random variables.*

Huang, Mu-Yeh, *Design of developmental test programs for one-shot systems with two-state reliability.*

Kang, Shin-Soo, *Life-table analysis for correlated response times.*

Ko, Seoung-gon, *Optimal flexible two-stage plans.*

Rana, Abdul Wajid, *Variance estimation in repeated samples of size one.*

Shin, Chungyeol, *On the multivariate random and mixed coefficient analysis.*

Vidyashankar, Anand V., *Large deviation results for branching processes in fixed and random environments.*

Wang, Ouhong, *Application of numerical interval analysis for statistical computing in a massively parallel computing environment.*

Yalcin, Ilker, *Nonlinear factor analysis.*

University of Iowa (21)

APPLIED MATHEMATICS AND
COMPUTATIONAL SCIENCES

Dai, Weizhong, *Numerical solutions of unsteady incompressible Navier-Stokes equations using an explicit finite analytic scheme.*

Hung, Pi-Fang, *An asymptotical $O(NL)$ -iteration path-following linear programming algorithm that uses wider neighborhood in its implementation.*

MATHEMATICS

Buber, Mehmet Tekamul, *Foundations of metric fixed point theory and aspects of constructive fixed points.*

Bullock, Douglas, *Finiteness results for skein modules of 3-manifolds.*

Chen, Yan, *Galerkin methods for solving single layer integral equations in three dimensions.*

Erljman, Juliana, *New subfactors from braid group representations.*

Feil, David, *Some radical properties of semigroups.*

Johnson, Roberto Herrera, *Some Whitaker models for $GL_N(F)$.*

Kremer, Darla, *Enumerative properties of the Fibonacci lattices.*

LaGrassa, Susan, *Semirings: Ideals and polynomials.*

Mullins, Bernadette, *Finiteness theorems for factorization in integral domains.*

Oktac, Asuman, *Semigroups whose sub-semigroups are left congruence classes.*

Olesen, Martin, *Continuous fields of C^* -algebras with application to quantum physics.*

Trautwein, Aaron, *Harmonic knots.*

Xiao, Yufei, *On rings some of whose quotients are flat.*

Zhou, Zhengping, *Correspondence theorems and modules inducing category equivalences.*

Zurlo, Luis, *Mackey completions and measures.*

STATISTICS AND ACTUARIAL SCIENCE

Lu, Hsiao-Chuan, *On the distributions of the sample covariogram and semivariogram and their use in testing for isotropy.*

Oh, Myongsik, *Statistical tests concerning a set of multinomial parameters under order restrictions: Approximations to null hypotheses distributions.*

Tsimikas, John, *State space methods in longitudinal data analysis.*

Yue, Huibin, *Gibbs sampling and correlated survival data.*

KANSAS

Kansas State University (3)

MATHEMATICS

Lee, Mi-Aeng, *A pushing up theorem for $SL(2, R)$ and $SL(2, C)$: An application of the amalgam method.*

Sayyar, Hassan, *Brownian motion and a Nagel and Stein criteria.*

Youvaraj, Gummidigampatti Perum, *Kolmogorov's rearrangement problem with respect to some summability methods.*

University of Kansas (1)

MATHEMATICS

Zane, Omar, *Stochastic adaptive control and its applications to the theory of finance.*

Wichita State University (1)

MATHEMATICS

Najafi, Mahmoud, *Energy decay estimates and stabilizability for wave equations in bounded domains coupled in parallel.*

KENTUCKY

University of Kentucky (4)

MATHEMATICS

Brooks, Clayton, *Homotopy theory of modules.*

Cyrus, Vivian, *The category of monoids.*

STATISTICS

Jin, Jianqing (James), *Robust estimation for AR(1) process with missing data.*

Smith, Brian, *Compositional data analysis using Liouville distributions and their generalities.*

LOUISIANA

Louisiana State University (7)

MATHEMATICS

Dobson, Edward, *Some problems in algebraic and extremal graph theory.*

Edie, Richard, *Generalization of the optimal control problem for the Vidale-Wolfe advertising model.*

Kim, Mihi, *Abstract Volterra equations.*

Kingan, Sandra, *Structural results for matroids.*

Knuckles, Craig, *Continuously differentiable selections and parametrizations of multifunctions in one dimension.*

Paris, Stephen P., *Link theory: Applications to real algebraic curves.*

Wu, Haidong, *Connectivity for matroids and graphs.*

University of Southwestern Louisiana (6)

MATHEMATICS

Nip, Kit Keung, *Quenching for semilinear initial-boundary value problems.*

Reeves, Kevin J., *Sets determining group topologies.*

Stutson, Donna Sue, *Stability in terms of two measures and generalized quasilinearization for nonlinear differential equations.*

STATISTICS

Chang, Ching-Hui, *Risk performance and model robustness of some shrinkage estimators.*

Jordan, Scott, *Interval estimation and hypothesis testing of the common mean of several normal populations.*

Ling, Chiahua, *Some results on normal scale parameter estimation.*

MARYLAND

Johns Hopkins University (3)

MATHEMATICAL SCIENCES

Wang, Tao, *Interior point algorithms for constrained systems of equations.*

MATHEMATICS

Feng, Zuming, *An upper bound for the rank of elliptic curves.*

Kida, Masanari, *Arithmetic of abelian varieties under field extensions.*

University of Maryland, Baltimore County (3)

MATHEMATICS AND STATISTICS

Baron, Michael, *Confidence estimation in the change-point problem.*

Wu, Zhong, *Some contributions to parametric estimation using a ranked set sample.*

Zha, Wenxing, *Confidence regions in multivariate calibration.*

University of Maryland, College Park (18)

MATHEMATICS

Black, Elena V., *Arithmetic lifting of Galois extensions.*

Cheah, Sin-Chnuah, *Malfunctions for sheaves of holomorphic functions with growth conditions.*

Dichman, Donald James, *Hamiltonian dynamics of an elastical and the stability of solitary waves.*

Guijarro, Luis, *Rigidity in open manifolds with nonnegative curvature.*

Hayakawa, Yoshiko, *Degeneration of Calabi-Yau manifold with Weil-Petersson metric.*

Jiang, Xun, *Numerical approximation of a phase relaxation model.*

Liu, Kang-Man, *Dimensional reduction for problems of vibrating solids.*

Liu, Ning, *Decomposition theorems for standard processes.*

Melenk, Jens Markus, *On generalized finite element methods.*

Naiman, Aaron E., *Computer solution of finite element linear systems.*

Narasimhan, Revathi, *Robustness of some mixed finite element methods.*

Nickerson, James, *The homology of non-commutative polynomial algebras over valuation domains.*

Sahin, Ayse, *Tiling representations of R^2 actions and alpha-equivalence in two dimensions.*

Santos, Felix Christian Guimaraes, *Numerical analysis of finite element solutions of parametrized nonlinear partial differential equations.*

Shvartsman, Mikhail, *Phase boundaries in anisotropic elastic materials.*

Tzavelas, George, *Parameter estimator: Quasi-likelihood, generalized linear models, semiparametric models and exponential families.*

Vilarrubi, Roberto, *Large deviations results for some stochastic partial differential equations.*

Zimmermann, Georg, *Projective multiresolution analysis and generalized sampling.*

MASSACHUSETTS

Boston University (4)

MATHEMATICS

Fagella, Nuria, *The complex standard family.*

Jones, Charles, *Problems in nonparametric estimation of density and measurement error regression models.*

Kasman, Alexander, *Rank R KP solutions with singular rational spectral curves.*

Nirenberg, Marc, *Cuspidal divisor groups, ordinary modular forms and p -adic L -functions.*

Brandeis University (5)

MATHEMATICS

Guan, Guo-qiang, *Trace quotient modules over hereditary algebras.*

Kaminsky, Szczesny, *Geometric construction of characters.*

Lu, Zhouwen, *Poisson structures on coadjoint orbits and a convexity theorem of moment maps on weak symplectic manifolds.*

Mederer, Kurt, *Moduli of G -equivariant vector bundles.*

Talamanca, Valerio, *Height preserving transformations on linear spaces.*

Harvard University (18)

APPLIED SCIENCES

Christensen, Jon M., *Managing design complexity: Using stochastic optimization in the production of computer science.*

Daniels, Karen M, *Containment algorithms for nonconvex polygons with application to layout.*

Kehler, Andrew W., *Interpreting cohesive forms in the context of discourse inference.*

Kosowsky, Jeffrey J., *Flows suspending interactive algorithms.*

Lochbaum, Karen E., *Using collaborative plans to model the intentional structure of discourse.*

Roth, Dan, *Learning in order to reason.*

MATHEMATICS

Angehrn, Eugen Urban, *An effective polynomial bound for base point freeness and point separation of adjoint bundles.*

Costes, Constantine, *Some explicit cocycles for cohomology classes of groups of diffeomorphisms preserving a G -structure.*

Durenard, Eugene A., *A Mayer-Vietoris principle for monopoles.*

Grabner, David, *Walks and representation theory.*

Ng, Kok Onn, *The moduli space of (3, 3, 3) trilinear forms.*

Rains, Eric M., *Topics in probability on compact Lie groups.*

Ruan, Wei-Dong, *On the convergence of Kähler metrics.*

Shahrouz, Henri, *The Grothendieck quotient scheme and composition laws for Grassmannians.*

Su, Francis Edward, *Methods for quantifying rates of convergence for random walks on groups.*

Verbitsky, Misha, *Cohomology of compact hyperkaehler manifolds.*

STATISTICS

Chen, Xianghui, *Weighted sampling, statistical applications and generalizations.*

Everson, Philip, *Inference for multivariate normal hierarchical models.*

Massachusetts Institute of Technology (30)

MATHEMATICS

Braden, Tom, *Characteristic cycles of toric varieties; perverse sheaves on rank stratifications.*

Celentano, Carlos, *Finite amplitude resonant acoustic waves without shocks.*

Chan, Wendy, *Invariant theoretical applications of supersymmetric algebra.*

Chow, Timothy, *Symmetric function generalizations of graph polynomials.*

Fan, Chenteh, *A Hecke algebra quotient and properties of commutative elements of a Weyl group.*

Hawrylycz, Michael, *Geometric identities in invariant theory.*

Kaledin, Dmitry, *Singular hyperkähler quotients.*

Klugerman, Michael, *Small-depth counting networks and related topics.*

Lam, Tao Kai, *B and D analogues of stable Schubert polynomials and related insertion algorithms.*

Ma, Yuan, *Fault-tolerant sorting networks.*

Monta, Peter, *Signal processing for high-definition television.*

Quinn, Malcolm, *A new completely integrable system on the symmetric periodic Toda lattice phase space.*

Saia, Alain, *Randomness versus non-determinism in distributed computing.*

Sher, Joshua, *The geometry of the generic line complex.*

Shiple, Brooke, *Convergence of the homology spectral sequence of a cosimplicial space.*

Sidney, Raymond, *Digital signatures from probabilistically checkable proofs.*

Spielman, Daniel, *Computationally efficient error-correcting codes and holographic proofs.*

Tesler, Glenn, *Semi-primary lattices and tableau algorithms.*

Wang, Weiqiang, *Representations of vertex operator algebras and superalgebras.*

Watanabe, Shinya, *Nonlinear dynamics of one-dimensional Josephson junction arrays.*

Wong, Siman, *On the Selmer groups of elliptic curves in quadratic twist families.*

Yin, Yiqun, *Teaching, learning, and exploration.*

OPERATIONS RESEARCH

Chi, Zhihang, *Airline yield management in a dynamic network environment.*

Milner, Joseph, *Dynamic slot allocation with airline participation.*

Mourtzinou, Georgia, *An axiomatic approach to queueing systems.*

Nino-Mora, Jose, *Optimal resource allocation in a dynamic stochastic environment: A mathematical programming approach.*

Raghavan, S., *Formulations and algorithms for network design problems with connectivity requirements.*

Ramakrishnan, V. S., *On cuts and clutters.*

Ricard, Michael, *Optimization of queueing networks: An optimal control approach.*

Theodosopoulos, Theodore, *Stochastic models for global optimization.*

Northeastern University (2)

MATHEMATICS

Yang, Rixin, *Bifunctor theory and representation theory of algebras.*

Zafar, Omid, *Some necessary and sufficient conditions for sequence of integers to be a score sequence of a Steinhaus tournament.*

Tufts University (1)

MATHEMATICS

Shao, Yongzhao, *Spacings and likelihood.*

University of Massachusetts, Amherst (6)

MATHEMATICS AND STATISTICS

Kotler, Mitchell, *Some theorems on ergodicity conditions for multi-dimensional Markov chains with applications.*

Li, Yu Ping, *Statistical inference for time series with nonuniformly spaced observations.*

Miller, Patrick, *Stability of travelling waves for a three-component reaction-diffusion system.*

Thayer, Edward, *Complete minimal surfaces in Euclidean space.*

Wiedie, Ann, *Problems in accounting for measurement error in the dependent variable in a general linear model.*

Zhang, Luping, *Quasiperiodic and almost periodic solutions for forced nonlinear second order conservative systems.*

MICHIGAN

Michigan State University (8)

MATHEMATICS

Bang, Keumseong, *Riemannian geometry of vector bundles.*

Jovovic, Mirjana, *Hankel operators on harmonic Bergman spaces.*

Lee, Changwoo, *On the domination number of a digraph.*

Nicolaescu, Liviu, *The spectral flow, the Maslov index and decompositions of manifolds.*

Ozan, Yildiray, *Algebraic G-bundles.*

Shelburne, Peter, *Low dimensional formal fibers in characteristic p .*

Yi, Heung Su, *Harmonic Bergman functions on half-spaces.*

STATISTICS AND PROBABILITY

Gawarecki, Leszek, *Anticipative stochastic calculus, kinematics of stochastic motion in Hilbert space and time reversal problem.*

University of Michigan, Ann Arbor (43)

BIOSTATISTICS

Chao, Chiangsun, *A comparison of models including possibility of cure for survival data.*

Green, Paul E., *Bayesian estimation of rates using a hierarchical log-linear model.*

Liang, Wen-min, *A test for treatment effects in a clinical trial when the probability of being a dropout is affected by the outcome.*

Park, Pil S., *Errors of misclassification in discriminant analysis.*

Schultz, Lonni, *Delayed observation covariates in a survival model.*

Shyr, Yu, *Some aspects of canonical correlations analysis.*

INDUSTRIAL AND OPERATIONS

ENGINEERING

Abillama, Walid, *Optimal production policies in production systems with uncertainties.*

Benhajla, Saida, *A neural network decision model for managing product mix.*

Black-Nembhard, Harriet, *A transient period control methodology for continuous mix manufacturing.*

Hadj-Alouane, Atidel, *A genetic algorithm for nonlinear integer programs.*

Hwang, Juhwen, *Production policy for systems with uncertain capacity and demand.*

Kim, Jonghwa, *Transfer batch sizing in trip-based material handling systems.*

Ledersnaider, David, *A sequential methodology for response surface estimation.*

Liaw, Ching-Fang, *Heuristic search and its transit applications.*

Majeske, Karl, *Interpreting automobile warranty data for engineering design and process movement.*

Nembhard, David, *Heuristic path selection in graphs with non-order preserving reward structure.*

Takriti, Samer, *Stochastic programs with dynamically varying right-hand sides.*

Wang, Chi-Yueh, *The use of statistical quality improvement methods in automotive body manufacturing: Three research topics.*

Wang, Wei-Ching, *Detection of process change with non-geometric failure time distribution.*

Wunderlich, Karl, *Link-time prediction for real-time anticipatory route guidance in vehicular traffic networks.*

Yi, Tongnyoul, *Bipartite matchings with specified values for a 0-1 linear function.*

MATHEMATICS

Buzzard, Gregory T., *Persistent homoclinic tangencies and infinitely many sinks for automorphisms of C^2 .*

Chang, Yaotsu, *Imprimitive symmetric rank 4 association schemes.*

Chen, Jing, *Relativistic conservation laws.*

Doyle, David R., *Error bounds for finite-difference approximations for certain nonlinear parabolic systems in the quarter-plane.*

Eisworth, Erick Todd, *Contributions to the theory of proper forcing.*

Ferry, Audrey P., *Topological characterizations for logic programming semantics.*

Frey, Darrin D., *Conjugacy of alternating groups of degree 5 and $SL(2, 5)$ subgroups of the complex Lie group of type E_5 .*

Headley, Patrick T., *Reduced expressions in infinite Coxeter groups.*

Kan, SuJen, *The global Burns-Epstein invariant and Grauert tubes.*

Katzman, Mordechai, *Some finiteness properties of the Frobenius endomorphism and their applications to tight closure.*

Miller, Judith R., *Asymptotic stability of solitary waves for the regularized long wave equation.*

Miller-Van Wieren, Leila, *Univalence criteria for analytic functions.*

Moon, Myoung-Ho, *An extension of a theorem of Griffiths to 3-manifold groups.*

Pambuccian, Victoria, *Proper holomorphic mappings.*

Pehlivanian, Charles Ara, *Minimality and perturbations of CR manifolds.*

Shaw, Douglas J., *A non-associative approach to the finite projective plane conjecture.*

Stephenson, Darin R., *Artin-Schelter regular algebras of global dimension three.*

Teo, Kok-Ming, *Homological properties of fully bounded Neotherian rings and Sklyanin algebras.*

Thurman, Robert E., *Extremal problems for logarithmic capacity and extremal length.*

Wuchter, Gerald J., *Polynomial hulls of subsets of the two torus.*

Yiparaki, Olga, *On some tree partitions.*

STATISTICS

Lai, Shou-Ren, *Bayesian nonparametric survival analysis for finite populations.*

Wayne State University (3)

MATHEMATICS

Dakka, Imad, *Optimization of differential inclusion problems with delay.*

Su, Xiang-Ying, *Subgraphs of graphs and digraphs.*

Wu, Ying, *A new estimate using double splines.*

Western Michigan University (8)

MATHEMATICS AND STATISTICS

Chang, William, *High breakdown rank-based estimates.*

Cong, Fan, *Semi-strongly regular graphs and generalized cages.*

McKnight, Scott, *A bootstrap method to analyze an intervention model with autoregressive error terms.*

Rashidi, Reza, *The theory and applications of stratified graphs with applications.*

Schultz, Kelly Lynne, *Step domination in graphs.*

Tesar, Ester, *Probability polynomials for cubic graphs in the framework of random topological graph theory.*

Xie, Feipeng, *Asymptotic diagonalizations of a linear ordinary differential system.*
 Yue, Quan, *Efficient dominating sets in oriented trees.*

MINNESOTA

University of Minnesota, Minneapolis (25)

BIOSTATISTICS

Chan, Ivan Siu Fung, *Test of mutual independence in high dimensional sparse contingency tables.*

Dain, Bradley, *Methods of estimation in parametric models for interval-censored survival data.*

Darif, Mohamed, *Parameter estimates in the logistic regression with covariates measured with errors.*

Ireland, Marjorie, *Logistic regression with missing covariate data.*

MATHEMATICS

Cabanela, Rosa, *The retrograde solutions of the planar three body problem in the neighborhood of the restricted problem via a submanifold convex to the flow.*

Ellman, Michael, *Analysis of integrals arising as local factors of L-functions.*

Gau, Huiing, *Numerical methods for conservation laws of mixed type.*

Hakimhashemi, Mehdi, *Functors of the category of spaces and homology.*

Huang, Chaocheng, *Homogenization methods in partial differential equations and modeling multiphase materials.*

Jones, Philip, *Asymptotic potentials for simulated annealing.*

Lapic, Stephan, *On the first-initial boundary value problem for stochastic partial differential equations.*

Li, Changchun, *Motivic classes in crystalline cohomology.*

Moniri, Mojtaba, *Models of open induction and generalized power series.*

Nichols, Preston, *Minimizing p-harmonic maps into projective space.*

Ren, Xiaofeng, *A singular perturbation problem and its peaking solutions.*

Shao, Zhoudde, *Inertial manifolds for partly dissipative reaction diffusion equations in higher space dimensions.*

Srinivasan, Gopala, *WTC expansions and Painleve analysis.*

Tabacman, Eduardo, *Variational computation of homoclinic orbits for twist maps.*

Wei, Juncheng, *Qualitative properties of some semilinear elliptic equations.*

Yun, Jie, *Homogenization of a two-region model for the spontaneous combustion of coal stockpiles.*

STATISTICS

Croos-Dabrera, Rodney, *Graphical methods for studying curvature in regression.*

Deppa, Brant, *Optimal designs for smoothing.*

Papandonatos, George, *Interim analysis of regression models with possible censoring.*

Park, Chongsun, *Topics in generalized linear models.*

Secchi, Piercesare, *Problems in two person, zero sum stochastic games.*

MISSISSIPPI

University of Mississippi (2)

MATHEMATICS

Hurst, Fair Barbour, *Ramsey and extremal theory for matroids.*

Wingard, George Clifton, *Properties and applications of the Fibonacci polynomial of a graph.*

University of Southern Mississippi (1)

MATHEMATICAL SCIENCES

Wild, Michael Martin, *Modeling long, continuous wave, acoustic signals scattering from the ocean surface.*

MISSOURI

Saint Louis University (1)

MATHEMATICS AND COMPUTER SCIENCE

Stephanus, Mary C., *Orientation-reversing Z_2 -actions on handlebodies.*

University of Missouri, Columbia (1)

STATISTICS

Lee, Hyungseok, *Markov chain Monte-Carlo methods for estimating multidimensional ability in item response analysis.*

Washington University (13)

MATHEMATICS

Fu, Siqi, *Geometry of bounded domains and behavior of invariant metrics.*

Huang, Xiaojun, *Geometric analysis in several complex variables.*

Liu, Li, *Structures of NY-groups and SNY-groups.*

Shen, Youfeng, *Harmonic analysis on the tree relating to Green's operator.*

Wang, Xihua, *The study of wavelets from the properties of their Fourier transforms.*

Xian, Hong, *Studies of geometric models of composition operators.*

SYSTEMS SCIENCE AND MATHEMATICS

De, Prasanta, *Closed form optimal synthesis and general analysis of manipulator trajectories for real-time control.*

Guo, Chuanfan, *Flexible robot control with periodic feedback and sampled output.*

Hu, Ning, *Multi-p processes: Iterative algorithms and pre-conditionings for the p-version of finite element analysis.*

Jankovic, Miroslava, *A geometric analysis of bang-bang trajectories in the boundary of the small time reachable set for nondegenerate 5 dimensional systems.*

Loucks, Edward, *A perspective systems approach to parameter identification problems in machine vision.*

Suzuki, Sadanori, *H-infinity control of nonlinear systems with sampled measurement.*

Zhou, Jing, *New methods in image processing: Segmentation, feature extraction and matching.*

MONTANA

Montana State University (5)

MATHEMATICAL SCIENCES

Buhl, David, *Student teaching: Opportunities for observing, experimenting with, and implementing assessment practices recommended by the NCTM standards documents.*

Carlson, Timothy, *A sinc-collocation method for Burgers' equation.*

Hoar, Robert, *An adaptive stencil finite difference method for first order linear hyperbolic systems.*

Oman, Mary, *Iterative methods for total variation based image reconstruction.*

Sanford, Michael, *Extensions of Cantor set maps to disk homeomorphisms.*

University of Montana (4)

MATHEMATICAL SCIENCES

Hawkins, Debbie Sue, *Categories of additives, fractions and localization for rings and categories of R-modules.*

Keck, Andrew Gareth, *A local model for dendritic solidification.*

Steele, Brian Margulies, *Estimation in generalized linear mixed models via EM algorithm.*

Zhong, Ninghui, *Submodularity, min-max results and total dual integrality of combinatorial optimization problems.*

NEBRASKA

University of Nebraska-Lincoln (8)

MATHEMATICS AND STATISTICS

Arora, Vipin, *Empirical and hierarchical Bayes estimation in finite population sampling with application to small area estimation.*

Cimen, Nuri, *One dimensional rings of finite Cohen-Macaulay type.*

Holay, Sandeep, *Generators and resolutions of ideals defining certain surfaces in projective space.*

Huffman, Timothy, *An analytic Yeh-Feynman-Fourier transform and convolution.*

Jajcay, Robert, *Vertex-transitive graphs and maps and their automorphism groups.*

Kilibarda, Vesna, *On the algebra of semigroup diagrams.*

Li, Aihua, *Partially ordered sets of prime ideals and prime filtrations of finitely generated modules.*

Pfabe, Kristin Anne, *A problem in nonlinear ion transport.*

NEW HAMPSHIRE

Dartmouth College (2)

MATHEMATICS

Peterson, Annalisa, *Forcing below \emptyset' -jump in models of Σ_1 .*

Rajpal, Sanjay, *On paving matroids representable over finite fields.*

University of New Hampshire (4)

MATHEMATICS

Bochert, Mark Lloyd, *Extensions of bialgebras and their cohomological description.*

Kilic-Bahi, Semra, *On the Berezin symbol.*

McHugh, Michael James, *Orbit-reflexivity.*

Narang, Deborah, *Reflexive subspaces and lattices of pairs of projectives.*

NEW JERSEY

Princeton University (13)

APPLIED AND COMPUTATIONAL MATHEMATICS

Bronski, Jared, *Aspects of randomness in nonlinear wave propagation.*

Chekhlov, Alexey, *Studies of forced-dissipative turbulence in model hydrodynamics.*

McLaughlin, Richard, *Turbulent transport.*
Shouraboura, Nadia, *Algorithms for 3D space tetrahedralization: An experimental study.*

MATHEMATICS

Andreotti, Alejandro C., *The weighted Bergman kernel in a strictly pseudoconvex domain.*

Hsu, Timothy M., *Quilts, T-systems, and the combinatorics of Fuchsian groups.*

Jakobson, Dmitry, *Quantum limits on flat tori and on $PSL_2(\mathbb{Z})/PSL_2(\mathbb{R})$.*

Jarvis, Tyler J., *Compactification of the moduli space of generalized spin curves.*

Keel, Markus, *The critical power Yang-Mills-Higgs equations.*

McCann, Robert John, *A convexity theory for interacting gases and equilibrium crystals.*

Tanton, James Stuart, *On the homology of general linear groups over field extensions.*

Vasiv, Adrian, *Integral canonical models for Shimura varieties of Hodge type.*

Zaharescu, Alexandru, *Quadratic diophantine inequalities.*

Rutgers University (30)

MATHEMATICS

Altinel, Ahmet Tuna, *Groups of finite Morley rank with strongly embedded subgroups.*

Alvarez, Juan Carlos, *The symplectic geometry of spaces of geodesics.*

Corso, Alberto, *Blowups of links of irreducible varieties.*

Fairman, Randall S., *p -subnormal subgroups of finite simple subgroups.*

Fundia, Andres Daniel, *Random algorithms, derandomization and independent sets.*

Gao, Wenyun, *Elliptic curves attaining everywhere good reduction over abelian extensions.*

Giacomin, Giambattista, *Interacting particle models for phase segregation and motion of interfaces.*

Guo, Hong, *On abelian intertwining algebras and their modules.*

Huang, Ying, *A nonlinear operator related to refinable functions.*

Kayll, Peter Mark, *Asymptotically good covers in hypergraphs.*

Koplon, Renee Beth, *Linear systems with constrained outputs and transitions.*

Morey, Susan Elaine, *The equations of Rees algebras of low codimension.*

Polini, Claudia, *Studies on singularities.*

Sanderson, Yasmine B., *On characters of Demazure modules.*

Sanje Mpacko, Guillaume Donat, *Bernstein decomposition and types for smooth representations of $SL_N(F)$, N prime.*

Sharp, James Dimitri, *The structure of the subgroup lattice of the symmetric group on the natural numbers.*

Smyth, Robert William, *Characterization of Lorentz surfaces via the conformal boundary.*

Trimble, Todd Hampton, *Linear logic, bimodules, and full coherence for autonomous categories.*

Vaz Pinto, Maria Telo, *Structure of Sally modules and Hilbert functions.*

Webb, David Winfield, *A uniform upper bound for the modulus of the Cesaro-Laguerre kernel of a given nonnegative order.*

Xie, Jiahai, *Restriction of discrete series for real reductive groups to certain subgroups.*

OPERATIONS RESEARCH

Li, Wen-Zhong, *Dual method and bounding for stochastic programs with applications in activity networks.*

Long, Jianmin, *Some new probability bounds and their applications.*

Maio, Jianming, *Topics in matrix theory and optimization.*

STATISTICS

Berger, Vance, *Testing for stochastic order in contingency tables.*

Choi, Daiwoo, *On the latent trait model with items of equal difficulty.*

Kim, Yongman, *On resampling based inference.*

Li, Xin, *Estimation in linear regression models with doubly censored data.*

Luz, Beatriz, *Constrained M-estimation for linear regression models.*

Rogers, Christopher, *Peeking at data hypothesis testing and exploration data analysis.*

Stevens Institute of Technology (3)

MATHEMATICAL SCIENCES

Curtis, Debra V., *Picard-Fuchs differential equations for the quadratic periods of Abelian integrals of the first kind.*

Matagrano, Anthony, *Generalization of the classic birthday problem from probability theory.*

Saccoman, John Thomas, *Some synthesis results in network reliability theory.*

NEW MEXICO

University of New Mexico (7)

MATHEMATICS AND STATISTICS

Epler, William C., *Bayes, empirical Bayes and accelerated life testing.*

Gutierrez, Miguel, *Random perturbations of dynamical systems: Stochastic averaging results and limit theorems on $(0, \infty)$ intervals.*

Kindilien, Peter John, *Numerical computation of invariant curves and invariant tori of systems of ordinary differential equations.*

Price, Andrew, *The type-N twisting equations as involutive exterior differential system.*

Sanders, Margaret Lind, *Analysis of spatial cluster processes: Applications in cell biology.*

Wang, Yao, *Partial prior information and hierarchical Bayes.*

Waters, Arlon J., *Breakup theory and computation for three-body scattering with the Chandler-Gibson equations.*

NEW YORK

CUNY, Graduate Center (9)

MATHEMATICS

Barbano, Paolo, *Automorphisms and quasiconformal mappings of Heisenberg-type groups.*

Bednarchak, Debe, *Heat diffusion on graphs.*

Goldstone, Richard, *Geometric realization of homotopy systems.*

Helm, Martin, *On Sidon sets and related topics in additive number theory.*

Lakic, Nikola, *On the geometry of Teichmüller space.*

Mannucci, Mirco Antonio, *Categorical semantics of modal doctrines.*

Schneider, Elizabeth, *Invariants of 1-relator groups and residual properties of amalgamated products.*

Skurnick, Ronald, *Integer sequences associated with trees.*

Vulis, Dimitri, *Collective encryption: Cryptosystems based on the commutator collection process for certain free products.*

Clarkson University (2)

MATHEMATICS AND COMPUTER SCIENCE

Burtsev, Sergei, *The novel integrable equations of nonlinear optics and inverse scattering transforms.*

Kang, Yimin, *Analysis and applications of combined numerical methods for systems of differential equations.*

Columbia University (10)

MATHEMATICS

Cuccagna, Scipio, *On Sobolev estimates for fractional and singular Radon transforms.*

Guo, Jiandong, *On the generalization of a Waldspurger's result.*

Ilic, Bozidar, *Geometric properties of the double point divisor.*

Kalfagianni, Efstratia, *Finite type invariants for knots in 3-manifolds.*

Lim, Yuhan, *Computation of Donaldson invariants for elliptic surfaces of geometric genus 1.*

Meng, Jianyun, *Effective bound on summation of Green's function.*

Mikkelsen, Per, *Effective bounds for the degree of integral points on plane arithmetic surfaces.*

STATISTICS

Gu, Xiai-Fend, *Asymptotic properties of the estimator for the two-sample problem with truncated data.*

Kou, Shing-Gang (Steven), *On the pricing of contingent claims under constraints.*

Pikovsky, Igor, *Anticipative stochastic control in finance.*

Cornell University (23)

APPLIED MATHEMATICS

Liu, Jianguo, *Interior and exterior Newton methods for large-scale quadratic programming.*

Manning, Robert Scott, *Semiclassical propagation for non-Cartesian variables.*

Saints, Keith, *Algebraic methods for the encoding and decoding problems for multidimensional cyclic codes and algebraic-geometric codes.*

Wise, Theresa Hull, *Column generation and polyhedral combinatorics for airline crew.*

de Loera, Jesus Antonio, *Triangulations of polytopes and computational algebra.*

BIOMETRICS

Hobert, James Patrick, *Occurrences and consequences of nonpositive Markov chains in Gibbs sampling.*

Lynn, Henry Sui-Heng, *Comparing maximum likelihood ordination with principal components analysis and correspondence analysis.*

MATHEMATICS

Coykendall, James Barker, *Normsets and rings and algebraic integers.*

Dalbec, John, *Geometry and combinatorics of Chow forms.*

Kalies, William David, *Regularized models of phase transformation in one-dimensional nonlinear elasticity.*

Lee, Susan, *Optimal drift on the unit interval.*

Liu, Niandong, *Algebraic and combinatorial methods for face enumeration in polytopes.*

Luo, Jiaqi, *Combinatorics and holomorphic dynamics: Captures, matings, Newton's method.*

Schleicher, Dierk, *Internal addresses in the Mandelbrot set and irreducibility of polynomials.*

OPERATIONS RESEARCH

Carr, Stuart, *A partial make-to-order production-inventory strategy for industrial manufacturers.*

Chance, Beth Lynn-Nyerges, *Behavior characterization and estimation for general hierarchical multivariate linear regression models.*

Magnusson, Sverker, *Cutting stock problems: Theory and practice.*

Ralphs, Theodore, *Parallel branch and cut for vehicle routing.*

Thomas, Rekha Rachel, *Grobner basis methods for integer programming.*

STATISTICS

Hobert, James, *Occurrences and consequences of nonpositive Markov chains in Gibbs sampling.*

Lynn, Henry Sui Heng, *Comparing maximum likelihood ordination with principal components analysis for equicorrelated data.*

Tsao, Chen-Hai, *Confidence estimation and conditional inference for Fieller's sets.*

Tseng, Yu-Ling, *Good exact confidence sets and minimax estimators for the mean vector of a multivariate normal distribution.*

New York University, Courant Institute (19)

MATHEMATICS

Caniceros, Angelo Hector, *Convergence of a reformulated boundary integral method for two fluid interfaces with surface tension.*

Davis, Geoffrey, *Adaptive non-linear approximations.*

Emerson, Thomas, *Computation over abstract ordered rings: Rings of computable functions, NP-completeness, and relativized complexity classes.*

Engelberg, Shlomo, *On the stability of certain classes of solutions of the Burgers' equation with higher order viscosity.*

Fibich, Gadi, *Self-focusing in the nonlinear Schrödinger equation for ultrashort laser-tissue interactions.*

Grabovsky, Yury, *Bounds of extremal microstructures with two-component composites: A unified treatment based on the translation method.*

Howard, C. Douglas, *The orthogonality of measures induced by random walks with scenery.*

Komorowski, Tomasz, *Limit theorems for motion in random fields.*

Lee, June-Yub, *Adaptive numerical methods for singular perturbation problems in one space dimension.*

McLaughlin, Kenneth, *A continuum limit of the Toda lattice.*

Psarelli, Maria, *Asymptotic behavior of the solutions of Maxwell, Klein-Gordon field equations in 4-dimensional Minkowski space.*

Qiu, Longdong, *Gravitational collapse of the spherically symmetric charged dust.*

Rosar, Madeleine, *A three-dimensional computer model for fluid flow through a collapsible tube.*

Sarkis, Marcus, *Schwartz preconditioners for elliptic problems with discontinuous coefficients using conforming and non-conforming elements.*

Sethuramah, Sunder, *Limit theorems and estimates for interfacing particle systems.*

Tehrani, Hossein, *On some semilinear elliptic boundary value problems.*

Venkatsubramani, Ramesh, *Hydrodynamic limit for the asymmetric exclusion process with deterministic initial data and the Hammersley process of $S(1)$.*

Volchan, Sergio, *Some survival results for one-dimensional contact process in a random environment.*

Young, Robert, *Approximate equilibrium and local stability of the Earth's magnetotail.*

New York University (2)

STATISTICS AND OPERATIONS RESEARCH

Alevras, Dimitris, *Essays on combinatorial optimization.*

Krishnasamy, Ilangkovan, *Statistical modelling of the sleep hypnogram and an analysis of sufficient statistics for grouped data.*

Rensselaer Polytechnic Institute (10)

MATHEMATICAL SCIENCES

Bongiovanni, Kevin, *Environmental influences on acoustic propagation in the ocean.*

Buckmire, Rondel, *The design of shock-free transonic slender bodies.*

Caprioli, Paul, *Optimizing nonlinear functions on parallel computing machines.*

Doerstling, Brendan, *A 3-D reconstruction algorithm for the linearized inverse boundary value problem for Maxwell's equations.*

Geist, Bruce, *The asymptotic expansion of the eigenvalues of the Timoshenko beam.*

Jardine, Richard, *Non-reflecting boundary conditions for parabolic approximations.*

Labenski, Caroline, *Coils.*

Ng, David, *An incomplete boundary measurement problem in impedance imaging.*

Schmidt, David, *Noneven digraphs, symplectic Paris, and full sign-invertibility.*

Wettergren, Thomas, *Near-integrable dynamics of the Maxwell-Bloch equation.*

SUNY at Albany (6)

MATHEMATICS AND STATISTICS

Cox Paul, Maureen, *The image of the Picard invariant map for Hopf Galois extensions.*

Grossman, Eric J., *The Berezin transform.*
Koch, Alan H., Jr., *Cyclic Dieudonne modules, Witt subgroups, and their lifts to characteristic zero.*

Lacey, Laurie L., *Astral collision and a theorem of Whitehead.*

Rice, John P., *Continuous linear functionals on compact and convex integral families of analytic functions.*

Sheng, Jiaying, *An entropic Bayesian algorithm for reconstructing incomplete Poisson data.*

SUNY at Binghamton (7)

MATHEMATICAL SCIENCES

Fischer, Matthew Paul, *Two-groups with a self-centralizing element.*

Garrison, David James, *Subnormality conditions in metabelian groups.*

Harris, David M., *The mapping class group of a rotation domain.*

Krajcevski, Mile Pavle, *Tilings of the plane and hyperbolic groups.*

Lamprecht, Elizabeth Ann, *A Bernoulli one-armed bandit problem involving a changepoint.*

Okun, Boris, *Non-zero degree tangential maps between dual symmetric spaces.*

Raduns, Gary Lee, *Ergodic decompositions and sweeping in Riesz spaces.*

SUNY at Buffalo (6)

MATHEMATICS

Berlind, Roger, *An alternative method of stochastic discrimination with applications to pattern recognition.*

Ni, Yigong, *Dynamic limit of viscoelastic relaxation with a van der Waals type stress.*

Shi, Zhixin, *Precise solution of linear elliptic partial differential equations.*

Shyu, Shih-min, *d-hypoelliptic convolution equations in K_M .*

Xu, Guangwu, *Multipliers of the algebras $Ap(G)$.*

Zhang, Jianhe, *Existence and global approximation of a homoclinic orbit of the Lorenz equation.*

SUNY at Stony Brook (16)

APPLIED MATHEMATICS AND STATISTICS

Beltran, Hector Fernando, *On some design and cost allocation problems in telecommunications networks.*

Chen, Xiaoan, *Modeling and numerical simulation of microwave heating.*

Chen, Yupin, *Two phase flow analysis of turbulent mixing in the Rayleigh-Taylor instability.*

Holmes, Richard Lansing, *A numerical investigation of the Riehtmeyer-Meshkov instability using front tracking.*

Monroe, Susan Lynn, *Optimization of stochastic models for planning reservoir releases.*

Yan, Xiaorong, *A weighted product-limit statistic for survival analysis under left truncation.*

MATHEMATICS

Burton, Renee, *Irreducible tempered representations of the special linear group over a p-adic field.*

Durán-Fernandez, Carlos Eduardo, *On the geodesic flow of Zoll manifolds.*

Jiang, Xinhui, *An index theorem on foliated bundles.*

McRae, Alan Stuart, *Darboux theorems for pairs of submanifolds.*

Moore, Helen, *Minimal submanifolds with various curvature bounds.*

Mrakovic, Darko, *On encryption of infinitesimal neighborhoods in geometric invariants of cone structures on the space of nearby submanifolds.*

Ontaneda-Portal, Pedro, *Some examples of spaces with non-positively and negatively curved exotic triangulations.*

Reyes, Eduardo, *The deformation spaces of certain subgroups of Kleinian groups.*

Stingley, Robert, *Singularities of maps between n-manifolds.*

Taylor, Edward, *On volumes of convex cores under algebraic and geometric convergence.*

Syracuse University (5)

MATHEMATICS

Hamdan, May, *On the asymptotic values of analytic functions in the unit disk.*

Jagadeeshan, Shashidhar, *Stable Artin algebras.*

Prus-Wisniowska, Ewa, *Cognitive, meta-cognitive, and social aspects of mathematical proof with respect to calculus.*

Prus-Wisniowska, Franciszek, *General properties of functions of bounded λ -variation.*

Riordan, JeanAnn, *Effect of persistence time on learner achievement.*

University of Rochester (4)

MATHEMATICS

Boyd, Cheri Loretta, *A type number formula for orders of level $p^{2r+1}M$.*

Chang, Chien-Hung, *Martin boundaries and conditional Brownian motions on Denjoy domains in \mathbb{R}^n .*

Mao, Binhua, *A BP analog of Lin's Theorem and the realization of $A(n)^*$.*

Sonn, Seonhee Yoon, *Homology of the double loop space of the exceptional Lie groups.*

NORTH CAROLINA

Duke University (3)

MATHEMATICS

Hornung, Richard D., *Adaptive mesh refinement and multi-level iteration techniques.*

Hughen, Walker Keener, *The sub-Riemannian geometry of three-manifolds.*

Moulton, Vincent Lynmore, *Vector braids.*

North Carolina State University, Raleigh (16)

MATHEMATICS

Etheridge, Debra Lynn, *Existence and behavior of solutions of nonlinear discrete-time boundary value problems.*

Lawson, Jeffrey Kent, *Generalized symplectic geometry for classical fields and spinors.*

Pennell, Edwin Adam, *Generalized Bruhat order on reductive monoids.*

OPERATIONS RESEARCH

Kraus, Mark Edward, *A generalized path-following approach to solving semi-infinite linear programming problems.*

Messner, Michael Jay, *Application of decision analysis to a superfund remedial investigation.*

Mishra, Shankaranand, *Tandem queues with general blocking: A maximum entropy optimization approach.*

Rhee, Young, *Analysis of an open tandem queueing network with population constraint and constant service times.*

STATISTICS

Akdi, Yilmaz, *Periodogram analysis for unit roots.*

Belanger, Bruce Albert, *Calibration inference in nonlinear heteroscedastic models with application to bioassay.*

Elsheimer, David Bruce, *Development and adaptations of data-driven nonparametric goodness-of-fit tests for a regression function.*

Gould, William Robert IV, *New developments in catch-effort estimation of important demographic population parameters.*

Hess, George Richard, *Disease in metapopulation models: Implications for conservation.*

Huang, Ju-Chin, *New discrete choice methods for valuing environmental amenities: Theory and evaluation.*

Mesenbrink, Peter Grant, *Model and transformation selection in fractionated experiments with complex aliasing.*

Unal, Cemal, *Reliability improvement with mean and variance modeling for censored data from industrial experiments.*

Wakeford, Charles William, *The use of composite sampling in compliance testing when the underlying probability distribution is continuous.*

University of North Carolina, Chapel Hill (7)

BIOSTATISTICS

DeMasi, Ralph A., *Proportional hazards models for multivariate failure time data with generalized competing risks.*

Lipschutz, Katherine Harris, *Evaluation of methods used to analyze multiple time to failure data.*

Munoz, Sergio, *Group sequential methods for bivariate survival data in clinical trials: A proposed analytic method.*

Ng'andu, Nicholas Hakavuna, *A comparison of test statistics for assessing the proportional hazards assumption of Cox's model.*

Pedroso de Lima, Antonio Carlos, *A semi-parametric matrix-valued counting process model for survival analysis.*

Phillips, James A. III, *A multistage multiple comparison procedure for the analysis of multiple treatment group clinical trials.*

Preisser, John Stephen, *Regression diagnostics and resistant fits for generalized estimating equations.*

OHIO

Air Force Institute of Technology (2)

MATHEMATICS AND STATISTICS

Carter, Martha Alvey, *The mathematics of measuring capabilities of artificial neural networks.*

Fulk, David Allen, *A numerical analysis of smoothed particle hydrodynamics.*

Bowling Green State University (2)

MATHEMATICS AND STATISTICS

Dey, Partha Pratim, *Cartesian groups and incidence matrices.*

VanAken, Troy, *Affine difference sets.*

Case Western Reserve University (1)

MATHEMATICS

Chou, Yonggang, *Some results on bilinear control systems with rank-one inputs.*

Kent State University (4)

MATHEMATICS AND COMPUTER SCIENCE

Davis, Timothy, *Finite element analysis of the Landau-de Gennes minimization problem for liquid crystals in confinement.*

Gonsor, Daniel E., *Some theoretical issues concerning computer aided geometric design.*

Krautstengl, Alan, *Matrix vectorial norms and their application to the Gerschgorin theory for block partitioned matrices.*

Lemma, Mulatu, *Some power series transformations and weighted mean transformations that preserve absolute convergence.*

Ohio State University (14)

MATHEMATICS

Giust, Steve, *Generalized controllability and observability filtrations and the Weddeburn Forney construction.*

Jiang, Dihua, *L-function for the standard tensor product representation of $GSP(2) \times GSP(2)$.*

Lee, Cary, *The descriptive set theory of Borel Abelian reduced p -groups.*

Lee, Yoonweon, *Contributions to regularized determinants of elliptic operators.*

Pinter, Ferenc, *Perturbation of orthogonal polynomials on an arc of the unit circle.*

Shao, You-yu, *Representation theory of quadratic forms.*

Snell, Michael, *An asymptotic series for norms of powers.*

Xu, Mingzhi, *On cohomology groups of global units in \mathbb{Z}_p^d -extensions.*

Zhang, Jiexiang, *Orthogonal polynomials, their relative growth and their applications.*

STATISTICS

Baggs, Marcia Geraldine Edralin, *Properties of order statistics from bivariate exponential distributions.*

Bush, Christopher, *Semi-parametric Bayesian linear models.*

Ho, Yu-Yun, *Diagnostics for heirarchical Bayesian regression.*

Johnson, Jeffrey Alan Draskoci, *A technique for incorporating certain kinds of prior knowledge in a nonparametric analysis.*

Pan, Guohua, *Compare groups with umbrella orderings.*

Ohio University (2)

MATHEMATICS

Ding, Yimin, *Volterra integral equations in Banach spaces.*

Kline, Jeannette, *Statistical convergence and densities generated by sequences of measures.*

University of Cincinnati (5)

MATHEMATICAL SCIENCES

Liu, Yinghui, *Mollification method for 2-D IHCP on bounded domains.*

Meng, Qiuyue, *Robust Bayesian analysis in linear models.*

Ning, Ke, *Statistical analysis of genetic linkage data.*

Yao, Xue, *Smash products and the Connes spectrum of a Hopf algebra action.*

Zheng, Hongcai, *Numerical solution for 3D-IHCP and some related problems.*

University of Toledo (1)

MATHEMATICS

Swami, Prem Kumar, *Some new results in the rapidly forced pendulum.*

OKLAHOMA

Oklahoma State University (3)

MATHEMATICS

Decloss, Robert Ray, *Free extensions of partial I -groups.*

Lorch, John, *Unitary structures for ladder representations of $U(p, q)$.*

STATISTICS

Cho, Tae Kyoung, *Approximate confidence intervals and approximate confidence bands for logistic models.*

University of Oklahoma (3)

MATHEMATICS

Fine, Anne Elizabeth, *An investigation in the use of performance assessment tasks in undergraduate mathematics.*

Moore, Deborah Ann, *A study of metacognitive strategies and organizing tactics in precalculus mathematics.*

Spriestersbach, Karla Kathleen, *The determination of convex bodies from geometric averages of their projections, and associated stability results.*

OREGON

Oregon State University (7)

MATHEMATICS

Danielson, Lynda, *The Galois theory of iterated binomials.*

Nam, Kiwon, *Detecting piecewise linear approximate fibrations.*

Senkyrik, Martin, *A topological approach to dry friction and nonlinear beams.*

Zhang, Qing, *Some tree structure function asymptotics.*

STATISTICS

Lang, Andreas, *An empirical evaluation of parameter approximation methods for phase-type distributions.*

Pratt, James, *The Laplace approximation and inference in generalized linear models with two or more random effects.*

Sjamsoe'oed, Roza, *The use of logistic regression for developing habitat association models.*

Portland State University (1)

MATHEMATICAL SCIENCES

Neil, John R., *Tunnel one generalized satellite knots.*

University of Oregon (10)

MATHEMATICS

- Cruz, Robin, *Examples of noncommutative algebraic geometry.*
- Desjardins, Sylvie, *Heat content asymptotics.*
- Faurot, Donald, *Twisted differential operator rings over projective spaces in positive characteristic.*
- Gibson, Cynthia, *Two aspects of knot theory.*
- Kim, Gie-whan, *Exact slopes of test statistics for the multivariate exponential family.*
- Leen, Michael, *Factorization in the invertible group of a C^* -algebra.*
- Rodman, Stacey, *New conditions for the freeness of arrangements.*
- Tenny, Nathan, *Ball models, free products and splitting surfaces in singular 3-manifolds.*
- Wick, Darren, *Generalizations of quasi-hereditary rings and monomial algebras.*
- Williams, Michael, *$Z(4)$ -linear Kerdock codes, orthogonal geometries, and non-associative division algebras.*

PENNSYLVANIA**Carnegie Mellon University (3)**

MATHEMATICS

- Aronson, Jonathan Walter, *Analysis of a randomized greedy matching algorithm.*
- Golovaty, Dmitry, *The volume preserving motion by mean curvature as an asymptotic limit of reaction diffusion equations.*
- Jayewardene, Romaine Delorine, *Relations and functional relations in categories, with examples from fuzzy set theory.*

Drexel University (1)

MATHEMATICS AND COMPUTER SCIENCE

- Kiesel, Harry A., *A study of new classes of orthogonal polynomials.*

Lehigh University (4)

MATHEMATICS

- Dodson, Margaret, *Extended Runge-Kutta Monte-Carlo methods.*
- Liebars, Cathy S., *Stochastic differentiability in maximum likelihood theory.*
- Stolz, Robert, *Radon-Nikodym property and law of large numbers.*
- Yang, Huajian, *Stable homotopy types of stunted lens spaces mod 4.*

Pennsylvania State University (16)

MATHEMATICS

- Chang, Qing, *Automorphisms of generic 2×2 matrices.*

- Degli-Esposti, Mirko, *Classical and quantum equidistribution: An (easy) example.*
- Godev, Kalin, *Mathematical models of liquid crystals with variable degree of orientation.*
- Guentner, Erik P., *Relative e -theory quantization and index theory.*
- Hundal, Hein S., *Generalizations of Dykstra's algorithm.*
- Li, Yi, *Uniqueness and analyticity of solitary waves.*
- Luo, Laihan, *Initial- and boundary-value problems for some nonlinear partial differential equations.*
- McInerney, Andrew, *On the group of contact diffeomorphisms.*
- Piccione, Paolo, *Discrete regular subalgebras of semifinite von Neumann algebras.*
- Qin, Jinshui, *On the convergence at some low order mixed finite elements for incompressible fluids.*
- Shan, Hwai-Ling, *Denominators in Hilbert's Nullstellensatz.*
- Zhong, Jun, *Approximation with inequality constraints.*

STATISTICS

- Kang, Hee-Jeong, *Bootstrapping autoregressive processes with infinite variance.*
- Ndlovu, Principal, *Statistical designs for calibration using nonlinear models.*
- Ozturk, Omer, *Minimum distance estimation.*
- Tomick, John, *On convergence of the Nelder-Mead simplex algorithm for unconstrained stochastic optimization.*

Temple University (6)

MATHEMATICS

- Culp-Ressler, Wendell E., *Modular forms and integrals.*
- Iannucci, Douglas E., *On the third largest prime divisor of an odd perfect number.*
- Mohammed, Ahmed, *A modulus of continuity and Harnack's inequality for second order parabolic Schroedinger equations.*
- Orr, Craig R., *A computer algebra approach to partial difference equations.*
- Yan Yongqian,, *Statistical inference for extreme models with dependence.*
- Zhou, Jiazuo, *Kinematic formulas and geometric inequalities.*

University of Pennsylvania (12)

MATHEMATICS

- Alimohamed, Moez, *A characterization of lambda definability in categorical models of implicit polymorphism.*
- Finkelstein, Stacy, *Tau categories and logic programming.*
- Ge, Liming, *On maximal injective subalgebras of factors.*
- Gu, Weiqing, *The stable 4-dimensional geometry of the real Grassmann manifolds.*

- Hansen, Mogens Lemvig, *Unitary norms on Banach algebras.*
- Hicks, R. Andrew, *Group actions and the topology of non-negatively curved 4-manifolds.*
- Katzarkov, Ludmil, *Factorization theorems for the representations of the fundamental groups of quasiprojective varieties and some applications.*
- Kerr, Megan, *Homogeneous Einstein metrics.*
- Kwon, Seon-In, *Galois module structure of tame covers.*

STATISTICS

- Athaide, Claude Raymond, *Likelihood evaluation and state estimation for nonlinear state space models.*
- Love, Thomas Ezra, *Distractors and item response theory.*
- Zhang, Hao, *Best tests of treatment effect for matching with multiple controls.*

University of Pittsburgh (8)

MATHEMATICS AND STATISTICS

- Hu, Ping, *Error estimates of finite volume methods for steady convection-diffusion equations.*
- Lei, Xuming, *Singularities of a sheet metal stretching problem and second order ordinary differential equations.*
- Wang, Cunqi, *Discussion on Bäcklund transformations for some nonlinear differential equations.*
- Wong, Wing Lit, *The Box-Cox and other transformation families for inference in errors-in-variables regression model.*
- Xie, Weiqing, *A mathematical analysis of phase field alloys and transition layers.*
- Xue, Lianyong, *Constrained experimental plans.*
- Yang, Hefei, *Confirmatory factor analysis and its application to receptor modeling.*
- Zhao, Yue, *Statistical inference for degradation models.*

RHODE ISLAND**Brown University (8)**

APPLIED MATHEMATICS

- Bauer, Robert, *Numerical shock capturing techniques.*
- Jiang, Guang-Shan, *Algorithm analysis and efficient computation of conservation laws.*
- Quillen, Carl, *Parallel ENO schemes applied to shock/cylinder interactions and numerical methods by radon transform.*
- Wong, Peter, *Computational algorithms for discontinuous problems.*

MATHEMATICS

- Dutta Gupta, Shamita, *Average value of quadratic twists of L-functions over function field.*
- Geloneze-Neto, Antonio, *Cusp parity and generalized Riemann-Hurwitz formulas for simplicial maps.*

Saccone, Scott Frank, *A study of strongly tight uniform algebras.*

She, Xiaotie, *On the nonvanishing of cubic twists of automorphic L-series.*

SOUTH CAROLINA

Clemson University (7)

MATHEMATICAL SCIENCES

Abalo, Kokou Y., *Berge and Nash games: Existence theorems and applications.*

Cawood, Mark E., *Development and stability analysis of algorithms for robust pole assignment of linear multi-input systems.*

Feng, Zhoujun, *A study of local polynomial regression.*

Jones, Walter F., *A numerical analysis of Richard's equation for unsaturated porous media flow.*

Rudolph, Gerald L., *An investigation of the usefulness of detailed scheduling information.*

Stephenson, Paul L., *Control charts for multiple stream processes.*

Wypasek, Christian J., *Stochastic models for workstation utilization.*

University of South Carolina (10)

MATHEMATICS

Beasley, Brian, *The distribution of power-free values of irreducible polynomials.*

Dujmovic, Davorin, *Infinite finitely presentable simple groups: Membership problem, free subgroups.*

Mitrea, Marius, *Clifford algebras in harmonic analysis and elliptic boundary value problems on nonsmooth domains.*

Ouyang, Jianxin, *The Zarankiewicz problem and connectivity of k-chromatic graphs.*

Piatkiewicz, Leszek, *Paracompact spaces in box product topology and the equivalence of some consequences of the proper forcing axiom.*

Sabac, Florin, *Hyperbolic nonlinear conservation laws.*

Wu, Qun, *p-wavelets and their applications.*

Yang, Zesheng, *Wavelets and image compression.*

von Rosenberg, Peter, *Countable and finite migrant covers.*

STATISTICS

McCann, Melinda, *Classical multiple comparisons via Neyman's inequality.*

TENNESSEE

University of Memphis (4)

MATHEMATICAL SCIENCES

Ali, Firasath, *Probability that a random partition is graphical.*

Bartlett, Ronald E., *Discrete computation in the continuum.*

Clapsadle, Raymond A., *Polychromatic structures and substructures in edge colorings of graphs.*

Tang, Si Chin, *General stochastic models of the HIV epidemic.*

University of Tennessee (2)

MATHEMATICS

Henson, Shandelle, *Individual-based physiologically structured population and community models.*

Katsaounis, Theodoros, *On fully discrete Galerkin approximations for the incompressible Navier-Stokes equations.*

Vanderbilt University (3)

MATHEMATICS

Fasshauer, Gregory Eric, *Radial basis functions on spheres.*

Nelson, Amy Lynne (Wildsmith), *Intersociativity of Clifford semigroups and cyclic semigroups.*

Rickert, John Phillip, *On the simple connectivity at infinity of $Out F_4$.*

TEXAS

Rice University (15)

COMPUTATIONAL AND APPLIED

MATHEMATICS

Dadmehr, Shireen, *An efficient simplex-based method for solving large linear programs.*

Gonzalez-Lima, Maria, *Effective computation of the analytic center of the solution set in linear programming using primal-dual interior-point methods.*

Lehoucq, Richard, *Analysis and implementation of an implicitly restarted Arnoldi iteration.*

Minkoff, Susan, *Multiparameter inversion and energy source estimation for a reflection seismic experiment.*

Parr, Victor, *Preconditioner schemes for elliptic saddle-point matrices based upon Jacobi multi-band polynomial matrices.*

Song, Hua, *On a transmission inverse problem.*

MATHEMATICS

Dona, Luca, *Hyperbolic geometry, regular presentations and curves on surfaces.*

Fu, Lei, *On the boundaries of special Lagrangian submanifolds.*

Li, Ming, *Harmonic maps, heat flows and currents on singular spaces.*

Sirotnie, Serguei, *Approximation of knots invariants by Vassiliev invariants.*

STATISTICS

Baggerly, Keith Alan, *Visual estimation of structure in ranked data.*

Elliot, Marc Nathan, *An automatic algorithm for the estimation of mode location and numerosity in general multidimensional data.*

McGee, Monnie, *Diversified methods of categorical time series analysis.*

Stivers, David, *Multi-type branching process models of cell proliferation.*

West, Ronnie Webster, *Modeling the potential impact of HIV on the spread of tuberculosis in the United States.*

Southern Methodist University (4)

MATHEMATICS

Woodson, Kenneth Mack Jr., *Projected implicit Runge-Kutta methods for solving differential-algebraic equations.*

STATISTICAL SCIENCES

Fu, Lei, *On the long-memory time series models.*

Miller, James, *Forecasting with fractional differenced time series models.*

Wang, Eugene, *Modified maximum likelihood estimations of generalized gamma distribution.*

Texas A&M University (14)

MATHEMATICS

Chen, Chih-Hsuan, *A finite difference-boundary element scheme for solving parabolic boundary value problems and supercomputing.*

Cupps, Brian Perry, *Global existence and large time behavior of solutions to reaction-diffusion systems with large diffusion coefficients.*

Deng, Yuanhua, *Boundary elements methods for nonlinear elliptic boundary value problems.*

Ding, Zhonghai, *Topics on potential theory on Lipschitz domains and boundary control problems.*

Hendricks, Thomas David, *Existence of hypersurfaces of prescribed mean curvature.*

Ionescu, Adrian, *On pairs of commuting operators.*

McClaran, Lea Beth, *Some results on lattice structures on Banach spaces.*

STATISTICS

Harvill, Jane, *A bispectral-based test for Gaussianity and linearity of a time series.*

Hu, Ying-Sheng, *Wavelet approach to change point detection with application to density estimation.*

Kim, Jaehee, *Test for change in a mean function when the data are dependent.*

Ogden, Todd, *Wavelet thresholding in nonparametric regression with change-point applications.*

Ou, Shyh-Tyan, *Confidence intervals for variance components in mixed linear models.*

Vasquez Rojas, Tito Roque, *Estimation of variance components: An extension to include continuous variables in the fixed effect design matrix and a development of software.*

Wang, Shaohung, *A data-driven smoothing parameter selection for robust non-parametric regression.*

Texas Tech University (7)

MATHEMATICS

Abukhaled, Marwan, *Runge-Kutta and recursive distributive numerical methods for approximate solutions of stochastic differential equations.*

Bian, An-Gwo, *Determination of root-diffusivity during water flow in root-soil systems.*

Dey, Aswini Kumar, *Cross-validation for parameter selection in statistical inverse estimation problems.*

El-Qasas, Majed, *The observability of Burger's equation, the Riccati equation and the heat equation.*

Lee, Jonathan Todd, *The radius of convexity of parametrized transforms of univalent functions.*

Okasha, Nahed, *Dynamics of boundary controlled convective reaction-diffusion equations.*

Packard, Erik, *The order of a perfect k -shuffle on a moded-out deck.*

University of Houston (3)

MATHEMATICS

Carthel, craig, *Numerical methods for some exact and approximate controllability problems for the heat equation.*

Martin, Christopher, *A class of quasi-linear reaction-diffusion systems with temperature dependent kinetics.*

Zhang, Chun, *Representation and geometry of operator spaces.*

University of North Texas (4)

MATHEMATICS

Garza, Javier, *Using steepest descent to find energy-minimizing maps satisfying nonlinear constraints.*

Lim, Daekeum, *Cycles and cliques in Steinhilber graphs.*

Olsen, Lars, *Multifractal measures.*

Wang, Jing-Ling, *Topics in fractal geometry.*

University of Texas at Arlington (1)

MATHEMATICS

Davamani, Jeyaraj John, *Convergence of iterative processes arising in the theory of convex sets and convex functions.*

University of Texas, Austin (10)

MATHEMATICS

Boerkoel, Antonie, *Diophantine approximation in local fields by algebraic numbers of bounded degree.*

Buehler, Suejeudi Grayson, *The James function space.*

Chen, Debao, *Cardinal spline wavelets.*

Fabel, Paul Andrew Simon, *Self-homeomorphisms of the 2-sphere which pointwise fix a nonseparating continuum.*

Goodman-Strauss, Chaim, *On composite twisted unknots.*

Hollingsworth, Brooke Lanae Hagood, *Generate semilinear parabolic systems and distributed capacitance models.*

Jia, Lia, *On automatic theorem proving in conjugate geometries.*

Li, Shan, *A new approach to sensitivity analysis of the DEA models and their applications to ranking and productivity growth.*

Loepp, Susan Renee, *Making the generic formal fiber local.*

Tyler, Stephanie Michelle, *The LaGrange spectrum in projective space over a local field.*

University of Texas at Dallas (3)

MATHEMATICAL SCIENCES

Crawford, Isom Lawrence Jr., *Multivariable nonlinear system realization.*

Hartung, Ferenc, *On classes of functional differential equations with state-dependent delays.*

Lai, Dejian, *Contribution to non-linear time series analysis.*

UTAH

Brigham Young University (2)

MATHEMATICS

Fordham, Stuart Blake, *Minimal length elements of Thompson's group F .*

Shawcroft, Paul Howard, *Algorithmic methods in combinatorial group theory.*

University of Utah (6)

MATHEMATICS

Kovács, Sándor J., *The cone of curves of $K3$ surfaces and families of varieties of general type.*

Le, Vy K., *On global bifurcation for variational inequalities.*

Ma, Lingyun, *Multinomial change-point problems.*

Mayer, Uwe F., *Gradient flows on nonpositively curved metric spaces.*

Sawicz, Romuald, *Bounds on the effective parameters of composite materials by analytic continuation method.*

Van Kirk, Robert Welsh, *Integrodifference models for biological growth and dispersal.*

Utah State University (1)

MATHEMATICS AND STATISTICS

Cordero-Braña, Olga, *Minimum Hellinger distance estimation for finite mixture models.*

VIRGINIA

George Mason University (2)

OPERATIONS RESEARCH AND ENGINEERING

Fateh, Hossein, *Automatic differentiation for large-scale nonlinear programming.*

Srinivasan, Meena, *Using directions of negative curvature in Newton-type methods for nonlinear nonconvex problems.*

Old Dominion University (5)

MATHEMATICS AND STATISTICS

Khan, Mushtaq A., *Thermal ignition analysis in the laminar boundary layer behind a propagating shock front.*

Panetta, John Carl, *Mathematical models of chemotherapy.*

Toner, Michael, *Invariant manifolds of a toy climate model.*

Vaish, Akhil, *Invariance properties of statistical tests for dependent observations.*

Yang, Sang K., *Elimination of edge effects using spline wavelets which maintain a uniform two-scale relation.*

University of Virginia (17)

APPLIED MATHEMATICS

Avalos, George, *An analysis and regulator theory for the active control of a system of partial differential equations arising in the modelling of smart structures and materials.*

Baxter, Sarah Collins, *Saint-Venant end effects for anti-plane shear deformations of sandwich structures.*

Crow, Philip David, *Power-law creep consolidation of metal matrix composites.*

Hendrickson, Erik S., *Approximation theory for compensator design for partially observed hyperbolic systems with boundary/point control.*

Vaver, Jon Gerald, *Accurate incorporation of self-gravitating N -body components in galactic models; global and intermediate-scale spiral structures.*

MATHEMATICS

Blanchard, Peter, *Exceptional group ring automorphisms and the isomorphism problem.*

Fenster, Della, *Leonard Eugene Dickson and his work in the theory of algebras.*

Geisler, Lyn, *Quantum stability for the quasi-periodic Rabi oscillator.*

Hall, Jacqueline, *Specialty of quadratic Jordan algebras.*

Morics, Steven, *Jack symmetric functions and Young's lattice.*

Shorter, Paula, *Diffusion processes for stochastic global optimization on a manifold with applications in image processing.*

Sontz, Stephen, *L^p mapping properties of the Segal-Bargmann transform.*

Wilmot, James, *Topics in divisible codes.*

Wood, Maria, *Pseudodifferential C^* -algebras associated with one-parameter groups of singular inner functions.*

STATISTICS

Kirkwood, Bessie Hershberger, *Constructing confidence regions for a composition of tectonic plate rotations under heteroscedasticity.*

Neeman, Teresa Margaret, *Rank statistics for spherical data.*

Sun, Weiman, *Statistical modeling and simulation of the time delayed feedback regulation of the hypothalamic-pituitary-testicular gonadal axis.*

Virginia Commonwealth University (1)

BIOSTATISTICS

Lu, Jiandong, *The standardized influence matrix and its application to the generalized linear models.*

Virginia Polytechnic Institute and State University (17)

MATHEMATICS

Borggaard, Jeffrey, *The sensitivity equation method for optimal design.*

Burkardt, John, *Sensitivity analyses and computational shape optimization for incompressible flows.*

Chasen, Lee, *The cohomology ring of classical Brauer tree algebras.*

Chen, Jun, *Discrete dynamical systems in solving H-equation.*

Chung, Myungsuk, *Lie Derivations on rings of differential operators.*

Huang, Guowei, *Asymptotic properties of solutions of a KdV-Burgers equation with localized dissipation.*

Karamikhowa, Rossitza, *Finite element analysis of a Ginzburg-Landau type model for semiconductor.*

Lynch, James Keith, *Structures of triangles and quadrilaterals of groups.*

McCall, Thomas Mark, *Units and class groups of imaginary octic fields.*

Pitts, George, *Domain decomposition and high order discretization of elliptic partial differential equations.*

Puls, Michael, *Analytic versions of the zero divisor conjecture.*

Ranalli, Ramona, *The 2-Sylow subgroup of the class group of biquadratic fields.*

Yao, Aixiang, *Kinetic theory and global existence in L^1 for a dense square-well fluid.*

STATISTICS

Griffiths, Kristi, *Model selection and analysis tools in response surface.*

Kim, Donggeon, *Least squares mixture decomposition.*

Letsinger, William Curtis, *Optimal one and two-stage designs for the logistic regression model.*

Mangeshkar, Milan, *Estimation of partial group delay with applications to small samples.*

WASHINGTON

University of Washington (13)

BIOSTATISTICS

Couper, David, *Complementing survival analysis with analysis of the mean function of longitudinal data subject to censoring.*

DeMoor, Carl, *Adaptive testing in clinical trials.*

Griffith, William, *Penalized likelihood estimation of the tumor incidence rate in survival sacrifice experiments with laboratory animals.*

McBurnie, MaryAnn, *Logistic regression when the prevalence of a covariate is extremely low.*

McKinney, Steve, *Autopaint: A toolkit for visualizing data in four or more dimensions.*

Shen, Yu, *Estimation of survival distribution in heterogeneous samples and assessment of treatment effects.*

MATHEMATICS

Hudelson, Matthew Guy, *Geometric and computational methods for finding largest j -simplices in d -cubes.*

Neely, William Whipple, *Integral identities and cohomology on complex manifolds.*

Verzani, John Andrew, *On geometric properties of the path-valued process.*

STATISTICS

Assunção, Renato Martins, *Robust estimation in point processes.*

Higdon, David Mitchell, *Spatial applications of Markov chain Monte Carlo for Bayesian inference.*

Hoeting, Jennifer Ann, *Accounting for model uncertainty in linear regression.*

Lewis, Steven Michael, *Multilevel modeling of discrete event history data using Markov chain Monte Carlo methods.*

Washington State University (4)

MATHEMATICS

Kimball, William A., *Asymptotic uniform distributions in finite groups with applications to binomial coefficients.*

Olmos-Gomez, Miguel, *Analytical and numerical solutions of diffusion problems with convection/reaction.*

Valdivia, Rebekiah, *A mathematical model for transdermal drug delivery.*

Zhou, Yingpeng, *Affine planes with collineation groups doubly transitive on the line at infinity.*

WEST VIRGINIA

West Virginia University (3)

MATHEMATICS

Caulfield, Michael, *Some properties of full, half and quarter plane infinite latin squares, including connection with sequenceable groups and directed graphs.*

Darrah, Marjorie Anne, *Paths and cycles in semicomplete digraphs.*

Pierce, Robert Allen, *Two problems in continuum theory.*

WISCONSIN

Marquette University (3)

MATHEMATICS, STATISTICS, AND COMPUTER SCIENCE

Antonipillai, Anne, *Subsemigroups of completely simple semigroups.*

Ardeshir, Behrotaghi Mohammad, *Aspects of basic logic.*

Cheong, Kyeong-hyeui, *Closed inverse subsemigroup lattices of inverse semigroups.*

University of Wisconsin-Madison (50)

INDUSTRIAL ENGINEERING

Ankenman, Bruce, *Inference for the eigenvalues in second order response surface models.*

Booske, Bridget, *Determining health plan coverage: Priority setting and objectives.*

Desiraju, Ramakrishna, *Performance analysis of flexible manufacturing systems with a single discrete material handling device.*

Gujar, Ravindra, *Performance analysis and productivity improvement of flexible assembly cells.*

Hsu, Yi-Hsin, *Quality of technical care in cardiac patients: Patient judgment compared to professional evaluation.*

Jeng, One-Jang, *Quantitative assessment of functional deficits associated with carpal tunnel syndrome.*

Lee, Seongil, *Shape constancy of two-dimensional euclidean transformed figures in haptic environments.*

Polarouthu, Chandrasekhar, *Performance evaluation of multilevel closed fabrication assembly systems.*

Tang, Ben C., *Technology transfer: An exploratory study of patent licensing pattern.*

Yang, Chien-Lin, *Test of a model of cognitive demands and worker stress in computerized offices.*

MATHEMATICS

Akgul, Nilgun A., *Coagulation-diffusion systems.*

Cooper, Shaun, *On the Macdonald identities, a conjecture of Forrester and a functional equation.*

Deckelman, Steven M., *Studies of holomorphic functions having absolutely continuous boundary values on curves in the unit ball of \mathbb{C}^n .*

Dolinak, Joseph II, *Homotopy operations in Tate cohomology.*

Dougherty, Anne M., *Averaging and diffusion approximations for stochastic network models.*

Galminas, Lisa Rae, *Computable algebraic structures.*

- Ghazel, Moncef, *The relative loop space.*
- Guo, Likang, *The peak-interpolation sets in product domains.*
- Johnson, Kurt N., *Circularly symmetric deformation of shallow elastic membrane caps.*
- Johnson, Mark James, *Techniques in iterated forcing.*
- Johnson, Michael James, *Approximation in $L_p(\mathbb{R}^d)$ from principal shift-invariance spaces.*
- Juan-Pineda, Daniel, *Cohomology and k -theory of discrete groups.*
- Lawrence, K. Mark, *Combinatorial bounds and constructions in the theory of uniform point distributions in unit cubes, connections with orthogonal arrays and a poset generalization of a related problem in coding theory.*
- Leduc, Robert E., *A two-parameter version of the centralizer algebra of the mixed tensor representation of the quantum general linear group.*
- Lee, Chang-Ock, *Multigrid methods and parallel computations for elliptic problems, with an emphasis on linear elasticity.*
- Lee, Jongwoo, *Gravity-capillary two-dimensional free surface flows in the presence of rigid walls.*
- Leonhardi, Steven D., *Generalized non-splitting in the recursively enumerable degrees.*
- Letarte, Alan L., *Covering properties on the hyperfinite time line.*
- Lewis, Mark L., *A new character correspondence in solvable groups.*
- Maxwell, Thomas O., *Periodic and connecting orbits of Hamiltonian systems.*
- Mellendorf, Stephen P., *Hamilton decompositions of Cartesian products of multicycles.*
- Pruim, Randall James, *Weakly hard languages and Kuratowski-Ulam theorems in resource bounded category.*
- Sellami, Hichem, *A nonsmooth continuation method.*
- Spasojevic, Zoran, *Gaps, trees and iterated forcing.*
- Spradlin, Gregory S., *Multibump solutions to a class of semilinear elliptic partial differential equations.*
- Temple, William V., *Finite representation degree groups.*
- Waldron, Shayne F., *L_p -error bounds for multivariate polynomial interpolation schemes.*
- Wilson, Mark C., *Primeness of enveloping algebras.*
- Zakeri, Golbon, *Multi-coordination methods in parallel solution of block-angular programs.*
- STATISTICS
- Banerjee, Mousumi, *Influence diagnostics in longitudinal models.*
- Chang, Shih-Chieh, *Time-varying relationship and measurement error model on marketing research.*
- Dias, Ronaldo, *Density estimation via H -splines.*

- Lee, Jaekyun, *Inference for deleterious gene structure: Direct modeling, Markov chain Monte Carlo, and model validation using Bayesian predictive methods.*
- Lu, Yili, *Stochastic models of random fatigue under step-stress accelerated life test and their applications in bioassay and clinical trials.*
- Pinheiro, Jose, *Topics in mixed effects models.*
- Qu, Peng, *Application of Box-Cox transformations to discrimination for the two-class problem.*
- Sim, Songyong, *A multivariate multi-sample quantile test for ordered alternatives.*
- Wang, Yuedong, *Smoothing spline analysis of variance of data from exponential families.*
- Yan, Chongqing, *Regression trees and nonlinear time series modeling.*
- Zheng, Xiaodong, *Contributions to confidence interval construction via bootstrap calibration.*

University of Wisconsin-Milwaukee (6)

MATHEMATICAL SCIENCES

- Charlwood, Kevin E., *On multiparametric quantum deformations of $GL(n)$ and its dual.*
- Condie, Steven Michael, *Continuous maps on the interval: Minimal sets, observable attractors, and the skeleton of λ .*
- Kondoyannidis, Nicholas, *Multiparameter spectral theory and higher order initial value problems, solution and scattering theory.*
- Shim, Hong-Tae, *On Gibbs' phenomenon in wavelet subspaces and summability.*
- Wang, Long, *ω -limit sets for a map on an interval.*
- Wu, Dane W., *Probability density estimation with wavelets.*

WYOMING

University of Wyoming (2)

STATISTICS

- Edwards, Daren Lynn, *An empirical comparison of maximum difference sensitivity modeling and discrete choice analysis.*
- Pontius, Jeffrey, *Counting/Markov processes, design-based sampling, and animal resource use.*

Doctoral Degrees Conferred 1993-1994

Supplementary List

The following list supplements the list of thesis titles published in the November/December 1994 *Notices*, pages 1137-1154.

ARKANSAS

University of Arkansas (2)

MATHEMATICAL SCIENCES

- Hammosh, Mamoun Ahmad, *Parameter dependence in dynamical systems and functional integer equations with delay.*
- Zhang, Shu, *Determination of semigroups by their inverse semigroups of partial automorphisms.*

CALIFORNIA

Stanford University (4)

OPERATIONS RESEARCH

- Hu, Chuanpu, *Suboptimal control policies in medical drug therapy.*
- Juneja, Sandeep Kumar, *Efficient rare event simulation of stochastic systems.*
- Krishna, Alamuru Syamagopala, *Enhanced algorithms for stochastic programming.*
- Zajic, Timothy Ronald, *Large deviations for sample path processes and applications.*

MICHIGAN

University of Michigan (4)

IND. AND OPERATIONS ENG.

- Erlebacher, Steven John, *Optimally allocating processing time variability on a synchronous assembly line.*
- Kaufman, David Edward, *Direct choice in random walk algorithms with application to global optimization.*
- Kawra, Raj, *Development and application of a methodology for minimizing manufacturing costs based on optimal tolerance allocation.*
- Rosa, Charles Henry, *Modeling investment uncertainty in the costs of global CO₂ emission policy.*

NEW YORK

Syracuse University (1)

MATHEMATICS

- Gaskin, Joseph Granville, *Singly-generated closed subalgebras of the Banach algebra of twice continuously differentiable functions on a closed interval.*

NORTH DAKOTA

North Dakota State University (2)

MATHEMATICS

- Burns, David R., *On the convergence of ergodic averages over zero density sequences in topological dynamics.*

Lehmann, Steven, *The edge effect for diffusion to cylindrical electrodes.*

SOUTH CAROLINA

University of South Carolina (1)

MATHEMATICS

Hsu, Yu-Ping, *The uniform Kadec-Klee property in the unitary matrix spaces C_E and the Lorentz spaces $L_{w,1}$.*

TEXAS

Southern Methodist University (3)

STATISTICAL SCIENCE

Gerard, Patrick D., *Combining independent nonparametric regression estimators.*

Li, Ping, *Statistical inference for spatial variogram model parameters.*

Miller, James, *Forecasting with fractionally differenced time series models.*

WISCONSIN

Marquette University (2)

MATHEMATICS

Ajan, K. S., *Presentations of completely regular semigroups.*

He, Zhixiong, *Mathematical models in muscle by periodic stimuli.*

University Lecture Series Volumes 5-7

V. I. Arnold

Topological Invariants of Plane Curves and Caustics

The book describes recent progress in the topological study of plane curves. Arnold describes applications to the geometry of caustics and of wavefronts in symplectic and contact geometry. These applications extend the classical four-vertex theorem of elementary plane geometry to estimates on the minimal number of cusps necessary for the reversion of a wavefront and to generalizations of the last geometrical theorem of Jacobi on conjugated points on convex surfaces.

1994, 60 pp. (softcover), ISBN 0-8218-0308-5.
All AMS members \$12, List \$15. Ordering Code ULECT/5NA

Dusa McDuff and Dietmar Salamon

J-holomorphic Curves and Quantum Cohomology

The first half of this book is an expository account of the field, explaining the main technical aspects. The second half of the book focuses on the definition of quantum cohomology. The authors give a new proof of the Ruan-Tian theorem on existence of the quantum cohomology ring, that is, that the quantum multiplication is associative on appropriate manifolds. They then describe the Givental-Kim calculation of the quantum cohomology of flag manifolds, leading to quantum Chern classes and Witten's calculation for Grassmannians, which relates to the Verlinde algebra.

1994, 207 pp. (softcover), ISBN 0-8218-0332-8.
All AMS members \$21, List \$24. Ordering Code ULECT/6NA

Andy R. Magid

Lectures on Differential Galois Theory

This book deals with the differential Galois theory of linear homogeneous differential equations, whose differential Galois groups are algebraic matrix groups. In addition to providing a convenient path to Galois theory, this approach also leads to the constructive solution of the inverse problem of differential Galois theory for various classes of algebraic groups. Providing a self-contained development and many explicit examples, this book provides a unique approach to differential Galois theory and is suitable as a textbook at the advanced graduate level.

1994, 105 pp. (softcover), ISBN 0-8218-7004-1.
All AMS members \$16, List \$19. Ordering code ULECT/7NA



All prices subject to change. Charges for delivery are \$3.00 per order, or for air delivery outside of the continental U.S., please include \$6.50 per item. *Prepayment required.* Order from: **American Mathematical Society**, P. O. Box 5904, Boston, MA 02206-5904. Or for credit card orders, fax (401) 331-3842 or call toll free 800-321-4AMS (4267) in the U.S. and Canada. Residents of Canada, please include 7% GST.

Mathematics People

Prizes Awarded by Institut Henri Poincaré and Gauthier-Villars

On November 24, 1995, in Paris three prizes were awarded by the Institut Henri Poincaré and the publisher Gauthier-Villars, with the support of the Centre National de la Recherche Scientifique. The prizes, each of which carries an award of 10,000 FF, recognize outstanding articles appearing in each of the three sections of the journal *Annales de l'Institut Henri Poincaré*.

In the theoretical physics section, the prize goes to L. CHERCHIA and G. GALLAVOTTI of Università di Roma for their paper "Drift diffusion in phase space" (Vol. 60, No. 1, 1994). In the probability and statistics section, the prize goes to J. PICARD of Université Blaise Pascal for the paper "Barycentres et martingales sur une variété" (Vol. 30, No. 3, 1994). In the nonlinear analysis section, the prize goes to N. S. TRUDINGER of the Australian National University for the paper "Isoperimetric inequalities for quermassintegrals", (Vol. 11, No. 4, 1994).

The juries for the three prizes are as follows. Theoretical physics: P. Collet, T. Damour, J. Ginibre, and J. Bellissard; probability and statistics: G. Ben Arous, F. Ledrappier, J.-F. Le Gall, and P. Massart; nonlinear analysis: J. Ball, J.-M. Coron, J.-C. Saut, C. Viterbo, and P.-L. Lions.

— Allyn Jackson

Previato Named Bunting Fellow

EMMA PREVIATO of Boston University has been selected as a Fellow for 1995–1996 at the Mary Ingraham Bunting Institute of Radcliffe College. Her area of research is the geometry of abelian and nonabelian theta functions.

The Bunting Institute is a multidisciplinary research center for women scholars, scientists, artists, and writers and provides one of the major fellowship programs for the support of women doing advanced study in the United States.

— Bunting Institute

Visiting Mathematicians

(Supplementary List)

Mathematicians visiting other institutions during the 1995–1996 academic year have been listed in recent issues of the *Notices*: July 1995, pp. 789–791; September 1995, p. 1065; and November 1995, p. 1309. The following is an update to those lists (home countries are listed in parentheses).

GERD BRUECHERT (Germany), University of Alberta, Lie Algebras/Lie Groups, 9/95–8/96.

PAUL CONNOR (Scotland), University of Alberta, Continuum Mechanics, 11/95–8/96.

YUN GAO (China), University of Alberta, Lie Theory, 9/95-8/96.

LIANGER GONG (China), University of Alberta, Computer Applications, 9/95-8/96.

PETR HAJEK (Czech Republic), University of Alberta, Banach Space Theory, 9/95-8/96.

ALIAKAR MOHAMMADI HASSANABADI (Iran), University of Alberta, Group Theory, 10/95-9/96.

STANLEY JURIAANS (Brazil), University of Alberta, Algebra, 9/95-8/96.

JEAN-PAUL KAUTHEN (Switzerland), Oregon State University, Singular Volterra Integral Equations, 10/95-9/96.

KYRILL KOPOTUN (Ukraine), University of Alberta, Approximation Theory, 9/95-8/96.

MAHMOOD LASHKARIZADEH BAMI (Iran), University of Alberta, Harmonic Analysis 9/95-7/96.

CHENG LU MA (China), University of Alberta, Numerical Computations Maxwell's Equations, 1/96-6/96.

ASSAD NIKNAM (Iran), University of Alberta, Banach Algebra, 2/96-11/96.

Y. S. RAMA KRISHNAIAH (India), University of Alberta, Asymptotics of L,M,R-Statistics, 1/96-4/96.

K. ROUNOVSKII (Germany), University of Alberta, Approximation, 1/96-4/96.

JOON-KOOK SHIN (Korea), University of Oklahoma, Algebraic Topology, 8/95-5/96.

S. K. SINGH (India), University of Alberta, Finsler/Hamilton Geometry, 11/95-4/96.

MARK SOLOMONOVICH (Israel), University of Alberta, Differential Equations/Mathematical Modelling, 9/95-8/96.

LIOR TZAFRIRI (Israel), University of Missouri, Analysis, 1/96-5/96.

XIAO-QIANG ZHAO (China), University of Alberta, Partial Differential Equations, 6/96-12/96.

DING-XUAN ZHOU (China), University of Alberta, Approximation Theory, 9/95-8/96.

CURTIS M. FULTON, of Carmel Valley, CA, died on August 29, 1995. Born on July 4, 1910, he was a member of the Society for 48 years.

JACK C. GIBSON, of Lakeland, FL, died on April 16, 1995. Born on July 23, 1922, he was a member of the Society for 47 years.

MILDRED E. HULL, of Wilmington, DE, died on April 14, 1995. Born on September 12, 1907, she was a member of the Society for 46 years.

JOHN D. MATHESON, of Arlington, VA, died on September 16, 1995. Born on March 9, 1912, he was a member of the Society for 45 years.

LEONARD SARASON, of Bellevue, WA, died on September 29, 1994. Born on May 29, 1925, he was a member of the Society for 33 years.

FREDERICK B. STRAUSS, of El Paso, TX, died on May 19, 1995. Born on February 24, 1931, he was a member of the Society for 32 years.

JEONG SHENG YANG, professor at the University of South Carolina, Columbia, SC, died on August 19, 1995. Born on July 11, 1934, he was a member of the Society for 31 years.

CLARENCE R. WYLIE, of Greenville, SC, died on August 31, 1995. Born on September 9, 1911, he was a member of the Society for 59 years.

Deaths

HUBERT A. ARNOLD, professor emeritus of University of California, Davis, CA, died on October 20, 1994. Born on November 15, 1912, he was a member of the Society for 58 years.

SIDNEY BIRNBAUM, of California State Polytech University, Pomona, CA, died on September 21, 1995. Born on September 22, 1928, he was a member of the Society for 33 years.

WILLARD E. BLEICK, professor emeritus of the Naval Postgraduate School, Monterey, CA, died on May 24, 1995. Born on December 8, 1907, he was a member of the Society for 55 years.

WEI LIANG CHOW, professor emeritus of Johns Hopkins University, Baltimore, MD, died on August 10, 1995. Born on October 1, 1911, he was a member of the Society for 48 years.

A. L. FOSTER, of the University of California, Berkeley, CA, died on December 24, 1994. Born in 1904, he was a member of the Society for 67 years.

Mathematics Opportunities

New NSF Office of Multidisciplinary Activities

The Office of Multidisciplinary Activities (OMA) is a new addition to the Mathematical and Physical Sciences (MPS) Directorate of the National Science Foundation (NSF). With a budget of about \$30 million, the OMA will work cooperatively with the MPS divisions, including the Division of Mathematical Sciences (DMS), to support nontraditional multidisciplinary projects. "We are looking for bold, meritorious, new ideas that go beyond the bounds of individual disciplines," says OMA Director John Weiner. "We want to allow people to act on opportunities they see and to carry out projects that go beyond traditional boundaries."

In particular, the OMA is designed to concentrate on projects with relatively large budgets—budgets of a size that make it difficult for the divisions to fund them in the context of their usual award sizes and mechanisms. The main purpose of the OMA is to provide a "mechanism whereby bold but unconventional ideas can find a receptive home," Weiner says. Sometimes investigators continue to submit proposals for research in which they are established rather than risk a move in a new direction, he explains. The likelihood that an unconventional proposal would go unfunded is a real disincentive. The OMA is a way to encourage investigators to try out new, riskier ideas. (DMS staff note that they continue to be interested in innovative, nontraditional proposals, even if those proposals do not end up receiving funding through the OMA.)

One area in which the OMA is especially interested is that of graduate education in mathematics and the sciences. A number of recent reports have called for changes in graduate education (see, for example, "NRC Report on Graduate Education", *Notices*, September 1995, pages 984-987). The main recommendations center on broad-

ening the range of areas students learn about, increasing opportunities for traineeships outside academia, and reducing the time-to-degree. The OMA is interested in innovative ideas for how these recommendations can be carried out and in explorations of new kinds of graduate degrees that would respond to these recommendations.

Proposals in graduate education need not involve more than one academic department; for example, an OMA-funded project could focus only on graduate education in mathematics. Noneducation proposals must be multidisciplinary, but the other discipline(s) need not be within the MPS. (The disciplines represented in the MPS are mathematics, physics, astronomy, chemistry, and materials science.) For example, the OMA could fund proposals combining mathematics and biology or mathematics and engineering.

The OMA does not accept proposals directly; proposals are funneled to it from the MPS divisions. When a program officer receives a proposal that appears to be suitable for OMA funding, he or she confers with the OMA liaison within that division; the OMA liaison for the DMS is Alvin Thaler. A number of times per year (probably two or three), the OMA collects together the proposals from all the divisions, and a working group, consisting of the liaisons and Weiner, plans the review of that set of proposals.

The OMA also does not fund projects on its own, but cost-shares them with the MPS divisions. Generally, the division to which a project is most closely tied will contribute 50 percent of the budget, with OMA making up the other half. For a multiyear project, the OMA will grant funds for all of the years of the project in the first year of its operation. The \$30 million OMA budget includes \$5 million for a program of liaisons between universities and industry, \$5 million for an initiative in optical sciences, and other commitments. This means that about \$13-15 million will likely be available for funding other proposals.

For more information, consult the announcement on the NSF's World Wide Web site, <http://www.nsf.gov/>. Links to the NSF are also available through the AMS World Wide Web site, <http://www.ams.org/>, or through e-MATH, the AMS online information service. To connect to e-MATH, type "telnet e-math.ams.org", and then use "e-math" as login name and password. To reach the OMA, telephone 703-306-1800, or write to: Office of Multidisciplinary Activities, Room 1005, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230.

—Allyn Jackson

IAS/Park City Mathematics Institute

The IAS/Park City Mathematics Institute (PCMI), sponsored by the Institute for Advanced Study (IAS) in Princeton and funded by the National Science Foundation, will hold its 1996 Summer Session from June 23 through July 13 at the IAS. The PCMI is a flagship mathematics program built on the theme that interaction among researchers, graduate students, undergraduate students, and high school teachers is essential to the optimal functioning of the mathematics enterprise. During the summer session, these groups participate in distinct but overlapping programs. Teachers and researchers come together as equal partners in a supportive setting where education at all levels is the explicit concern.

The research topic for the graduate summer school and research programs is probability, and the organizers are S.R.S. Varadhan of the Courant Institute and Elton Pei Hsu of Northwestern University.

Women undergraduates and graduate students also have the opportunity to attend a mentoring program for Women in Mathematics, which will be held at the IAS in June. This program provides a combination of lectures, seminars, working problem groups, mentoring and networking sessions, and the opportunity to meet and interact with leading mathematicians.

The deadline for applying to participate in the PCMI is **February 15, 1996**. Applications are available by contacting: IAS/Park City Mathematics Institute, Institute for Advanced Study, Olden Lane, Princeton, NJ 08540; telephone 800-726-4427; e-mail pcmi@math.ias.edu. Applications and information are also available on the Web site <http://www.admin.ias.edu/park.html>.

—from PCMI Announcement

1996–1997 Program at Mittag-Leffler

The Mittag-Leffler Institute in Djursholm, Sweden, announces that it will devote the academic year 1996–1997

to the topic "Enumerative geometry and its interaction with theoretical physics".

The program will focus on the interactions between theoretical physics and algebraic geometry, in particular enumerative geometry. Special emphasis will be on mirror symmetry, moduli spaces, and quantum cohomology. On the organizing committee are Geir Ellingsrud, Dan Laksov, Stein Arild Strømme, and Anders Thorup.

The application deadline for postdoctoral fellowships is **April 1, 1996**. For more information, contact Kjell-Ove Widman, Director, Mittag-Leffler Institute, Auravägen 17, S-182 62 Djursholm, Sweden; e-mail widman@m1.kva.se.

—Mittag-Leffler Institute Announcement

1996 NSF-CBMS Regional Conferences

Contingent upon funding from the National Science Foundation (NSF), three NSF-CBMS Regional Research Conferences will be held in the summer of 1996. Sponsored by the Conference Board of the Mathematical Sciences (CBMS), the lectures are intended to stimulate interest and activity in mathematical research.

Each five-day conference features a distinguished speaker who delivers ten lectures on a topic of important current research. The speaker subsequently prepares a monograph based on the lectures, which is published by the AMS, by the Society for Industrial and Applied Mathematics, or jointly by the American Statistical Association and the Institute of Mathematical Statistics.

Support for about thirty participants per conference is provided. Conference organizers invite both established researchers and interested newcomers, including postdoctoral fellows and graduate students. Information about the conferences is given below; further information can be obtained from the conference organizers.

Euler Products and Eisenstein Series, Goro Shimura, lecturer. May 19–24, 1996, at Texas Christian University. Organizers: Robert Doran (r.doran@tcu.edu), Ze-Li Dou (z.dou@tcu.edu), and George T. Gilbert (g.gilbert@tcu.edu, telephone 817-921-7335).

Advances in Inverse Spectral Geometry, Carolyn S. Gordon, lecturer. June 24–28, 1996, at Texas Tech University. Organizers: Lance D. Drager (drager@math.ttu.edu, 806-742-1429), Ruth E. Gornet (gornet@math.ttu.edu, 806-742-2578), and Jeffrey M. Lee (jlee@math.ttu.edu, 806-742-2574).

Normal Surfaces and Decision Problems in 3-Manifolds, J. Hyam Rubenstein, lecturer. August 1996 (exact dates to be announced) at University of California, Davis. Organizer: Joel Hass (hass@math.ucdavis.edu, 916-752-1082).

Proposals are invited for NSF-CBMS Regional Conferences for 1997. Proposals must be received by the NSF by **April 1, 1996**. For further information, contact: Conference Board of the Mathematical Sciences, 1529 Eighteenth Street, NW,

Washington, DC 20036; telephone 202-293-1170; fax 202-265-2384.

— *CBMS Announcement*

NSF Systemic Change Program

The Division of Elementary, Secondary, and Informal Education at the National Science Foundation (NSF) has announced the next phase of its initiative to implement education reform at the school district level. This program, called Local Systemic Change through Teacher Enhancement in Mathematics, Grades 7-12, will extend the mathematics and science focus for K-8 to secondary school mathematics. The goal is to shift from professional development of the individual teacher to the professional development of the teacher within the whole school organization.

School systems or coalitions of school districts, in partnership with organizations with a scientific or educational mission, are eligible to submit proposals. Projects must provide teacher enhancement for a minimum of one hundred teachers.

A preliminary proposal is required before a full proposal can be accepted. The first set of deadlines is **January 3, 1996**, for preliminary proposals and **March 1, 1996**, for full proposals; the second set is **April 1, 1996**, for preliminary proposals and **September 2, 1996**, for full proposals. Proposals for planning grants may be submitted at any time.

To obtain the program announcement (NSF publication number NSF95-145), contact: NSF Forms and Publications Unit, 4201 Wilson Boulevard, Room P-15, Arlington, VA 22230; telephone 703-306-1130; fax 703-644-4278; e-mail pubs@nsf.gov. Individuals wishing to discuss potential projects should contact the program director, Diane Spresser, by telephone at 703-306-1613, by e-mail at dspresse@nsf.gov.

— *from NSF Announcement*

List of REU Programs Available

The Research Experiences for Undergraduates (REU) program of the National Science Foundation (NSF) provides opportunities for undergraduate students to participate in hands-on research projects. Each summer a number of REU sites around the country bring together groups of students for multi-week programs. Faculty members may wish to encourage their students to apply to such programs. A list of REU sites funded by the NSF's Division of Mathematical Sciences for the summer of 1996 will be available in early January. Requests for the list may be sent by e-mail to reu.dms@nsf.gov.

—*Allyn Jackson*

American Mathematical Society



Global Minimization of Nonconvex Energy Functions: Molecular Conformation and Protein Folding

This book contains refereed papers presented at a remarkable interdisciplinary scientific meeting attended by a mix of leading biochemists and computer scientists held at DIMACS in March 1995.

Editors: Panos M. Pardalos, *University of Florida, Gainesville*
David Shalloway, *Cornell University, Ithaca, NY*
Guoliang Xue, *University of Vermont, Burlington*

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science;

Volume 23, 1995; 271 pages; ISBN 0-8218-0471-5

Hardcover; Individual member \$39; List \$65;

Order code DIMACS/23NA

All prices subject to change. Charges for delivery are \$3.00 per order, or for air delivery outside of the continental U.S., please include \$6.50 per item. Prepayment required. Order from: American Mathematical Society, P. O. Box 5904, Boston, MA 02206-5904. Or for credit card orders, fax (401) 331-3842 or call toll free 800-321-4AMS (4267) in the U.S. and Canada. Residents of Canada, please include 7% GST.

American Mathematical Society

BILLIARDS

by Serge Tabachnikov

New Series
distributed
by the AMS

Presented as a survey of the theory of billiards, this book reflects the present state of this active research area. In the book, Tabachnikov looks at billiards from a geometric viewpoint.

He covers smooth convex billiards, billiards in polygons, and chaotic dispersing billiards. He also touches upon dual (outer) billiards. Intended for nonexperts, *Billiards* provides a general mathematical background from which to approach this stimulating topic.

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, B.P. 67, 13274 Marseille cedex 09, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France.

Members of the SMF receive a 30% discount from list.

Panoramas et Synthèses, Number 1; 1995; 142 pp.; ISBN 2-85629-030-2; Softcover; List \$45; Individual AMS member \$41; Order code PASY/1NA

All prices subject to change. Charges for delivery are \$3.00 per order, or for air delivery outside of the continental U.S., please include \$6.50 per item. Prepayment required.

Order from:
American Mathematical Society,
P. O. Box 5904,
Boston, MA 02206-5904.
Or for credit card orders,
Fax (401) 331-3842 or
call toll free
800-321-4AMS (4267)
in the U.S. and Canada.
Residents of Canada, please include 7% GST

For Your Information

SIAM Report on Mathematics in Industry

On October 23, 1995, the Society for Industrial and Applied Mathematics (SIAM) issued a report entitled *Mathematics in Industry*. The report examines the roles of mathematicians outside academia and the fit between traditional graduate education in mathematics and the needs of industry.

The report is based on a three-year study involving a survey of nearly 500 engineers, mathematicians, scientists, and their managers. The 17-person steering committee of applied mathematicians from academia, government, and industry conducted interviews and in-depth site visits to gather information for the report.

The report confirms the range and variety of applications of mathematics in industry and in government. Success stories about the usefulness of mathematics came from materials processing, automobile design, medical diagnosis, development of financial products, network management, and weather prediction. The study found that mathematicians who work outside academia are especially valued for their ability to think analytically and to analyze underlying structures and for their expertise with the best tools available to formulate and solve problems. At the same time, some mathematicians in the study reported that while their graduate training prepared them to think analytically and to deal with complex problems, it did not always prepare them to use computation, to approach problems from different areas, to communicate effectively, and to work in teams.

Of special interest to the mathematical community will be the long list of suggestions offered in the report. These suggestions are guided by two related themes: broadening the graduate curriculum and educational programs, and creating mechanisms for actively connecting academic and nonacademic mathematical scientists. Some of the suggestions are straightforward and small-scale, while others involve cooperation among academic departments and formal affiliations with nonacademic institutions. Many of the suggestions are quite specific and based on experience with programs that have worked well.

The report acknowledges that the current attention to this set of issues stems in part from the troubles of the mathematics job market and the perception that federal agencies wish to concentrate on applied rather than basic research. But, it says, "Even if the academic job market improves and funding pressure eases, we are convinced that mathematics and mathematicians should change permanently along the lines indicated in our multiplicity of suggestions. We also believe that the traits valued in nonacademic mathematicians are important and worthwhile in a far wider context."

Copies of the report "Mathematics in Industry" will be sent to all mathematics departments in the U.S. by the end of 1995. Single copies of the report may be requested from: Customer Service Department, SIAM, 3600 University City Science Center, Philadelphia, PA 19104-2688; telephone 800-447-7436 or 215-382-9800. The report is also posted on SIAM's World Wide Web site, <http://www.siam.org/>.

— Allyn Jackson

Call for Nominations for AWM Schafer Prize

The Association for Women in Mathematics (AWM) calls for nominations for the Alice T. Schafer Prize, to be awarded to an undergraduate woman for excellence in mathematics. All members of the mathematical sciences community are invited to submit nominations for the prize. The nominee may be at any stage of her undergraduate career.

The letter of nomination should include, but not be limited to, an evaluation of the nominee based on the following criteria: quality of performance in mathematics, exhibition of real interest in mathematics, ability for independent work, and performance in mathematics competitions at the local or national level, if any. Supporting materials, if any, should be enclosed with the nomination.

One original and four copies of the nomination materials must be received by April 1, 1996, and should be sent to: Alice T. Schafer Prize Selection Committee, Association for Women in Mathematics, 4114 Computer and Space Science Building, University of Maryland, College Park, MD 20742. Questions about the prize may be directed to the AWM by e-mail (awm@math.umd.edu) or phone (301-405-7892). For a list of last year's awardees, see the *Notices*, August 1995, page 890.

— AWM Announcement

New Forum on Mathematics Education Reform

EXTEND is a national forum intended to expand dialogue about mathematics education reform to constituencies whose engagement is of central importance to sustaining improvement of mathematics education at the high school and postsecondary levels. Mathematicians and scientists, vocational and technical educators, business and policy leaders will join mathematics teachers and teacher educators through seminars and at electronic round tables. EXTEND is funded by the Exxon Education Foundation.

EXTEND is directed by: Susan L. Forman, Senior Program Officer for Education, The Charles A. Dana Foundation, 746 Fifth Avenue, Suite 700, New York, NY 10151; e-mail sforman@danany.dana.org; telephone 212-223-4040; and Lynn Arthur Steen, Department of Mathematics, St. Olaf College, 1520 St. Olaf Avenue, Northfield, MN 55057-1098; e-mail steen@stolaf.edu; telephone 507-646-3412.

—Susan L. Forman and Lynn Arthur Steen

FULLY NONLINEAR ELLIPTIC EQUATIONS

Luis A. Caffarelli and **Xavier Cabré**,
Institute for Advanced Study, Princeton

This book provides a self-contained development of the regularity theory for solutions of fully nonlinear elliptic equations. Caffarelli and Cabré offer a detailed presentation of all techniques needed to extend the classical Schauder and Calderón-Zygmund regularity theories for linear elliptic equations to the fully nonlinear context. The authors present the key ideas and prove all the results needed for the regularity theory of viscosity solutions of fully nonlinear equations. The book contains the study of convex fully nonlinear equations and fully nonlinear equations with variable coefficients.

Colloquium Publications, Volume 43; 104 pp.; September 1995; ISBN 0-8218-0437-5; Hardcover; List \$39; Individual member \$23; Order code COLL/43CML

NEW!

TOPICS IN TOPOLOGY AND MATHEMATICAL PHYSICS

S. P. Novikov, *Landau Institute of
Theoretical Physics, Moscow*, Editor

The papers in this collection grew out of talks presented at S. P. Novikov's seminar on topology and mathematical physics in Moscow.

Contents: **V. M. Buchstaber** and **S. P. Novikov**, The S. P. Novikov seminar; **V. M. Buchstaber**, Semigroups of maps into groups, operator doubles, and complex cobordisms; **E. V. Ferapontov**, Nonlocal Hamiltonian operators of hydrodynamic type; Differential geometry and applications; **P. G. Grinevich** and **S. P. Novikov**, Nonselfintersecting magnetic orbits on the plane. Proof of the overthrowing of cycles principle; **I. Krichever**, **O. Babelon**, **E. Billey**, and **M. Talon**, Spin generalization of the Calogero-Moser system and the matrix KP equation; **O. Mokhov**, Symplectic and Poisson geometry on loop spaces of manifolds and nonlinear equations; **S. M. Natanzon**, Real nonsingular finite zone solutions of soliton equations; **O. K. Sheinman**, Representations of Krichever-Novikov algebras; **A. P. Veselov**, Huygens' principle and algebraic Schrodinger operators.

**American Mathematical Society
Translations—Series 2**, Volume 170;
September 1995; 206 pp.; ISBN 0-8218-0455-3; Hardcover; List \$89; Individual member \$53; Order code TRANS2/170CML

All prices subject to change. Charges for delivery are \$3.00 per order, or for air delivery outside of the continental U.S., please include \$6.50 per item. Prepayment required. Order from: **American Mathematical Society**, P.O. Box 5904, Boston, MA 02206-5904, Fax (401) 331-3842 or call toll free 800-321-4AMS (4267) in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.

NEW!



Add this Cover Sheet to all of your Academic Job Applications

How to use this form

1. Using the facing page or a photocopy, (or a T_EX version which can be downloaded from the e-math "Employment Information" menu), fill in the answers which apply to *all* of your academic applications. Make photocopies.
2. As you mail each application, fill in the remaining questions neatly on one cover sheet and include it *on top of* your application materials.

The Joint Committee on Employment Opportunities has adopted the cover sheet on the facing page as an aid to job applicants and prospective employers. The 1995-96 hiring season is the second year in which the cover form is being utilized. The form is now available on e-math in a T_EX format which can be downloaded and edited. The purpose of the cover form is to aid department staff in tracking and responding to each application.

Mathematics Departments in Bachelor's, Master's and Doctorate granting institutions have been contacted and are expecting to receive the form from each applicant, along with any other application materials they require. Obviously, not all departments will utilize the cover form information in the same manner. Please direct all general questions and comments about the form to:
dmm@math.ams.org
or call the Professional Programs and Services Department, AMS, at 800-321-4267 extension 4105.

JCEO Recommendations for Professional Standards in Hiring Practices

The JCEO believes that every applicant is entitled to the courtesy of a prompt and accurate response that provides timely information about his/her status. Specifically, the JCEO urges all institutions to do the following after receiving an application:

- (1) Acknowledge receipt of the application—immediately; and
- (2) Provide information as to the current status of the application, as soon as possible.

The JCEO recommends a triage-based response, informing the applicant that he/she

- (a) is not being considered further;
- (b) is not among the top candidates; or
- (c) is a strong match for the position.

AMS STANDARD COVER SHEET

Last Name _____

First Name _____

Middle Names _____

Social Security Number *optional* _____

Address through June 1996 _____

Home Phone _____

e-mail Address _____

Current Institutional Affiliation _____

Work Phone _____

Highest Degree and Source _____

Ph.D. Advisor _____

If the Ph.D. is not presently held, date on which you expect to receive _____

Indicate the mathematical subject area(s) in which you have done research using the 1991 Mathematics Subject Classification printed on the back of this form. If listing more than one number, list first the one number which best describes your current primary interest.

Primary Interest _____

Secondary Interests *optional* _____

Give a brief synopsis of your current research interests (e.g. finite group actions on four-manifolds). Avoid special mathematical symbols and please do not write outside of the boxed area.

Most recent, if any, position held post Ph.D.

University or Company _____

Position Title _____ Dates _____

Indicate the position for which you are applying and position posting code, if applicable

If unsuccessful for this position, would you like to be considered for a temporary position?

- Yes No If yes, please check the appropriate boxes.
- Postdoctoral Position 2+ Year Position 1 Year Position

List the names, affiliations, and e-mail addresses of up to four individuals who will provide letters of recommendation if asked. Mark the box provided for each individual whom you have already asked to send a letter.

- _____
- _____
- _____
- _____

This form is provided courtesy of the American Mathematical Society.

This cover sheet is provided as an aid to departments in processing job applications. It should be included with your application material.

Please print or type. Do not send this form to the AMS.



1991 Mathematics Subject Classification

- 00 General
- 01 History and biography
- 03 Logic and foundations
- 04 Set theory
- 05 Combinatorics
- 06 Order, lattices, ordered algebraic structures
- 08 General mathematical 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
- 39 Finite differences and functional equations
- 40 Sequences, series, summability
- 41 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, optimal control
- 51 Geometry
- 52 Convex and discrete geometry
- 53 Differential geometry
- 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
- 86 Geophysics
- 90 Economics, operations research, programming, games
- 92 Biology and other natural sciences, behavioral sciences
- 93 Systems theory, control
- 94 Information and communication, circuits

There will be
a number of
contested seats
in the
1996 AMS Elections.
Your suggestions
are wanted by:

CALL FOR SUGGESTIONS

The Nominating Committee

for vice-president, trustee,
and five members-at-large of the council

and by

The President

for three Nominating Committee members
and two Editorial Boards Committee members.

In addition

The Editorial Boards Committee

requests suggestions for appointments to
various editorial boards of Society publications.

Send your suggestions for any of the above to:

Robert M. Fossum

American Mathematical Society
Department of Mathematics
University of Illinois
1409 West Green Street
Urbana, IL 61801
e-mail: r-fossum@uiuc.edu



1996 AMS Election

Nominations by Petition

Vice-President or Member-at-Large

One position of vice-president and member of the Council *ex officio* for a term of three years is to be filled in the election of 1996. The Council intends to nominate at least two candidates, among whom may be candidates nominated by petition as described in the rules and procedures.

Five positions of member-at-large of the Council for a term of three years are to be filled in the same election. The Council intends to nominate at least ten candidates, among whom may be candidates nominated by petition in the manner described in the rules and procedures.

Petitions are presented to the Council, which, according to Section 2 of Article VII of the bylaws, makes the nominations. The Council of 23 January 1979 stated the intent of the Council of nominating all persons on whose behalf there were valid petitions.

Prior to presentation to the Council, petitions in support of a candidate for the position of vice-president or of member-at-large of the Council must have at least fifty valid signatures and must conform to several rules and operational considerations, which are described below.

Editorial Boards Committee

Two places on the Editorial Boards Committee will be filled by election. There will be four continuing members of the Editorial Boards Committee.

The President will name at least four candidates for these two places, among whom may be candidates nominated by petition in the manner described in the rules and procedures.

The candidate's assent and petitions bearing at least 100 valid signatures are required for a name to be placed on the ballot. In addition, several other rules and operational considerations, described below, should be followed.

Nominating Committee

Three places on the Nominating Committee will be filled by election. There will be six continuing members of the Nominating Committee.

The President will name at least six candidates for these three places, among whom may be candidates nominated by petition in the manner described in the rules and procedures.

The candidate's assent and petitions bearing at least 100 valid signatures are required for a name to be placed on the ballot. In addition, several other rules and operational considerations, described below, should be followed.

Rules and Procedures

Use separate copies of the form for each candidate for vice-president, member-at-large, or member of the Nominating and Editorial Boards Committees.

1. To be considered, petitions must be addressed to Robert M. Fossum, Secretary, P.O. Box 6248, Providence, Rhode Island 02940, and must arrive by 29 February 1996.
2. The name of the candidate must be given as it appears in the *Combined Membership List* (CML). If the name does not appear in the list, as in the case of a new member or by error, it must be as it appears in the mailing lists, for example on the mailing label of the *Notices*. If the name does not identify the candidate uniquely, append the member code, which may be obtained from the candidate's mailing label or the Providence office.
3. The petition for a single candidate may consist of several sheets each bearing the statement of the petition, including the name of the position, and signatures. The name of the candidate must be exactly the same on all sheets.
4. On the next page is a sample form for petitions. Copies may be obtained from the secretary; however, petitioners may make and use photocopies or reasonable facsimiles.
5. A signature is valid when it is clearly that of the member whose name and address is given in the left-hand column.
6. The signature may be in the style chosen by the signer. However, the printed name and address will be checked against the *Combined Membership List* and the mailing lists. No attempt will be made to match variants of names with the form of name in the CML. A name neither in the CML nor on the mailing lists is not that of a member. (Example: The name Robert M. Fossum is that of a member. The name R. Fossum appears not to be.)
7. When a petition meeting these various requirements appears, the secretary will ask the candidate to indicate willingness to be included on the ballot. Petitioners can facilitate the procedure by accompanying the petitions with a signed statement from the candidate giving consent.

Nomination Petition for 1996 Election

The undersigned members of the American Mathematical Society propose the name of

as a candidate for the position of (check one):

- Vice President**
- Member-at-Large of the Council**
- Member of the Nominating Committee**
- Member of the Editorial Boards Committee**

of the American Mathematical Society for a term beginning 1 February, 1997.

Name and address (printed or typed)

Signature

Signature

Signature

Signature

Signature

Signature

Reference

The Reference section of the *Notices* is intended to provide the reader with frequently sought information in an easily accessible manner. New information is printed as it becomes available and is referenced after the first printing. As soon as information is updated or otherwise changed, it will be noted in this section.

Staff in the NSF's Division of Mathematical Sciences

The October 1995 issue of the *Notices* carried a list of the staff in the Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) for the academic year 1995-1996. Because that list had a number of omissions, an updated list appears below.

Administrative Staff

Division Director
Donald J. Lewis
dlew@nsf.gov
703-306-1870
Acting Executive Officer
Ann K. Boyle
aboyle@nsf.gov
703-306-1875
Administrative Officer
Tyzcer L. Henson
thenson@nsf.gov
703-306-1873

Analysis (Classical and Modern)

Joe W. Jenkins, Program Director
jjenkins@nsf.gov
703-306-1879
Charles A. Akemann
Adjunct Program Director
cakemann@nsf.gov
703-306-1887
John E. Osborn
Adjunct Program Director
josborn@nsf.gov
703-306-1994

Geometric Analysis

Kichoon Yang, Program Director
kyang@nsf.gov
703-306-1881

Topology and Foundations

Ralph M. Krause, Program Director
rkrause@nsf.gov
703-306-1886
Carol Wood, Adjunct Program Director
cwood@nsf.gov
703-306-1870

Algebra and Number Theory

Gary Cornell, Program Director
gcornell@nsf.gov
703-306-1979
Sidney W. Graham, Program Director
sgraham@nsf.gov
703-306-1876

Alvin I. Thaler, Program Director
athaler@nsf.gov
703-306-1880

Applied Mathematics

Subramaniya I. Hariharan, Program Director
sharihar@nsf.gov
703-306-1877
Deborah F. Lockhart, Program Director
dlockhar@nsf.gov
703-306-1882
James C. Alexander, Adjunct Program Director
jalexand@nsf.gov
703-306-1870
John E. Lagnese, Adjunct Program Director
jlagnese@nsf.gov
703-306-1870

Computational Mathematics (including mathematical biology)

Michael Steuerwalt
msteuerw@nsf.gov
703-306-1878

Statistics and Probability

Sallie Keller-McNulty, Program Director
smcnulty@nsf.gov
703-306-1870
Stephen M. Samuels, Program Director

ssamuels@nsf.gov
703-306-1884

Infrastructure Program

Keith N. Crank, Program Director
kcrank@nsf.gov
703-306-1885
Lloyd E. Douglas, Program Director
ldouglas@nsf.gov
703-306-1874

Strategic Activities and Special Projects

Alvin I. Thaler, Program Director
thaler@nsf.gov
703-306-1880

The DMS World Wide Web home page address is <http://www.nsf.gov/mps/dms>. The mailing address is: Division of Mathematical Sciences, National Science Foundation, Room 1025, 4201 Wilson Boulevard, Arlington, VA 22230. The fax number is 703-306-0555.

Upcoming Deadlines

January 5, 1996: Deadline for applications for Ford Foundation Postdoctoral Fellowships for Minorities, The Fellowship Office, National Research Council, 2101 Constitution Ave., Washington, DC 20418; telephone 202-334-2860; e-mail: infofell@nas.edu.

January 12, 1996: Deadline for 1996-1997 IBM Postdoctoral Fellowship in Mathematical Studies, Committee on Postdoctoral Fellowships, Department of Mathematical Sciences, IBM Research Division, T. J. Watson Research Center, P. O. Box 218, Yorktown Heights, NY 10598.

January 15, April 15, August 15, 1996: Deadlines for NRC 1996 Resident, Cooperative, and Postdoctoral Research Associateship Awards, National Research Council, Associateship Programs (TJ 2094/D3), 2101 Constitution Ave., NW, Washington, DC 20418; fax 202-334-2759.

January 15, 1996: Competition deadline for Group Infrastructure Grants from Division of Mathematical Sciences at NSF. Alvin Thaler, Program Director for Strategic Activities and Special Projects, telephone 703-306-1870; e-mail thaler@nsf.gov.

February 1, 1996: Applications for AWM Travel Grants for Women. Travel Grant Selection Committee, Association for Women in Mathematics, 4114 Computer & Space Sciences Bldg., Univ. of Maryland, College Park, MD 20742-2461; telephone 301-405-7892; e-mail awm@math.umd.org.

April 1, 1996: Deadline for nominations for AWM Alice T. Schafer Prize. Information: telephone 301-405-7892; e-mail awm@math.umd.edu.

Where to Find It

A brief index to information which appeared in previous issues of the *Notices*.

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Mathematics Research Institutes Contact Information: The Fields Institute, The Geometry Center, Institute for Advanced Study, Institute for Mathematics and its Applications, Mathematical Sciences Institute, Mathematical Sciences Research Institute, Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), Centre de recherches mathématiques (CRM)
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Mathematics Calendar

1996

* 1996-1997 Mittag-Leffler Institute's Academic Program for 1996-1997: **Enumerative geometry and its interaction with theoretical physics**, Mittag-Leffler Institute, Djursholm, Sweden.

Program: The program will focus on the interactions between theoretical physics and algebraic geometry, in particular enumerative geometry. Special emphasis will be on the following topics: Mirror symmetry, moduli spaces and quantum cohomology.

Deadline: Application deadline for post-doctoral fellowships: April 1, 1996. Send to: Mittag-Leffler Inst., Auravägen 17, S-182 62 Djursholm, Sweden.

Information: D. Laksov, Dept. of Mathematics, KTH, S-100 44 Stockholm, Sweden; e-mail: laksov@math.kth.se.

January 1996

* 13-15 **Workshop Course on Wavelets and Filter Banks**, University of South Florida, Tampa, FL.

Program: Theory and applications of wavelets and perfect reconstruction filter banks. The course develops the background to signal processing and audio and image compression. The Daubechies wavelets and symmetric wavelets and new binary wave-

lets are constructed by spectral factorization. Participants will receive the new textbook *Wavelets and Filter Banks* by Strang and Nguyen (Wellesley-Cambridge Press).

Information: E-mail message with subject Workshop to the organizer G. Strang: gs@math.mit.edu.

* 19-21 **12th GAMM-Seminar Kiel on Boundary Elements: Implementation and Analysis of Advanced Algorithms**, Mathematisches Seminar und Institut für Informatik und Praktische Mathematik, Universität Kiel, Germany.

Topics: Implementation and application of: wavelets to boundary integral equations, matrix compression techniques, multipole and panel-clustering, cubature techniques for singular and nearly singular surface integrals, parallelization techniques for BEM, fast solvers and software design aspects for BEM.

Local Organization: J. Burmeister, tel: ++49-431-880-4462; fax: ++49-431-880-4054; e-mail: jb@informatik.uni-kiel.d400.de; WWW-site: <http://www.informatik.uni-kiel.de/~jb/gamm.html>.

February 1996

* 8-13 **1996 AAAS Annual Meeting**, Baltimore, Maryland.

Purpose: The world's largest federation of scientists, the American Association for the Advancement of Science, will hold its 1996 annual meeting in Baltimore, Maryland. More than 900 speakers will share their latest research advances and examine emerging issues in the areas of neuroscience, behavior, and language; policy, science, and engineering; reproduction and development; educating for the future; and science and society.

Registration Deadline: Advance registration deadline is January 5, 1996. The meeting will be held at the Baltimore Convention Center, and the Hyatt Regency Baltimore and the Stouffer Renaissance Hotels.

Information: For more information, contact the AAAS Meetings Office, 1333 H Street, N. W., Washington, DC 20005, or call 202-326-6450. The office can also be reached on the internet at amsie96@aaas.org.

* 24 **Pacific Northwest Geometry Seminar**, MSRI, Berkeley, CA.

Organizers: J. M. Lee, lee@math.washington.edu; tel: 206-543-1735; P. Gilkey, gilkey@math.uoregon.edu; tel: 503-346-4717.

Information: Limited travel support is available for participants. Please contact J. M. Lee, lee@math.washington.edu for information.

This section contains announcements of meetings and conferences of interest to some segment of the mathematical public, including ad hoc, local, or regional meetings, and meetings and symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. A complete listing of meetings of the Society, and of meetings sponsored by the Society, will be found on the first page of the Meetings and Conferences section.

An announcement will be published in the *Notices* if it contains a call for papers and specifies the place, date, subject (when applicable), and the speakers; a second announcement will be published only if there are changes or necessary additional information. Once an announcement has appeared, the event will be briefly noted in every third issue until it has been held and a reference will be given in parentheses to the month, year, and page of the issue in which the complete information appeared. Asterisks (*) mark those announcements containing new or revised information.

In general, announcements of meetings and conferences held in North America carry only the date, title of meeting, place of meeting, names of speakers (or sometimes a general statement on the program), deadlines for abstracts or contributed papers, and source of further information. Meetings held outside the North American area may carry more detailed information. In any case, if there is any application deadline with respect to participation in the meeting, this fact should be noted. All communica-

tions on meetings and conferences in the mathematical sciences should be sent to the Editor of the *Notices* in care of the American Mathematical Society in Providence or electronically to notices@math.ams.org.

In order to allow participants to arrange their travel plans, organizers of meetings are urged to submit information for these listings early enough to allow them to appear in more than one issue of the *Notices* prior to the meeting in question. To achieve this, listings should be received in Providence **six months** prior to the scheduled date of the meeting.

The complete listing of the Mathematics Calendar will be published only in the September issue of the *Notices*. The March, June, and December issues will include, along with new announcements, references to any previously announced meetings and conferences occurring within the twelve-month period following the month of those issues. New information about meetings and conferences that will occur later than the twelve-month period will be announced once in full and will not be repeated until the date of the conference or meeting falls within the twelve-month period.

The Mathematics Calendar, as well as Meetings and Conferences of the AMS, is now available electronically through e-MATH on the World Wide Web. To access e-MATH, use the URL: <http://e-math.ams.org/> (or <http://www.ams.org/>). (For those with VT100-type terminals or for those without WWW browsing software, connect to e-MATH via Telnet ([telnet e-math.ams.org](telnet://e-math.ams.org); login and password e-math) and use the Lynx option from the main menu.)

March 1996

*12-13 **A Model Theory Conference in Honor of H. J. Keisler**, Madison, Wisconsin.

Program: On the occasion of Keisler's 60th birthday, a two-day conference will be held, immediately following the 1995-96 Annual Meeting of the Association for Symbolic Logic. The meeting will include lectures on topics such as finite model theory, nonstandard analysis and probability, and applications of model theory to algebraic geometry, real analytic functions, computer science, linguistics, and set theory. The meeting will also feature a banquet in honor of H. J. Keisler on the evening of March 12.

Invited Speakers: J. Barwise, E. Bouscaren, Y. Gurevich, C. W. Henson, A. Macintyre, D. Marker, and H. Woodin.

Organizing Committee: K. Bruce, K. Compton, C. W. Henson, S. Lempp, C. Steinhorn, chair.

Contact Person for Program: C. Steinhorn, steinhorn@vassar.vassar.edu, tel: 914-437-5525, fax: 914-437-7065; for local arrangements: S. Lempp, lempp@math.wisc.edu, tel: 517-263-1975.

Student Travel Grants: Depending on availability of funds, it is hoped that there will be modest travel grants to graduate students in logic, so that they may attend this conference. To be considered for a Student Travel Grant, please (1) send a letter of application, and (2) ask your thesis supervisor to send a brief recommendation letter. The application letter should be brief (one page) and should include (1) your name, (2) your home institution, (3) your supervisor's name, (4) a one-paragraph description of your studies in logic, and (5) your estimate of the travel expenses you will incur. (Only modest grants will be possible, partially covering travel costs and perhaps some of the living expenses during the meeting.) Application materials should be sent by the deadline of January 31, 1996, to C. Steinhorn, Mathematics Dept., Vassar College, Poughkeepsie, New York 12601 or steinhorn@vassar.vassar.edu. The use of e-mail for applications is allowed, in fact encouraged. (NOTICE that the application procedure is identical to that for the annual ASL meeting, but applications for this meeting should be sent to C. Steinhorn. Travel grants will be coordinated with the ASL.)

*15-17 **Elliptic Curves and Modular Forms**, National Academy of Sciences, Washington, DC.

Topics: Elliptic curves, modular forms, modular curves, Galois representation, L-functions, Iwasawa theory.

Speakers: J. Coates, R. Coleman (not yet confirmed), F. Diamond, G. Faltings (not yet confirmed), J.-M. Fontaine, R. Greenberg, H. Hida, K. Kato, B. Perrin-Riou, K. Ribet, G. Shimura, R. Taylor, and A. Wiles.

Organizers: B. Mazur, K. Rubin.

Information: (e-mail list) send e-mail to:majordomo@math.ohio-state.edu with mes-

sage "subscribe nas-conf". On the World Wide Web: <http://www.math.ohio-state.edu/~rubin/nas-conf.html>.

*21-22 **Barrett Lectures**, University of Tennessee, Knoxville, TN.

Program: The theme of the conference is spectral theory and computational methods of Liouville problems. Lectures will cover a range of topics and applications dealing with theoretical and numerical methods for regular and singular Sturm-Liouville problems. The format will be three lectures by the principal speaker supplemented by lectures from the invited speakers.

Principal Speaker: A. Zettl, Northern Illinois Univ.

Invited Speakers: P. Bailey (N. Mexico), J. Boyd (U. Michigan), M. Brown (U. Wales), R. Brown (U. Alabama), B. Curgus (W. Washington U.), N. Everitt (U. Birmingham), W. Evans (U. Wales), C. Fulton (Florida Inst. Tech.), M. Klaus (Va. Tech.), D. Pearson (U. Hull), M. Plum (U. Claustal), S. Pruess (Colorado School of Mines), J. Pryce (Royal Military Col.), T. Read (W. Washington U.), A. Schneider (U. Dortmund), G. Stolz (U. Alabama-Birmingham), K. Shaw (Va. Tech).

Organizers: D. Hinton and P. Schaefer.

Information: D. Hinton, Mathematics Dept., Univ. of Tennessee, Knoxville, TN; e-mail: hinton@novell.math.utk.edu.

*28-30 **The First Annual International Press Lecture Series**, University of California, Irvine, CA.

Program: This is the first announcement for the First Annual International Press Lecture Series to be held in Irvine, California, in March 1996. During this full three day period C. Taubes will deliver three one-hour lectures. These lectures will be supplemented by nine one-hour invited lectures.

Invited Speakers: M. Atiyah, S. Donaldson, P. Kronheimer, M. Furuta, M. Gromov, J. Morgan, T. Mrowka, Y. Ruan, G. Tian, C. Vafa, and S. -T. Yau.

Support: The International Press and the University of California at Irvine are supporting this lecture series. It is anticipated that there will be limited support for graduate students and recent Ph.D.s.

Information: If you are interested in attending this conference and/or wish further information, contact R. Wentworth at Dept. of Mathematics, Univ. of California, Irvine, CA 92717-3875; or by e-mail at rwentwor@math.uci.edu.

*30-31 **Mid-Atlantic Algebra Conference**, North Carolina State University, Raleigh, NC.

Principal Speaker: Professor Efim Zelmanov, Yale University.

Organizers: K. C. Misra and M. F. Singer.

Information: M. F. Singer, Department of Mathematics, North Carolina State University, Raleigh, NC 27695-8205; e-mail: singer@math.ncsu.edu. Up-to-date conference information is also available on the

World Wide Web: <http://www2.ncsu.edu/math/Announcements/MAAC>.

April 1996

*1-4 **Conference on The State of the Art in Numerical Analysis**, York, England.

Program Outline: All talks are invited, and the program outline is as follows: Session on Linear Algebra: I. S. Duff (Rutherford Appleton Laboratory), G. H. Golub (Stanford Univ.), N. J. Higham (Univ. of Manchester), and H. A. van der Vorst (Rijksuniversiteit Utrecht); Session on Optimisation: N. I. M. Gould (Rutherford Appleton Laboratory), J. Nocedal (Northwestern Univ.), and D. F. Shanno (Rutgers Univ.); Session on Approximation: D. S. Broomhead (RSRE Malvern), M. J. D. Powell (Univ. of Cambridge), and G. A. Watson (Univ. of Dundee); Session on Ordinary Differential Equations: A. Iserles (Univ. of Cambridge), J. M. Sanz-Serna (Universidad de Valladolid), and A. M. Stuart (Stanford Univ.); Session on Partial Differential Equations: F. Brezzi (Universita di Pavia), C. M. Elliot (Univ. of Sussex), K. W. Morton (Univ. of Oxford), and E. Suli (Univ. of Oxford); Session on Integral Equations: C. T. H. Baker (Univ. of Manchester) and K. E. Atkinson (Univ. of Iowa); Session on New Applications: J. M. Morel (Université Paris IX Dauphine) and F. Natterer (Institut für Numerische & Instrumentelle Mathematik, Munster).

Information: For registration and further information, contact: IMACRH@V-E.ANGLIA.AC.UK. For information on the World Wide Web: <http://www.amtp.cam.ac.uk/user/na/SotANA/SotANA.html>. A. Watson, chairman of Conference Committee (gawatson@mcs.dundee.ac.uk).

*2 **Dynamics and Optimal Control of Turbulence and Combustion: Basic Research and Industrial Applications**, Aerodynamics and Fluid Dynamics Dept., Chrysler Technical Center, Auburn Hills, Michigan.

Topic: Recent advances in basic research and their transfer to industries.

Guest Speakers: K. Schadow (Naval Air Warfare Center, China Lake), E. Gutmark (Louisiana State Univ.), S. Parameswaran (Texas Tech Univ.), K. Kailasanath (Naval Research Laboratory, Washington, D.C.), S. S. Sritharan (Univ. of Colorado-Boulder, and NRAD). In addition there will be an open forum and discussion panel.

Chairman: M. Gleason, Supervisor, Aerodynamics and Fluid Dynamics Dept., Chrysler Technical Center; tel: 810-576-3894.

Coordinator: R. Sun, Technical Specialist, Aerodynamics and Fluid Dynamics Dept., Chrysler Technical Center; tel: 810-576-4034.

*3 **Dynamics and Optimal Control of Turbulence and Combustion: Basic Research and Industrial Applications**, United Technologies Research Center, E. Hartford, CT.

Topic: Recent advances in basic research and their transfer to industries.

Guest Speakers: K. schadow (Naval Air Warfare Center, China Lake), E. Gutmark (Louisiana State Univ.), K. Kailasanath (Naval Research Laboratory, Washington, DC), S. S. Sritharan (Univ. of Colorado-Boulder and NRAD). In addition there will be speakers from UTRC and an open forum and discussion panel.

Chairman: C. N. Nett, Manager, System Technology, UTRC, MS 129-15, 411 Silver Lane, E. Hartford, CT 06108; tel: 203-727-7957; e-mail: mettcn@utrc.utc.com.

Coordinator: B. Proscia, UTRC, 411 Silver Lane, E. Hartford, CT 06108; tel: 203-727-7679; e-mail: prosciw@utrc.utc.com.

* 17-23 **Rotafest and Umbral Workshop**, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Program: On April 17-20 there will be a conference in honor of the 64th birthday of Gian-Carlo Rota. It will be followed by a two-day Umbral Workshop on April 22-23. The Rotafest and Umbral Workshop are open to anyone interested, but Rotafest speakers will be former students and collaborators of Rota. Talks will be on all topics of interest to Rota, with about eighty percent on combinatorics. There may be limited support for graduate students and recent Ph.D.s not directly connected with Rota.

Organizing Committee: For the Rotafest—R. Stanley (M.I.T.), N. White (Univ. of Florida), and R. Ehrenborg (Cornell Univ.). For the Umbral Workshop—A. Di Bucchianico (Eindhoven Univ. of Technology), D. Loeb (Univ. of Bordeaux I), and N. Ray (Univ. of Manchester).

Information: For further information and future announcements, contact S. Entzminger-Merritt, Dept. of Mathematics, M.I.T., Cambridge, MA 02139; e-mail: daisymae@math.mit.edu; URL <http://www-math.mit.edu/~loeb/rotafest.html>.

May 1996

* 3 **Annual Conference of the American Statistical Association, Harrisburg Chapter**, Franklin & Marshall College, Lancaster, Pennsylvania.

Theme: This year's conference will be divided into two parts—one on the history of statistics, the other on statistics on the Internet.

Speakers: T. Seidenfeld, G. Shafer, S. Zabell (part I).

Information: T. Drucker, 304 S. Hanover St., Carlisle, PA 17013; tel: 717-243-1331; or B. Greenberg, e-mail: greenbem@dickinson.edu.

* 4-5 **Pacific Northwest Geometry Seminar (Spring Meeting)**, University of Washington, Seattle, WA.

Organizer: J. M. Lee, lee@math.washington.edu; tel: 206-543-1735.

Information: Limited travel support is available for participants. Please contact J. M. Lee, lee@math.washington.edu for information.

* 13-15 **Optimization Days '96**, Montreal, Canada.

Information: Presentations on all aspects of optimization and its applications are welcome. Please submit a 50 word abstract before December 15, 1995, to M. Gendreau or G. Laporte, Centre for Research on Transportation, Univ. of Montreal, P. O. Box 6128, Station Centre-ville, Montreal, Canada H3C 3J7; tel: 514-343-6143; fax: 514-343-7121; e-mail: jopt96@crt.umontreal.ca. Fees (Canadian dollars): before March 31, 1996: \$150; after: \$180; students: \$30.

* 14-18 **International Conference on Modern Algebra and Its Applications**, Vanderbilt University, Nashville, Tennessee.

Purpose: The conference will bring together researchers working in a broad range of contemporary algebra and its applications. The following areas will be emphasized: algebraic combinatorics; algebra in computer science; algebraic logic; universal algebra; equations in groups, semigroups, and rings; ordered algebraic structures and lattices.

Speakers: E. Zelmanov (Yale Univ.) will deliver two lectures on Burnside problems in groups as Vanderbilt University's 1996 Shanks Lecturer. Additionally, there will be twelve invited talks as well as numerous 30-minute contributed talks.

Information: R. McKenzie and C. Tsinakakis, co-chairs, Conference on Modern Algebra and Its Applications, Vanderbilt Univ., Dept. of Mathematics, Nashville, TN 37240; e-mail: cmaa@math.vanderbilt.edu. Web: <http://math.vanderbilt.edu/~cmaa/cmaa.html>.

* 27-30 **Volterra Centennial. The Second International Conference on the numerical Solution of Volterra and Delay Equations**, Arizona State University, Tempe, Arizona.

Theme: The conference will commemorate the one-hundredth anniversary of the publication by V. Volterra of his seminal papers on integral equations and will be devoted to the computational and applied aspects of Volterra and delay equations. These include functional differential equations (delay, advanced and neutral), Volterra integral equations, and Volterra integro-differential equations. There will be both invited lectures and contributed talks at the meeting. In addition, there will be ample time for minisymposia and informal discussions. The conference will emphasize the following topics: Convergence and order properties of numerical methods; stability analysis and construction of highly stable methods; implementation problems: software development and testing; applications of Volterra and delay equations. This conference will be preceded by the Volterra Centennial Symposium (devoted mainly to the qualitative aspects of Volterra equations), May 23-25, 1996, at the Univ. of Texas at Arlington.

Invited Speakers: C. T. H. Baker (Manchester), A. Bellen (Trieste), H. Brunner (Newfoundland), J. C. Butcher (Auckland), P. E.

Crouch (Tempe), W. H. Enright (Toronto), F. Hoppensteadt (Tempe), A. Iserles (Cambridge), Ch. Lubich (Tubingen), L. R. Petzold (Minneapolis), M. N. Spijker (Leiden), S. Thompson (Radford), P. J. van der Houwen (Amsterdam), M. Zennaro (Trieste).

Organizers: A. Feldstein and Z. Jackiewicz, Dept. of Mathematics and Center for Systems Science and Engineering, Arizona State Univ., Tempe, Arizona 85287-1804.

Information: Interested persons are requested to announce their intention to participate and/or present contributed papers and/or organize a minisymposia by contacting the organizers. A. Feldstein, tel: 602-965-3779 (office); 602-965-4600 (home); Z. Jackiewicz, tel: 602-965-0082; fax: 602-965-8119; e-mail: jackiewi@math.la.asu.edu; URL: <http://math.la.asu.edu/whatsnew/volterra/index2.html>.

June 1996

* 10-14 **Advances in Partial Differential Equations and Applications**, Venice, Italy.

Purpose: This event will be dedicated to P. D. Lax and to L. Nirenberg on their 70th birthdays.

Main Speakers: (all confirmed) will be: C. Cercignani, A. Chorin, G. Da Prato, E. De Giorgi, P. Deift, G. Gallavotti, S. Klainerman, C. D. Levermore, P. L. Lions, D. W. McLaughlin, A. Majda, U. Mosco, G. Papanicolaou, J. M. Sanz-Serna, E. Tadmor, and S. Venakides.

Information: More information can be obtained by sending a message to venice96@ulam.dmsa.unipd.it, wherefrom an automatic reply will be sent. A companion conference, also dedicated to Lax and Nirenberg and devoted to "purer" math, will be held in Florence, Italy, the previous week. Information can be obtained writing to florence@cims.nyu.edu.

* 13-15 **Conference on Algebraic Multilevel Iteration Methods with Applications**, University of Nijmegen, Nijmegen, The Netherlands.

Scope: The purpose of the conference is to provide a forum for the presentation and the discussion of recent progress in the analysis, implementation, and applications in various fields of algebraic multilevel iteration methods in a broad sense. This includes their implementation on massively parallel computers.

Topics: Topics covered include algebraic multilevel iteration methods for second and fourth order elliptic scalar equations and systems of equations; mixed variable variational problems; nonselfadjoint problems and indefinite matrix problems; inner-outer iteration methods; parallel implementations, efficiency measures, scalability; robust implementation, i.e. convergence uniform with respect to meshsize parameter and singular perturbation parameters; applications for Navier's equations and Stokes problem; applications outside partial differential equation problems; applications

for nonlinear problems, such as electromagnetic field, plastic flow, Navier-Stokes, and Miscible displacement problems.

Local Organization Committee: O. Axelsson, B. Polman, R. Stevenson, M. Neytcheva, and M. Nikolova.

Information: O. Axelsson, Faculty of Mathematics and Informatics, Toernooiveld 1, NL-6525 ED Nijmegen, The Netherlands; e-mail: aml196@sci.kun.nl; fax: +31 0 24 3652140.

* 18-22 **The Second International Workshop on Mathematical Methods in Stochastic Simulation and Experimental Design**, St. Petersburg, Russia.

Program: The workshop will be devoted to the development and application of sophisticated mathematical techniques, to the solution of actual problems in stochastic simulation and experimental design, as well as to the software.

Call for Papers: Original papers on workshop topics are solicited. Authors should submit two hard copies (no more than six pages) typed in a one-column format, and an electronic version in LaTeX, or AMS-TeX, by December 30, 1995. Proceedings will be available to the participants at the beginning of the workshop.

Organizers: V. Melas, e-mail: melas@niimm.spb.su; B. Nelson, e-mail: nelson@primal.iems.nwu.edu.

* 23-28 **U.S.-Chinese Conference on Recent Developments in Differential Equations and Applications**, Zhejiang University, Hangzhou, P. R. China.

Program: This conference will focus on dynamical systems in finite and infinite dimensional spaces and partial differential equations with emphasis on applications in circuits, materials, mechanics, fluids, nonlinear optics, neural networks, and population biology.

Partial List of Participants: USA: N. Alikakos (Tennessee), S. Angenent (Wisconsin), P. Bates (BYU), J. Cao (Cornell), J. Chandra (ARO), X. Chen (Pittsburgh), S-N. Chow (Gatech), J. Escobar (Cornell), C. Evans (Berkeley), P. Fife (Utah), R. Johnson (Florence), C. Jones (Brown), C. Kenig (Chicago), H. Kocak (Miami), Y. Li (Rochester), F-H. Lin (NYU), T-P. Liu (Stanford), K. Lu (BYU), J. Mallet-Paret (Brown), D. McLaughlin (NYU), W-M. Ni (Minnesota), R. Nussbaum (Rutgers), T. Ouyang (BYU), G. Sell (Minnesota), W. Shen (Auburn), D. Terman (Ohio), X. Wang (Tulane), G. Wayne (Penn. State), J. Wu (ARO), Z. Xia (Northwestern), Y. Yi (Gatech), J. Yorke (Maryland). Asia: D. Bai (China), K-C. Chang (China), S-P. Chen (China), Z-C. Chen (China), W-Y. Ding (China), G-C. Dong (China), J-X. Hong (China), L. Hsiao (China), L-S. Jiang (China), J. Li (China), K. Li (China), X-B. Pan (China), D. Wang (China), Z-Q. Xu (China), Q-X. Ye (China), Z-F. Zhang (China), S. Zheng (China), K. S. Chao (HK), Y-W. Qi (HK), T. Ogawa (Japan), S. Omata (Japan), H-K. Ju (S. Korea), M. Kwak (S. Korea), K-H. Kwet (Singapore),

X. Xu (Singapore), S-B. Hsu (Taiwan), S-S. Lin (Taiwan).

Format: In addition to the invited lectures, a number of contributed lectures are anticipated. The proceedings of the conference will be published.

How to Contribute: Potential contributors should submit, no later than March 1, 1996, an abstract of no more than one page to: S-P. Chen, Center for Mathematical Science, Zhejiang Univ., Hangzhou, 310027 P.R. China; e-mail: ama_sxs@zUNET.ihep.ac.cn.

* 23-July 13 **IAS/Park City Mathematics Institute 1996 Summer Session**, Institute for Advanced Study, Princeton, New Jersey.

Program: The research topic for the graduate summer school and research programs is probability, organized S. Varadhan of Courant Institute and E. P. Hsu of Northwestern Univ. The PCMI is a flagship mathematics program which is built on the fundamental theme that interaction among researchers, graduate students, undergraduate students, and high school teachers of mathematics is essential to the optimal functioning of the mathematical enterprise.

Lecturers: Graduate Summer School: M. Avelaneda (Courant Institute), J. Chayes (Univ. of California at Los Angeles), R. Durrett (Cornell Univ.), E. P. Hsu (Northwestern Univ.), D. W. Stroock (Massachusetts Institute of Technology), and H-T. Yau (Courant Institute). Undergraduate lecturers include: G. Lawler (Duke Univ.). The High School Teacher Program Lecturers include: N. Fisher (Univ. of Illinois at Chicago), C. Hays (McCallum High School, Austin, TX), J. King (Univ. of Washington), and J. Polking (Rice Univ.).

Deadlines and Information: Deadline for application is February 15, 1996. Applications for the PCMI Summer Session and the Women's Program are available by contacting IAS/Park City Mathematics Institute, Institute for Advanced Study, Olden Lane, Princeton, NJ, 08540; tel: 800-726-4427; e-mail: pcmi@math.ias.edu. Applications and brochure information are also available on the Internet at <http://www.admin.ias.edu/park.htm>.

* 26-28 **12th International Conference on Analysis and Optimization of Systems, Images, Wavelets and PDEs**, Paris, France.

Presentation: This conference is devoted to image processing, wavelets and partial differential equations. Its aim is to discuss the impact on image analysis of the recent mathematical developments of mathematical theories of multiscale analysis (wavelet theory and variants: wavelet packets, etc.), partial differential equations, variational methods that have recently been proposed for image processing tasks like image restoration, shape recognition, etc. Presentations by image processing researchers and by mathematicians on both theoretical and practical aspects will be welcome.

Organizers: CEREMADE and INRIA.

Organizing Committee: M. -O. Berger (INRIA Lorraine, Nancy, (France)), R. Deriche (INRIA Sophia Antipolis, (France)), I. Herlin (INRIA Rocquencourt, (France)), J. Jaffre (INRIA Rocquencourt, (France)), and J. -M. Morel (CEREMADE, (France)).

Important Dates: November 15, 1995: Deadline for submission of full papers. January 31, 1996: Notification of acceptance. March 20, 1996: Camera-ready paper and electronic version of papers.

Information: C. Thenault, INRIA Rocquencourt, Relations Exterieures, Bureau des Cours et Colloques, BP 105, 78153 Le Chesnay Cedex; tel: 33-1-39-63-56-75; fax: 33-1-39-63-56-38; e-mail: symposia@inria.fr.

July 1996

* 1-5 **Grid Adaptation in Computational PDEs; Theory and Application**, Edinburgh, Scotland.

Purpose: The conference is being organized by the International Centre for Mathematical Sciences (ICMS), with the aim of bringing together theoreticians and practitioners in the field of grid adaptation in PDEs to present and discuss new results and trends.

Scientific Committee: M. Baines (UK), M. Berzins (UK), J. Flaherty (USA), L. Formaggia (Italy), K. Morgan (UK), J. Verwer (Netherlands), and N. Weatherill (UK). Local organization will be by the ICMS and D. B. Duncan of the Department of Mathematics at Heriot-Watt University, Edinburgh.

Information: Further announcements about the main speakers and how to contribute paper will follow on the WWW page given below, by direct mail (if you place yourself on our mailing list) and in NA Digest. If you want further information about the conference and the ICMS, then please consult our WWW page

URL <http://www.ma.hw.ac.uk/icms/apde/> where you will also find a form to fill in to get on our mailing list. If you do not have WWW access and want to get on our mailing list, then e-mail your Name, e-mail and postal addresses to Dugald Duncan at dugald@ma.hw.ac.uk with subject line "APDE meeting".

* 1-13 **NATO Advanced Study Institute (ASI) on Nonstandard Analysis and its Applications**, Edinburgh, Scotland.

Organizers: N. J. Cutland (Hull), Director, L. Arkeryd (Goteborg), and C. W. Henson (Illinois).

Program: This intensive instructional conference will be hosted by the International Centre for Mathematical Sciences (ICMS), at the Univ. of Edinburgh. It is aimed at the postdoctoral level, but will be accessible to good research students. The aim is to teach the basics of nonstandard analysis and to make the wide range of applications more widely known among research mathematicians. There will be courses and tutorial sessions covering: Foundations of nonstandard analysis and nonstandard models,

nonstandard real analysis, topological applications, Loeb measure theory, applications in probability and stochastic analysis, functional analysis, differential equations (ODEs, PDEs, SDEs and SPDEs), and applications in mathematical physics and mathematical finance theory.

Lecturers: L. Arkeryd, E. Benoit, M. Capinski, N. J. Cutland, C. W. Henson, R. Jin, H. J. Keisler, P. E. Kopp, T. Lindstrom, P. A. Loeb, D. A. Ross, and M. Wolff.

Financial Support: Available for suitable participants from NATO countries and NATO Cooperation Partner countries. (Apply by January 31, 1996, to the address below.)

Information: ICMS, 14 India Street, Edinburgh, EH3 6EZ Scotland; e-mail: icms@maths.ed.ac.uk; fax: +44-0-131-220-1053; WWW: <http://www.ma.hw.ac.uk/icms/>.

***8-19 Composition Operators on Spaces of Analytic Functions**, University of Wyoming, Laramie, Wyoming.

Program: The study of composition operators lies at the interface of analytic function theory and operator theory. The conference will emphasize the concrete operator theory that arises in the study of composition of analytic functions in the context of the classical function spaces. It will bring the emerging theory into focus and will raise many interesting and basic open problems.

Speakers: C. C. Cowen, Dept. of Mathematics, Purdue Univ., West Lafayette, IN 47907-1395; B. D. MacCluer, Dept. of Mathematics, Univ. of Virginia, Charlottesville, VA 22903.

Sponsors: The Rocky Mountain Mathematics Consortium and the Univ. of Wyoming.

Deadline: For application/call for papers: April 1, 1996.

Information: A. D. Porter, Mathematics Dept., Univ. of Wyoming, Laramie, WY 82071; ADPORTER@plains.uwyo.edu.

***15-17 Australian Engineering Mathematics Conference 1996.**

Theme: An international conference on Engineering Mathematics: Research, Education and Industry Linkage.

Organizers: Engineering Mathematics Group of the Australian Mathematical Society, Institution of Engineers, Australia, and Warren Centre for Advanced Engineering.

Topics: Applications of mathematics to manufacturing industry in the areas of planning and forecasting (supply and demand, performance, machine life, etc.), modelling (industrial processes, quality assurance, etc.), and operations (optimisation, scheduling, queuing, etc.). Applications of mathematics to the fields of information technology, including telecommunication (networks, physical component modelling, etc.), computing technology (algorithms for industry, industrial artificial intelligence, security, robotics, etc.), and computer interfaces (industry-friendly interfacing, etc.). Education and teaching of engineering mathematics, including curric-

ula in mathematics and statistics, use of computers in teaching, impact of computer algebra, internationalization of courses, achievement and assessment of quality.

Invited Speakers: A. Berkovits (Israel), J. Burgess (Australia), A. Friedman (USA), L. Mustoe (UK), G. Springer (USA), G. Steven (Australia), A. Samarin (Australia).

Program: Invited plenary addresses usually 55 minutes and contributed papers usually 20-25 minutes in parallel session. Papers will be submitted, reviewed and published in conference proceedings before the conference.

Abstracts: (from overseas participants) due soon but certainly before December 22.

Information: D. Yuen, Port Kembla Laboratories, BHP Research, P.O. Box 202, Port Kembla NSW 2505, Australia; tel: (61) 42-523453; fax: (61) 42-523120; e-mail: yuen@resptk.bhp.com.au.

***15-19 International Summer School on Evolution Equations**, Praha, Czech Republic.

Information: E. Feireisl, Math. Inst. Acad. Sci., Zitna 25, 115 67 Praha 1, Czech Republic; e-mail: feireisl@earn.cvut.cz.

***15-19 Numerical Methods and Computational Mechanics in Science and Engineering; Second Announcement and Call for Papers**, Miskolc, Hungary.

Purpose: This conference is a satellite conference prior to the 2nd European Congress of Mathematics to be held in Budapest, July 21-27, 1996. The aim of the conference is to bring together numerical analysts, specialists of computational mechanics and software developers.

Fields of Primary Interest: Numerical algebra (sparse and dense linear systems, eigenvalue problems, nonlinear systems, parallel algorithms, etc.); numerical solution of differential equations (FEM, BEM, multigrid, difference methods, spectral methods, parallel algorithms, etc.); computational mechanics (FEM, BEM, parallel algorithms, etc.). One hour plenary lectures and twenty minute talks are planned.

Plenary Speakers: I. Babuska, B. Szabo, B. Guo, R. Haber, V. P. Il'in, C. Johnson, M. Krizek, J. T. Oden, J. Pitkaranta, L. S. Xanthis, J. R. Whiteman, W. L. Wendland, M. F. Wheeler, Zs. Gaspar, P. Rozsa, and G. Stoyan.

Minisymposia: Finite element methods for parabolic and hyperbolic problems, computational methods for optimization of engineering systems, treatment of singular points associated with elliptic boundary value problems, computational linear algebra, boundary element methods.

Information: A. Galantai or G. Szeidl, Institute of Mathematics or Dept of Mechanics, University of Miskolc, 3515 Miskolc-Egyetemvaros, Hungary; tel: 36-46-365111; fax: 36-46-365174; e-mail: matnum@gold.uni-miskolc.hu (preferred); matgal@gold.uni-miskolc.hu, mechszy@gold.uni-miskolc.hu.

***18-20 1st Croatian Mathematical Congress**, Zagreb, Croatia.

Sponsor: Croatian Mathematical Society.

Invited Speakers: (tentative list): J. Azema (Univ. P. et M. Curie), J. Bertoin (Univ. P. et M. Curie), A. Bourgeat (Saint-Etienne), R. J. Daverman (Univ. of Tennessee), Z. Janko (Heidelberg), A. Ivic Weiss (York Univ.), A. Mikelic (Univ. Lyon 1), D. Milicic (Univ. of Utah), S. J. Patterson (Goettingen), M. Rao (Univ. of Florida), J. M. R. Sanjurjo (Univ. Complutense), K. Veselic (Hagen), M. V. Wickerhauser (Washington Univ., St. Louis).

Application Deadline: January 1, 1996.

Information: H. Sikic, Dept. of Mathematics, Univ. of Zagreb, Bijenicka 30, Croatia; e-mail: congress@math.hr.

***24-26 ISSAC 96 International Symposium on Symbolic and Algebraic Computation**, Zurich, Switzerland.

Program: ISSAC is an annual international symposium that provides an opportunity to learn of new developments and to present original research results in all areas of symbolic mathematical computation.

Topics: Topics of the meeting include, but are not limited to: algorithmic mathematics, computer science, and applications. ISSAC'96 will be held in the main building of the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland. Accommodations will be available at nearby hotels. The planned activities include invited presentation, original research papers, tutorial courses, vendor exhibits, and software demonstrations. Proceedings will be distributed at the symposium. Proposals for workshops, tutorial courses, demonstrations, panel discussions or related activities are welcomed. User-groups, editorial boards or other associations desiring meeting space during the course of the symposium are encouraged to contact the conference organizers.

Information: Further information on the symposium is available by the following means: on World Wide Web at the URL: <http://www.inf.ethz.ch/ISSAC96/ISSAC96.html>; by e-mail, by sending mail to: issac96@cis.ude1.edu with info as a subject line; by regular mail, sending a request to one of the organizers.

***27-August 3 1996 Federated Logic Conference**, Rutgers University, New Jersey.

Program: As part of its Special Year on Logic and Algorithms, DIMACS will host the 1996 Federated Logic Conference (FLoC). FLoC is modeled after the successful Federated Computer Research Conference (FCRC), and brings together synergetic conferences that apply logic to computer science. The participating conferences are: Conference on Automated Deduction (CADE), Conference on Computer-Aided Verification (CAV), IEEE Symposium on Logic in Computer Science (LICS), and Conference on Rewriting Techniques and Applications (RTA). LICS and RTA will be held in parallel during the first four days of FLoC. CADE and CAV will be

held during the last four days, with CADE workshops running in parallel with the last day of LICS. Plenary events involving all the conferences are scheduled.

CADE: July 30–August 3

CAV: July 31–August 3

LICS: July 27–July 30

RTA: July 27–July 30

Paper Submission: FLoC itself does not have a separate submissions process. Submissions must be directed to the individual conferences. Parallel submissions are not allowed: a paper may not be submitted to more than one of the participating conferences. The calls for papers of the participating conferences can be obtained via the FLoC web page, WWW: <http://www.research.att.com/lics/FLoC> or via anonymous ftp, FTP: [From research.att.com, directory/dist/floc/](ftp://research.att.com/directory/dist/floc/). Submission deadlines:

CADE: January 12, 1996

CAV: January 4, 1996

LICS: December 13, 1995

RTA: January 15, 1996

Information: For e-mail inquiries regarding the participating meetings, use rta96@mpi-sb.mpg.de, cade13@cisr.anu.edu.au, lics96@cs.cmu.edu, or cav96@research.att.com. Information about the DIMACS Special Year on Logic and Algorithms can be found in <http://dimacs.rutgers.edu>.

August 1996

*4–9 **Vision Geometry V (Part of SPIE's Denver96 International Symposium on Optical Science, Engineering, and Instrumentation)**, Denver Marriott City Center and Colorado Convention Complex, Denver, CO.

Conference Chairs: R. A. Melter (Long Island Univ.), A. Y. Wu (American Univ.), L. Latecki (Univ. of Hamburg (FRG)).

Program Committee: A. D. Gross (CUNY/Queens College and Columbia Univ.), T. Y. Kong (CUNY/Queens College), J. Koplowitz (Clarkson Univ.), D. M. Mount (Univ. of Maryland/College Park), F. Rhodes (Univ. of Southampton, UK), I. Stojmenovic (Univ. of Ottawa, Canada).

Topics of Interest: This conference is designed to bring together workers who use geometric theory and techniques to solve problems related to computer vision. Specific solutions as well as overviews of general topics are welcome. Abstracts are solicited on the following topics: digital geometry and topology; morphology related to vision; computational geometry related to vision; convexity problems in vision.

Important Deadlines: Paper abstracts due from authors: January 8, 1996. Manuscripts due from authors: July 8, 1996. For a printed call for papers or other information: e-mail: colo96@spie.org (if no special meeting address, use spie@spie.org); fax: 360-647-1445; tel: 360-676-3290.

*11–17 **International Research Symposium on Nonstandard Analysis and its Applications**, Edinburgh, Scotland.

Organizers: N. J. Cutland (Hull), director, L. Arkeryd (Goteborg), and C. W. Henson (Illinois).

Program: This conference will be hosted by the International Centre for Mathematical Sciences (IMCS) at the Univ. of Edinburgh. Invited speakers and contributed talks will report on recent developments in Nonstandard Analysis and its Applications.

Information: ICMS, 14 India Street, Edinburgh, EH3 6EZ Scotland; e-mail: icms@maths.ed.ac.uk; fax: +44-0-131-220-1053; WWW: <http://www.ma.hw.ac.uk/icms/>.

September 1996

*30–October 2 **International Conference on Interval Methods and Computer Aided Proofs in Science and Engineering**, Wuerzburg, Germany.

Program: The conferences INTERVAL'XX are significant meetings devoted to various aspects of reliable numerical computations based on the interval approach. (Sometimes the terms validated numerics, localizational computations, or enclosure methods are used.) Talks are devoted to development of corresponding mathematical structures, design of computer tools, and applications in a wide range of areas.

Time and Place: The conference will be held September 30–October 2, 1996, in Wuerzburg, Germany. Wuerzburg is a baroque city with many restored and well-preserved buildings; the most famous of which is the former bishops residence with its beautiful staircase. Excursions to other beautiful cities such as Rothenburg may be organized.

Information: For more detailed and current information, look at WWW: <http://www.informatik.uni-wuerzburg.de/interval96>. Or write to: J. W. v. Gudenberg, Lehrstuhl fuer Informatik II, Universitaet Wuerzburg, Am Hubland, D-97074 Wuerzburg; tel: +49-931-888-5517; fax: +49-931-888-4602; e-mail: wolff@informatik.uni-wuerzburg.de.

October 1996

*9–12 **Conference on Automorphic Forms, Geometry and Analysis**, Institute for Advanced Study.

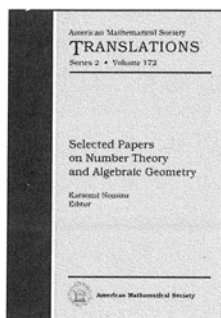
Program: It is almost thirty years since the conjectures of Robert Langlands changed the direction of research in automorphic forms and representation theory. His work in these and other subjects has profoundly altered the way the areas are perceived, particularly as they relate one to another. The conference has several aims. One is to bring some of the fundamental ideas of automorphic forms, as they are presently understood, before a wide mathematical audience. A second purpose is to describe recent developments in the major areas in which Langlands has worked. Finally, on the eve of the twenty-first century, there will be attempts to anticipate the future directions of work on the web of

problems and conjectures now known as the Langlands' program.

Information: Additional information may be obtained by contacting either M. Violi, e-mail: violi@math.ias.edu, or C. Warfield, e-mail: warfield@math.ias.edu. Information can also be accessed through WEBSITE: <http://www.math.ias.edu> and GOPHER-site: gopher.math.ias.edu.

New Publications Offered by the AMS

American Mathematical Society Translations— Series 2



Selected Papers on Number Theory and Algebraic Geometry Katsumi Nomizu, Editor Volume 172

This book presents papers that originally appeared in the Japanese journal *Sugaku* from the Mathematical Society of Japan. The papers explore the relationship between number theory and algebraic geometry.

Contents

Jun-ichi Igusa, *On local zeta functions*; **K. Nishioka**, *Mahler functions and transcendental numbers*; **K. Kato**, *Generalizations of class field theory*; **M. Miyanishi**, *Recent topics on open algebraic surfaces*; **T. Oda**, *Recent topics on toric varieties*.

January 1996, 91 pages (hardcover),

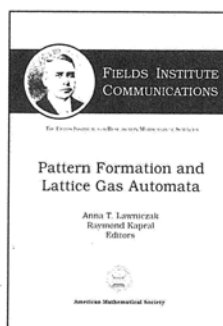
ISBN 0-8218-0445-6, LC 95-39091, ISSN 0065-9290

1991 *Mathematics Subject Classification*: 11-XX, 14-XX

Individual member \$25, List \$42, Institutional member \$34

To order, please specify TRANS2/172N

Fields Institute Communications



Pattern Formation and Lattice Gas Automata Anna T. Lawniczak and Raymond Kapral, Editors Volume 6

This book is the Proceedings of The Fields Institute Conference/NATO Advanced Research Workshop held in June 1993. The articles review the diverse recent progress in the theory and development of lattice-gas and lattice Boltzmann methods and their applications

to hydrodynamics, multi-phase flows, flows through porous media, reaction-diffusion systems, pattern formation phenomena, and phase separation processes. Discussed here are various aspects of the statistical analysis of these methods, with emphasis on fluctuations and correlations, as well as computational prospects including development of dedicated hardware.

Features:

- up-to-date articles covering theory and applications
- interdisciplinary approach, which includes mathematics, physics, chemistry, and geophysics
- abstracts of papers published from 1992 through 1995

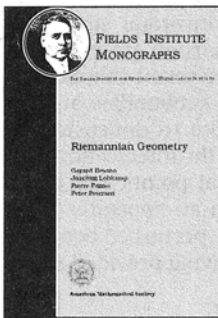
Contents

C. Appert, V. Pot, and S. Zaleski, *Liquid-gas models on 2D and 3D lattices*; **B. M. Boghosian and W. Taylor**, *Renormalization of lattice gas transport coefficients*; **I. Bonzani, M. A. Cimaschi, and R. Monaco**, *The discrete Boltzmann equation for gases with bimolecular or dissociation-recombination reactions*; **E. G. D. Cohen and F. Wang**, *Diffusion and propagation in Lorentz lattice gases*; **S. P. Dawson, B. Hasslacher, and J. E. Pearson**, *Lattice gas simulations of replicating domains*; **A. De Masi**, *Spinodal decomposition and interface dynamics for Glauber evolution with Kac potential*; **K. Diemer, A. Lawniczak, and R. Kapral**, *Fluctuations and chemical waves in a bistable reacting system*; **J. W. Dufty and M. H. Ernst**, *Lattice Boltzmann-Langevin equations*; **M. H. Ernst and H. J. Bussemaker**, *Instabilities and patterns*; **F. Hayot and L. Wagner**, *Vortex street and Lévy walks*; **M. Hénon**, *Lattice gases without semi-detailed balance*; **S. Hou, J. Sterling, S. Chen, and G. D. Doolen**, *A lattice Boltzmann subgrid model for high Reynolds number flows*; **N. Margolus**, *CAM-8: A computer*

architecture based on cellular automata; E. Presutti, *Critical fluctuations in a spin system*; Y. H. Qian, S. Succi, F. Massaioli, and S. A. Orszag, *A benchmark for lattice BGK model: Flow over a backward-facing step*; R. Rechtman and A. Salcido, *Lattice gas self diffusion in random porous media*; O. Tribel and J.-P. Boon, *Lévy laws for lattice gas automata*; J. R. Weimar and J.-P. Boon, *New class of cellular automata for reaction-diffusion systems applied to the CIMA reaction*; X.-G. Wu and R. Kapral, *Lattice-gas cellular automaton model for one-mode lasers*; J. Yepez, *A lattice-gas with long-range interactions coupled to a heat bath*; G. D. Doolen, *Abstracts of Lattice gas/lattice Boltzmann papers 1992-1995*.

December 1995, 346 pages (hardcover), ISBN 0-8218-0258-5, LC 95-43530, ISSN 1069-5265
 1991 *Mathematics Subject Classification*: 82C22; 82C05, 82C20, 82C24, 82C40, 82C41, 76M25, 76N15, 76F99, 76Md25, 60K35
Individual member \$59, List \$99, Institutional member \$79
 To order, please specify FIC/6N

Fields Institute Monographs



Riemannian Geometry Gérard Besson, Joachim Lohkamp, Pierre Pansu, and Peter Petersen Volume 4

This book is a compendium of survey lectures presented at a conference on Riemannian Geometry sponsored by The Fields Institute for Research in Mathematical Sciences (Waterloo, Canada) in August 1993. Attended by over 80 participants, the aim of the conference was to promote research activity in Riemannian geometry. A select group of internationally established researchers in the field were invited to discuss and present current developments in a selection of contemporary topics in Riemannian geometry. This volume contains four of the five survey lectures presented at the conference.

Features:

- Basic notions of volume and entropy and the difficult and deep relations of these invariants to curvature.
- A survey—including details and proofs—of recent amazing results on the flexibility of negative Ricci and scalar curvatures.
- LP cohomology, in which the methods combine various areas of mathematics going beyond Riemannian geometry.
- Curvature inequalities from a general point of view, leading to the study of general spaces.

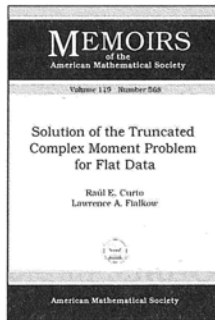
Contents

Lecture Series 1. Gérard Besson, Volumes and entropies: *Preface; Volumes; Simplicial volume; Entropies; Some results and a new method; Bibliography*; **Lecture Series 2. Joachim Lohkamp, Global and local curvatures:** *Preface; Curved balls; Approximation; Internal structures; Bibliography*; **Lecture Series 3. Pierre Pansu, Introduction to L^2 Betti numbers:** *Acknowledgments; Introduction; Von-Neumann dimension; Simplicial L^2 Betti numbers; Homotopy invariance; Invariants of discrete groups; Atiyah's L^2 index theorem; L^∞ cohomology and negative curvature; A vanishing theorem for Kähler hyperbolic manifolds; Non vanishing theorems for L^2 cohomology; L^2 index for projectively invariant operators*; **Lecture Series 4. Peter Petersen, Comparison geometry problem list:** *Bibliography; Introduction; Review of techniques*

in comparison theory; Results in comparison geometry; Problems; Bibliography.

January 1996, 115 pages (hardcover), ISBN 0-8218-0263-1, LC 95-47659, ISSN 1069-5273
 1991 *Mathematics Subject Classification*: 53C20, 53C21, 58G30, 58F17, 58G12, 58F11, 46L10, 20C07, 58E35; 53C55, 55P91
All AMS members \$37, List \$46
 To order, please specify FIM/4N

Memoirs of the AMS



Solution of the Truncated Complex Moment Problem for Flat Data Raúl E. Curto and Lawrence A. Fialkow Volume 119, Number 568

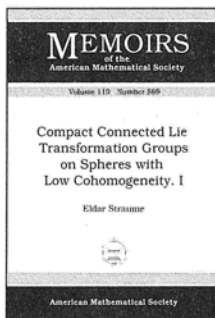
In this book, the authors introduce a matricial approach to the truncated complex moment problem and apply it to the case of moment matrices of flat data

type, for which the columns corresponding to the homogeneous monomials in z and \bar{z} of highest degree can be written in terms of monomials of lower degree. Necessary and sufficient conditions for the existence and uniqueness of representing measures are obtained in terms of positivity and extension criteria for moment matrices.

Contents

Introduction; Moment matrices; Positive moment matrices and representing measures; Existence of representing measures; Extension of flat positive moment matrices; Applications; Generalizations to several variables; References; List of symbols.

January 1996, 52 pages (softcover), ISBN 0-8218-0485-5, LC 95-39135, ISSN 0065-9266
 1991 *Mathematics Subject Classification*: 44A60, 47A20; 15A57, 15-04, 47B37
Individual member \$19, List \$32, Institutional member \$26
 To order, please specify MEMO/119/568N



Compact Connected Lie Transformation Groups on Spheres with Low Cohomogeneity, I Eldar Straume Volume 119, Number 569

In the study of Lie transformation groups on classical space forms, one of the most exciting features is the existence of nonlinear or "exotic" actions.

Among the many unsolved problems, the classification of G -spheres with 2-dimensional orbit space has a prominent place. The main purpose of this monograph is to describe the beginnings of a program to the complete solution of this problem. One major feature of the author's approach is the effectiveness of the geometric weight system, which was introduced by Wu-Yi Hsiang around 1970, as a book-keeping method for orbit structural data.

(continued)

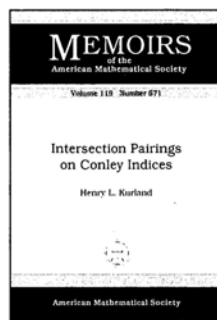
Features:

- Complete tables of compact connected linear groups of cohomogeneity < 3 .
- Geometric weight systems techniques.
- Complete classification of G-spheres of cohomogeneity one.
- Weight classification of G-spheres of cohomogeneity two, the crucial step of the complete classification for cohomogeneity two.

Contents

Introduction; Linear groups of cohomogeneity < 4 ; Determination of weight patterns; Fixed point results of P. A. Smith type; Classification of compact connected Lie transformation; Appendix; References.

January 1996, 93 pages (softcover),
 ISBN 0-8218-0409-X, LC 95-39136, ISSN 0065-9266
 1991 *Mathematics Subject Classification*: 57S15; 22E47
Individual member \$21, List \$35, Institutional member \$28
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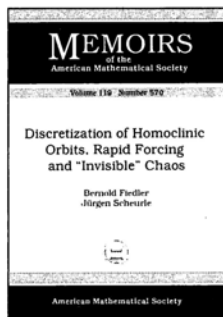
Intersection Pairings on Conley Indices
 Henry L. Kurland
 Volume 119, Number 571

Given an isolated invariant set of a flow on a manifold of dimension m oriented over a PID R , Kurland defines an intersection class pairing of degree $-m$ on the tensor product of the singular homology modules of the forward and reverse time Conley indices of the isolated invariant set with values in the Čech homology of the invariant set. Restricting the pairing to elements of degree m results in an intersection number pairing that is invariant under continuation along a continuous path of flows and isolated invariant sets. More generally, the unrestricted pairing defines continuous lifts to a space of Čech homology classes along such a path. Further, when the homology modules of the Conley indices are torsion free, the intersection number pairing is non-singular. Also, the pairing associated to an isolated invariant set of a product flow is, modulo torsion, the product (up to sign) of the pairings associated to the factor isolated invariant sets. Intersection classes of lowest and highest dimension are computed for any R -orientable, normally hyperbolic invariant submanifold whose expanding and contracting normal subbundles are also R -orientable. These computations yield, due to dimensionable considerations, a complete computation of the intersection class and number pairings for hyperbolic critical points and hyperbolic closed orbits. Application is made in an appendix to the existence of solution of a class of singularly perturbed two-point boundary value problems such problems having provided strong motivation for the present study.

Contents

Introduction; Basic notation and background definitions; The intersection pairings of L, \mathcal{L} , and \mathcal{L} ; Statement of the continuation results and examples; Construction of bilinear pairings on Conley indices; Proofs of the continuation results; Some basic computational tools; L for normally hyperbolic invariant submanifolds; Products of intersection pairings; The cap product representation of \mathcal{L} and the nonsingularity of $\#L$; Appendices; References.

January 1996, 184 pages (softcover),
 ISBN 0-8218-0440-5, LC 95-39138, ISSN 0065-9266
 1991 *Mathematics Subject Classification*: 55N45, 58F25, 58F35, 34C35; 34B15, 34E15
Individual member \$26, List \$44, Institutional member \$35
 To order, please specify MEMO/119/571N



Discretization of Homoclinic Orbits, Rapid Forcing and "Invisible" Chaos
 Bernold Fiedler and Jürgen Scheurle
 Volume 119, Number 570

One-step discretizations of order p and step size e of autonomous ordinary differential equations can be viewed as time- e maps of a certain first order ordinary differential equation that is a rapidly forced nonautonomous system.

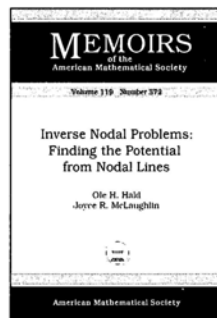
Fiedler and Scheurle study the behavior of a homoclinic orbit for $e = 0$, under discretization. Under generic assumptions they show that this orbit becomes transverse for positive e . Likewise, the region where complicated, "chaotic" dynamics prevail is under certain conditions estimated to be exponentially small.

These results are illustrated by high precision numerical experiments. The experiments show that, due to exponential smallness, homoclinic transversality is already practically invisible under normal circumstances, for only moderately small discretization steps.

Contents

Introduction and main results; Discretization and rapid forcing; Exponential smallness; Genericity of positive splitting; Estimating the chaotic wedge; Numerical experiments; Discussion; Appendix; References.

January 1996, 79 pages (softcover),
 ISBN 0-8218-0468-5, LC 95-39137, ISSN 0065-9266
 1991 *Mathematics Subject Classification*: 34C15, 34C35, 58F14, 65L60
Individual member \$20, List \$34, Institutional member \$27
 To order, please specify MEMO/119/570N



Inverse Nodal Problems: Finding the Potential from Nodal Lines
 Ole H. Hald and Joyce R. McLaughlin
 Volume 119, Number 572

Can you hear the shape of a drum? No. In this book, the authors ask, "Can you see the force on a drum?" Hald and McLaughlin prove that for almost all rectangles the potential in a Schrödinger equation is uniquely determined (up to an additive constant) by a subset of the nodal lines. They derive asymptotic expansions for a rich set of eigenvalues and eigenfunctions. Using only the nodal line

positions, they establish an approximate formula for the potential and give error bounds.

The theory is appropriate for a graduate topics course in analysis with emphasis on inverse problems.

Features:

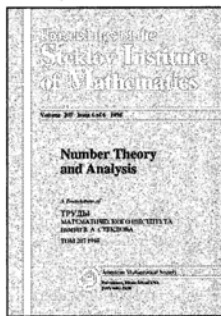
- The formulas that solve the inverse problem are very simple and easy to state.
- Nodal Line Patterns–Chaldni Patterns–are shown to be a rich source of data for the inverse problem.
- The data in this book is used to establish a simple formula that is the solution of an inverse problem.

Contents

Introduction; Separation of eigenvalues for the Laplacian; Eigenvalues for the finite dimensional problem; Eigenfunctions for the finite dimensional problem; Eigenvalues for $-\Delta + q$; Eigenfunctions for $-\Delta + q$; The inverse nodal problem; The case $fRq \neq 0$; Acknowledgment; References; Appendices.

January 1996, 148 pages (softcover), ISBN 0-8218-0486-3, LC 95-39139, ISSN 0065-9266
 1991 Mathematics Subject Classification: 35R30, 35P20, 73D50
Individual member \$23, List \$39, Institutional member \$31
 To order, please specify MEMO/119/572N

Proceedings of the Steklov Institute of Mathematics



Number Theory and Analysis
 A. A. Karatsuba and V. I. Blagodat'skikh, Editors
 Volume 207

This collection consists of papers by participants in the international conference celebrating the 100th anniversary of the birth of I. M. Vinogradov, held in Moscow in September 1991. The papers are devoted to current trends in analytic

number theory, function theory, algebraic number theory, algebraic geometry, and combinatorics. The collection begins with a paper by A. A. Karatsuba that describes the life and scientific activity of Vinogradov.

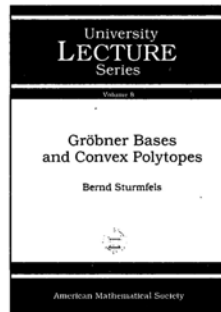
Contents

A. A. Karatsuba, *I. M. Vinogradov and his method of trigonometric sums; Main dates in the life and activity of I. M. Vinogradov; Chronological index of the works of I. M. Vinogradov*; V. I. Bernik and I. R. Dombrovskii, *Effective estimates of the measure of sets defined by Diophantine conditions*; S. V. Bochkarev, *Estimates of some character sums*; S. M. Voronin, *On an explicit formula for von Mangoldt's Λ -function*; A. I. Galochkin, *On approximation, by algebraic numbers, of the solutions of some equations containing E-functions*; S. A. Gritsenko, *On a density theorem*; I. Sh. Dzhabbarov, *On estimates of trigonometric integrals*; V. G. Zhuravlev, *Spherical theta-series and Hecke operators*; V. A. Iskovskikh and S. L. Tregub, *Relations in the two-dimensional Cremona group over a nonclosed field*; D. Ismoilov, *Estimates of complete trigonometric sums*; M. I. Israilov and I. A. Allakov, *On the sum of kth powers of natural numbers*; A. A. Karatsuba, *A new approach to the problem of the zeros of some Dirichlet series*; A. A. Lavrik, *Titchmarsh's problem in the discrete theory of the Riemann zeta-function*; A. F. Lavrik, *The equation of the zeta function and a*

segment of the Euler product; A. P. Laurinchikas [Laurinčikas], *Limit theorems for Dirichlet L-functions*; Y. Mozer [J. Moser], *On the multiplicities of the zeros of the Riemann zeta-function*; A. I. Pavlov, *On the number of permutations with a finite set of cycle lengths*; A. A. Polyanskiĭ, *On representation of numbers as the sum of three cubes and a binary quadratic form*; S. Raghavan and J. Sengupta, *On Fourier coefficients of Maass cusp forms in 3-dimensional hyperbolic space*; K. Ramachandra, *Little flowers to I. M. Vinogradov*; Z. Kh. Rakhmonov, *On the distribution of values of Dirichlet characters and their applications*; S. A. Stepanov, *On lower bounds for character sums over finite fields*; M. Sugi, *Lattice points in domains in the Lobachevsky plane*; V. N. Temlyakov, *On error estimates for cubature formulas*; N. M. Timofeev, *Arithmetic functions on the set of shifted primes*; V. G. Chirskii, *Arithmetic properties of values of hypergeometric series*; V. N. Chubarikov, *On Vinogradov's problems in the theory of prime numbers*; A. B. Shidlovskii, *On algebraic independence of the values of E-functions connected by algebraic equations over the field of rational functions*; K. M. Ėminyān, *On the representation of numbers with given properties of the binary expansion by sums of two squares.*

January 1996, 351 pages (softcover), ISBN 0-8218-0467-7, ISSN 0081-5438
 1991 Mathematics Subject Classification: 11-06, 00B30
Individual member \$161, List \$269, Institutional member \$215
 To order, please specify STEKLO/207N

University Lecture Series



Gröbner Bases and Convex Polytopes
 Bernd Sturmfels
 Volume 8

This book is about the interplay of computational commutative algebra and the theory of convex polytopes. It centers around a special class of ideals in a polynomial ring: the class of toric ideals. They are characterized as those prime ideals that are generated by monomial

differences or as the defining ideals of toric varieties (not necessarily normal).

The interdisciplinary nature of the study of Gröbner bases is reflected by the specific applications appearing in this book. These applications lie in the domains of integer programming and computational statistics. The mathematical tools presented in the volume are drawn from commutative algebra, combinatorics, and polyhedral geometry.

Contents

Gröbner basics; The state polytope; Variation of term orders; Toric ideals; Enumeration, sampling and integer programming; Primitive partition identities; Universal Gröbner bases; Regular triangulations; The second hypersimplex; A-graded algebras; Canonical subalgebra bases; Generators, Betti numbers and localizations; Toric varieties in algebraic geometry; Some specific Gröbner bases; Bibliography; Index.

December 1995, 162 pages (softcover), ISBN 0-8218-0487-1, LC 95-45780, ISSN 1047-3998
 1991 Mathematics Subject Classification: 13P10, 14M25; 52B12, 90C10, 14Q99
All AMS members \$23, List \$29
 To order, please specify ULECT/8N

Publications

O F C O N T I N U I N G I N T E R E S T

Following are some of our more popular books and videotapes as well as some with similar topics to those appearing in the New Publications section of this issue.

	List	Indiv. mem.
Algebraic Geometry , by Masayoshi Miyanishi, 1994, 0-8218-4615-9, 246 pages (hardcover). To order, please specify MMONO/136NP	\$100	\$60
Assistantships and Graduate Fellowships in the Mathematical Sciences, 1995-1996 , 1995, 0-8218-0188-0, 125 pages (softcover). To order, please specify ASST/95NP	\$19	\$11
Combined Membership List, 1995-1996 , 1995, 0-8218-0185-6, 392 pages (softcover). To order, please specify CML/95/96NP	\$59	\$35
Fermat's Last Theorem , Barry Mazur, videotape, 1995, 0-8218-0446-4. To order, please specify VIDEO/97NP	\$54.95	\$34.95
Foundations of Algebraic Geometry , by André Weil, revised and enlarged edition 1962, 0-8218-1029-4, 363 pages (softcover). To order, please specify COLL/29NP	\$29	\$24*
How to Teach Mathematics: a personal perspective , by Steven G. Krantz, 1993, 0-8218-0197-X, 76 pages (softcover). To order, please specify HTMNP	\$15	\$12*
The Joy of T_EX, A Gourmet Guide to Typesetting with the A_MS-T_EX Macro Package , Second Edition, by M. D. Spivak, 1990, 0-8218-2997-1, 309 pages (softcover). To order, please specify JOYTNP	\$39	\$32*
Mathematical Sciences Professional Directory , 1995, 0-8218-0190-2, 213 pages (softcover). To order, please specify PRODIR/95NP	\$50	\$50
Multivariable Operator Theory , edited by Raúl E. Curto, Ronald G. Douglas, Joel D. Pincus, and Norberto Salinas, 1995, 0-8218-0298-4, 380 pages (softcover). To order, please specify CONM/185NP	\$63	\$38
Ten Lectures on the Interface Between Analytic Number Theory and Harmonic Analysis , by Hugh L. Montgomery, 1994, 0-8218-0737-4, 220 pages (softcover). To order, please specify CBMS/84NP	\$29	\$24**
The Seiberg-Witten Invariants , Clifford H. Taubes, videotape, 1995, 0-8218-0434-0. To order, please specify VIDEO/96NP	\$54.95	\$34.95
What's Happening in the Mathematical Sciences , by Barry A. Cipra, 1993, 0-8218-8999-0, 47 pages (softcover). To order, please specify HAPPENING/1NP	\$7	\$7
What's Happening in the Mathematical Sciences , by Barry Cipra, 1994, 0-8218-8998-2, 51 pages (softcover). To order, please specify HAPPENING/2NP	\$8	\$8
What's Happening in the Mathematical Sciences, 1995-1996 , by Barry Cipra, 1995, 0-8218-0355-7, 111 pages (softcover). To order, please specify HAPPENING/3NP	\$12	\$12
World Directory of Mathematicians 1994 , 1994, 869 pages (softcover). To order, please specify WRLDIR/10NP	\$45	\$45

* All AMS members.

** All individuals.



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Notices of the American Mathematical Society
P.O. Box 6248
Providence, RI 02940 U.S.A.

.....

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No listing for a position will be printed if it expresses or implies any preference, limitation, specification, or discrimination based on age, color, race, religion, sex, or national origin in contravention of any federal or state statute prohibiting discrimination in employment on the basis of these criteria. The publisher reserves the right to edit any listing prior to publication which does not conform with federal or state law on discrimination in employment.

All employers in the United States are required to abide by the requirements of Title VII of the Civil Rights Act of 1964, announcing a national policy of equal employment opportunity in private employment, without discrimination because of color, race, religion, sex, or national origin. All U.S. listings are accepted with the understanding that the employer complies with federal requirements. Advertisers not subject to U.S. laws may be required to sign a statement that they do not discriminate in employment on grounds of age, color, race, religion, sex, or national origin. *Applicants should be aware that institutions outside the U.S. may not be legally bound to conform to these or similar requirements and the AMS cannot assume responsibility for*

enforcing compliance. Applicants are advised to inform themselves of conditions that may exist at the institutions to which they apply.

In particular, readers should note that the Equal Employment Opportunity Act (42 U.S.C., §§ 2000e et seq.), which prohibits discrimination in employment on the basis of race, religion, sex, or national origin, contains (in § 2000e-1) an exception from the provisions of the Act for any religious corporation, association, educational institution, or society with respect to employment of individuals of a particular religion to perform work connected with the carrying on by such corporation, association, educational institution, or society of its activities.

The Age Discrimination Act of 1967 (29 U.S.C., §§ 621 et seq., as amended), makes it unlawful for an employer to discriminate against any individual between the ages of 40 and 70 because of age. Thus it is legal to seek as an employee someone who is "over 30," but not one "over 50"; neither is it legal to express a preference for someone who is "young," or is a "recent graduate," since the latter tend (on statistical grounds) to be young.

Classified Advertisements

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

ARIZONA

NORTHERN ARIZONA UNIVERSITY Department of Mathematics Positions in Mathematics Education and Statistics

Two tenure-track positions starting August 19, 1996. One position is an assistant professorship in mathematics education and the other is an assistant professorship in statistics. For the mathematics education position, a doctorate in mathematics education or mathematics is required. Candidates should have an interest and/or experience in relations with public schools and in contributing to a vigorous and active mathematics education program at both the undergraduate and master's levels. Experience or interest in multicultural contexts of mathematics teaching would be beneficial. At present, there are three specialists in mathematics education in the department. For the statistics position, a requirement is a doctorate in statistics or biostatistics. Candidates should have a strong theoretical background, interest in applied statistics or actuarial science and in intramural consulting, and the ability to contribute to the development of an interactive research group in statistics. At present there are four statisticians and two probabilists in the department. The department of twenty-six tenure-track faculty offers bachelor's and master's degrees with emphases in mathematics, mathematics education, statistics, and actuarial science.

To apply: send a letter of application

(please indicate for which position the application is being made), graduate school transcripts, a curriculum vitae, and also three letters of reference to either Mathematics Education Screening Committee or Statistics Screening Committee, Department of Mathematics, Northern Arizona University, Flagstaff, Arizona 86011-5717. Send e-mail inquiries for the statistics position to: statsrch@odin.math.nau.edu. Screening will begin on December 15, 1995; the search will remain open until the positions are filled. NAU is an Equal Opportunity/Affirmative Action Institution. Minorities, persons with disabilities, veterans, and women are encouraged to apply.

CALIFORNIA

UNIVERSITY OF CALIFORNIA, DAVIS Regular and Visiting Faculty Positions in Mathematics

Applications are invited for two anticipated positions at either the assistant professor or associate professor level and Visiting Research Assistant Professorship (VRAP) positions in the Department of Mathematics, University of California, Davis, effective July 1, 1996. These positions are contingent on budgetary approval.

Appointments of the assistant or associate professor positions will be made commensurate with qualifications. Minimum qualifications include a Ph.D. degree in mathematical sciences and great promise in research and teaching. Duties include

mathematical research, undergraduate and graduate teaching, and service. For these positions, the Department of Mathematics is recruiting in (1) geometry/topology, and (2) mathematical physics. Candidates for the associate professor position must have demonstrated outstanding attainment in research and teaching.

The VRAP positions are renewable for a total of three years with satisfactory performance in research and teaching. The VRAP applicants are required to have completed their Ph.D. no earlier than 1992. The Department of Mathematics is interested in applicants in the following areas for the VRAP positions: (1) algebra, (2) analysis/PDEs, (3) applied mathematics, (4) computational mathematics, (5) geometry/topology, (6) mathematical physics.

The tenure-track positions are open until filled, but to assure consideration, applications should be received by December 15, 1995. The application deadline for the VRAP positions is February 1, 1996. To initiate the application process, request an application package by writing an e-mail message to forms@math.ucdavis.edu. Those who do not have access to e-mail can obtain the package by writing to:

Chair of Search Committee
Department of Mathematics
University of California
Davis, California 95616-8633

The Department of Mathematics at UC Davis is an Affirmative Action Employer with a strong institutional commitment to the achievement of diversity among its faculty and staff. In this spirit, we are

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 1995 rate is \$100 per inch or fraction thereof on a single column (one-inch minimum), calculated from top of headline. Any fractional text of $\frac{1}{2}$ inch or more will be charged at the next inch rate. No discounts for multiple ads or the same ad in consecutive issues. For an additional \$10 charge, announcements can be placed anonymously. Correspondence will be forwarded.

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

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

Upcoming deadlines for classified advertising are as follows: March issue-January 2, 1996; April issue-January 30, 1996; May issue-February

29, 1996; June issue-March 29, 1996.

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 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.

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

particularly interested in receiving applications from women, persons of color, and persons from other underrepresented groups.

HARVEY MUDD COLLEGE

Assistant Professor of Mathematics

Harvey Mudd College is hiring one tenure-track assistant professor in mathematics. Excellence in teaching is absolutely essential, as is evidence of a strong and ongoing research program. Preference will be given to applicants in the areas of differential geometry, dynamical systems theory, and functional analysis. Applicants should also have wide mathematical interests and be able to teach across the undergraduate mathematics curriculum. Candidates must be willing to supervise undergraduate research and work with others in the development of departmental programs.

Harvey Mudd College is a highly selective undergraduate institution of science and engineering. High school calculus is required for admission to the college. More than one-third of the student body are National Merit Scholarship finalists. The college enrolls about 630 students and is associated with four other undergraduate colleges and the Claremont Graduate School, forming together an academic community of about 5,000 students. There are over 40 mathematicians in Claremont.

Harvey Mudd College is an Equal Opportunity Employer and is committed to the recruitment of candidates historically underrepresented on college faculties. Preference will be given to applications received before January 15, 1996. Applicants should send a curriculum vitae, a description of their current research, and three letters of reference to the address that appears below. Letters should, as much as possible, assess the quality of the applicant's scholarship, potential as a mathematician, and abilities as a teacher.

Address for applications:
Search Committee
Department of Mathematics
Harvey Mudd College
Claremont, CA 91711-5990

NAVAL POSTGRADUATE SCHOOL Monterey, California

Chair of Department of Mathematics

The Department of Mathematics of the Naval Postgraduate School (NPS) seeks a department chair. The ideal candidate holds a Ph.D. in applied mathematics or a closely related field, has extensive academic experience, and maintains a continuing, strong involvement in research. A strong teaching record is essential, and experience with research on defense-related problems is desirable. The candidate should have demonstrated leadership ability, with strong interpersonal and communication skills. The department's needs include development of research funding

and enhancement of its role as a service department through mutual cooperation with other departments.

The department has nineteen full-time faculty and offers M.S. degrees and a few Ph.D.s in applied mathematics. Our students are military officers or civilian employees of the U.S. Department of Defense or of allied countries and are fully supported by their sponsoring organization during their studies. The department plays a very active role in DoD research in numerical computation and parallel processing, solutions of PDEs, orbital mechanics, networks and graphs, control theory, and game theory. The department's computing facilities include a network of state-of-the-art workstations and personal computers. Additional computing services are freely available from the school's computer center.

Applicants interested in the position should forward their résumé, an abstract of recent research, and the names of three references to:

Professor T. Jayachandran
Chair Search Committee, MA/Jy
Naval Postgraduate School
Monterey, CA 93943-5216
Tel: (408) 656-2600
Fax: (408) 656-2355
e-mail: tj@nps.navy.mil

NPS is an EO/AA Employer.

UNIVERSITY OF CALIFORNIA, BERKELEY Department of Statistics

Pending final budgetary approval, applications are invited for a special full-time Neyman Visiting Assistant Professor position, beginning fall 1996 or spring 1997. The appointment is of a two-year duration (but can be shorter by mutual agreement) and is not renewable. Applicants should have exhibited exceptional research potential in any of the following areas: theoretical or applied statistics, computational statistics, probability theory, applied probability. Appointees will be expected to teach effectively as well as carry out a vigorous program of research. Minimum salary \$38,800; salary commensurate with experience. Send applications or inquiries (include résumé and ask three references to write directly) by January 31, 1996, to: P.J. Bickel, Chair, Department of Statistics #3860, University of California, Berkeley, California 94720; fax: 510-642-7892; e-mail: chair@stat.berkeley.edu. The University of California is an Equal Opportunity, Affirmative Action Employer.

COLORADO

UNIVERSITY OF COLORADO Colorado Springs, CO 80933

The Department of Mathematics at the University of Colorado at Colorado Springs anticipates one full-year or two half-year

nonrenewable positions during AY 1996-97. Rank and salary are dependent on applicant's prior experience. Women and minorities are especially encouraged to apply. Applicants should have a strong current research program in one of the areas of: ring and module theory, computer vision, probability, differential equations, harmonic analysis/wavelets, industrial mathematics. Applicants will be expected to interact with those current department members having overlapping research interests. Applicants will also be expected to teach two three-hour courses during each semester. To apply, please submit in a single package: letter of application, AMS Standard Cover Sheet (indicate full-year or particular semester of interest), and curriculum vitae. Candidates should arrange for three letters of recommendation to be sent regarding research ability and promise and at least one letter of recommendation regarding teaching ability. Mail all materials to: Search Committee, Department of Mathematics, University of Colorado, Colorado Springs, CO 80933-7150. Questions regarding the position (no applications) may be addressed to employ@math.uccs.edu. Review of applications will begin on February 1, 1996. The University of Colorado is an AA/EOE.

CONNECTICUT

FAIRFIELD UNIVERSITY Department of Mathematics and Computer Science

Fairfield University's Department of Mathematics and Computer Science invites applications for a tenure-track assistant professorship which begins in September 1996. A doctorate in mathematics or statistics is required. Strong evidence of research potential, demonstrated success in classroom instruction, and a solid commitment to teaching are essential. The ability to teach mathematical statistics is preferred, but all applicants will be considered. Experience and interest in the use of technology in instruction are desirable.

Fairfield University, The Jesuit University of Southern New England, is a comprehensive university with about 2,900 undergraduates and a strong emphasis on liberal arts education. There are fourteen full-time faculty members in the department and approximately thirty-five majors a year. The picturesque campus is located on Long Island Sound in southwestern Connecticut about 50 miles from New York City. Fairfield is an Affirmative Action/Equal Opportunity Employer. Send a letter of application, a curriculum vitae, and three letters of recommendation, which comment on the applicant's experience and promise as a teacher and scholar, to Joan Weiss, Chair, Department of Mathematics and Computer Science, Fairfield University, Fairfield, CT 06430-

5195; tel: 203-254-4000, ext. 2516; e-mail: weiss@fair1.fairfield.edu. We plan to participate in the Employment Register at the AMS/MAA Meetings in Orlando. Full consideration will be given to complete applications received by February 1, 1996.

FLORIDA

FLORIDA INTERNATIONAL UNIVERSITY

The Department of Mathematics announces tenure-track positions effective August 1996 at the level of assistant professor. Candidates must have a Ph.D. in mathematics and a strong commitment to research and teaching.

We encourage applications from the following fields: algebra, number theory, numerical analysis, and partial differential equations. Outstanding candidates in other areas will be considered.

The teaching load consists of no more than five 3-credit courses per academic year. To apply, send a letter of application, a curriculum vitae, and three letters of recommendation to:

Recruitment Committee
Department of Mathematics
Florida International University
Miami, FL 33199

Florida International University is an Equal Opportunity/Equal Access Employer. It is a member of the State University system of Florida, with approximately 30,000 students. The department offers bachelor's and master's degrees.

GEORGIA

GEORGIA INSTITUTE OF TECHNOLOGY

The Center for Dynamical Systems and Nonlinear Studies expects to have some long- and short-term visiting/postdoctoral positions beginning fall 1996. These positions are in nonlinear differential equations, dynamical systems, computational methods, and related areas. In addition to a curriculum vitae and three letters of reference, candidates should send a summary of future research plans to Jack K. Hale, Regents' Professor and Director, CDSNS, Georgia Institute of Technology, Atlanta, GA 30332-0190. Deadline for applications: postmarked no later than 1/31/96. Georgia Tech, a member of the University System of Georgia, is an Equal Opportunity/Affirmative Action Employer.

ILLINOIS

LOYOLA UNIVERSITY OF CHICAGO

The Department of Mathematical and Computer Sciences of Loyola University of Chicago anticipates the availability of at least one tenure-eligible position in mathematics commencing fall 1996. Among

the requirements for the positions are a Ph.D. in mathematics and a commitment to excellence in both research and teaching. The department seeks applications from outstanding candidates in all areas of mathematics. Current research areas of the mathematics faculty include algebra, analysis, combinatorics and discrete mathematics, logic, partial differential equations, and statistics.

The department awards B.S. degrees in mathematics, computer science, and statistics and M.S. degrees in mathematics and computer science. The department has 24 full-time members, over 200 undergraduate majors, and over 140 graduate students. The department is located on Loyola's scenic Lake Shore Campus on the far north side of Chicago in the Rogers Park neighborhood on the shores of Lake Michigan. There is plenty of affordable, quality housing close to the campus and in other areas. A number of world-renowned academic institutions and industrial labs in the area make for an outstanding research environment.

Interviews will begin in late January 1996 and will continue until the positions are filled. Send a detailed curriculum vitae and three letters of recommendation to:

Chair, Math Search Committee
Department of Mathematical
and Computer Sciences
Loyola University of Chicago
Chicago, IL 60626

All documents should be in paper form.

**NORTHERN ILLINOIS UNIVERSITY
Department of Mathematical Sciences**

Anticipated assistant professorship with a specialization in applied wavelet analysis. The successful candidate will be well versed in both the theory and applications of wavelets. Ph.D. or equivalent and strong potential in research and teaching required. Application (vita), transcripts, three letters of reference, and a description of research program should be sent to: Applied Wavelet Analysis Position, c/o Professor William D. Blair, Chair, Department of Mathematical Sciences, Northern Illinois University, DeKalb, IL 60115, by February 29, 1996. NIU is an Equal Opportunity/Affirmative Action Employer and recognizes dual-career issues.

**NORTHERN ILLINOIS UNIVERSITY
Department of Mathematical Sciences**

Anticipated assistant professorship with a specialization in arithmetic algebraic geometry. Ph.D. or equivalent and strong potential in research and teaching required. Application (vita), transcripts, three letters of reference, and a description of research program should be sent to: Arithmetic Algebraic Geometry Position, c/o Professor William D. Blair, Chair, Department of Mathematical Sciences, Northern Illinois University, DeKalb, IL 60115, by February

29, 1996. NIU is an Equal Employment Opportunity/Affirmative Action Employer and recognizes dual-career issues.

MARYLAND

**UNIVERSITY OF MARYLAND
Institute for Physical
Science and Technology
College Park, MD
Faculty Positions in
Applied Mathematics**

Applications are invited for tenure and/or tenure-track positions in applied mathematics (subject to availability of resources and administrative approval) commencing fall 1996 at competitive salaries. Candidates must already have outstanding research records in applied mathematics. Candidates at all levels will be considered, but research will be evaluated primarily on the basis of significant achievements and only secondarily on potential. A major selection criterion will be the ability to communicate on a technical level with scientists and engineers. Fields to be considered include numerical analysis, scientific computation, computational analysis, and applied dynamics. The position may be joint with other departments and will have reduced teaching responsibilities. While a candidate's research need not be computational, the person must be able to teach graduate or undergraduate courses that have a significant computational component. To apply, send a letter of application, curriculum vitae (signed and dated), and a list of suggested names and addresses for letters of recommendation. Candidates wishing to be considered for an assistant professor position should arrange to have three or more letters of recommendation sent directly. Send applications to Chair, Faculty Search Committee, University of Maryland, Institute for Physical Science and Technology, B-224, Rm. 4203, College Park, MD 20742-2431. Applications should be received by January 22, 1996, for full consideration. Minority and women candidates are encouraged to apply. The University of Maryland is an Affirmative Action/Equal Opportunity Employer.

**UNIVERSITY OF MARYLAND
UNIVERSITY COLLEGE
Teach in Asia or Europe**

University of Maryland University College seeks excellent teachers for openings on U.S. military bases overseas. Appointments begin August 1996. Requirements include M.A. or Ph.D., recent college teaching experience, and U.S. citizenship. Competence to teach in another discipline desirable. Benefits include transportation and military base privileges (PX, commissary, etc.). Frequent travel and the cost of schooling make these position difficult for those with children. Send résumé to: University

of Maryland University College, Overseas Programs, College Park, MD 20742-1642. AA/EEO.

MASSACHUSETTS

BOSTON UNIVERSITY

The Department of Mathematics at Boston University invites applications for two-year positions at the visiting assistant professor level in the area of dynamical systems. The positions will begin in September 1996, subject to administrative approval. Candidates should demonstrate a strong commitment to teaching and research. Please submit the AMS Application Cover Sheet, available in the *Notices* or by e-MATH gopher with at least three letters of recommendation to: Search Committee (Dynamical Systems), Department of Mathematics, Boston University, 111 Cummington Street, Boston, MA 02215. AA/EOE.

NORTHEASTERN UNIVERSITY Mathematics Department Assistant Professor in Probability and Statistics

The Department of Mathematics invites applications for a tenure-track position, subject to the availability of funds, at the assistant professor level in probability and statistics to begin September 1996. Candidates must have a Ph.D. in probability or statistics, a strong research record, demonstrate a commitment to effective teaching, and show outstanding promise for future research and for working with others in the Mathematics Department to enhance the department's graduate and undergraduate programs in probability and statistics.

Applicants should arrange for a curriculum vitae and at least four letters of recommendation, one of which addresses teaching, to be sent to:

C/O Ms. Donna Marlowe
Department of Mathematics
Northeastern University
567 Lake Hall
Boston, MA 02115

Processing of applications will begin January 15, 1996.

Northeastern University does not discriminate on the basis of race, color, religion, sex, sexual orientation, age, national origin, veteran or disability status in admission to, access to, treatment in, or employment in its programs and activities.

NEBRASKA

UNIVERSITY OF NEBRASKA-LINCOLN Department of Mathematics and Statistics

We invite applications for an assistant professor tenure-track position starting in fall 1996. Candidates must have a Ph.D.

in mathematics by August of 1996. Candidates must demonstrate evidence of excellent teaching ability and outstanding research potential in an area that complements existing expertise in the department. Strong preference will be given to candidates with strengths in commutative algebra or algebraic geometry. Send vita and three letters of recommendation to the Algebra Search Committee, Department of Mathematics and Statistics, University of Nebraska-Lincoln, Lincoln, NE 68588-0323. The review of applications will begin January 15, 1996, and will continue until suitable candidates are selected. Women and minority candidates are particularly encouraged to apply. The University of Nebraska is committed to a pluralistic campus community through Affirmative Action and Equal Opportunity and is responsive to the needs of dual career couples. We assure reasonable accommodation under the Americans with Disabilities Act. Please contact Mavis Hettenbaugh at 402-472-3731 for assistance.

NEVADA

THE UNIVERSITY OF NEVADA, LAS VEGAS Assistant Professorship in Math Education

The Department of Mathematical Sciences invites applications for one tenure-track assistant professorship in math education, starting fall 1996. Candidates must have either (1) a doctoral degree in math education with a strong background in mathematics or (2) a Ph.D. in the mathematical sciences and an established record of teaching math education courses for prospective K-12 teachers. A serious commitment to research and teaching are required.

Teaching duties include teaching undergraduate and graduate math education courses and methods courses for prospective K-12 teachers. Service duties include advising math education students, interacting and serving as a liaison for the department with the College of Education and with the Clark County School District, coordinating math education courses, developing and supervising a Master's in Teaching program, and participating in university and professional service. Research duties include developing and maintaining a continuing program of published research in refereed journals.

A completed application consists of a letter of application, a current résumé, photocopies of graduate and undergraduate transcripts, and at least three letters of reference. Include an e-mail address and phone numbers if available. Applicants should arrange to have all application material sent to:

Math Education 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; tel: 702-895-3567
January 31, 1996, is the application deadline. Applications completed after this date cannot be considered. The University of Nevada, Las Vegas, is an Affirmative Action/Equal Opportunity Employer.

THE UNIVERSITY OF NEVADA, LAS VEGAS Associate Professorship

The Department of Mathematical Sciences invites applications for one tenure-track associate professorship, starting fall 1996. The position is open to all areas of pure and applied mathematics and statistics.

A Ph.D. in pure or applied mathematics or statistics is required. Candidates must have an established record of outstanding research, effective teaching, and professional service. Preference will be given to candidates with an active research program compatible with those of our current faculty. Experience supervising graduate students and Ph.D. theses and an established record of research-related professional service are preferred.

Duties include maintaining a continuing program of published research in refereed journals, teaching and developing undergraduate and graduate courses, and participating in university and professional service.

A completed application consists of a letter of application, a current résumé, and at least three letters of reference. Include an e-mail address and phone numbers if available. The vita should clearly specify refereed vs. non-refereed papers.

Applicants should arrange to have all application materials sent to:

Search Committee for
Associate Professor
Department of Mathematical Sciences
University of Nevada, Las Vegas
4505 Maryland Parkway, Box 454020
Las Vegas, NV 89154-4020
Fax: 702-895-4343; tel: 702-895-3567

January 31, 1996, is the application deadline. Applications completed after this date cannot be considered. The University of Nevada, Las Vegas, is an Affirmative Action/Equal Opportunity Employer.

NEW HAMPSHIRE

DARTMOUTH COLLEGE John Wesley Young Research Instructorship in Mathematics

The John Wesley Young Research Instructorship is a two-year postdoctoral appointment for promising new or recent Ph.D.s whose research interests overlap a department member's. Current departmental interests include areas in algebra,

analysis, combinatorics, differential geometry, logic and set theory, number theory, probability, and topology. Teaching duties of four 10-week courses spread over two or three quarters typically include at least one course in the instructor's specialty and include elementary, advanced, and (at instructor's option) graduate courses. Nine-month salary of \$37,000 supplemented by summer research stipend of \$8,222 for instructors in residence for two months in summer. Send letter of application, résumé, graduate transcript, thesis abstract, description of other research activities and interests if appropriate, and three or preferably four letters of recommendation (at least one should discuss teaching) to Betty Harrington, Department of Mathematics, 6188 Bradley Hall, Hanover, NH 03755-3551. Applications received by January 15 receive first consideration; applications will be accepted until position is filled. Dartmouth College is committed to Affirmative Action and strongly encourages applications from minorities and women.

DARTMOUTH COLLEGE

The Department of Mathematics has a tenure-track opening (assistant professor) for a statistician with strong interests in signal processing, with initial appointment in the 1996-97 academic year. A candidate for the position must be committed to outstanding teaching at all levels of the undergraduate and graduate curriculum and must give evidence of a well-regarded research program that shows real promise for the future. Candidates with several years of experience should, in addition, be ready to direct Ph.D. theses.

To create an atmosphere supportive of research, Dartmouth offers new faculty members grants for research-related expenses, a quarter of sabbatical leave for each three academic years in residence, and flexible scheduling of teaching responsibilities. The teaching responsibility in mathematics is four courses spread over two or three quarters. The department encourages good teaching with a combination of committed colleagues and bright, responsive students.

To apply, send a letter of application, curriculum vitae, and a brief statement of research results and interests. Also arrange for four letters of reference to be sent, at least one of which addresses teaching and, if the applicant's native language is not English, the applicant's ability to use English in a classroom. All application materials should be addressed to Betty Harrington, Recruiting Secretary, Department of Mathematics, Dartmouth College, 6188 Bradley Hall, Hanover, NH 03755-3551. Applications completed by February 1 will receive first consideration. Dartmouth is committed to Affirmative Action and encourages applications from African Americans, Asian Americans, His-

panics, Native Americans, and women. Inquiries about the progress of the selection process can be directed to Thomas R. Shemanske, recruiting chair.

NEW JERSEY

**RUTGERS UNIVERSITY-NEWARK
Assistant Professor of Mathematics**

The Department of Mathematics and Computer Science invites applications for an anticipated tenure-track assistant professor position in pure mathematics to begin September 1996. Candidates must have a Ph.D. and a strong research record, show outstanding promise for future work in mathematics, and demonstrate a commitment to effective teaching. Preference will be given to candidates with research interests similar to those in the department.

Applicants should arrange for a curriculum vitae and at least four letters of recommendation, one of which addresses teaching, to be sent to:

Personnel Committee
Department of Mathematics and
Computer Science
Rutgers University
Newark, NJ 07102

Processing of applications will begin in December 1995.

Rutgers University is an Equal Opportunity/Affirmative Action Employer.

OHIO

**OHIO UNIVERSITY
Department of Mathematics**

Applications are invited for a tenure-track assistant professorship which will begin September 1, 1996. A Ph.D. in mathematics in the area of analysis is required. We seek a person with strong evidence of research potential and a commitment to undergraduate teaching. Preference will be given to applicants whose research interests are compatible with those of present faculty members; in particular, we are looking for people in the areas of sequence spaces and harmonic analysis. The salary is competitive, and there is an excellent benefits package. Women and minorities are especially invited to apply.

The committee will begin processing applicants after January 31, 1996, and will continue to do so until the position is filled.

OU is an Equal Opportunity/Affirmative Action Employer.

Send a letter of application and a résumé, and have three letters of recommendation sent to:

Dr. Jeff Connor, Chair
Analysis Position Search Committee
Department of Mathematics
Ohio University
Athens, Ohio 45701.

KENYON COLLEGE

The Mathematics Department at Kenyon College invites applications for a visiting two-year position at the assistant professor level, beginning in the fall of 1996. Applicants should possess a Ph.D., with a specialty in algebra and geometry preferred. Normally, the teaching load is three courses per semester. Candidates who can demonstrate exceptional teaching ability, e.g., teaching awards and letters of reference which attest to teaching skill, will have an advantage.

The reading of dossiers will begin on December 15, 1995; however, dossiers received by January 30 will be assured of full attention. Members of the department will be present at the January 1996 AMS/MAA meetings in Orlando. Candidates are encouraged to apply in advance of the meetings in order to make interviews more useful.

Application, vita, transcripts, and at least three letters of reference (at least one regarding teaching ability) should be sent to: Chair, Search Committee, Department of Mathematics, Kenyon College, Gambier, OH 43022.

An Equal Opportunity Employer, Kenyon encourages the applications of women and minority candidates.

**KENT STATE UNIVERSITY
Chairperson - Department of
Mathematics and Computer Science**

Kent State University invites applications and nominations for the position of chairperson of the Department of Mathematics and Computer Science. Kent is a spacious, residential campus serving more than 22,000 students, situated in a small university town within 30 miles of the Cleveland metropolitan area. The Department of Mathematics and Computer Science is situated in the College of Arts and Sciences and houses programs through doctoral level in applied mathematics, computer science, pure mathematics, and statistics. It currently consists of twenty-three faculty in the mathematical sciences and eleven in computer science at the Kent campus and twenty faculty in the mathematical sciences at the regional campuses. The department recently moved to a new building and has an extensive network connecting SIMD and MIMD parallel processors, servers and over 140 workstations, and X-terminals for faculty and student use.

Applicants for the position must have an earned doctorate, an international research reputation as evidenced by publications, a successful history of grant activity, and other academic and scholarly achievements. In view of the composition of the department, applicants should have a strong research reputation among both computer scientists and mathematical scientists. They must have the ability

and vision to guide the department into the twenty-first century by developing and maintaining, in both disciplines, a strong program of scholarship, publications and grantsmanship, an effective advising system, and a strong teaching program. In addition, applicants should have the ability to work well within the university community and to foster interdisciplinary research and cooperation with industry. The successful applicant will be encouraged and supported in maintaining an active research program. The salary will be competitive.

Screening of applicants will begin February 1, 1996, for a start date of July 1, 1996, and will continue until the position is filled. Please submit a full résumé, including a list of publications; a statement of interest regarding the post; and the names, addresses, telephone numbers, and e-mail addresses of at least five references, or a letter of nomination to **Chairperson, Search Committee, Department of Mathematics and Computer Science, Kent State University, Kent, Ohio 44242, USA, fax: 216-672-7824**. Further information about the department is available on the World Wide Web at URL <http://www.mcs.kent.edu/>. Questions and enquiries can be sent by e-mail to: chair-search@mcs.kent.edu. Kent State University is an Affirmative Action/Equal Opportunity Employer.

KENT STATE UNIVERSITY
Department of Mathematics and
Computer Science
Kent, OH 44242
Tenure-Track Position

We invite applications for one tenure-track position at the rank of assistant professor effective August 19, 1996, in the areas of applied mathematics, algebra, analysis, numerical analysis, or scientific computation. Salary is negotiable. Candidates are required to have a Ph.D. within the mathematical sciences.

The Kent campus is a spacious, residential campus serving more than 22,000 students, situated in a small university town within 30 miles of the major metropolitan area of Cleveland. The Department of Mathematics and Computer Science is situated in the College of Arts and Sciences and houses programs through the doctoral level in applied mathematics, computer science, pure mathematics, and statistics. It currently consists of twenty-three faculty in the mathematical sciences and eleven in computer science. The department recently moved to a new building and has an extensive network of computers and workstations for faculty and student use.

Candidates with strong potential for excellence in research and teaching are invited to apply. Such applicants should send a curriculum vitae, dissertation abstract and/or published papers, if any, and three letters of reference to the As-

stant Professor, Search Committee at the above address. Applicants are requested to use the AMS standardized application form, available through the American Mathematical Society. Screening of applicants will begin January 22, 1996, and will continue until the position is filled. Kent State University is an Equal Opportunity/Affirmative Action Employer.

OKLAHOMA

THE UNIVERSITY OF OKLAHOMA
Department of Mathematics

Applications are invited for a tenure-track or tenured faculty position in mathematics education starting in fall 1996. Rank and salary will be commensurate with qualifications and experience. Candidates are required to have a Ph.D. in mathematics or in education with a mathematics specialization and demonstrated commitment to research in mathematics education. A strong background in mathematics beyond the master's level is also required. Preference will be given to those whose primary research involves collegiate mathematics education or secondary school teacher training.

The faculty member is expected to carry a teaching load of two courses per semester. Candidates should be capable of directing doctoral students and contributing leadership to the department's active graduate program in mathematics education. Responsibilities will include involvement with undergraduate mathematics courses and with both undergraduate and graduate courses in mathematics education.

The Mathematics Department at the University of Oklahoma offers a doctoral degree in research in undergraduate curriculum and pedagogy. Faculty interests include research in quantitative literacy, undergraduate curriculum and pedagogy, and international comparative mathematics education. The mathematics department faculty cooperate with the university's College of Education, which has an M.Ed. program in mathematics education and a Ph.D. program focusing on research in K-12 mathematics education. As a university service the department is also responsible for advising and preparing some undergraduate secondary mathematics education majors and for providing courses for both elementary and secondary preservice teachers (about 250 and 20 per year, respectively).

Applicants should send a vita, a statement of professional goals, and three letters of recommendation to:

Math Education Search Committee
 Department of Mathematics
 University of Oklahoma
 601 Elm Avenue, Phsc 423
 Norman, OK 73019-0315

Initial screening will begin on January 31, 1996, and will continue until the position is filled.

The University of Oklahoma is an Equal Opportunity/Affirmative Action Employer. Women and minorities are encouraged to apply. The University of Oklahoma has a policy of being responsive to the needs of dual-career couples.

PENNSYLVANIA

DICKINSON COLLEGE
Faculty Position in Mathematics

The Department of Mathematics and Computer Science invites applications for a tenure-track position in mathematics at the assistant professor level starting fall 1996. Applicants should have a Ph.D. in mathematics and a strong commitment to liberal arts education. Excellence in undergraduate teaching and strong research potential are expected. We encourage candidates specializing in analysis, but all areas will be considered. Experience with computer applications to teaching mathematics is desirable but not required.

Dickinson is a private, highly selective liberal arts college with 1,800 students located in south central Pennsylvania. The department has eight full-time members. We offer major and minor programs in both mathematics and computer science.

Please send a CV and separate statements on teaching philosophy and research interests to: Prof. Barry Tesman, Department of Mathematics and Computer Science, Dickinson College, Carlisle, PA 17013; or fax: 717-245-1690. Also, arrange for three letters of recommendation and copies of graduate transcripts to be sent to the same address. Reading of completed applications will begin on December 15. We will be conducting preliminary interviews at the Joint AMS-MAA Meetings in Orlando. Inquiries may be made to tesman@dickinson.edu.

Dickinson is an Affirmative Action/Equal Opportunity Employer; women and minorities are especially encouraged to apply.

SOUTH CAROLINA

COLLEGE OF CHARLESTON
Department of Mathematics

Applications are invited for one tenure-track position in computational mathematics at the assistant professor level starting in August 1996. The Mathematics Department at the College of Charleston has twenty-five full-time faculty and offers the B.S. and M.S. degrees in mathematics. Candidates must have a Ph.D. in an area of computational mathematics, a commitment to graduate and undergraduate teaching, and potential for continuing research. The normal teaching load is nine

hours per week for those engaged in research. The salary is competitive. Applicants should send a vita and three letters of recommendation to William Golightly, Chair, Department of Mathematics, College of Charleston, Charleston, SC 29424; e-mail: golightlyw@cofc.edu. The process of evaluating applications will begin on January 15, 1996, but applications will be considered until the position is filled. The College of Charleston is an Equal Opportunity/Affirmative Action Employer and encourages applications from minority and women candidates.

TENNESSEE

VANDERBILT UNIVERSITY Department of Mathematics (Position in Analysis)

Contact Person: Professor Constantine Tsinakakis, 1326 Stevenson Center, Nashville, TN 37240

We anticipate a tenure-track opening at the assistant professor level beginning fall 1996. This position carries an initial three-year appointment and requires a Ph.D. in mathematics. It is intended for a specialist in operator theory, differential equations, or mathematical biology. Outstanding research potential and evidence of effective teaching are required. To apply, send the following materials in a single mailing by 1/15/96: letter of application (including e-mail address and fax number if available), curriculum vitae, and brief research summary. Additional information, including letters of recommendation, will be requested from selected candidates after an initial screening. **Only solicited letters of recommendation will be accepted.** Vanderbilt University is an Affirmative Action/Equal Opportunity Employer.

TEXAS

UNIVERSITY OF TEXAS AT ARLINGTON Department of Mathematics

The department invites applications for possibly two to three anticipated tenure-track positions beginning with the fall semester 1996. We seek candidates in various areas of mathematics which are complementary to those of the current faculty and which would enhance and support the goals of the department. Application deadline is January 31, 1996, or until positions are filled. Salary and rank are commensurate with qualifications, which must include the Ph.D. degree (an earned doctorate by August 1996). Assistant professor candidates must show strong potential for excellence in teaching and research. For an associate or full professorial appointment the candidate must have excellent teaching credentials and a nationally established research record;

some success in attracting outside funding is desirable. Please send a résumé and three letters of recommendation to:

Chairperson, Faculty
Recruiting Committee
University of Texas at Arlington
Department of Mathematics
Box 19408
Arlington, TX 76019-0408

The University of Texas at Arlington is an Affirmative Action/Equal Opportunity Employer.

THE UNIVERSITY OF TEXAS AT AUSTIN Austin, Texas 78712 Department of Mathematics

Openings for fall 1996 include two instructorships, one of which may have an R.H. Bing Faculty Fellowship attached to it, and two or more positions at the tenure-track/tenure level.

Instructorships at The University of Texas at Austin are postdoctoral appointments, renewable for two additional years. It is assumed that applicants for instructorships will have completed all Ph.D. requirements by August 31, 1996. Preference will be given to those whose doctorates were conferred in 1995 or 1996. Candidates should show superior research ability and have a strong commitment to teaching. Consideration will be given only to persons whose research interests have some overlap with those of the permanent faculty. Duties consist of teaching undergraduate or graduate courses and conducting independent research. The projected salary is \$33,000 for the nine-month academic year.

Each R.H. Bing Fellow holds an instructorship in the Mathematics Department, with a teaching load of two courses in one semester and one course in the other. The combined instructorship-fellowship stipend for nine months is \$36,000, which is supplemented by a travel allowance of \$1,000. Pending satisfactory performance of teaching duties, the fellowship can be renewed for two additional years. Applicants must show outstanding promise in research. Bing Fellowship applicants will automatically be considered for other departmental openings at the postdoctoral level, so a separate application for such a position is unnecessary.

An applicant for a tenure-track or tenured position must present a record of exceptional achievement in her or his research area and must demonstrate a proficiency at teaching. In addition to the duties indicated above for instructors, such an appointment will typically entail the supervision of M.A. or Ph.D. students. The salary will be commensurate with the level at which the position is filled and the qualifications of the person who fills it.

Those wishing to apply for any of the aforementioned positions are asked to send a vita (including an e-mail address and telephone number, if possible) and

a brief research summary to the above address, c/o Recruiting Committee. Transmission of the preceding items via e-mail (address: recruit@math.utexas.edu) is encouraged. Please prepare e-mail materials in plain TeX, AMSTeX, or LaTeX, including all macros. Applications must be supported by three or more letters of recommendation, at least one of which speaks to the applicant's teaching credentials. The screening of applications will begin on December 1, 1995.

The University of Texas at Austin is an Equal Opportunity Employer. Qualified women and minority group members are urged to apply.

SOUTHERN METHODIST UNIVERSITY Department of Mathematics Assistant Professorships

The Department of Mathematics at Southern Methodist University invites applications for two tenure-track assistant professorships, with employment beginning in the fall semester of 1996. All applicants must provide evidence of outstanding achievement or potential for research in applied mathematics or scientific computation and a strong commitment to undergraduate and graduate teaching. The standard teaching load is two courses (six hours) per semester. For exceptionally qualified candidates, support is available from the David W. Starr Endowment. The funds may be awarded to support special research or teaching needs.

The Department of Mathematics has an active doctoral program in applied mathematics, numerical analysis, and scientific computation; research interests include asymptotic and perturbation methods, bifurcation theory, dynamical systems, fluid mechanics, mathematical software, nonlinear waves, and the numerical analysis of differential equations.

Applications will be accepted until February 1, 1996, or until the positions are filled. Send a letter of application and a vita to: Professor George Reddien, Chairman, Department of Mathematics, Southern Methodist University, Dallas, Texas 75275-0156; tel: 214-768-2506; fax: 214-768-2355; e-mail: greddien@mail.smu.edu. Applicants should arrange for three letters of recommendation to be sent directly to the department.

SMU is an Equal Opportunity/Affirmative Action/Title IX Employer.

UTAH

UNIVERSITY OF UTAH

University of Utah, Department of Mathematics, invites applications for the following positions. Availability of positions is contingent upon funding.

1. Three **full-time tenure-track appointments** in the professorial levels. The de-

partment is primarily interested in applicants who work in the research areas represented in the department and who received their Ph.D. degrees prior to 1995. Selection will be based on research and teaching ability.

2. Several nonrenewable **three-year instructorships**. Persons of any age receiving Ph.D. degrees in 1995 or 1996 are eligible. Applicants will be selected on the basis of ability and potential in teaching and research. Starting salary will be \$37,500; future cost of living increases are contingent on action by the state legislature. Duties consist of teaching five courses during the three-quarter academic year.

3. One **C. R. Wylie Instructorship**. The term of this instructorship is one year, but it may be renewed for up to three years. It will be awarded either to an incoming instructor or to one of the instructors already in residence on the basis of ability and potential in teaching and research. The stipend is \$41,500. Duties consist of teaching four courses during the three-quarter academic year.

4. One or more **visiting faculty positions** of one year or less in any of the professorial ranks. Selection will be based on potential contributions to the department's research program and on teaching ability.

It is expected that offers of instructorships will begin on January 1, 1996, but applications for all positions will be accepted until January 31, 1996, or until all positions are filled.

Applications for any of these positions should include curriculum vitae, bibliography, and three letters of reference. (Instructorship applications should also include an abstract of the thesis and either a list of graduate courses completed or a transcript of graduate work.) Visiting faculty applications should indicate the portion of the three-quarter academic year during which the applicant wishes to visit. Please send your application to Committee on Staffing, Department of Mathematics, 233 JWB, University of Utah, Salt Lake City, Utah 84112. The University of Utah is an Equal Opportunity/Affirmative Action Employer, encourages applications from women and minorities, and provides reasonable accommodation to the known disabilities of applicants and employees.

UTAH STATE UNIVERSITY
Department of Mathematics and
Statistics

Applications are invited for two tenure-track positions in mathematics at the assistant professor level, to begin September 1996. Requirements include a Ph.D. (by September 1996) in mathematics or mathematical sciences, potential for excellence in research and in teaching at both the undergraduate and graduate level, and the legal right to work in the United States. Candidates with research emphasis in the

following fields are especially encouraged to apply.

Position A:

In the general area of geometrical methods in differential equations, expertise in any one or more of the following subjects: group analysis of differential equations, equivalence methods, exterior differential systems, exact solution techniques for nonlinear PDE, geometric aspects of integrable systems, geometrical singularity theory, h-principles, and geometrical aspects of classical and quantum field theories.

Position B:

Any area closely related to nonlinear PDE, including numerical methods or dynamical systems aspects.

Applicants should explicitly indicate which position they are seeking. They should send a résumé and three letters of reference directly to:

Mathematics Search Committee
Department of Mathematics & Statistics
Utah State University
Logan, UT 84322-3900

The selection process will begin February 1, 1996, and will continue until the positions are filled.

Utah State University, with a student body of 20,000, is located in Logan, Utah, in the Wasatch Range of the Rocky Mountains. The University offers competitive salaries and excellent medical, retirement, and professional benefits.

Women and minorities are particularly encouraged to apply. Utah State University is an Equal Opportunity/Affirmative Action Employer.

VIRGINIA

MARYMOUNT UNIVERSITY
Assistant Professor
Department of Mathematics
Arlington, Virginia

Marymount University invites applications for a position at the assistant professor level in the Department of Mathematics, beginning in the fall of 1996. Responsibilities include academic advising, curriculum development, research, and scholarship. Ph.D. in mathematics, excellent teaching skills, and teaching expertise in analysis or applied mathematics required. Experience using technology in the classroom preferred. Research area open. The department includes five full-time faculty and twenty-three majors. Marymount University is an independent, comprehensive university related to the Catholic Church. The University enrolls 4,100 students in thirty-four undergraduate and twenty-four master's programs. The University is located in residential Arlington, Virginia, ten minutes from Washington, DC. Review will begin on February 1, 1996, by a search committee and will continue until the position is closed or filled. Contact Personnel

Services for an official faculty application by phone: 703-284-1680; or by mail: 2807 North Glebe Road, Arlington, VA 22207-4299. TDD 1516. Official application must include a letter of application, curriculum vitae, and five references. An official application must accompany supplements. Current authorization to work in the U.S.A. required.

24-Hour Employment Opportunities Job Line: 703-284-1518.
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CANADA

MCMASTER UNIVERSITY
Britton Post-Doctoral Fellowship
in Mathematics

Applications are invited for the Britton Post-Doctoral Fellowship in Mathematics. Named after Dr. Ronald Britton, the Britton Fellowship is intended for talented research mathematicians with a recent Ph.D.

The Britton Fellowship is open to candidates of any nationality, and selection will be based upon the candidate's research potential. In this year's competition, preference will be given to candidates working in homotopy theory, emphasizing applications to algebraic K-theory.

McMaster is committed to Employment Equity and encourages applications from all qualified candidates, including aboriginal peoples, persons with disabilities, members of visible minorities and women.

The Britton Fellowship is tenable for a period of two years beginning July 1, 1996, at a salary of \$35,000 per year plus a research grant of \$5,000. Duties include research and the teaching of one course per year.

Applications, including three letters of reference, should be received before January 15, 1996, by:

Dr. E. T. Sawyer, Chair
or
V. P. Snaith, Sc.D., F.R.S.C.
Britton Professor of Mathematics
Mathematics & Statistics
McMaster University
Hamilton, Ontario
Canada, L8S 4K1

We appreciate all replies to this advertisement, but only those applicants being seriously considered will be contacted.

MCMASTER UNIVERSITY
Department of Mathematics &
Statistics
Post-Doctoral Instructorships
in Mathematics

Applications are invited for post-doctoral fellowship positions in the Department of Mathematics & Statistics. These fellowships provide an opportunity to spend up to two years engaged in research, with a limited amount of teaching, and are

particularly suitable for talented young mathematicians who have recently completed the Ph.D. degree.

The Fellowships are open to candidates of any nationality, and selection will be based upon the candidate's research potential. McMaster is committed to Employment Equity and encourages applications from all qualified candidates, including aboriginal peoples, persons with disabilities, members of visible minorities and women.

Starting July 1, 1996, the stipend will be \$34,000 plus a \$2,000 grant for research expenses.

Applications and three letters of reference should be sent by January 15, 1996, to:

Dr. E. T. Sawyer, Chair
Mathematics & Statistics
McMaster University
Hamilton, Ontario
Canada, L8S 4K1

We appreciate all replies to this advertisement, but only those applicants being seriously considered will be contacted.

REPUBLIC OF CHINA

THE CHINESE UNIVERSITY OF HONG KONG

Applications are invited for: **Department of Mathematics (Ref. 95/091(576)/2)**, **Senior lecturer** (carrying the title of **associate professor** or **professor**, as appropriate), or **lecturer** (carrying the title of **assistant professor** or **associate professor**, as appropriate).

Candidates should preferably be specialized in analysis (geometric analysis, functional analysis) or scientific computation. Applicants from other fields with outstanding publications are also encouraged to apply. Duties include teaching and research, and candidates are expected to demonstrate excellence in both areas. Moreover, the appointee is expected to be able to interact well with other members of the department. English and/or Chinese are used in teaching and administration at the University.

Annual Salary and Fringe Benefits

Senior Lecturer: HK\$705,600-\$947,880 by 8 increments

Lecturer: HK\$454,200-\$758,700 by 10 increments

(approx. exchange rate in September 1995: US\$1=HK\$7.8)

Starting salary and grade will be commensurate with qualifications and experience.

Benefits include leave with full pay, medical and dental care, education allowance for children, housing benefit for eligible appointee (with appointee contributing 7.5% of salary towards the provision of housing). Appointment may be made either on regular or fixed-term contract. Under regular contract, retirement benefits are provided by the University. Fixed-term

contract also carries, where appropriate, a contract-end gratuity (15% of basic salary).

Application Procedure

Send full résumé in duplicate and names and addresses of three referees, with copies of academic credentials (in duplicate) and recent publications, to the Personnel Office, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong (fax: 852-2603-6852) before **January 20, 1996**. Please quote the reference no. and mark "Recruitment" on cover.

THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

The **Department of Mathematics** invites applications for reader/senior lecturer and lecturer position in the following areas: (1) algebra/number theory, (2) geometry/topology, (3) analysis (preferably: differential equations), and (4) mathematical sciences.

Ph.D. degree, distinguished research record or outstanding potential for research development, and a commitment to excellent teaching are required.

HKUST is a publicly funded research university. Salary scales per annum are as follows: reader (US\$94,400-\$125,400), senior lecturer/associate professor (US\$90,500-\$121,500), and lecturer/assistant professor (US\$58,200-\$97,300).

Applicants should send a curriculum vitae and ask at least three referees to send letters of recommendation direct, preferably before 15 February 1996, to:

The Director of Personnel
The Hong Kong University of Science and Technology
Clear Water Bay, Hong Kong
fax: 852-2358-0700

PUBLICATIONS WANTED

Wanted: Mathematical books, journals, reprints, ephemera. Contact R. K. Dennis, P.O. Box 8604, Ann Arbor, MI 48107; tel: 313-995-1993; fax: 313-996-2916; e-mail: dennis@math.cornell.edu.

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AMERICAN MATHEMATICAL SOCIETY



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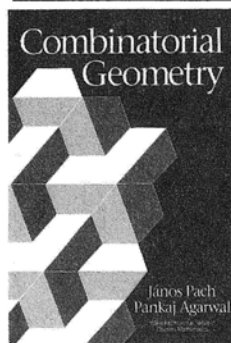
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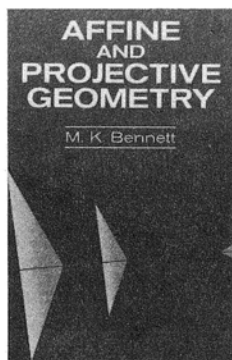
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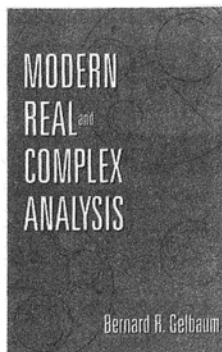
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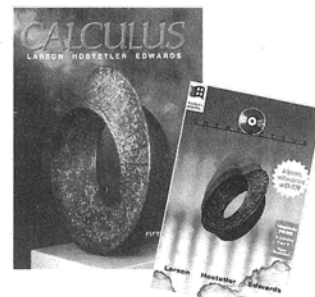
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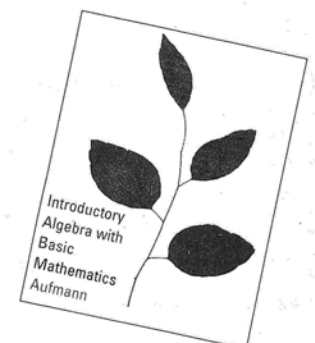
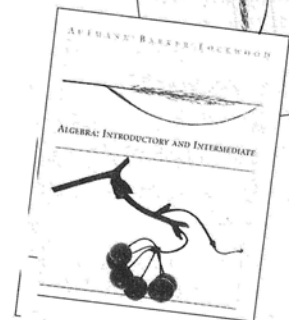
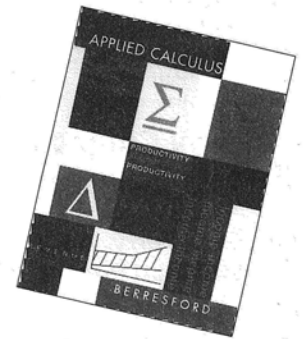
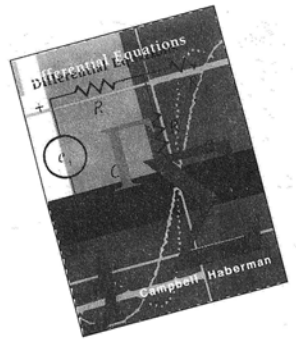
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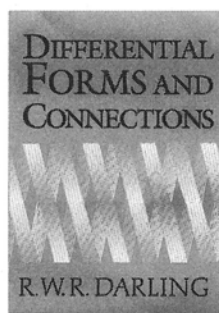
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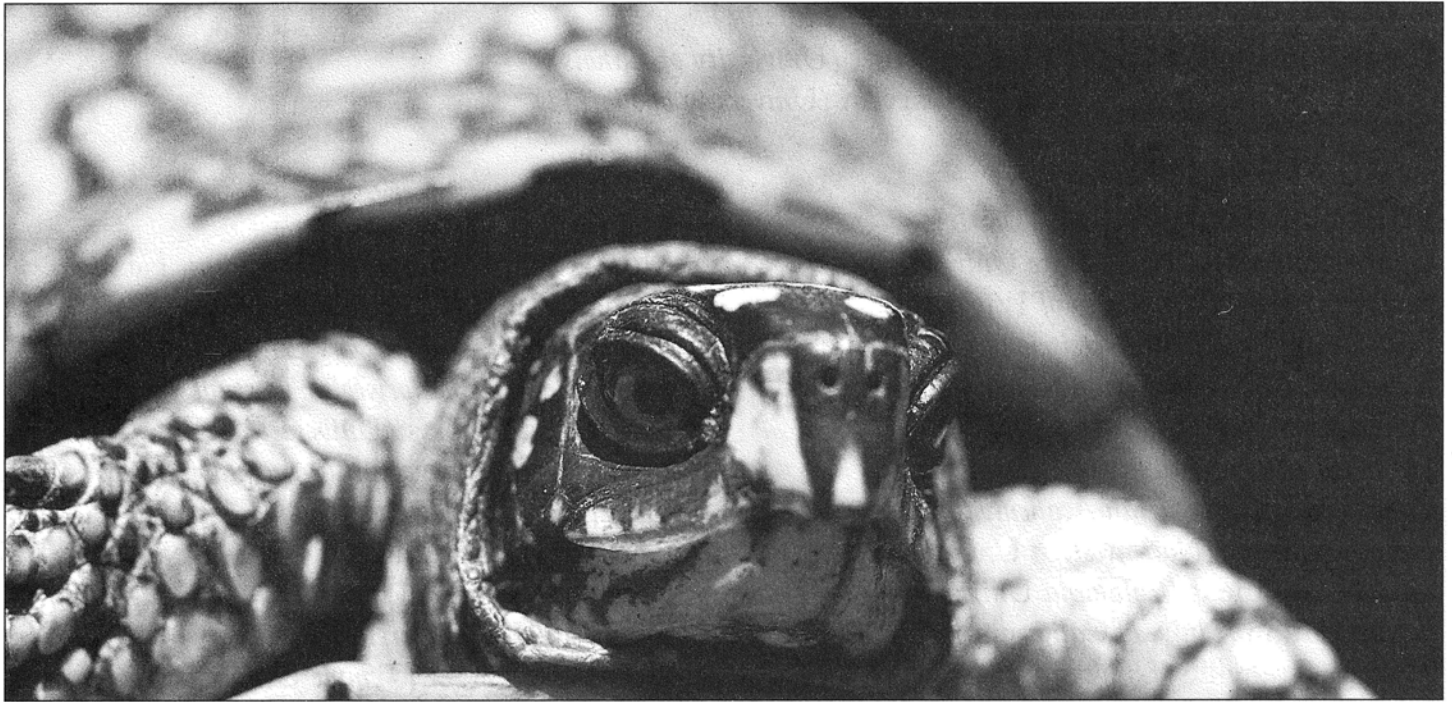
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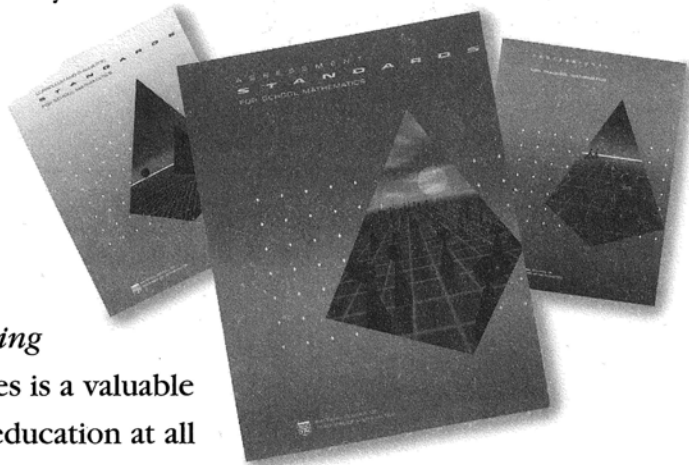
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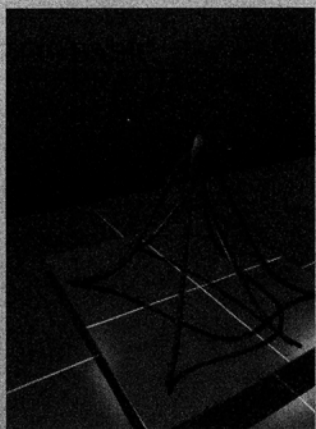
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Enquiries may be directed to Dr Nalini Joshi on telephone 61 2 385 2983 (office) or 61 2 385 2961 (messages), facsimile 61 2 385 1071 or email N.Joshi@unsw.edu.au. Applications close 26 January 1996.

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Funding is available for all participants. Applications and information: IAS/PCMI, Institute for Advanced Study, Olden Lane, Princeton, NJ 08540; phone: 1-800-726-4427; e-mail: pcmi@math.ias.edu; url: <http://www.ias.edu/>

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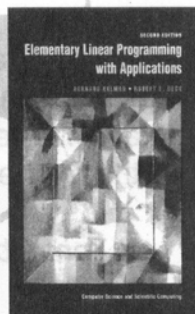
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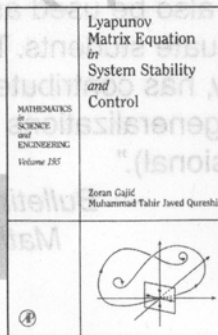
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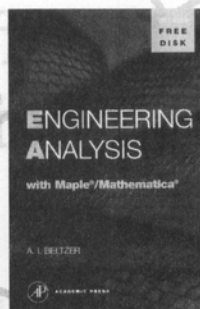
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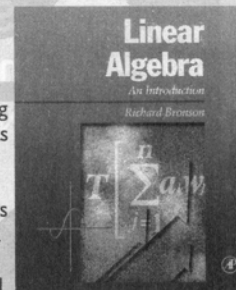
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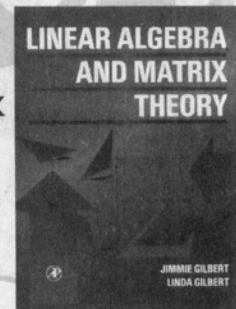
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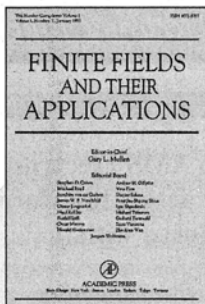
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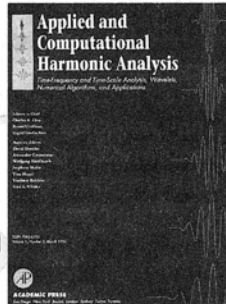
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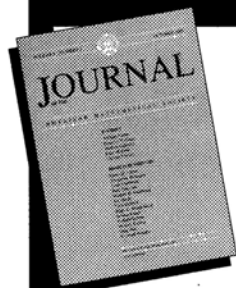
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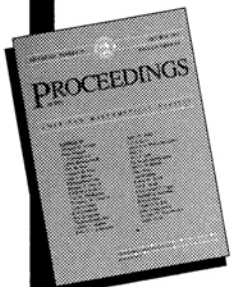
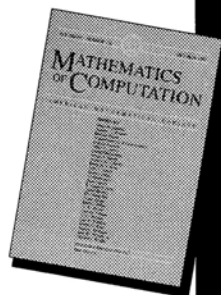


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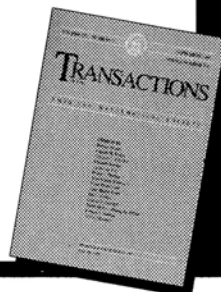


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Meetings & Conferences of the AMS

The following pages give information on all AMS meetings and conferences approved by press time for this issue. Please refer to the page numbers cited in the table of contents on this page for more detailed information on each event. Invited Speakers and Special Sessions are listed as soon as they are approved by the cognizant program committee. For some meetings the list may be incomplete.

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1996

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1998

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Conferences:

1996

January 8-9, AMS Short Course on *Artificial Intelligence*, Orlando, Florida. See October 1995, p. 1235 for details.

June 16-July 18, AMS-IMS-SIAM Joint Summer Research Conferences in the Mathematical Sciences, South Hadley, Massachusetts. See November 1995, p. 1454 for details.

June 17-22, AMS-SIAM Summer Seminar in Applied Mathematics on *The Mathematics of Stochastic Manufacturing Systems*, See January 1996 issue for details.

July 7-27, 1996 Summer Research Institute on *Cohomology Representations and Actions of Finite Groups*, Seattle, Washington. See October 1995, p. 1238 for details.

Cosponsored Meetings

1996

February 8-13, Section A (Mathematics) Sessions at the AAAS Annual Meeting, Baltimore, Maryland. See December 1995, p. 1610 for details.

Important Information regarding AMS Meetings

Up-to-date information regarding AMS meetings is available on the World Wide Web via the Internet at URL <http://e-math.ams.org/>.

General Information for Speakers and Organizers: The Council has decreed that no paper, whether invited or contributed, may be listed in the program of a meeting of the Society unless an abstract of the paper has been received in Providence prior to the deadline.

Although an individual may present only one ten-minute contributed paper at a meeting, any combination of joint authorship may be accepted, provided no individual speaks more than once. An author can speak by invitation in more than one Special Session at the same meeting.

Special Sessions: The number of Special Sessions at a Summer or Annual Meeting is limited. Special Sessions at Annual and Summer Meetings are held under the supervision of the Program Committee for National Meetings and, for Sectional Meetings, under the supervision of each Section Program Committee. They are administered by the associate secretary in charge of that meeting with staff assistance from the Meetings and Conferences Department in Providence. (See the list of associate secretaries by section below.)

Each person selected to give an Invited Address is also invited to generate a Special Session, either by personally organizing one or by having it organized by others. Proposals to organize a Special Session are sometimes solicited either by a program committee or by the associate secretary. Other proposals should be submitted to the associate secretary in charge of that meeting (who is an ex officio member of the program committee) at the address listed below. These proposals must be in the hands of the associate secretary at least nine months prior to the meeting at which the Special Session is to be held in order that the committee may consider all the proposals for Special Sessions simultaneously.

It should also be noted that Special Sessions must be announced in the *Notices* in such a timely fashion that any Society member who so wishes may submit an abstract for consideration for presentation in the Special Session. The consideration deadline is usually three weeks before the normal deadline for abstracts for the meeting.

Talks in Special Sessions are usually limited to twenty minutes; however, organizers who wish to allocate more time to individual speakers may do so within certain limits. A great many of the papers presented in Special Sessions at meetings of the Society are invited papers, but any member of the Society who wishes to do so may submit an abstract for consideration for presentation in a Special Session, provided it is received by the abstracts coordinator in Providence prior to the special early deadline for consideration. Contributors should know that there is a limit to the size of a single Special Session, so sometimes all places are filled by invitation. Papers submitted for consideration for inclusion in Special Sessions but not accepted will receive consideration for a contributed paper session, unless specific instructions to the contrary are given.

The Society reserves the right of first refusal for the publication of proceedings of any Special Session. If published by the AMS, these proceedings appear in the book series *Contemporary Mathematics*.

Contributed Papers: The Society also accepts abstracts for ten-minute contributed papers. These abstracts will be grouped by related Mathematical Reviews subject classifications into sessions insofar as possible. The title and author of each paper accepted and the time of presentation will be listed in the program of the meeting.

Western Section: (until 1/31/96) Lance W. Small, Associate Secretary, Department of Mathematics, University of California, San Diego, La Jolla, CA 92093; e-mail: g_small@ams.org; telephone: 619-534-3590. (as of 2/1/96) William A. Harris, Jr., Department of Mathematics, Uni-

versity of Southern California, Los Angeles, CA 90089-1113; e-mail: g_harris@ams.org; telephone: 213-740-3794.

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Eastern Section: Lesley M. Sibner, Associate Secretary, Department of Mathematics, Polytechnic University, Brooklyn, NY 11201-2990; e-mail: g_sibner@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@ams.org; telephone: 615-974-6577.

Abstracts

Abstracts must be received by the abstracts coordinator in Providence by the stated deadline. Unfortunately, late papers cannot be accommodated.

Electronic submission procedures: Electronic submission of abstracts is available to those who use the \TeX typesetting system. Individuals may FTP the packages, available in either plain \TeX or \LaTeX , from e-MATH on the WWW. The URL address for the meetings and conferences home page is: <http://www.ams.org/committee/meetings/>. An interactive abstract form is under development; no knowledge of \TeX will be necessary to use this interactive form. Watch for future announcements.

Requests for general information concerning abstracts may be sent to abs-misc@ams.org. **Completed electronic abstracts should be submitted to** abs-submit@ams.org.

Submission by U. S. mail: AMS abstract forms are available at many departments of mathematics or may be requested by contacting the Abstracts Coordinator, AMS Meetings and Conferences Department, P. O. Box 6887, Providence, RI 02940; telephone: 401-455-4182; e-mail: abs-misc@ams.org. Your completed abstract should be sent to the same address by the stated deadline.

See the inside front cover of *Abstracts of Papers Presented to the American Mathematical Society* for information on abstracts published by title and not presented at a meeting.

Site Selection for Sectional Meetings

Sectional meeting sites are recommended by the associate secretary for the section and approved by the Secretariat. Recommendations are usually made eighteen to twenty-four months in advance. Host departments supply local information, ten to twelve rooms with overhead projectors for contributed paper sessions and Special Sessions, an auditorium with twin overhead projectors for Invited Addresses, and registration clerks. The Society partially reimburses for the rental of facilities and equipment and for staffing the registration desk. Most host de-

partments volunteer; to do so, or for more information, contact the associate secretary for the section.

Orlando, Florida

Orange County Convention Center

January 10–13, 1996

Meeting #908

Joint Mathematics Meetings, including the 102nd Annual Meeting of the AMS, 79th Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL).

Associate secretary: Lance W. Small

Announcement issue of *Notices*: October 1995

Program issue of *Notices*: January 1996

Issue of *Abstracts*: Winter 1996

Deadlines

For organizers: Expired

For consideration of contributed papers in Special Sessions: Expired

For abstracts: Expired

For summaries of papers to MAA organizers: Expired

AMS-MAA Program Updates

William C. Harris, NSF, will give the AMS Committee on Science Policy-JPBM-MAA Science Policy Committee Government Address on *Realities and expectations in a time of change*, replacing **Ann Peterson**.

An additional presenter in the *Workshop on teacher enhancement opportunities* is **Philip D. Wagreich**, University of Illinois at Chicago.

AMS Program Updates

The title of **Andrew Wiles's** series of Colloquium Lectures is *Modular Forms, Elliptic Curves, and Galois Representations*.

The title of **Henry Rene Darmon's** Invited Address is *Pell's Equation and Elliptic Curves: From Fermat to Wiles*.

Nonacademic Career Opportunities in Mathematics: Wednesday, 4:30 p.m. to 6:00 p.m. The Committee on the Profession will sponsor a presentation by **Linda Thiel** (project director), Ursinas College, on this Sloan Foundation-funded AMS-SIAM project, which will provide information to students about career opportunities in government and industry. The goal is to introduce students to the wide variety of positions held by people with degrees in the mathematical sciences by focusing first on individual careers. A Mathematical Sciences Career Information home page is accessible from either the AMS e-MATH WWW page or the SIAM WWW home page. This home page includes a careers bulletin board featuring profiles of mathematical scientists working in nonacademic positions and a forum allowing them to be questioned directly about their jobs. Informa-

tion about books and articles on career planning and links to other online resources, including online job listing services, is also provided. This presentation will familiarize the mathematics community with the information available through this WWW site and inform them about other aspects of the project. We are also interested in soliciting input from the membership to guide the project toward providing the resources students need to make informed career decisions.

Establishing Priorities for Mathematical Research: Friday 2:30 p.m. to 4:00 p.m. The Committee on Science Policy will sponsor presentations by mathematicians **John C. Polking**, Rice University, and **Jean E. Taylor**, Rutgers University, and astronomer **John Bahcall**, Institute for Advanced Study. The purpose of these presentations is to discuss the issues in establishing research priorities in the mathematical sciences.

Because of projected federal budget cuts in science funding for the remainder of the nineties, the discipline divisions of the NSF are being asked to establish priorities for research. This program is intended to make the mathematical community aware of these requests for establishing priorities and to be the first of several discussions on the topic of establishing research priorities in mathematics.

Each of the presenters will give a fifteen- to twenty-minute presentation and then form a panel to field questions and comments from the audience. Professor Bahcall's presentation will be based on the astronomy community's experience in establishing research priorities.

MAA Program Updates

Panelists for the discussion on *The job market for new Ph.D.s* include **Ronald M. Davis**, Anoka-Ramsey Community College; **Paul D. Humke**, St. Olaf College; **Donald E. McClure**, Brown University; **James F. Ramaley**, Ziff-Davis Publishing; and **James R. Schatz**, National Security Agency.

Panelists for the discussion on *Women and mathematics: Case studies of intervention programs* include **Diana C. Dismus-Campbell**, Rutgers University and Spelman-Bryn Mawr Summer Mathematics Program; **Sarah J. Greenwald**, University of Pennsylvania Women in Mathematics; and **Julie Kimbell**, Chemical Industry Institute for Toxicology and North Carolina Women and Mathematics/Wake County Schools Math Mentoring Program.

Panelists for the *Ph.D. in mathematics education: Program structures and professional opportunities for graduates* discussion are **Eileen Donoghue**, Teachers College-Columbia; **John Dossey**, Illinois State University; **Bradford Findell**, University of New Hampshire; **Richard Grassl**, University of Northern Colorado; and **Paul Kehle**, Indiana University.

Activities of Other Organizations

Panelists in the AWM panel discussion include **Ingrid Daubechies**, Princeton University; **Robion C. Kirby**, University of California at Berkeley; **William A. Massey**, AT&T Bell Laboratories; and **Cora S. Sadosky**, Howard Uni-

versity. The moderator is **Mary W. Gray**, American University.

The NSF Invited Address has been cancelled.

Additional panelists in the YMN panel discussion include **Suzanne M. Lenhart**, University of Tennessee, Knoxville; and **Michael J. McAsey**, Bradley University.

Registration at the Meetings

Individuals who registered by November 16 and who so elected will have their badge and the final program mailed to them before the meetings. All other registrants will receive the final program at the meetings. The additional information below is to assist those who will register at the meetings and those who registered in advance but elected not to receive their badges and final programs by mail.

Advance and on-site meeting registration fees only partially cover expenses of holding meetings. All mathematicians who wish to attend sessions are expected to register and should be prepared to show the meetings badge, if so requested. Badges are required to obtain discounts at the AMS and MAA Book Sales and to cash a check with the meetings cashier. If advance registrants should arrive too late in the day to pick up their badges, they may show the acknowledgment received from the Mathematics Meetings Service Bureau (MMSB) as proof of registration.

Registration fees may be paid at the meetings in cash, by personal or traveler's check, or by VISA, MasterCard, American Express, or Discover. Canadian checks must be marked for payment in U.S. funds. Letters verifying attendance at the meetings can be obtained from the cashier or at the Registration Assistance section of the Registration Desk.

Participants wishing to attend sessions for one day only may take advantage of a one-day fee which is equal to 55% of the on-site registration fee for either members or nonmembers. These special fees are effective daily, January 10 through 13, and are available at the meetings to both members and nonmembers. These one-day fees are not applicable to librarians; high school teachers; unemployed or emeritus participants; or high school, undergraduate, or graduate students.

Joint Mathematics Meetings

Member of AMS, Canadian Mathematical Society (CMS), MAA	\$169
Emeritus Member of AMS, MAA	\$45
Nonmember	\$262
Temporarily Employed	\$124
Graduate Student/Unemployed	\$45
Librarian/High School Teacher	\$45
Third-World Country Participant	\$45
Undergraduate Student	\$26
High School Student	\$5

Joint Mathematics Meetings One Day

Member of AMS, CMS, MAA	\$101
Nonmember	\$144

Employment Register

Employer	\$220
Additional Interviewer (each)	\$110
Applicant	\$75
Employer Posting Fee	\$50

AMS Short Course

Student/Unemployed	\$45
Emeritus Member of AMS, MAA	\$45
All Other Participants	\$90

MAA Minicourses (if openings available)

Minicourses #1-5, 7-9, 11, 13, 14, 16, 18	\$45
Minicourses #6, 10, 12, 15, 17	\$65

Accommodations and Travel

Participants who did not reserve a room during advance registration but who would like to obtain a room at one of the hotels listed on page 1205 in the October issue of the *Notices* should call the hotels directly **after December 13**. However, we regret that after that date the MMSB can no longer guarantee availability of rooms or of the special convention rates.

Please see the October issue for special discount fare information on USAir, as well as driving directions to the Orange County Convention Center.

Registration Dates, Times, and Locations

AMS Short Course

Ballroom Foyer, Clarion	
Monday, January 8	9:00 a.m. to 5:00 p.m.

Joint Mathematics Meetings and MAA Minicourses (until filled)

Registration Concourse, Convention Center	
Tuesday, January 9	3:00 p.m. to 7:00 p.m.
Wednesday-Friday	
January 10-12, 7:30 a.m. to 4:00 p.m.	
Saturday, January 13	7:30 a.m. to 2:00 p.m.

Employment Register

Hall D, Convention Center	
Wednesday, January 10	7:30 a.m. to 4:00 p.m. (registration only)
Thursday, January 11	7:00 a.m. to 5:00 p.m. (schedule distribution and interviews only)
Friday, January 12	8:15 a.m. to 5:00 p.m. (interviews only)

Employment Register participants must register and fill out interview request forms on **Wednesday, January 10**. There will be no registration on Thursday and Friday; only interviews will take place on these days.

Iowa City, Iowa

University of Iowa

March 22-23, 1996

Meeting #909

Central Section

Associate secretary: Andy R. Magid

Announcement issue of *Notices*: January 1996

Program issue of *Notices*: March 1996

Issue of *Abstracts*: Spring 1996

Deadlines

For organizers: Expired

For consideration of contributed papers in Special Sessions: Expired

For abstracts: Expired

Invited Addresses

Franc Forstneric, University of Wisconsin, Madison, *Title to be announced.*

Ruth J. Lawrence, University of Michigan, Ann Arbor, *Title to be announced.*

Michal Misiurewicz, Indiana University-Purdue University, Indianapolis, *Title to be announced.*

Daniel I. Tataru, Northwestern University, *Title to be announced.*

Special Sessions

Arrangements of Hyperplanes, **Michael J. Falk**, Northern Arizona University, and **Richard C. Randell**, University of Iowa.

Commutative Ring Theory, **Daniel D. Anderson**, University of Iowa.

Current Issues in Nonlinear Conservation Laws, **Suncica Canic**, Iowa State University.

Derivatives and Financial Mathematics, **John F. Price**, Maharishi International University.

Geometric and analytic methods in several complex variables, **Franc Forstneric**, University of Wisconsin, Madison.

Geometry and Cohomology, **Walter I. Seaman**, University of Iowa.

Group Representations and Mathematical Physics, **Tuong Ton-That**, University of Iowa.

Moments and Operators, **Raul E. Curto**, **Palle E. T. Jorgensen**, and **Paul S. Muhly**, University of Iowa.

Mostly Finite Geometries, **Norman L. Johnson**, University of Iowa.

Nonlinear Partial Differential Equations, **Lihe Wang** and **Gerhard O. Strohmmer**, University of Iowa.

Physical Knot Theory, **Jonathan K. Simon**, University of Iowa, and **Gregory Buck**, St. Anselm's College.

Research in Mathematics by Undergraduates, **Carl C. Cowen**, Purdue University, West Lafayette.

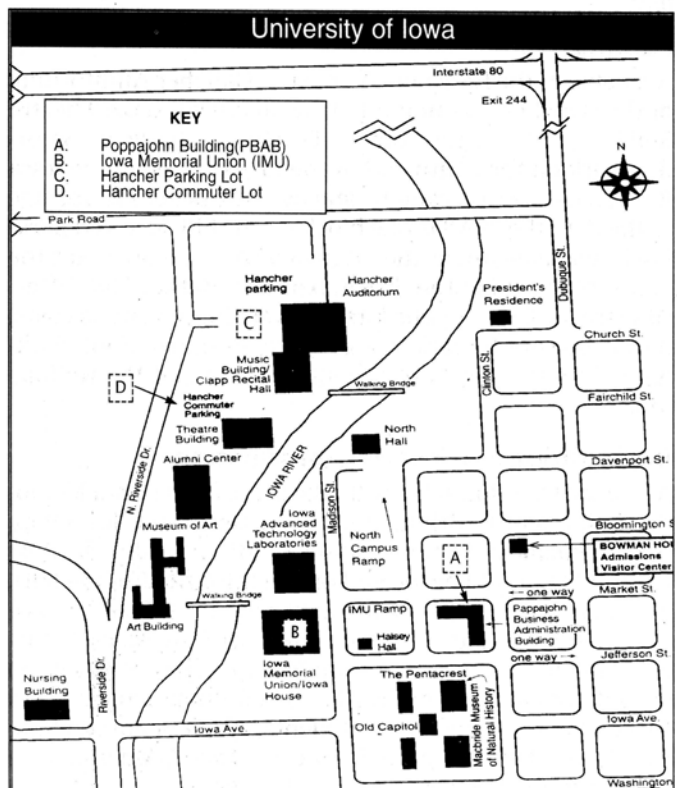
Theta Correspondences and Automorphic Forms, **David C. Manderscheid**, University of Iowa.

Topology of 3-manifolds, **Charles Frohman** and **Ying-Qing Wu**, University of Iowa.

Accommodations

Participants should make their own arrangements directly with the hotel of their choice and state that they will be attending the AMS meeting. **All rooms will be on a space available basis after the deadline given.** The AMS is not responsible for rate changes or for the quality of the accommodations.

- Comfort Inn (2 miles), 209 W. 9th Street, Coralville. Exit 242 off I-80. Telephone: 319-351-8144; \$49.95/single, \$55.95/double, triple, or quadruple. **Deadline for reservations is: March 1, 1996.**
- Fairfield Inn by Marriott (1.5 miles), 214 W. 9th Street, Coralville. Exit 242 off I-80. Telephone: 319-337-8382; \$55/single, \$61/double and \$6 per additional person. **Deadline for reservations is: March 1, 1996.**
- Heartland Inn (5 miles), 87 Second Street, Coralville. Telephone: 319-351-8132 or 800-334-3277; \$50/single, \$58/double, \$63/triple, and \$70/quadruple. **Deadline for reservations is: February 23, 1996.**
- Holiday Inn, Iowa City (2 blocks), 210 S. Dubuque Street, near the intersection of Dubuque and Burlington Sts. Telephone: 319-337-4058; \$68/single, \$73/double. **Deadline for reservations is: March 1, 1996.**
- Iowa House, Iowa Memorial Union, at the intersection of Jefferson and Madison Streets (on campus). Telephone: 319-335-3513; \$47/single, \$55/double and \$10



per additional person. **Deadline for reservations is: March 8, 1996.**

- Super 8 Motel of Iowa City (2 miles), 611 1st Avenue, Coralville. Telephone: 319-337-8382; \$39/single or \$47/double. **Deadline for reservations is: March 1, 1996.**

Food Service

There are three food service venues located in the Iowa Memorial Union; they are: the Union Pantry, which will be open from 7:30 a.m. to 5:00 p.m. on Friday (closed Saturday and Sunday); the River Room, which will be open from 7:00 a.m. to 2:00 p.m. on Friday and from 7:00 a.m. to 11:00 a.m. on Saturday and Sunday; and the State Room, open from 11:30 a.m. to 2:00 p.m., and 5:30 to 10:00 p.m. on Friday, and 5:30 to 10:00 p.m. on Saturday. In addition other restaurants are located in the surrounding area.

Other Activities

AMS representatives will be on hand to demonstrate and discuss the newest AMS electronic products available on the World Wide Web, including MathSciNet, the MR database on the Internet; electronic journals; the preprint server; and other products and member services available on e-MATH. Participants can also discuss membership opportunities, examine new titles, and order most AMS books at a special 50% discount offered only at meetings.

Joint Books, Journals, and Promotional Materials Exhibit: This exhibit will be open the same hours as the registration desk and will provide participants with the opportunity to order publications and other materials from various commercial publishers not represented at the meeting.

Parking

Available at the Hancher Lot, next to Hancher Auditorium, or the Hancher Commuter Lot, located next to the Theatre Building; cost is \$1.50/day on Friday, no charge on Saturday. Park on the south end of the lot, walk along the Iowa River, past the Arts campus and over the pedestrian bridge to the IMU; the PBAB is one block up the hill. Metered parking is available under the PBAB at a cost of \$.50/hour; the entrance is on Clinton Street, between Market and Jefferson Streets. Other public lots are available at various costs; please be sure to park in a properly designated lot. Parking is free for guests of the Iowa House and the Holiday Inn.

Registration and Meeting Information

All Special Session talks will take place in the Iowa Memorial Union (IMU), with Invited Addresses in the John Popajohn Business Administration Building (PBAB). The Registration Desk will be located on the third floor of the IMU. The hours of registration are 8:00 a.m. to 5:00 p.m. on Friday, March 22, and from 8:00 a.m. to 1:00 p.m. on Saturday, March 23. The registration fees (payable on-site only) are \$30 for members of the AMS; \$45 for nonmembers; and \$10 for emeritus members, students, or unemployed mathematicians. Fees are payable by cash, check, American Express, Discover, MasterCard or VISA only.

A link maintained by Prof. Thomas Branson of the University of Iowa mathematics department, containing information on corollary session to be held in conjunction with this sectional meeting, can be reached through the URL, <http://www.math.uiowa.edu/faculty/miniconf.html>.

Travel

USAir has been selected as the official airline for this meeting due to its generally convenient schedule to the Cedar Rapids International Airport. The following benefits are available exclusively to mathematicians and their families attending the meeting: 5% discount off first class and any published USAir promotional round-trip fare, or 10% discount off unrestricted coach fares with seven-day advance reservations and ticketing required. These discounts are valid providing all rules and restrictions are met and are applicable for travel from the continental U.S., Bahamas, Canada, and San Juan, P.R. Discounts are not combinable with other discounts or promotions. Additional restrictions may apply on international travel. For reservations call (or have your travel agent call) 800-334-8644 between 8:00 a.m. and 9:00 p.m. Eastern Time. Refer to Gold File Number **41380104**.

Travel from the airport: The University of Iowa has made arrangements with Airport Limousine Service departing Cedar Rapids International Airport, \$34 round trip for first person and \$5 extra each person each way. Reservations should be made by calling 800-814-8008 no later than **March 15, 1996**, giving arrival/departure times. Airport Limousine is located before the baggage area of the airport. Car rental from Cedar Rapids Airport is readily available.

The University of Iowa is located in Iowa City, IA, along Route I-80, approximately 20 miles from Cedar Rapids Airport.

Participants travelling by car from the east or west: Take I-80, Exit 244; at third stop light turn right on Market Street; in left-hand lane at bottom of the hill is the IMU with the parking ramp to the left.

From the north and airport: Take I-380 South to I-80 East, Exit 244 (Dubuque Street); at third stop light turn right on Market Street; on left at bottom of the hill is the IMU with the parking ramp to the left.

From the south: Take U.S. 6 & 218 to Riverside Drive exit, follow Riverside Drive to fourth stop light (Iowa Ave.), turn right and cross river, then turn left on Madison Street, turn left at 4-way stop, which is the Iowa House entrance.

Weather

Participants should prepare for seasonally cool temperatures in the low 30's in the evening to the mid 40's during the day.

New York, New York

New York University, Courant Institute

April 13-14, 1996

Meeting #910

Eastern Section

Associate secretary: Lesley M. Sibner

Announcement issue of *Notices*: February 1996

Program issue of *Notices*: April 1996

Issue of *Abstracts*: Spring 1996

Deadlines

For organizers: Expired

For consideration of contributed papers in Special Sessions: Expired

For abstracts: December 14, 1995

Invited Addresses

Claude R. LeBrun, State University of New York, Stony Brook, *Title to be announced.*

Ze'ev Rudnick, Princeton University, *Title to be announced.*

Jose Scheinkman, University of Chicago, Department of Economics, *Title to be announced.*

Michael F. Singer, North Carolina State University, *Title to be announced.*

Special Sessions

Differential Algebra, **Michael F. Singer**, North Carolina State University, **William F. Keigher**, Rutgers University, Newark, and **Phyllis J. Cassidy**, Smith College.

Gauge Field Theory, **Yisong Yang**, Polytechnic University, and **Janet C. Talvacchia**, Swarthmore College.

Global Riemannian Geometry, **Tobias H. Colding**, Courant Institute of Mathematical Sciences, New York University, **Santiago R. Simanca**, Polytechnic University, and **Claude R. LeBrun**, State University of New York, Stony Brook.

Hyperbolic Geometry and Discrete Groups, **Jane P. Gilman**, Rutgers University, Newark.

Number Theory, **Ze'ev Rudnick**, Princeton University, and **William D. Duke**, Rutgers University, New Brunswick.

Partial Differential Equations, **Fanghua Lin**, Courant Institute of Mathematical Sciences, New York University, **Peter J. Sternberg**, Indiana University, Bloomington, and **Patricia E. Bauman**, Purdue University, West Lafayette.

Stochastic Models in Mathematical Finance, **Thaleia Zariphopoulou**, University of Wisconsin, Madison.

Topological Methods, **Charles R. Traina**, Lawrence Narici, and **Edward Beckenstein**, Saint John's University.

Baton Rouge, Louisiana

Louisiana State University

April 19-21, 1996

Meeting #911

Southeastern Section

Associate secretary: Robert J. Daverman

Announcement issue of *Notices*: February 1996

Program issue of *Notices*: April 1996

Issue of *Abstracts*: Spring 1996

Deadlines

For organizers: Expired

For consideration of contributed papers in Special Sessions: Expired

For abstracts: December 14, 1995

Invited Addresses

Ronald A. Fintushel, Michigan State University, *Title to be announced.*

Fritz Gesztesy, University of Missouri, Columbia, *Variations on a Theme of Picard.*

Edward L. Green, Virginia Polytechnic Institute and State University, *Title to be announced.*

William A. Massey, AT&T Bell Laboratories, Murray Hill, New Jersey, *Title to be announced.*

Special Sessions

Asymptotic Behavior of Difference Equations with Applications, **Saber N. Elaydi**, Trinity University, San Antonio, and **Vlajko Lj Kocic**, Xavier University of Louisiana.

Control Theory, **Guillermo Segundo Ferreyra** and **Peter R. Wolenski**, Louisiana State University.

Fixed Point Theory and Dynamical Systems, **Michael R. Kelly**, Loyola University.

Fluid Dynamics, **Jerome A. Goldstein** and **Michael Mudi Tom**, Louisiana State University.

Geometric Group Theory, **Barry S. Spieler**, Birmingham-Southern College, **Jon M. Corson**, University of Alabama, and **Stephen G. Brick**, University of South Alabama.

Low-dimensional Topology, **Neal W. Stoltzfus**, **Patrick M. Gilmer**, and **Rick Litherland**, Louisiana State University.

Nonlinear Partial Differential Equations, **James R. Dorroh** and **Gisele Ruiz Goldstein**, Louisiana State University.

Number Theory and Quadratic Forms, **Jurgen Hurrelbrink**, **Jorge F. Morales**, **Robert V. Perlis**, and **Paul B. Van Wamelen**, Louisiana State University.

Real Algebraic Geometry and Ordered Algebraic Structures, **Charles N. Delzell** and **James Joseph Madden**, Louisiana State University, and **Scott Woodward**, Southern University.

Real Analytic Geometry and o-minimal Structures, **Chris Miller**, University of Illinois, Chicago, and **Lou P. van den Dries**, University of Illinois, Urbana-Champaign.

Representations of Finite Groups, Algebraic Groups, and Lie Algebras, **Randall R. Holmes**, Auburn University, Auburn, and **Cornelius Pillen**, University of South Alabama.

Rings and Modules, **Dan Zacharia**, Syracuse University, and **Ellen E. Kirkman**, Wake Forest University.

Stochastic Analysis and Its Applications, **Hui-Hsiung Kuo** and **Ambar Niel Sengupta**, Louisiana State University.

Transform Theory and Evolution Equations, **Frank Neubrander** and **Lutz Weis**, Louisiana State University.

Louisiana State University maintains a page on the WWW. The URL address to access it is <http://math.lsu.edu/conf/ams.html>.

First joint meeting of the AMS and the mathematical societies of the BeNeLux countries (Belgium, the Netherlands, and Luxemburg).

Associate secretary: Robert J. Daverman
Announcement issue of *Notices*: January 1996
Program issue of *Notices*: May 1996
Issue of *Abstracts*: None

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: January 11, 1996
For abstracts: February 1, 1996

All abstracts should be sent to Ms. Kristel Van Rompay, Department of Mathematics, University of Antwerp, UIA, Universiteitsplein 1, B-2610 Wilrijk, Belgium; electronic submissions may be sent to the following e-mail address: vrmpay@hwins.uia.ac.be

Antwerp, Belgium

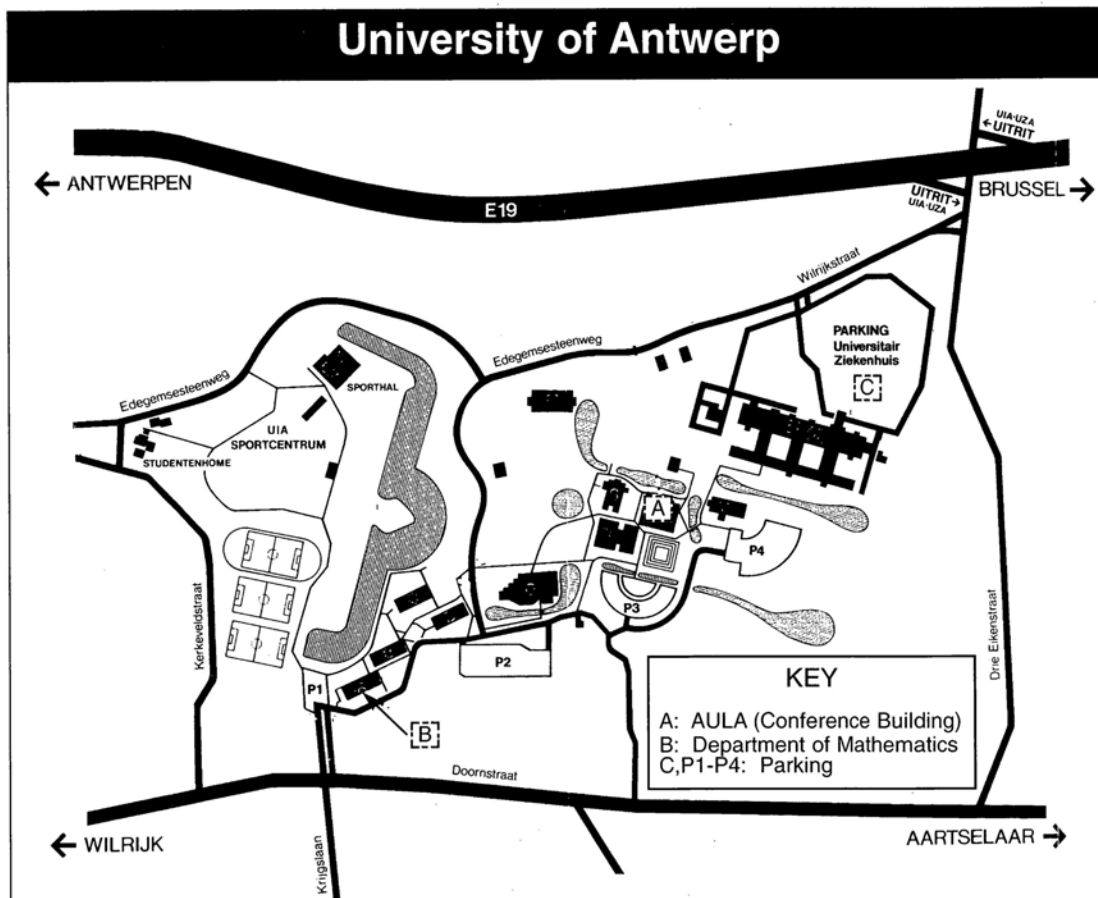
University of Antwerp

May 22-24, 1996

Meeting #912

Joint Invited Addresses

- J. McLaughlin
- F. Schrijver
- Elias M. Stein, Princeton University
- Stephen Smale, University of California at Berkeley



Clifford Taubes, Harvard University
 F. Takens, University of Groningen
 M. Van den Berg, Heriot-Watt University

Proposed Special Sessions

Algebra
Algebraic Geometry
Buildings
Differential Geometry
Discrete Mathematics and Finite Geometry
Dynamical Systems
Harmonic Analysis
History of Mathematics
Logic
Mathematical Physics
Modular Functions
Motivic Cohomology and Algebraic K-theory
Number Theory and Discrete Mathematics
Numerical Mathematics
Wavelets

Accommodations

Participants should make their own arrangements through Luc Willaert, Universitaire Instelling Antwerpen, Universiteitsplein 1, B-2610 Wilrijk, Belgium, or by e-mail: willaert@uia.ua.ac.be or by fax 32-3-820-24-21; please state you will be attending the AMS-BeNeLux meeting. Neither the AMS nor the BeNeLux mathematical societies are responsible for rate changes or quality of the accommodations.

- SWITEL, a five-star hotel, offers reduced rates for meeting participants: \$85/single and \$105/double; rates include free use of swimming pool and fitness center. The SWITEL is located within walking distance of the Central Station of Antwerp (train) and the public bus stop.
- Additional smaller (two- or three-star) hotels are available, with prices ranging from \$45-\$70/single occupancy and \$55-\$80/double occupancy.

Food Service

Lunch is available in the university restaurant at a cost of about \$8. There are other venues for food service available nearby at varying costs.

Other Activities

AMS representatives will be on hand to demonstrate and discuss the newest AMS electronic products available on the World Wide Web, including MathSciNet, the MR database on the Internet; electronic journals; the preprint server; and other products and member services available on e-MATH. Participants can also discuss membership opportunities, examine new titles, and order most AMS books at a special 50% discount offered only at meetings.

Parking

There is parking available at the hotels and on the campus in appropriately labelled lots. Lots P3 and P4 (see the map) are closest to the AULA, but the Universitair Ziekenhuis (UZA) is the largest lot and the most convenient.

Registration and Meeting Information

All talks will take place in the AULA. The Registration Desk will be located near the AULA on Wednesday, May 22; hours to be announced. Advance registration is required and is available through May 1, 1996, by contacting Ms. Kristel Van Rompay, Universitaire Instelling Antwerpen, Universiteitsplein 1, B-2610 Wilrijk, Belgium, or by e-mail: vrompay@uia.ua.ac.be. The fee is US \$35 (1,000 Bfr). Information concerning payment of this fee will be provided after registration.

Social Events

A congress dinner will take place on May 23; price is estimated to be US \$50; exact time and location to be announced. On Saturday, May 25, various extracurricular activities will take place: city tours, harbor tours, boat trips on the Schelde River, etc. Further details, including costs, will be available at the meeting.

Travel

KLM/Royal Dutch Airlines is the official carrier of the congress due to convenient scheduling to the surrounding airports. You may call the airline directly at 800-3-747-747. It is easy to fly to Antwerp Airport, however, a small but efficient airport is located in the town of Deurne, via Amsterdam or London. It is also possible to fly into the Brussels airport, located 37 km from Antwerp in the town of Zaventem. For further details, ticket information, or reservations, please contact voyst@uia.ua.ac.be.

Travel from the airport: Depending upon the airport of arrival, public transportation is readily available to Antwerp by SABENA bus or by train. More detailed information will be available to registered participants at a later date.

Weather

The average daily temperature during the end of May is between 20 and 25 degrees Celcius; but the Belgian weather is unpredictable, and evening temperatures could drop to 10 degrees Celcius.

Seattle, Washington

University of Washington

August 10-12, 1996

Meeting #913

Seattle Mathfest including the 98th Summer Meeting of the American Mathematical Society (AMS), the 74th meeting of

the *Mathematical Association of America (MAA)*, and the summer meetings of the *Association for Women in Mathematics (AWM)* and *Pi Mu Epsilon (PME)*.

Associate secretary: Susan J. Friedlander
Announcement issue of *Notices*: May 1996
Program issue of *Notices*: August 1996
Issue of *Abstracts*: None

Deadlines

For organizers: January 1, 1996
For consideration of contributed papers in Special Sessions: None
For abstracts: None
For summaries of papers to MAA organizers: To be announced

Invited Addresses

Joel Hass, University of California, Davis (AMS-MAA Invited Address).

Lawrenceville, New Jersey

Rider University

October 5–6, 1996

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: August 1996
Program issue of *Notices*: October 1996
Issue of *Abstracts*: Fall 1996

Deadlines

For organizers: January 5, 1996
For consideration of contributed papers in Special Sessions: June 12, 1996
For abstracts: July 2, 1996

Invited Addresses

Louis J. Billera, Cornell University, Ithaca, *Title to be announced*.

Fred I. Diamond, University of Cambridge, United Kingdom, *Title to be announced*.

Nicole Tomczak Jaegermann, University of Alberta, *Title to be announced*.

Karen E. Smith, Massachusetts Institute of Technology, *Title to be announced*.

Special Sessions

Algebraic K-theory, **Charles A. Weibel**, Rutgers University, New Brunswick.

Automorphic Forms, **Peter Sarnak**, Princeton University, and **Jian-Shu Li**, University of Maryland, College Park.

Combinatorial and Computational Geometry, **William Steiger**, Rutgers University, New Brunswick, and **Ileana Streinu**, Smith College.

Commutative Algebra, **Karen E. Smith**, Massachusetts Institute of Technology, and **Irena Swanson**, New Mexico State University.

Elliptic Surfaces, **Charles Freund Schwartz**, Rider University, and **William F. Hoyt**, Rutgers University, New Brunswick.

Geometric Functional Analysis, **N. Tomczak-Jaegermann**, University of Alberta, and **Edward Odell**, University of Texas, Austin.

Geometric Topology, **Norman J. Levitt**, Rutgers University, New Brunswick, and **Georgia Triantafillou**, Temple University.

Homotopy Theory, **Martin Bendersky**, Hunter College, City University of New York, and **Donald M. Davis**, Lehigh University.

Infinite Groups and Group Rings, **Simon Thomas**, Rutgers University, New Brunswick, and **Samuel M. Vovsi**, The Chubb Corporation, New Jersey.

Invariants of Smooth 4-manifolds, **John W. Morgan**, Columbia University, and **Frank S. Quinn**, Virginia Polytechnic Institute and State University.

Mirror Symmetry and Toric Varieties, **Sylvain E. Cappell**, Courant Institute of Mathematical Sciences, New York University, and **Ciprian S. Borcea**, Rider University.

Moduli Spaces of Vector Bundles over Curves with or without Additional Structure, **Hans Ulysses Boden**, Max Planck Institute for Mathematics, Germany, and McMaster University.

Operads, Hopf Algebras, and Categories, **Arthur M. Dupre**, Rutgers University, New Brunswick, and **James D. Stasheff**, University of North Carolina, Chapel Hill.

Partial Differential Equations in Geometry, **Robert C. McOwen**, Northeastern University, and **Thomas Patrick Branson**, University of Iowa.

Radon Transforms and Tomography, **Andrew G. Markoe**, Rider University, and **Eric Todd Quinto**, Tufts University.

Chattanooga, Tennessee

University of Tennessee, Chattanooga

October 11–12, 1996

Southeastern Section
Associate secretary: Robert J. Daverman
Announcement issue of *Notices*: August 1996
Program issue of *Notices*: October 1996
Issue of *Abstracts*: Fall 1996

Deadlines

For organizers: January 10, 1996

For consideration of contributed papers in Special Sessions: May 7, 1996

For abstracts: July 12, 1996

Invited Addresses

Orlando Alvarez, University of Miami, *Invited Address*

Christopher J. Bishop, State University of New York, Stony Brook, *Title to be announced.*

David Harbater, University of Pennsylvania, *Title to be announced.*

Joyce R. McLaughlin, Rensselaer Polytechnic Institute, *Title to be announced.*

Special Sessions

Applied Probability, **Thomas Kozubowski** and **Anna Katarzyna Panorska**, University of Tennessee, Chattanooga.

Commutative Ring Theory, **David F. Anderson** and **David E. Dobbs**, University of Tennessee, Knoxville.

Conformal Analysis, **David Howard Hamilton**, University of Maryland, College Park.

Galois Theory, **Helmut Voelklein**, University of Florida, and **Kevin R. Coombes**, University of Maryland, College Park.

Geometric Topology, **Alexander Nikolaevich Dranishnikov** and **James E. Keesling**, University of Florida, and **Jerzy Dydak**, University of Tennessee, Knoxville.

Mathematical Aspects of Wave Propagation Phenomena, **B. Belinskiy** and **Steve Xu**, University of Tennessee, Chattanooga.

Matrix Theory, **Zhongshan Li**, Georgia State University, **Ronald Lee Smith**, University of Tennessee, Chattanooga, and **Shu-An Hu**, University of Tennessee, Chattanooga.

Nonlinear Partial Differential Equations, **James R. Ward, Jr.** and **Gilbert A. Weinstein**, University of Alabama, Birmingham.

Optimization, **Jerald P. Dauer** and **Ossama A. Saleh**, University of Tennessee, Chattanooga.

Reform in Undergraduate Mathematics Education, **Betsy Darken**, **Aniekan Asukwo Ebiefung**, **Stephen W. Kuhn**, and **Robert Glenn Wynegar**, University of Tennessee, Chattanooga.

Columbia, Missouri

University of Missouri

November 1-3, 1996

Central Section

Associate secretary: Andy R. Magid

Announcement issue of *Notices*: September 1996

Program issue of *Notices*: November 1996

Issue of *Abstracts*: Fall 1996

Deadlines

For organizers: February 1, 1996

For consideration of contributed papers in Special Sessions: July 10, 1996

For abstracts: July 31, 1996

Invited Addresses

Alejandro Adem, University of Wisconsin, Madison, *Recent Developments in the Cohomology of Finite Groups.*

David E. Barrett, University of Michigan, Ann Arbor, *Title to be announced.*

Patricia E. Bauman, Purdue University, West Lafayette, *Title to be announced.*

Ya S. Soibelman, Kansas State University, *Title to be announced.*

Special Sessions

Algebraic Geometry, **Dan Edidin** and **Qi Zhang**, University of Missouri.

Classifying Spaces and Cohomology of Finite Groups, **Stewart B. Priddy**, Northwestern University, and **Alejandro Adem**, University of Wisconsin.

Commutative Algebra, **Steven Dale Cutkosky** and **Hema Srinivasan**, University of Missouri, Columbia.

Differential Equations and Dynamical Systems, **Carmen C. Chicone** and **Yuri D. Latushkin**, University of Missouri, Columbia.

Differential Geometry, **John Kelly Beem** and **Adam D. Helfer**, University of Missouri, Columbia.

Gauge Theory and Its Interaction with Holomorphic and Symplectic Geometry, **Stamatis A. Dostoglou**, University of California, Santa Barbara, and **Jan Segert** and **Shuguang Wang**, University of Missouri, Columbia.

Harmonic Analysis and Probability, **Nakhle Habib Asmar** and **Stephen John Montgomery-Smith**, University of Missouri, Columbia.

Lie Groups and Physics, **Ya S. Soibelman**, Kansas State University, and **Victor A. Ginzburg**, University of Chicago.

Partial Differential Equations and Mathematical Physics, **Mark S. Ashbaugh**, University of Missouri, Columbia.

Spectral Theory and Completely Integrable Systems, **Fritz Gesztesy**, University of Missouri, Columbia.

San Diego, California

San Diego Convention Center

January 8-11, 1997

Joint Mathematics Meetings, including 103rd Annual Meeting of the AMS, 80th Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and winter meeting of the Association for Symbolic Logic (ASL).

Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: October 1996
Program issue of *Notices*: January 1997
Issue of *Abstracts*: Winter 1997

Deadlines

For organizers: April 8, 1996
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced
For summaries of papers to MAA organizers: To be announced

Memphis, Tennessee

University of Memphis

March 21–22, 1997

Southeastern Section
Associate secretary: Robert J. Daverman
Announcement issue of *Notices*: January 1997
Program issue of *Notices*: March 1997
Issue of *Abstracts*: Spring 1997

Deadlines

For organizers: June 21, 1996
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Special Sessions

Approximation in Mathematics, George A. Anastassiou,
University of Memphis.

College Park, Maryland

University of Maryland, College Park

April 12–13, 1997

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: February 1997
Program issue of *Notices*: April 1997
Issue of *Abstracts*: Spring 1997

Deadlines

For organizers: July 12, 1996
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Detroit, Michigan

Wayne State University

May 2–4, 1997

Central Section
Associate secretary: Andy R. Magid
Announcement issue of *Notices*: March 1997
Program issue of *Notices*: May 1997
Issue of *Abstracts*: Spring 1997

Deadlines

For organizers: August 2, 1996
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Montreal, Quebec Canada

University of Montreal

September 26–28, 1997

Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of *Notices*: To be announced
Program issue of *Notices*: To be announced
Issue of *Abstracts*: Fall 1997

Deadlines

For organizers: December 20, 1996
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Atlanta, Georgia

Georgia Institute of Technology

October 10–12, 1997

Southeastern Section
Associate secretary: Robert J. Daverman
Announcement issue of *Notices*: August 1997
Program issue of *Notices*: October 1997
Issue of *Abstracts*: Spring 1997

Deadlines

For organizers: August 8, 1996
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced



Milwaukee, Wisconsin

University of Wisconsin

October 24–26, 1997

Central Section

Associate secretary: Andy R. Magid

Announcement issue of *Notices*: August 1997

Program issue of *Notices*: October 1997

Issue of *Abstracts*: Fall 1997

Deadlines

For organizers: January 4, 1997

For consideration of contributed papers in Special Sessions: To be announced

For abstracts: To be announced

Baltimore, Maryland

Baltimore Convention Center

January 7–10, 1998

Joint Mathematics Meetings including the 104th Annual Meeting of the AMS, 81st Annual Meeting of the Mathematical Association of America (MAA), and annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM).

Associate secretary: Robert J. Daverman

Announcement issue of *Notices*: October 1997

Program issue of *Notices*: January 1998

Issue of *Abstracts*: Winter 1998

Deadlines

For organizers: April 10, 1997

For consideration of contributed papers in Special Sessions: To be announced

For abstracts: To be announced

For summaries of papers to MAA organizers: To be announced

Manhattan, Kansas

Kansas State University

March 27–28, 1998

Central Section

Associate secretary: Andy R. Magid

Announcement issue of *Notices*: January 1998

Program issue of *Notices*: March 1998

Issue of *Abstracts*: Spring 1998

Deadlines

For organizers: June 26, 1997

For consideration of contributed papers in Special Sessions: To be announced

For abstracts: To be announced

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Orlando, Florida; January 10-13, 1996

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Program of the Sessions

Orlando, Florida, January 10-13, 1996

Monday, January 8

AMS Short Course Registration

9:00 AM – 5:00 PM

AMS Short Course on Artificial Intelligence

1:00 PM – 5:00 PM

Organizer: **Frederick Hoffman**, Florida Atlantic University

1:00 PM Introduction: **Frederick Hoffman**

2:00 PM *Outsearching Kasparov.*

(1) **Monty Newborn**, McGill University

3:15 PM Break

3:45 PM *Probabilistic foundations for casual reasoning.*

(2) **Glenn Shafer**, Rutgers University, Newark

3:45 PM *The basis of computer vision.*

(6) **Victor Nalwa**, AT&T Bell Laboratories, Murray Hill, New Jersey

AMS Council

1:00 PM – 11:00 PM

Joint Meetings Registration

3:00 PM – 7:00 PM

MAA Minicourse #1: Part A

3:00 PM – 5:00 PM

How to use computer-based numerical, graphical, and computer symbolic algebra methods to enhance the teaching and learning of calculus.

Organizers: **Bert K. Waits**, Ohio State University, Columbus
Wade Ellis, Jr., West Valley College

Tuesday, January 9

MAA Board of Governors

8:30 AM – 4:00 PM

AMS Short Course on Artificial Intelligence

9:00 AM – 5:00 PM

Organizer: **Frederick Hoffman**, Florida Atlantic University

9:00 AM *Reasoning about time.*

(3) **Martin Charles Golumbic**, Bar Ilan University, Israel

10:15 AM Break

10:45 AM *On the use of orderings in automated theorem-proving.*

(4) **Hélène Kirchner**, CRIN-CNRS, and INRIA-Lorraine, France

2:00 PM *Programming with constraints.*

(5) **Catherine Lassez**, IBM T. J. Watson Research Center, Yorktown Heights, New York

3:15 PM Break

MAA Minicourse #2: Part A

3:00 PM – 5:00 PM

An activity-based approach to teaching introductory statistics.

Organizers: **Ann E. Watkins**, California State University, Northridge
Mrudulla Gnanadesikan, Fairleigh Dickinson University, Teaneck
Richard L. Scheaffer, University of Florida

MAA Minicourse #3: Part A

3:00 PM – 5:00 PM

Hands-on activities for developmental mathematics courses.

Organizers: **Rosalie A. Dance**, University of Maryland, Baltimore County
James T. Sandefur, Georgetown University

The time limit for each AMS contributed paper in the sessions is ten minutes. The time limit for each MAA contributed paper varies. In the Special Sessions the time limit varies from session to session and within sessions. To maintain the schedule, time limits will be strictly enforced. For papers with more than one author, an asterisk follows the name of the author who plans to present the paper at the meeting.

Papers flagged with a solid triangle (▶) have been designated by the author as being of possible interest to undergraduate students. Abstracts of papers presented in the sessions at this meeting will be found in the Winter 1996 issue of *Abstracts of papers presented to the American Mathematical Society*, ordered according to the numbers in parentheses following the listings.

Mathchats and Graduate Student Reception

6:00 PM – 9:00 PM

MAA Minicourse #1: Part B

7:00 PM – 9:00 PM

How to use computer-based numerical, graphical, and computer symbolic algebra methods to enhance the teaching and learning of calculus.

Organizers: **Bert K. Waits**, Ohio State University, Columbus
Wade Ellis, Jr., West Valley College

MAA Minicourse #2: Part B

7:00 PM – 9:00 PM

An activity-based approach to teaching introductory statistics.

Organizers: **Ann E. Watkins**, California State University, Northridge
Mrudulla Gnanadesikan, Fairleigh Dickinson University, Teaneck
Richard L. Scheaffer, University of Florida

MAA Minicourse #3: Part B

7:00 PM – 9:00 PM

Hands-on activities for developmental mathematics courses.

Organizers: **Rosalie A. Dance**, University of Maryland, Baltimore County
James T. Sandefur, Georgetown University

- 9:00 AM (10) *An etale analog of Goresky-MacPherson formula for subspace arrangements.*
Zhao Yan, University of Minnesota, Minneapolis (908-14-242)
- 9:30 AM (11) *Simplicity of rings of differential operators in prime characteristic.*
Karen E. Smith*, Massachusetts Institute of Technology, and **Michel Van den Bergh**, University Centrum Limburg, Belgium (908-13-702)

AMS Special Session on Recursive and Feasible Mathematics, I

8:00 AM – 10:50 AM

Organizers: **Douglas Cenzer**, University of Florida
Jeffrey B. Remmel, University of California at San Diego, La Jolla

- 8:00 AM (12) *Permitting, forcing and copies of recursive structures.*
Christopher John Ash, Monash University, Australia, **Peter A. Cholak*** and **Julia Knight**, University of Notre Dame (908-03-109)
- 8:30 AM (13) *Turing degrees of certain isomorphic images of recursive relations.*
Valentina S. Harizanov, George Washington University (908-03-626)
- 9:00 AM (14) *Complexity and real computation.*
Lenore Blum, University of California, Berkeley (908-03-547)
- 9:30 AM (15) *On the computability of fractal dimensions and Hausdorff measure.* Preliminary report.
Ker-I Ko, State University of New York, Stony Brook (908-68-106)
- 10:00 AM (16) *Recursive approximations in point-free topological spaces and nonextendible functions.* Preliminary report.
Iraj Kalantari, Western Illinois University (908-03-631)
- 10:30 AM (17) *Index sets for Π_1^0 classes.*
Douglas Cenzer*, University of Florida, and **Jeffrey B. Remmel**, University of California at San Diego, La Jolla (908-03-381)

AMS Special Session on Multidimensional Complex Dynamics, I

8:00 AM – 10:55 AM

Organizers: **John Hamal Hubbard**, Cornell University
Ralph W. Oberste-Vorth, University of South Florida

- 8:00 AM (18) *The isoenergetical classification of integrable Hamiltonian systems with simple singular points.*
Lev Lerman, Research Institute for Applied Mathematics & Cybernetics, and **Ya L. Umanskii***, Greenacres, Florida (908-34-252)
- 8:40 AM (19) *Solving the sextic by iteration: A complex dynamical approach.* Preliminary report.
Scott W. Crass, University of California at San Diego, La Jolla (908-32-556)
- 9:30 AM (20) *Parts and counterparts of the Hilbert 16th problem for differential equations.*
Yulij Sergeevich Ilyashenko, Moscow State University, Russia (908-32-764)
- 10:20 AM (21) *Some dynamical properties of polynomial automorphisms on C^n .*
He Wu, University of Michigan, Ann Arbor (908-58-763)

Wednesday, January 10

Joint Meetings Registration

7:30 AM – 4:00 PM

Employment Register Registration

7:30 AM – 4:00 PM

AMS Special Session on Commutative Algebra, I

7:30 AM – 9:50 AM

Organizers: **Craig L. Huneke**, Purdue University, West Lafayette, and University of Michigan, Ann Arbor
Gennady Lyubeznik, University of Minnesota, Minneapolis

- 7:30 AM (7) *Lifting chains of primes to integral extensions.*
Stephen J. McAdam, University of Texas, Austin, and **Chandni Shah***, University of California, Riverside (908-13-158)
- 8:00 AM (8) *Birational morphisms.*
Steven Dale Cutkosky, University of Missouri, Columbia (908-13-627)
- 8:30 AM (9) *Descent of divisorial ideals.*
Dana Weston, University of Missouri, Columbia (908-13-365)

AMS Special Session on Computational Harmonic Analysis and Approximation Theory, I

8:00 AM – 10:55 AM

Organizers: **Richard A. Zalik**, Auburn University, Auburn**Narendra Kumar Govil**, Auburn University, Auburn8:00 AM (22) *On the Bernstein inequality for rational functions with a prescribed zero.***Roy C. Jones, Jr.**, **R. N. Mohapatra*** and **Rene S. Rodriguez, Jr.**, University of Central Florida (908-41-144)8:25 AM (23) *Poisson and related kernels.***Mourad E.H. Ismail**, University of South Florida (908-33-346)8:50 AM (24) *Jackson and Bernstein theorems for weighted polynomial approximation.***Doron S. Lubinsky**, University of Witwatersrand, Republic of South Africa (908-41-779)9:15 AM (25) *On polynomial with coefficients 0, -1, +1 and related matters.***Peter B. Borwein**, Simon Fraser University (908-41-756)9:45 AM (26) *Regularity estimates for multiwavelet constructions.***Ingrid Daubechies**, Princeton University (908-42-778)10:10 AM (27) *Irregular sampling, Toeplitz matrices, and approximation of entire functions.***Karlheinz U. Grochenig**, University of Connecticut, Storrs (908-42-786)10:35 AM (28) *General convergence properties of wavelet expansions.***Mark Andrew Kon***, Boston University, and **Louise A. Raphael**, Howard University (908-41-358)**MAA Minicourse #4: Part A**

8:00 AM – 10:00 AM

*Interdisciplinary lively applications.*Organizers: **David C. Arney**, U. S. Military Academy**Frank Giordano**, U. S. Military Academy**MAA Minicourse #5: Part A**

8:00 AM – 10:00 AM

*Business calculus: A new real-data/model-building approach.*Organizers: **Donald LaTorre**, Clemson University**John L. Kenelly**, Clemson University**Iris B. Feta**, Clemson University**MAA Minicourse #6: Part A**

8:00 AM – 10:00 AM

*Workshop mathematics: Using new pedagogy and technology in introductory courses.*Organizers: **Nancy Baxter Hastings**, Dickinson College**Allan Rossman**, Dickinson College**AMS Session on Combinatorics and Graph Theory, I**

8:00 AM – 11:25 AM

8:00 AM (29) *Some observations on derangements.***Donald F. Bailey**, Trinity University (908-11-42)8:15 AM (30) *The computation of the five-digit Kaprekar sequences via a table.***Linda Musco** and **Seok Sagong***, Middlesex Community-Technical College (908-11-24)8:30 AM (31) *On achieving channels in a bipolar communications game.***Curtis Clark**, Morehouse College (908-05-363)8:45 AM (32) *Random Cayley maps and symmetry.* Preliminary report.**Michelle Schultz**, Western Michigan University (908-05-339)9:15 AM (33) *Degrees in stratified graphs.***Gary Chartrand**, **Reza Rashidi**, **Farrokh Saba***, Western Michigan University, and **Curtiss E. Wall**, Norfolk State University (908-05-333)9:30 AM (34) *Path vectors in directed trees.* Preliminary report.**Gary Chartrand**, Western Michigan University, and **Donald W. Vanderjagt***, Grand Valley State University (908-05-335)9:45 AM (35) *A multiplicity problem related to Schur numbers.* Preliminary report.**Daniel John Schaal***, Clarion University of Pennsylvania, and **Hunter S. Snevily**, University of Idaho (908-05-198)10:00 AM (36) *Cyclic homology and de-Rham cohomology of affine hypersurfaces.* Preliminary report.**Ruth I. Michler**, University of North Texas (908-19-127)10:15 AM (37) *Partitions and sums and products.* Preliminary report.**Dan Tang**, Howard University (908-05-384)10:30 AM (38) *Binomial and q -binomial coefficient inequalities related to the Hamiltonicity of the Kneser graphs and their q -analogues.***W. Edwin Clark*** and **Mourad E.H. Ismail**, University of South Florida (908-05-428)10:45 AM (39) *Cycle decompositions of an even cycle to a power.***Charles L. Vanden Eynden**, Illinois State University (908-05-444)11:00 AM (40) *Orderings of finite fields and balanced tournaments.***Mark B. Beintama**, **Jeffrey Thomas Bonn***, **Robert W. Fitzgerald** and **Joseph Lewis Yucas**, Southern Illinois University, Carbondale (908-05-368)11:15 AM (41) *Pegging number of a graph.***Madeeha Khalid***, University of Texas, Austin, and **David P. Moulton**, University of California, Berkeley (908-05-805)**AMS Session on Applied Mathematics and Mathematical Physics, I**

8:00 AM – 11:10 AM

8:00 AM (42) *An optical echo theory of quasars.***Dennis Collins**, University of Puerto Rico, Mayaguez (908-85-247)8:15 AM (43) *Uniform stabilization of nonlinear shells and their approximations.***Richard J. Marchand*** and **Irena M. Lasiecka**, University of Virginia (908-93-609)8:30 AM (44) *Waves in an inviscid rotating stratified fluid.***Lokenath Debnath**, University of Central Florida (908-76-503)8:45 AM (45) *Global existence of solutions of classical Yang-Mills equations in 4-dimensional curved spacetime.***D. Petrescu**, IME-USP, Brazil (908-81-131)9:00 AM (46) *Spurious limit cycles in higher order averaging methods.***Ronald E. Mickens**, Clark Atlanta University (908-82-38)

- 9:15 AM *Nonlinear evolution of modulated gravity wavetrains in water of finite depth.* (47)
David K. Rollins* and **Bhimsen K. Shivamoggi**, University of Central Florida (908-76-714)
- 9:30 AM *Analytic properties of the nonlinear evolution equations for modulated gravity wavetrains.* (48)
Bhimsen K. Shivamoggi* and **David K. Rollins**, University of Central Florida (908-76-713)
- 9:45 AM *Exact solutions for some simple flows of an Oldroyd-B fluid.* (49)
Kumbakonam R. Rajagopal, University of Pittsburgh, Pittsburgh, and **Rakesh K. Bhatnagar***, University of Pittsburgh, Greensburg (908-76-417)
- 10:00 AM *Permanent magnets can't levitate...or can they?* (50)
 Preliminary report.
Bruce K. Driver, University of California at San Diego, La Jolla, and **Rodney D. Driver***, University of Rhode Island (908-70-561)
- 10:15 AM *Whirling of elastic tubes.* (51)
Timothy J. McDevitt* and **James G. Simmonds**, University of Virginia (908-73-645)
- 10:30 AM *Hamiltonian mechanics on finite symmetric space graphs.* Preliminary report. (52)
Elinor L. Velasquez, University of California, Berkeley (908-73-118)
- 10:45 AM *Generalized symplectic geometry on the vertically adapted frame bundle and Kaluza-Klein theory.* (53)
Jeffrey K. Lawson, Wake Forest University (908-53-812)
- 11:00 AM *Computations of magnetic vortices.* (54)
M. Affouf, Pennsylvania State University, Dunmore (908-82-51)

AMS Session on Education, I

8:00 AM – 10:55 AM

- 8:00 AM *Personalized research projects in the teaching of abstract algebra.* (55)
Bruce A. Magurn, Miami University (908-98-809)
- 8:15 AM *Calculus connections: Using multimedia technology to enhance the math learning environment.* (56)
Douglas A. Quinney, University of Keele, UK (908-98-10)
- 8:30 AM *Using guided discovery of recent research in an undergraduate course.* (57)
Brenda J. Latka, Lafayette College (908-99-509)
- 8:45 AM *Recognition and construction of graphs of elementary functions.* (58)
Gerald Wildenberg*, Saint John Fisher College, and **Carol L. Freeman**, Finger Lakes Community College (908-99-780)
- 9:00 AM *Calculus I and II with an extra laboratory hour.* (59)
Maria E. Calzada, Loyola University (908-99-534)
- 9:15 AM *Constructing topographic maps from on-line data using Mathematica.* (60)
Allan A. Struthers, Michigan Technological University (908-98-608)
- 9:30 AM *Apparent benefits of computer lab support for calculus.* (61)
Dietrich Burbulla and **Christopher T. J. Dodson***, University of Toronto (908-98-548)
- 9:45 AM *Improvement of students' performance on functions and mathematical models when using a graphic calculator.* (62)
Margo P. Alexander* and **Teresa Joan Murphy**, Georgia State University (908-98-167)
- 10:00 AM *Calculus reading quizzes: Getting students to read the text.* (63)
Philip E. Gustafson, Emporia State University (908-98-377)

- 10:15 AM *Teaching students to read technical material: The use of reading outlines.* Preliminary report. (64)
Janet Lynn Andersen, Hope College (908-99-730)
- 10:30 AM *An exploration into geometric visualization among pre-service teachers: Do drawing skills promote understanding?* (65)
Dusty E. Sabo, University of Idaho (908-98-92)
- 10:45 AM *Mathematics for the community: The ethnomathematics major.* Preliminary report. (66)
Cynthia E. Trimble*, University of California at San Diego, La Jolla, and **Elinor L. Velasquez**, University of California, Berkeley (908-98-794)

MAA Session on Standards for Introductory College Mathematics Courses Before Calculus, I

8:00 AM – 10:40 AM

- Organizers: **Gregory D. Foley**, Sam Houston State University
Jon Wilkin, Northern Virginia Community College
- 8:00 AM *An applications-driven curriculum: The Maricopa Mathematics Consortium (M2C) addresses the AMATYC standards.* (67)
Alan R. Jacobs, Scottsdale Community College (908-00-1317)
- 8:15 AM *Connected geometry: Powerful mathematical "habits-of-mind" integrating geometric, algebraic, and analytical thinking.* (68)
E. Paul Goldenberg, Education Development Center (908-00-1313)
- 8:30 AM *Empowering underprepared college mathematics students.* (69)
Sylvia M. Svitak*, Queensborough Community College, City University of New York, and **Arlene H. Kleinstein**, State University of New York Agricultural and Technical College, Farmingdale (908-00-1328)
- 8:45 AM *Restructuring to effect change: A developmental algebra curriculum.* (70)
Philip A. DeMarois, **Mercedes A. McGowen***, William Rainey Harper College, and **Darlene Whitkanack**, Indiana University, Bloomington (908-00-1323)
- 9:00 AM *Some real mathematics for elementary education majors.* (71)
Jerrold W. Grossman, Oakland University (908-00-1315)
- 9:15 AM *Guidelines for the mathematics preparation of prospective elementary teachers.* (72)
Jane F. Schielack, Texas A & M University, College Station (908-00-1326)
- 9:30 AM *A functional approach to algebra.* (73)
Shoko Brant and **Ed Zeidman***, Essex Community College (908-00-1331)
- 9:45 AM *Using data to enrich an algebra course.* (74)
Philip R. Carlson, University of Minnesota, Minneapolis (908-00-1307)
- 10:00 AM *Modeling and simulation in finite mathematics.* (75)
Richard D. Bronson, Fairleigh Dickinson University, Teaneck (908-00-1305)
- 10:15 AM *Difference equations and models at the college algebra level.* (76)
Dan Kalman, American University (908-00-1319)
- 10:30 AM *The Ohio State University Technology Summer College Short Course and the college instructor network.* (77)
Edward D. Laughbaum, Ohio State University, Columbus (908-00-1320)

MAA Session on Chaotic Dynamics and Fractal Geometry, I

8:00 AM – 10:55 AM

Organizers: **Denny Gulick**, University of Maryland, College Park
Jon W. Scott, Montgomery College

- 8:00 AM Introduction
- 8:15 AM *Non-hyperbolic iterated function systems.*
 ▶ (78) **Lawrence S. Husch**, University of Tennessee, Knoxville (908-00-1057)
- 8:30 AM *The Levy dragon and self-similar fractals.*
 ▶ (79) **James E. Keesling**, University of Florida (908-00-1058)
- 8:50 AM *Recent results on the dimension of attractors and repellers.*
 (80) **Brian R. Hunt**, University of Maryland, College Park (908-00-1056)
- 9:25 AM *Origins and early history of chaos and dynamical systems.*
 ▶ (81) **Barbara Bohannon**, Hofstra University, and **Sharon Kunoff***, Long Island University (908-00-1051)
- 9:45 AM *Intermittent chaos: A brief history.*
 ▶ (82) **Steven M. Hetzler**, Salisbury State University (908-00-1055)
- 10:05 AM *Computation of long periodic orbits in chaotic dynamical systems.*
 ▶ (83) **Huseyin Kocak**, University of Miami (908-00-1061)
- 10:40 AM *Relating periodic cycles: The method of digraphs.*
 ▶ (84) **Philip D. Straffin, Jr.**, Beloit College (908-00-1066)

MAA Session on Constructivism Across the Curriculum, I

8:00 AM – 10:55 AM

Organizers: **David M. Mathews**, Longwood College
Keith E. Schwingendorf, Purdue University, North Central

- 8:00 AM *Some social aspects of assuming a constructivist model of learning.*
 (85) **James R. Morrow**, Mount Holyoke College (908-00-1081)
- 8:15 AM *DAREC: A developmental algebra curriculum using a constructivist approach.*
 (86) **Mercedes A. McGowen***, **Philip A. DeMarois**, William Rainey Harper College, and **Darlene Whitkanack**, Indiana University, Bloomington (908-00-1080)
- 8:30 AM *A constructivist approach to precalculus.*
 (87) **Jerome J. Przybylski**, Elmira College (908-00-1084)
- 8:45 AM *Making the transition from learner to teacher: A mathematics course for pre-service elementary teachers.*
 (88) **Tracy L. Rusch**, University of Texas, Austin (908-00-1085)
- 9:00 AM *A constructivist approach to a capstone course for prospective secondary teachers.*
 (89) **Dale R. Oliver*** and **Phyllis Z. Chinn**, Humboldt State University (908-00-1083)
- 9:15 AM *Assessing constructivist techniques in a secondary mathematics certification program.*
 (90) **Carol Jean Bell**, University of Texas, Austin (908-00-1071)
- 9:30 AM *Computer-based liberal arts mathematics.*
 ▶ (91) **Mazen Mohammed Shahin**, College Misericordia (908-00-1087)

- 9:45 AM *Scripting to learn with Maple and the TI-92: Constructivism in action.*
 (92) **Phoebe T. Judson**, Trinity University, San Antonio (908-00-1078)
- 10:00 AM *"Discovering" abstract algebra in the classroom.*
 (93) **Jill Dietz**, Gettysburg College (908-00-1074)
- 10:15 AM *The undergraduate geometry course: Problems, models, and projects.*
 ▶ (94) **David A. Gay**, University of Arizona (908-00-1077)
- 10:30 AM *A constructivist approach to the history of mathematics.*
 ▶ (95) **Janet Lea Heine Barnett**, University of Southern Colorado (908-00-1070)
- 10:45 AM *Constructivism in teaching mathematics at UPRH. Preliminary report.*
 (96) **Malhab C. Keirouz**, University of Puerto Rico, Humacao College (908-00-1079)

MAA Session on Active Learning Strategies for Statistics and Probability, I

8:00 AM – 10:55 AM

Organizers: **Mary R. Parker**, Austin Community College
Allan J. Rossman, Dickinson College

- 8:00 AM *Probability through gambling.*
 ▶ (97) **Larry R. Anderson**, Whitman College (908-00-1001)
- 8:15 AM *Active learning strategies through laboratory analysis and technical report writing.*
 (98) **Diane L. Benner**, **Cathy Ann Godbois*** and **Linda Harper**, Harrisburg Area Community College (908-00-1007)
- 8:30 AM *Teamwork, case analyses with Excel, and formal business writing in an introductory statistics course.*
 (99) **Nancy C. Weida**, Bucknell University (908-00-1030)
- 8:45 AM *Use of the jigsaw for teaching hypothesis testing.*
 ▶ (100) **Clare T. Hemenway**, University of Wisconsin, Marathon County Center (908-00-1011)
- 9:00 AM *Sampling distribution, binomials, and hypothesis testing activities.*
 (101) **Olivia M. Carducci*** and **Brenda J. Latka**, Lafayette College (908-00-1002)
- 9:15 AM *Student statistical projects: Connecting the classroom to the real world.*
 ▶ (102) **Florence S. Gordon***, New York Institute of Technology, and **Sheldon P. Gordon**, Suffolk Community College (908-00-1008)
- 9:30 AM *Incorporating cooperative learning strategies in an introductory statistics course.*
 (103) **Julia M. Clark**, Emory and Henry College (908-00-1003)
- 9:45 AM *Workshop statistics—a graphing calculator approach.*
 (104) **Barr Von Oehsen**, Piedmont College (908-00-1029)
- 10:00 AM *A look at history: An activity using student-produced data.*
 (105) **Kay B. Somers**, Moravian College (908-00-1028)
- 10:15 AM *Applications of the Internet in a statistics class.*
 (106) **Brian E. Smith**, McGill University (908-00-1027)
- 10:30 AM *Using PUMS in a statistics course.*
 ▶ (107) **Charlie Jacobson**, Elmira College (908-00-1013)
- 10:45 AM *Use of ergonomic data in statistics and research methods.*
 ▶ (108) **Laurie J. Sawyer*** and **Paulette A. St. Ours**, University of New England (908-00-1025)

MAA Panel Discussion

8:00 AM – 9:20 AM

A modern course in calculus.

Organizer: **A. Wayne Roberts**, Macalester College

Panelists: **Martin Flashman**, Humboldt State University

Sheldon Gordon, Suffolk Community College

Margret Hoft, University of Michigan, Dearborn

Sharon Ross, DeKalb University

MAA Panel Discussion

8:00 AM – 9:20 AM

Mathematical modeling as a precursor of mathematics reform.

Organizer: **Henry J. Ricardo**, Medgar Evers College (CUNY)

Panelists: **Ben Fusaro**, Florida State University

John Loase, Westchester Community College

William Lucas, Claremont Graduate School

Joyce McQuade, Westchester Community College

MAA Panel Discussion

8:00 AM – 9:20 AM

Visiting lecturer programs in the mathematical sciences.

Organizer: **Deane E. Arganbright**, University of Papua New Guinea

Panelists: **Marilyn Durkin**, Bentley College

Hal Berghel, ACM Visiting Lecturer Program

Leon H. Seitelman, SIAM Visiting Lecturer Program

SUMMA Presentation

8:00 AM – 9:20 AM

Intervention projects for minority precollege students.

Organizer: **William A. Hawkins**, Director of SUMMA

Presenters: **Carolyn R. Mahoney**, California State University, San Marcos

Jack Morrell, Atlanta Metropolitan College

Margaret Wiener, Marymount Manhattan College

MAA Panel Discussion

9:35 AM – 10:55 AM

Distance learning.

Organizer: **L. Carl Leinbach**, Gettysburg College

Panelists: **William J. Davis**, Ohio State University, Columbus

Thomas Upson, Rochester Institute of Technology

Jeffrey Xavier Watt, Purdue University, Indianapolis

MAA Panel Discussion

9:35 AM – 10:55 AM

Future perspectives on calculus.

Organizer: **Donald B. Small**, U. S. Military Academy

MAA Committee on the Participation of Women Panel Discussion

9:35 AM – 10:55 AM

Women and mathematics: Case studies of intervention programs.

Organizers: **Virginia E. Knight**, Meredith College

Carole B. Lacampagne, U.S. Department of Education

Panelists: **Diana C. Dismus-Campbell**, Rutgers University and Spelman-Bryn Mawr Summer Mathematics Program

Sarah J. Greenwald, University of Pennsylvania Women in Mathematics

Julie Kimbell, Chemical Industry Institute for Toxicology and North Carolina Women and Mathematics

AMS Retiring Presidential Address

10:05 AM – 10:55 AM

(109) *Rings and things.*

Irving Kaplansky, Mathematical Sciences Research Institute, Berkeley (908-00-901)

AMS-MAA Invited Address

11:10 AM – NOON

(110) *A century of syzygies.*

Roger A. Wiegand, University of Nebraska, Lincoln (908-00-907)

AMS Colloquium Lectures: Lecture I

1:00 PM – 2:00 PM

(111) *Modular forms, elliptic curves and Galois representations.*

Andrew J. Wiles, Princeton University

Book Sale and Exhibits

1:00 PM – 5:00 PM

MAA Invited Address

2:15 PM – 3:05 PM

(112) *Perspectives in the geometry of differential equations.*

Robert Moses, The Algebra Project, Boston, Massachusetts (908-00-955)

AMS-MAA Special Session on Research in Undergraduate Mathematics Education, I

2:15 PM – 6:00 PM

Organizers: **Annie Selden**, Tennessee Technological University
John Selden, MERC

- 2:15 PM *Successful students' conceptions of mean, standard deviation, and the central limit theorem.*
(113) **David M. Mathews**, Central Michigan University (908-00-987)
- 2:40 PM *What is dynamic geometry?—How students learn mathematics using Geometer's Sketchpad, Cabri, Geometry Inventor.*
▶ (114) **E. Paul Goldenberg**, Education Development Center (908-00-981)
- 3:05 PM *Enhancing learning in Calculus II with the use of the TI-92 graphing calculator.*
(115) **Phoebe T. Judson**, Trinity University (908-00-983)
- 3:25 PM *Critical thinking and calculus reform.*
▶ (116) **Connie M. Yarema**, East Texas State University (908-00-996)
- 3:45 PM *The effects of writing to learn mathematics on conceptual and procedural understanding in introductory college calculus.*
▶ (117) **Mary K. Porter**, Saint Mary's College (908-00-990)
- 4:05 PM *Concepts and procedure in mathematics and the MBTI.*
▶ (118) **Dennis Sentilles***, University of Missouri, Columbia, and **Robert F. Wheeler**, Northern Illinois University (908-00-992)
- 4:25 PM *Applications of pedagogical principles to undergraduate mathematics curriculum.*
(119) **Guershon Harel** and **Richard Cole Penney***, Purdue University, West Lafayette (908-00-989)
- 4:45 PM *Trends in the organization and content of linear algebra courses.*
(120) **Natasha Warikoo*** and **Wayne Harvey**, Educational Development Center (908-00-993)
- 5:05 PM *Enhancing fairness in mathematics placement testing.*
(121) **Alvin Baranchik** and **Barry M. Cherkas***, Hunter College, City University of New York (908-00-975)
- 5:25 PM *A statistical survey of the effectiveness of remedial college mathematics.*
▶ (122) **Timothy W. Flood**, Pittsburgh State University (908-00-978)
- 5:45 PM *Evaluating the effects of changing a mathematics core curriculum.*
(123) **Richard Douglas West**, U. S. Military Academy (908-00-995)

AMS Special Session on Analytic Methods in Several Complex Variables, I

2:15 PM – 5:35 PM

- Organizer: **F. Michael Christ**, University of California, Los Angeles
- 2:15 PM *The Cauchy-Riemann equations on a Hilbert space.*
(124) **Laszlo Lempert**, Purdue University, West Lafayette (908-32-195)
- 2:45 PM *Rigidity and analyticity of CR immersions into real hypersurfaces.*
(125) **Chong-Kyu Han***, Seoul National University, Korea, and **Jae-Nyun Yoo**, Pohang University of Science & Technology, Korea (908-32-180)
- 3:15 PM *Boundary values of cohomology classes.*
(126) **Francois Trèves**, Rutgers University (908-32-622)
- 3:45 PM *Unimodular invariants of totally real tori in C^n .*
(127) **Xianghong Gong**, Mathematical Science Research Institute (908-32-508)
- 4:15 PM *The singularity of the Bergman kernel.* Preliminary report.
(128) **Masatake Kuranishi**, Columbia University (908-53-623)

- 4:45 PM *Local analytic structure of an n -manifold in complex n -space.*
(129) **Xiaojun Huang**, Mathematical Science Research Institute (908-32-580)
- 5:15 PM *The Szegő projector as a function of the CR-function.*
(130) **Charles L. Epstein**, University of Pennsylvania (908-32-546)

AMS Special Session on Knot Theory, I

2:15 PM – 6:05 PM

- Organizer: **Tim D. Cochran**, Rice University
- 2:15 PM *Finite type invariants of homology 3-spheres.*
(131) **Jerome P. Levine***, Brandeis University, and **Stavros Garoufalidis**, Brown University (908-05-316)
- 2:45 PM *Invariants of graphs.*
▶ (132) **Simrat M. Ghuman**, Rice University (908-57-398)
- 3:15 PM *Milnor invariants of singular knots.* Preliminary report.
(133) **Ted Stanford**, University of California, Berkeley (908-57-766)
- 3:45 PM *A TQFT for wormhole cobordisms over the field of rational functions.*
(134) **Patrick M. Gilmer**, Louisiana State University, Baton Rouge (908-57-274)
- 4:45 PM *Quantum invariants of templates.*
(135) **Louis H. Kauffman**, University of Illinois, Chicago, **Masahico Saito***, University of South Florida, and **Michael C. Sullivan**, Northwestern University (908-57-220)
- 5:15 PM *Equivariant slice knots in dimension 3.* Preliminary report.
(136) **Swatee Naik**, University of Nevada, Reno (908-57-52)
- 5:45 PM *Minimal energies of polygonal knots.* Preliminary report.
▶ (137) **Jonathan K. Simon**, University of Iowa (908-57-219)

AMS Special Session on Algebraic Groups and Invariant Theory, I

2:15 PM – 6:20 PM

- Organizers: **Amassa C. Fautleroy**, North Carolina State University
Aloysius G. Helminck, North Carolina State University
- 2:15 PM *Projective projective S_n -modules and McMahon symmetric functions.*
(138) **Peter Norman Hoffman**, University of Waterloo (908-20-620)
- 2:40 PM *Symbolic theory for invariants in positive characteristic.* Preliminary report.
(139) **Joseph P. Brennan**, North Dakota State University (908-13-577)
- 3:05 PM *G_a actions on C^n .*
(140) **James K. Deveney***, Virginia Commonwealth University, and **David R. Finston**, New Mexico State University, Las Cruces (908-14-392)
- 3:30 PM *On representations associated with p -adic symmetric spaces* Preliminary report.
(141) **Gerard F. Helminck**, University of Twente, The Netherlands (908-20-621)
- 3:55 PM *Dimensional criteria for the semisimplicity of certain representations.*
(142) **George Joseph McNinch**, University of Oregon (908-20-476)

- 4:20 PM *Invariant analytic domains in complex semisimple groups.* (143)
Ralph J. Bremigan, Ball State University (908-20-150)
- 4:45 PM *Induced modules from Frobenius kernels.* (144)
 Preliminary report.
Andy R. Magid, University of Oklahoma (908-17-251)
- 5:10 PM *How many parameters does it take to define a generic polynomial?* (145)
Joe P. Buhler, Reed College, and **Zinovy Reichstein***, Oregon State University (908-14-475)
- 5:35 PM *Stratifying endomorphism algebras, I.* (146)
Edward T. Cline*, University of Oklahoma, **Brian J. Parshall** and **Leonard L. Scott, Jr.**, University of Virginia (908-16-758)
- 6:00 PM *Cohen-Macaulayness for SL_n and SO_n actions.* (147)
V. Lakshmibai, Northeastern University, and **Pradeep K. Shukla***, Suffolk University (908-14-138)

AMS Special Session on Differential Geometry and Mathematical Relativity, I

2:15 PM – 5:35 PM

- Organizer: **Gregory J. Galloway**, University of Miami, Coral Gables
- 2:15 PM *The geodesic space.* (148)
John Kelly Beem*, University of Missouri, Columbia, **Robert J. Low**, Coventry University, England, and **Phillip E. Parker**, Wichita State University (908-53-75)
- 2:45 PM *The nonspacelike cut locus revisited.* Preliminary report. (149)
Paul Ewing Ehrlich, University of Florida (908-53-105)
- 3:15 PM *Results on the categoricity of the causal boundary.* Preliminary report. (150)
Steven Guy Harris, Saint Louis University (908-53-435)
- 3:45 PM *Simplicial geometries for experimental mathematics.* (151)
Kristin A. Schleich* and **Donald M. Witt**, University of British Columbia (908-58-676)
- 4:15 PM *The conformal boundary of strongly asymptotically hyperbolic manifolds.* (152)
Lars Andersson, Royal Institute of Technology, Sweden, and **Ralph E. Howard***, University of South Carolina, Columbia (908-53-677)
- 4:45 PM *On functionals of Willmore type.* (153)
Mingliang Cai, University of Miami (908-53-218)
- 5:15 PM *Complete simply-connected minimal surfaces in \mathbb{R}^3 .* (154)
Lucio L. Rodriguez*, Institute for Pure-Applied Mathematics, Brazil, and **Harold Rosenberg**, University of Paris VII, France (908-83-415)

AMS Special Session on Multidimensional Complex Dynamics, II

2:15 PM – 6:00 PM

- Organizers: **John Hamal Hubbard**, Cornell University
Ralph W. Oberste-Vorth, University of South Florida
- 2:15 PM *Complex horseshoes and Hénon mappings.* (155)
Ralph W. Oberste-Vorth, University of South Florida (908-32-664)
- 3:00 PM *Green's functions and iteration of birational maps of CP^2 .* (156)
Jeffrey Diller, Cornell University (908-32-69)

- 3:50 PM *Convex cores of 3-laminations and a proof of Thurston's rigidity for rational maps.* (157)
Yair N. Minsky, State University of New York, Stony Brook (908-58-614)
- 4:35 PM *Hyperbolic 3-laminations associated to rational maps.* (158)
M. Lyubich, State University of New York, Stony Brook (908-58-482)
- 5:25 PM *A compactification of the Fatou mapping.* (159)
Vladimir Veselov, University of South Florida (908-32-613)

AMS Special Session on Nonselfadjoint Operator Algebras and Their Applications, I

2:15 PM – 6:25 PM

- Organizers: **Timothy D. Hudson**, East Carolina University
Elias G. Katsoulis, East Carolina University
- 2:15 PM *Reflexive closures of spaces of Toeplitz operators.* Preliminary report. (160)
Edward A. Azoff*, University of Georgia, and **Marek Ptak**, University of Agriculture, Poland (908-47-630)
- 2:45 PM *What is a nonselfadjoint operator algebra?* (161)
David P. Blecher, University of Houston (908-46-213)
- 3:15 PM *Free semigroup algebras, I.* Preliminary report. (162)
Kenneth R. Davidson, University of Waterloo, and **David R. Pitts***, University of Nebraska, Lincoln (908-47-573)
- 3:45 PM *Free semigroup algebras, II.* (163)
Kenneth R. Davidson*, University of Waterloo, and **David R. Pitts**, University of Nebraska, Lincoln (908-47-457)
- 4:15 PM *Algebraic orders on K_0 and limit algebras.* (164)
Allan P. Donsig, University of Waterloo (908-46-550)
- 4:45 PM *Points of spectral continuity in algebras and manifolds.* (165)
Douglas R. Farenick*, University of Regina, and **Woo Young Lee**, Sung Kyun Kwan University, (908-47-373)
- 5:15 PM *Simultaneous triangularization: Problems and some solutions.* (166)
Peter Rosenthal, University of Toronto (908-47-459)
- 5:45 PM *Recent progress in operator algebras.* (167)
Frank L. Gilfeather, University of New Mexico (908-47-807)
- 6:10 PM *On weakly closed Lie ideals of nest algebras.* (168)
Timothy D. Hudson, East Carolina University, **Laurent W. Marcoux***, University of Alberta, and **Ahmed Ramzi Sourour**, University of Victoria (908-47-171)

AMS Special Session on Commutative Algebra, II

2:15 PM – 6:05 PM

- Organizers: **Craig L. Huneke**, Purdue University, West Lafayette, and University of Michigan, Ann Arbor
Gennady Lyubeznik, University of Minnesota, Minneapolis
- 2:15 PM *Mixed multiplicities and local Chern characters.* (169)
Paul C. Roberts, University of Utah (908-13-458)
- 2:45 PM *Some conjectures on Artin local rings.* (170)
N. Mohan Kumar, Washington University (908-13-762)

- 3:15 PM (171) *Resolution of singularities and Tschirnhausen approximate roots.* Preliminary report.
Mark Spivakovsky, University of Toronto (908-13-440)
- 3:45 PM (172) *Tight closure and Frobenius closure in homogenous coordinate rings of certain elliptic curves.* Preliminary report.
Maira A. McDermott, University of Michigan, Ann Arbor (908-13-541)
- 4:15 PM (173) *Maximal Betti numbers and deformations of graded modules.*
Keith Aaron Pardue, University of Toronto (908-13-624)
- 4:45 PM (174) *Adjunction maps, symmetric algebras, and linear programming duality.* Preliminary report.
David Eisenbud* and **Sorin Popescu**, Brandeis University (908-13-754)
- 5:15 PM (175) *Rigidity of local cohomology.* Preliminary report.
Craig L. Huneke, Purdue University, West Lafayette, and **Roger A. Wiegand***, University of Nebraska, Lincoln (908-13-478)
- 5:45 PM (176) *Test modules for complete intersections.*
Luchezar L. Avramov, Purdue University, West Lafayette (908-13-753)

AMS Special Session on Computational Harmonic Analysis and Approximation Theory, II

2:15 PM – 5:40 PM

Organizers: **N. K. Govil**, Auburn University, Auburn
Richard A. Zalik, Auburn University, Auburn

- 2:15 PM (177) *A modified minimum norm solution method for band-limited signal extrapolation with inaccurate data.*
M. Zuhair Nashed*, University of Delaware, and **Xiang-Gen Xia**, Hughes Research Laboratories (908-41-775)
- 2:40 PM (178) *The zeroes of the Daubechies polynomials.*
Gilbert Strang*, **Jianhong Shen**, Massachusetts Institute of Technology, and **Cleve B. Moler**, The Mathworks Incorporated (908-42-463)
- 3:05 PM (179) *Nonabelian fast Fourier transforms.*
David K. Maslen, Utrecht University, The Netherlands (908-20-445)
- 3:30 PM (180) *Spectral analysis for data on experimental designs.* Preliminary report.
R. A. Bailey, Queen Mary & Westfield College, England, **Persi W. Diaconis**, Harvard University, **Daniel N. Rockmore***, Dartmouth College, and **Chris Rowley**, Open University, England (908-20-653)
- 4:05 PM (181) *Crystallographic Fourier transforms.* Preliminary report.
Louis Auslander, Graduate School & University Center (CUNY) (908-65-785)
- 4:30 PM (182) *Spherical harmonic spectral methods.*
Mark A. Taylor, National Center for Atmospheric Research (908-65-635)
- 4:55 PM (183) *Local tomography using wavelets.*
David F. Walnut, George Mason University (908-42-707)
- 5:20 PM (184) *Wavelets, fractals, and image compression.*
Geoffrey M. Davis, Dartmouth College (908-94-549)

MAA Minicourse #10: Part A

2:15 PM – 4:15 PM

Mathematical algorithms, models, and graphic representations using spreadsheets.

Organizers: **Deane E. Arganbright**, University of Papua New Guinea
Erich Neuwirth, University of Vienna
Robert S. Smith, Miami University, Oxford

MAA Minicourse #7: Part A

2:15 PM – 4:15 PM

The historical development of the foundations of mathematics.

Organizer: **Robert L. Brabenec**, Wheaton College

MAA Minicourse #8: Part A

2:15 PM – 4:15 PM

Cooperative learning in undergraduate mathematics education.

Organizers: **Ed Dubinsky**, Purdue University, West Lafayette
Janet Ray, Seattle Central Community College
Barbara Reynolds, Cardinal Stritch College

MAA Minicourse #9: Part A

2:15 PM – 4:15 PM

Calculus for the 21st century.

Organizers: **Lawrence C. Moore**, Duke University
David A. Smith, Duke University

AMS Session on Group Theory

2:15 PM – 6:10 PM

- 2:15 PM (185) *Some results on projective limits in convergence semigroups.*
Phoebe Ho* and **Shing Seung So**, Central Missouri State University (908-22-520)
- 2:30 PM (186) *Groups whose ascendant abelian subgroups have finite rank.*
Vonn A. Walter, Southeastern Oklahoma State University (908-20-243)
- 2:45 PM (187) *Preliminary results on amalgams involving $SL_2(2^n)$.*
Mark Allen Lesperance, Kansas State University (908-20-96)
- 3:00 PM (188) *Groups with many subgroups having a supplement.*
Luise-Charlotte Kappe*, State University of New York, Binghamton, and **Joseph Kirtland**, Marist College (908-20-173)
- 3:15 PM (189) *Irreducible modules and normal subgroups of prime index.*
Stephen P. Glasby*, University of Sydney, Australia, and **Laszlo G. Kovacs**, Australian National University, Australia (908-20-767)
- 3:30 PM (190) *On the near Frattini subgroups of residually finite amalgamated free products.*
Mohammad K. Azarian, University of Evansville (908-20-179)
- 3:45 PM (191) *Direct products of inseparable finite groups, II.*
Joseph Kirtland, Marist College (908-20-32)

- 4:00 PM (192) *Verification of Dade's conjecture for the covering groups of J_3 .*
Sonja Kotlica, University of Illinois, Urbana-Champaign (908-99-710)
- 4:15 PM (193) *Intersections with S_2 -subgroups in nonsolvable groups.* Preliminary report.
Arnold D. Feldman* and **Amil Dasgupta**, Franklin & Marshall College (908-20-278)
- 4:30 PM (194) *Large product-free subsets of finite groups.*
Kiran S. Kedlaya, Harvard University (908-20-313)
- 4:45 PM (195) *On a class of R -groups.*
Temple Harold Fay and **Gary L. Walls***, University of Southern Mississippi (908-20-319)
- 5:00 PM (196) *P_∞ -subgroups for finite non-solvable groups.* Preliminary report.
Mark C. Hofmann, Skidmore College (908-20-399)
- 5:15 PM (197) *A characterization of complete metacyclic groups.*
Jason P. Leasure, State University of New York, Binghamton (908-20-434)
- 5:30 PM (198) *Stochastic dynamics and log-Sobolev inequalities.*
Stephen Bruce Sontz, University of the Americas (908-82-19)
- 5:45 PM (199) *Counting primitive roots of unity in a finite group.* Preliminary report.
Donald E. Spickler, Jr.* and **Lenny K. Jones**, Shippensburg University of Pennsylvania (908-20-404)
- 6:00 PM (200) *Some results on compact convergence semigroups.*
Shing Seung So* and **Paul J. Plummer**, Central Missouri State University (908-22-519)

AMS Session on Combinatorics and Graph Theory, II

2:15 PM - 6:10 PM

- 2:30 PM (201) *Triads and triangles in 3-connected matroids.*
John W. Leo, Louisiana State University, Baton Rouge (908-05-539)
- 2:45 PM (202) *Restricted choice numbers and thwart numbers.*
Evan B. Wantland*, Western Connecticut State University, **Dean Hoffman** and **Peter D. Johnson, Jr.**, Auburn University, Auburn (908-05-566)
- 3:00 PM (203) *On a seating rearrangement problem.*
Curtis N. Cooper* and **Robert E. Kennedy**, Central Missouri State University (908-05-564)
- 3:15 PM (204) *Generalized stress on non-simplicial polytopes.* Preliminary report.
Susan Lynn Foegen, University of Kentucky (908-05-644)
- 3:30 PM (205) *Extremal cases of the Ahlswede-Cai inequality.*
Andrew J. Radcliffe and **Susanna Saniszló***, University of Nebraska, Lincoln (908-05-698)
- 3:45 PM (206) *Completing certain partial latin squares.*
Tristan Mark Denley* and **Roland Haggkvist**, Umea University, Sweden (908-05-743)
- 4:00 PM (207) *Homogenous hamming triple systems.*
Jerome M. LeVan, Transylvania University (908-05-598)
- 4:15 PM (208) *The Marica-Schönheim inequality in lattices.*
Zsolt Lengvarszky, University of South Carolina, Columbia (908-05-596)
- 4:30 PM (209) *Sequencing the dihedral groups D_{4k} .*
Paul Li, Harvard University (908-05-593)
- 4:45 PM (210) *On the degree of regularity of linear systems.* Preliminary report.
Arie Bialostocki, **Terry B. Meerdink***, University of Idaho, and **Hanno Lefmann**, University of Dortmund, Germany (908-05-518)
- 5:00 PM (211) *Matrices connected to Brauer's centralizer algebras.*
Mark D. McKerihan, University of Michigan, Ann Arbor (908-05-99)

- 5:15 PM (212) *The independence and clique covering numbers of the Cartesian product of graphs.*
Glenn G. Chappell, University of Illinois, Urbana-Champaign (908-05-726)
- 5:30 PM (213) *Unavoidable minors of graphs of large type.* Preliminary report.
John J. Dittmann, Jr.* and **Bogdan S. Oporowski**, Louisiana State University, Baton Rouge (908-05-711)
- 5:45 PM (214) *On induced path number of graphs.*
Akira Negi, University of North Carolina, Chapel Hill (908-05-678)
- 6:00 PM (215) *Some polynomials associated with up-down permutations.*
Warren P. Johnson, Pennsylvania State University, University Park (908-05-496)

AMS Session on Applied Mathematics and Mathematical Physics, II

2:15 PM - 5:10 PM

- 2:15 PM (216) *Biorthogonality series solution of Stokes flow problems in sectorial regions.*
S. A. Khuri, University of Houston, Downtown (908-76-733)
- 2:30 PM (217) *Integral equations for a unified linear time-harmonic Maxwell type system.*
George A. Avirappattu, Indiana University, East (908-35-359)
- 2:45 PM (218) *Elimination of sensitivity to initial conditions and state selection under noise.*
Madjid Amir, University of Karlsruhe, Rechenzentrum, Germany (908-99-197)
- 3:00 PM (219) *Energy equations and existence of global attractors.* Preliminary report.
Xiaoming Wang, Indiana University, Bloomington (908-35-751)
- 3:15 PM (220) *Orbit structure of certain one dimensional multiple valued dynamical systems.*
Richard E. Lampe, University of Illinois, Urbana-Champaign (908-99-706)
- 3:30 PM (221) *Characterization of blow-up solutions to a certain nonlinear Volterra integral equation with a concentrated source.* Preliminary report.
Kelly Ann Molkenhain*, University of Rhode Island, and **Catherine A. Roberts**, Northern Arizona University (908-45-237)
- 3:45 PM (222) *On the interaction between a strongly continuous unitary group of operators and a projection.*
Stephen William Taylor, University of Auckland, New Zealand (908-99-814)
- 4:00 PM (223) *PBVP for second order integro-differential equations with general kernel.* Preliminary report.
M. V. Moorthy*, Ohio Dominican College, and **Sivapragasam Sathanathan**, Tennessee State University (908-45-420)
- 4:15 PM (224) *Bounded and periodic solutions in integral equations.*
Tingxiu Wang, Oakton Community College (908-45-34)
- 4:30 PM (225) *The Bourgain algebra of a nest algebra.*
Timothy G. Feeman, Villanova University (908-47-25)
- 4:45 PM (226) *Chern characters associated with almost commuting algebras.* Preliminary report.
Daoxing Xia, Vanderbilt University (908-47-59)
- 5:00 PM (227) *Antoine's necklace related to the Cantor set.*
Margaret M. LaSalle, University of Southwestern Louisiana (908-54-09)

AMS Session on Ordered Algebraic Structures

2:15 PM – 5:40 PM

- 2:15 PM (228) *Analytical translation of the mathematical lemmas in Newton's Principia, Book 1, Section 1.* Preliminary report.
Robert L. Lamphere, Elizabethtown Community College (908-01-749)
- ▶ 2:30 PM (229) *A Spanish translation of the Disquisitiones Arithmeticae.*
Michael Josephy, University of Costa Rica, Costa Rica (908-01-540)
- 2:45 PM (230) *Al-Karaji contribution to the development of algebra.* Preliminary report.
Ahlam E. Tannouri, Morgan State University (908-01-637)
- 3:00 PM (231) *Subdirect product decompositions for two classes of effect algebras.* Preliminary report.
Kuppusamy Ravindran, Louisiana Tech University (908-99-542)
- 3:15 PM (232) *Representable, non-solvable varieties of lattice ordered groups.* Preliminary report.
Michael A. Button, Bowling Green State University (908-06-443)
- 3:30 PM (233) *On the involuntary dimension of involution posets.* Preliminary report.
Khaled Al-Agha, Louisiana Tech University (908-06-679)
- 3:45 PM (234) *Effect algebras as partially ordered sets.* Preliminary report.
Scott R. Sykes, University of Massachusetts, Amherst (908-06-371)
- 4:00 PM (235) *The equivalence between Z -algebraic posets and Z -bialgebraic frames.*
Deborah L. Cotten, Vanderbilt University (908-06-512)
- 4:15 PM (236) *The automorphism group of a function lattice: A problem of Jónsson and McKenzie.*
Jonathan David Farley, Mathematical Science Research Institute (908-06-126)
- 4:30 PM (237) *Polynomial algorithms in the membership problem.*
Zoltan Szekely, University of South Carolina, Columbia (908-08-659)
- 4:45 PM (238) *Representing a many-sorted algebra as a partial algebra.* Preliminary report.
William P. Wardlaw* and **Anthony M. Gaglione**, U. S. Naval Academy (908-08-345)
- 5:00 PM (239) *Operations of fuzzy numbers under the general extension principle (I).*
Zengxiang Tong, Otterbein College (908-99-699)
- 5:15 PM (240) *Lebesgue measure and gambling.*
Vladimir Grigorievitch Kanovai, Moscow Institute of Railway Transport Engineers, Russia, and **Tom J. Linton***, Western Oregon State College (908-04-507)
- 5:30 PM (241) *Some peculiarities in the models of set theory.*
Tekamul Buber, Castleton State College (908-03-244)

MAA Session on Innovations in Teaching Linear Algebra, I

2:15 PM – 6:00 PM

- Organizers: **Donald R. LaTorre**, Clemson University
David C. Lay, University of Maryland, College Park
Steven J. Leon, University of Massachusetts, Dartmouth

- 2:15 PM (242) *Matrix-vector products geometrically: A versatile teaching tool.*
David R. Hill* and **David E. Zitarelli**, Temple University (908-00-1137)
- ▶ 2:35 PM (243) *A short course in linear algebra: A matrix approach using MATLAB.*
Lila Freeman Roberts, Georgia Southern University (908-00-1147)
- 2:55 PM (244) *Using ATLAST software tools to visualize linear transformations.*
Steven J. Leon, University of Massachusetts at Dartmouth (908-00-1144)
- 3:20 PM (245) *Pitch, roll and yaw.*
David W. Boyd*, Valdosta State University, and **Richard H. Elderkin**, Pomona College (908-00-1124)
- 3:40 PM (246) *A linear algebra project on circles in space.*
Carl C. Cowen, Purdue University, West Lafayette (908-00-1128)
- ▶ 4:00 PM (247) *Geometry of the singular value decomposition.*
Thomas A. Hern*, Bowling Green State University, and **Kermit N. Sigmon**, University of Florida (908-00-1136)
- 4:20 PM (248) *Eigenvalues of the alphabet.*
Larry C. Grove, University of Arizona (908-00-1134)
- ▶ 4:40 PM (249) *Coordinate systems and satellite tracking.*
Dan Kalman, American University (908-00-1141)
- 5:00 PM (250) *Visualizing linear combinations.*
David E. Zitarelli* and **David R. Hill**, Temple University (908-00-1153)
- 5:20 PM (251) *Using MATLAB without killing the instructor.*
James R. Weaver, University of West Florida (908-00-1151)
- 5:35 PM (252) *ATLAST experiences and their influence on teaching vector space concepts.*
Robert James Tilidetzke, Charleston Southern University (908-00-1149)
- 5:50 PM (253) *Three MATLAB projects.*
Richard O. Hill, Jr., Michigan State University (908-00-1138)

MAA Session on Teaching Mathematics by Blind Instructors or to Blind Students

2:15 PM – 5:35 PM

- Organizer: **Norberto Salinas**, University of Kansas
- ▶ 2:15 PM (254) *Teaching mathematics as a blind person.*
Abraham Nemeth, University of Detroit Mercy (908-00-1338)
- 2:45 PM (255) *New braille tools for blind mathematicians.*
John Gardner, Oregon State University (908-00-1336)
- 3:15 PM (256) *The blind professor and the sighted student.*
Lawrence W. Baggett, University of Colorado, Boulder (908-00-1335)
- 3:45 PM (257) *Teaching calculus using alternative techniques.*
Norberto Salinas, University of Kansas (908-00-1340)
- 4:15 PM (258) *Communicating with the graphing calculator.*
Elizabeth L. Doane, Housatonic Community Technical College (908-00-1341)
- 4:45 PM (259) *Both sides of the teacher's desk.*
Charles Hallenbeck, University of Kansas (908-00-1337)
- 5:15 PM (260) *Audio system for technical readings.*
T. V. Raman, Digital Equipment Corporation (908-00-1339)

AMS Special Session on Recursive and Feasible Mathematics, II

2:30 PM – 5:20 PM

Organizers: **Douglas Cenzer**, University of Florida
Jeffrey B. Remmel, University of California at San Diego

2:30 PM (261) *Computably categorical structures and the degree spectra of relations.* Preliminary report.

Richard A. Shore, Cornell University (908-03-453)

3:00 PM (262) *Reductibilities and dimensions of recursive structures.*

Bakhadyr Khoussainov, Cornell University (908-03-386)

3:30 PM (263) *Low_n Boolean algebras and the search for recursive copies.* Preliminary report.

John J. Thurber, Eastern Oregon State College (908-03-615)

4:00 PM (264) *Σ_2 -constructions and $I\Sigma_1$.*

Marcia J. Groszek, Dartmouth College, and **Tamara J. Hummel***, Allegheny College (908-03-265)

4:30 PM (265) *Partitions of Euclidean space.*

James H. Schmerl, University of Connecticut, Storrs (908-03-408)

5:00 PM (266) *On the semilattice of NP substructures of a polynomial time structure.* Preliminary report.

Anil Nerode*, Cornell University, and **Jeffrey B. Remmel**, University of California at San Diego, La Jolla (908-03-657)

MAA Invited Address

3:20 PM – 4:10 PM

(267) *Perspectives in the geometry of differential equations.*

Robert L. Bryant, Duke University (908-00-951)

AWM Panel Discussion

3:20 PM – 4:20 PM

Affirmative action: A look back and a look ahead.

Moderator: **Mary W. Gray**, American University

Panelists: **Ingrid Daubechies**, Princeton University

Robion C. Kirby, University of California, Berkeley

William A. Massey, AT&T Bell Laboratories

Cora S. Sadosky, Howard University

AWM Business Meeting

4:20 PM – 4:50 PM

MAA Minicourse #11: Part A

4:30 PM – 6:30 PM

Earth math: Applications of precalculus mathematics to environmental issues.

Organizers: **Christopher Schaufele**, Kennesaw State College

Nancy Zumoff, Kennesaw State College

MAA Minicourse #4: Part B

4:30 PM – 6:30 PM

Interdisciplinary lively applications.

Organizers: **David C. Arney**, U. S. Military Academy

Frank Giordano, U. S. Military Academy

MAA Minicourse #6: Part B

4:30 PM – 6:30 PM

Workshop mathematics: Using new pedagogy and technology in introductory courses.

Organizers: **Nancy Baxter Hastings**, Dickinson College

Allan Rossman, Dickinson College

AMS Committee on the Profession Presentation

4:30 PM – 6:00 PM

Nonacademic career opportunities in mathematics.

Presenter: **Linda Thiel**, Ursinas College

MAA Section Officers

4:30 PM – 6:30 PM

Reception for First-Time Participants

6:00 PM – 7:00 PM

Young Mathematicians Network Open Forum

7:15 PM – 8:15 PM

Concerns of young mathematicians: A town meeting.

Organizer: **Edward F. Aboufadel**, Southern Connecticut State University

AMS Josiah Willard Gibbs Lecture

8:30 PM – 9:30 PM

(268) *Is field theory the answer? Is string theory the answer? What was the question?*

Steven Weinberg, University of Texas, Austin (908-00-904)

AWM Open Reception

9:30 PM – 11:00 PM

Thursday, January 11

Joint Meetings Registration

7:30 AM – 4:00 PM

AMS-MAA Special Session on Research in Undergraduate Mathematics Education, II

8:00 AM – NOON

Organizers: **Annie Selden**, Tennessee Technological University
John Selden, MERC

- 8:00 AM *Anxiety in entry level mathematics and speech courses.* (269)
Bette L. Warren* and **Kathy Stacey**, Eastern Michigan University (908-00-994)
- 8:20 AM *Basic algebra via modeling.* (270)
Susan J. Lamon, Marquette University (908-00-986)
- 8:40 AM *Symbolism in precalculus mathematics.* (271)
▶ **Lillie F. Crowley**, Lexington Community College (908-00-976)
- 9:00 AM *Students' decision making for learning algebra.* (272)
▶ **Albert D. Otto*** and **Cheryl Lubinski**, Illinois State University (908-00-988)
- 9:25 AM *An assessment of pedagogical content knowledge for prospective secondary teachers.* (273)
Christine L. Ebert*, University of Delaware, and **Linda A. Bolte**, Eastern Washington University (908-00-977)
- 9:50 AM *Preservice teachers' levels of understanding functions in multirepresentational environments.* (274)
▶ **David B. Klanderma**, Trinity Christian College (908-00-985)
- 10:15 AM *Student preferences for representations of functions.* (275)
Brian A. Keller*, Iowa State University, and **Christian R. Hirsch**, Western Michigan University (908-00-984)
- 10:40 AM *Students' use of visual representations in the creation of proofs in advanced calculus.* (276)
▶ **David R. Gibson**, Murray State University (908-00-979)
- 11:05 AM *College students' understanding of proof.* (277)
Mary M. Goetting, Georgetown Day School (908-00-980)
- 11:25 AM *Interviewing undergraduate majors about proof.* (278)
▶ **Guershon Harel**, Purdue University, West Lafayette, and **Larry K. Sowder***, San Diego State University (908-00-991)
- 11:45 AM *Making sense of abstract algebra: The student's view.* (279)
▶ **Orit Hazzan*** and **Uri Leron**, Technion-Israel Institute of Technology, Israel (908-00-982)

AMS Special Session on Knot Theory, II

8:00 AM – NOON

- Organizer: **Tim D. Cochran**, Rice University
- 8:00 AM *Stability of lower central series of compact 3-manifold groups.* (280)
Tim D. Cochran, Rice University (908-57-397)
- 8:30 AM *Three manifold invariants and finite dimensional Hopf algebras.* Preliminary report. (281)
Louis H. Kauffman, University of Illinois, Chicago (908-57-80)
- 9:00 AM *Multiple strong fusions of boundary links.* (282)
Paul A. Bellis, Rice University (908-57-396)
- 9:30 AM Discussion
- 10:10 AM *The Kauffman-Radford-Hennings invariant for a general quantum group.* Preliminary report. (283)
Stephen F. Sawin, Massachusetts Institute of Technology (908-57-93)
- 10:40 AM *Links, Bousfield-Kan completions and closures of groups.* Preliminary report. (284)
Tim D. Cochran, Rice University, and **Kent Orr***, Indiana University, Bloomington (908-57-668)
- 11:10 AM *Link homotopy and the relative slice problem.* (285)
Vjacheslav S. Krushkal, University of California at San Diego, La Jolla (908-57-114)

- 11:40 AM *Vassiliev invariants of two component links and the Casson-Walker invariant.* (286)
Paul A. Kirk* and **Charles Livingston**, Indiana University, Bloomington (908-57-264)

AMS Special Session on Algebraic Groups and Invariant Theory, II

8:00 AM – 11:50 AM

- Organizers: **Amassa C. Fautleroy**, North Carolina State University
Aloysius G. Helminck, North Carolina State University
- 8:00 AM *Rings of covariants for finite coregular groups.* (287)
Preliminary report.
Harold E.A. Campbell, **Ian Hughes**, **Robert James Shank**, Queen's University, and **David L. Wehlau***, Royal Military College (908-13-581)
- 8:30 AM *Centralizers of locally nilpotent derivations.* (288)
David R. Finston*, New Mexico State University, Las Cruces, and **Sebastian Walcher**, Technical University of Munich, Germany (908-14-258)
- 9:00 AM *Quantization and invariant theory of nilpotent orbits.* Preliminary report. (289)
Ranee Kathryn Brylinski*, Pennsylvania State University, University Park, and **Bertram Kostant**, Massachusetts Institute of Technology (908-58-666)
- 9:30 AM Discussion
- 10:00 AM *Generalized Capelli identities.* (290)
Friedrich Knop* and **Siddhartha Sahi**, Rutgers University, New Brunswick (908-14-430)
- 10:30 AM Discussion
- 11:00 AM *Variation of geometric invariant theory quotients.* (291)
Yi Hu, University of Michigan, Ann Arbor (908-14-11)
- 11:30 AM *Dual to the McKay correspondence.* Preliminary report. (292)
Jean-Luc Brylinski, Pennsylvania State University, University Park (908-14-619)

AMS Special Session on Multidimensional Complex Dynamics, III

8:00 AM – NOON

- Organizers: **John Hamal Hubbard**, Cornell University
Ralph W. Oberste-Vorth, University of South Florida
- 8:00 AM *Remarks on multidimensional algebraic complex dynamics.* (293)
Petru Papadopol, Grand Canyon University (908-32-301)
- 8:50 AM *The topology of generalized Hénon mappings.* (294)
John Hamal Hubbard, Cornell University (908-32-665)
- 9:40 AM *On "Möbius" transformations of the 2×2 Siegel upper half plane.* (295)
Shmuel Friedland and **Pedro Freitas***, University of Illinois, Chicago (908-20-485)
- 10:30 AM *On some problems of complex dynamics in several variables.* (296)
Shmuel Friedland, University of Illinois, Chicago (908-58-513)
- 11:20 AM Discussion

AMS Special Session on Nonselfadjoint Operator Algebras and Their Applications, II

8:00 AM - 11:50 AM

Organizers: **Timothy D. Hudson**, East Carolina University
Elias G. Katsoulis, East Carolina University

- 8:00 AM (297) *Stable invariant subspaces.* Preliminary report. **Don W. Hadwin***, University of New Hampshire, and **John B. Conway**, University of Tennessee, Knoxville (908-47-575)
- 8:30 AM (298) *Extreme points in triangular UHF algebras.* **Timothy D. Hudson**, **Elias G. Katsoulis**, East Carolina University, and **David R. Larson***, Texas A & M University, College Station (908-47-590)
- 9:00 AM (299) *A new S. Brown-Lomonosov type lemma.* **Bernard Chevreau**, University of Bordeaux I, France, **WingSuet Li***, Georgia Institute of Technology, and **Carl M. Pearcy**, Texas A & M University, College Station (908-47-487)
- 9:30 AM (300) *Factoring upper triangular operators through the diagonal.* **John L. Orr*** and **David R. Pitts**, University of Nebraska, Lincoln (908-47-770)
- 10:00 AM (301) *Topological nilpotence.* **Justin R. Peters***, Iowa State University, and **Warren R. Wogen**, University of North Carolina, Chapel Hill (908-47-755)
- 10:30 AM (302) *Positive-definite functions on semigroups and isometric representations.* Preliminary report. **Gelu Fanica Popescu**, University of Texas, San Antonio (908-47-344)
- 11:00 AM (303) *Classification of direct systems of 4-cycle digraph algebras.* **Stephen C. Power***, University of Lancaster, England, and **Allan P. Donsig**, University of Waterloo (908-46-184)
- 11:30 AM (304) *Higher-dimensional amenability for operator algebras.* **Alan T. Paterson**, University of Mississippi, and **Roger R. Smith***, Texas A & M University, College Station (908-46-652)

AMS Special Session on Commutative Algebra, III

8:00 AM - 10:50 AM

Organizers: **Craig L. Huneke**, Purdue University, West Lafayette, and University of Michigan, Ann Arbor
Gennady Lyubeznik, University of Minnesota, Minneapolis

- 8:00 AM (305) *Factorial extensions of regular local rings and invariants of finite groups.* **Lucezar L. Avramov** and **Adam Richard Borek***, Purdue University, West Lafayette (908-13-229)
- 8:30 AM (306) *Saturated lexicographic ideals.* Preliminary report. **Heather A. Hulett***, Miami University, Oxford, and **Heath Mayall Martin**, University of Central Florida (908-13-461)
- 9:00 AM (307) *Hilbert functions and multiplicities.* Preliminary report. **Hema Srinivasan**, University of Missouri, Columbia (908-13-625)
- 9:30 AM (308) *Torsion-free morphisms and testing of flatness.* Preliminary report. **Volmer V. Vasconcelos**, Rutgers University, New Brunswick (908-13-85)

10:00 AM (309) *Weak and strong F-regularity are equivalent for isolated singularities.* **Brian C. MacCrimmon**, University of Michigan (908-13-380)

10:30 AM (310) *Intermediate rings between a local domain and its completion.* **William J. Heinzer**, Purdue University, West Lafayette, **Christel Rotthaus**, Michigan State University, and **Sylvia Margaret Wiegand***, University of Nebraska (908-13-773)

AMS Special Session on Computational Harmonic Analysis and Approximation Theory, III

8:00 AM - NOON

Organizers: **N. K. Govil**, Auburn University, Auburn
Richard A. Zalik, Auburn University, Auburn

- 8:00 AM (311) *Minimax analysis of signal recovery problems: Brutal reality or unrealistic counterexamples.* **Timothy E. Olson**, Dartmouth College (908-42-514)
- 8:25 AM (312) *Oblique multiwavelets.* **Akram Aldroubi**, National Institute of Health (908-42-661)
- 8:50 AM (313) *Non-orthogonal wavelet approximation with rates of deterministic signals.* Preliminary report. **George A. Anastassiou**, University of Memphis (908-41-33)
- 9:25 AM (314) *Poisson's summation formula and multiresolution discretization.* Preliminary report. **John J. Benedetto***, University of Maryland, College Park, and **Georg Zimmermann**, Vienna University, Austria (908-42-394)
- 9:50 AM (315) *Weyl-Heisenberg systems and the finite Zak transform.* **Richard Tolimieri**, City College, City University of New York (908-42-784)
- 10:15 AM (316) *Self-similarity and multiwavelets.* **Carlos Cabrelli*** and **Ursula M. Molter**, University of Buenos Aires, Argentina (908-42-654)
- 10:50 AM (317) *Efficient and reliable algorithms for convolution on the 2-sphere.* **Dennis M. Healy**, Dartmouth College (908-42-569)
- 11:15 AM (318) *Frame and basis perturbations.* Preliminary report. **Narendra Kumar Govil** and **R. A. Zalik***, Auburn University, Auburn (908-42-505)
- 11:40 AM (319) *Two-scale similarity transform and multiwavelets.* **Vasily Vladimirovich Strela**, Massachusetts Institute of Technology (908-30-88)

MAA Minicourse #11: Part B

8:00 AM - 10:00 AM

Earth math: Applications of precalculus mathematics to environmental issues.

Organizers: **Christopher Schaufele**, Kennesaw College
Nancy Zumoff, Kennesaw College

MAA Minicourse #12: Part A

8:00 AM - 10:00 AM

The use of symbolic computation in probability and statistics.

Organizers: **Zaven Karian**, Denison University
Elliot Tanis, Hope College

AMS Session on Combinatorics and Graph Theory, III

8:00 AM - 11:55 AM

- 8:00 AM *Radius versus diameter in cocomparability and intersection graphs.*
(320) **Erich Prisner**, Clemson University (908-05-669)
- 8:15 AM *The minimally 3-connected graphs with exactly five simple-contractible edges.*
(321) **Talmage James Reid**, University of Mississippi, and **Hai-dong Wu***, Southern University (908-05-646)
- 8:30 AM *The boundaries of squeezed 3-balls are Hamiltonian.*
(322) **Robert L. Hebble**, University of Kentucky (908-05-641)
- 8:45 AM *Hamiltonian decomposition of complete regular multipartite digraphs and lexicographic products.*
▶ (323) **Lenhard L. Ng**, Harvard University (908-05-594)
- 9:00 AM *Random player orderings on graph orientation games.*
▶ (324) **Ryan C. Siders**, University of Minnesota (908-05-607)
- 9:15 AM *Origami tessellations.*
▶ (325) **Thomas C. Hull**, University of Rhode Island (908-05-538)
- 9:30 AM *Optimally balanced orientations of graphs.*
(326) **John Frederick Fink***, University of Michigan, Dearborn, and **Joseph R. Barr**, University of California, Santa Barbara (908-05-537)
- 9:45 AM *Greatest common distance-preserving subgraphs.*
(327) **Heather Gavlas**, Western Michigan University (908-05-280)
- 10:00 AM *A minimization problem on product of graphs.*
(328) **Hosien S. Moghadam**, University of Wisconsin, Oshkosh (908-05-297)
- 10:15 AM *Rotation and jump distances between graphs.*
(329) **Gary Chartrand***, Western Michigan University, **Hector Hevia**, University Catolica de Valparaiso, Chile, and **Mark A. Johnson**, Upjohn (908-05-334)
- 10:30 AM *The decycling index of graphs.*
▶ (330) **Robert Charles Vandell*** and **Lowell W. Beineke**, Indiana University-Purdue University, Indianapolis (908-05-364)
- 10:45 AM *A multigraph result in network reliability theory.*
(331) **John Thomas Saccoman**, Seton Hall University (908-05-148)
- 11:00 AM *Polychrome spanning trees in complete graphs.*
(332) **Z. Tong** and **Deda Zheng***, South Carolina State University (908-99-49)
- 11:15 AM *Hamilton decompositions of block-intersection graphs.*
(333) **David Angus Pike**, Auburn University, Auburn (908-05-209)
- 11:30 AM *Combinatorial representations of visibility graphs.*
(334) Preliminary report.
Alice M. Dean*, Skidmore College, and **Joan P. Hutchinson**, Macalester College (908-05-409)
- 11:45 AM *Properties of codes from difference sets in 2-groups.*
(335) **Deirdre Longacher Smeltzer**, University of Saint Thomas (908-08-765)

AMS Session on Lie and Algebraic Groups

8:00 AM - 11:25 AM

- 8:00 AM *B-sheaves on G/B .* Preliminary report.
(336) **Thomas L. La Framboise**, Kenyon College (908-20-689)
- 8:15 AM *Pseudo algebraic integers.* Preliminary report.
(337) **Heather D. Ries*** and **Alexandra V. Shlapentokh**, East Carolina University (908-20-300)

- 8:30 AM *Finite presentation of subgroups of graph groups.*
(338) **Leonard A. VanWyk***, **Joshua D. Levy**, Hope College, and **Cameron Parker**, University of Redlands (908-20-172)
- 8:45 AM *The Frobenius direct image of line bundles and a positive characteristic resolution problem.*
(339) **Mary Lynn Reed**, Philadelphia College of Pharmacy and Science (908-20-110)
- 9:00 AM *$SL_2(\mathbb{C})$, the cubic and the quartic.*
(340) **Yannis Y. Papageorgiou**, Yale University (908-20-98)
- 9:15 AM *A classification of multiplicity free actions.*
(341) **Chal Benson*** and **Gail D.L. Ratcliff**, University of Missouri, St. Louis (908-20-22)
- 9:30 AM *When is a Weyl group a subgroup?*
▶ (342) **Daniel J. Goldstein**, Harvard University (908-22-740)
- 9:45 AM *Lengths of closed geodesics in Heisenberg-like 2-step nilmanifolds.* Preliminary report.
(343) **Maura B. Mast***, University of Northern Iowa, and **Ruth Gornet**, Texas Tech University (908-22-683)
- 10:00 AM *Dual representations of GL_∞ and decomposition of Fock spaces.*
(344) **R. Michael Howe**, University of Iowa (908-22-599)
- 10:15 AM *Lusternik-Schnirelmann category and simplicial objects.*
(345) **Aaron G. Montgomery**, University of Wisconsin, Madison (908-22-498)
- 10:30 AM *Complex analytic subgroups of affine algebraic groups.*
(346) **Patrick B. Chen***, John Carroll University, and **Ta-Sun Wu**, Case Western Reserve University (908-22-526)
- 10:45 AM *A canonical decomposition of the Kasparov groups.*
(347) **Claude L. Schochet**, Wayne State University (908-19-592)
- 11:00 AM *HNN extensions of inverse semigroups.*
(348) **Akihiro Yamamura**, University of Nebraska, Lincoln (908-20-808)
- 11:15 AM *The mod 2 cohomology of the Sylow 2 subgroup of the Higman-Sims sporadic simple group.*
(349) **Richard A. Laird**, Emporia State University (908-20-811)

AMS Session on Probability Theory

8:00 AM - 12:10 PM

- 8:00 AM *Runs of no winner in Oregon Megabucks lottery.*
▶ (350) Preliminary report.
D. Richard Iltis, Willamette University (908-60-717)
- 8:15 AM *Rate of convergence for the $\pm\alpha$ random walk on the circle.*
(351) **Francis Edward Su**, Harvard University (908-60-777)
- 8:30 AM *On moments of squared norm of a RKHS valued Gaussian random element.*
(352) **Milan N. Lukic**, University of Wisconsin, Milwaukee (908-60-606)
- 8:45 AM *Stochastic integration with respect to a stochastic integral in Banach spaces.*
(353) **Nicolae Dinculeanu**, University of Florida (908-60-529)
- 9:00 AM *Directionally reinforced processes.* Preliminary report.
(354) **R. Daniel Mauldin**, **Michael G. Monticino***, University of North Texas, and **Heinrich V. Weizsacker**, University of Kaiserslautern, Germany (908-60-499)

- 9:15 AM (355) *Discrete approximations for stochastic differential equations coupled with a variational inequality.*
Roger Pettersson, University of North Carolina, Chapel Hill (908-60-488)
- 9:30 AM (356) *The stock market: Deterministic or probabilistic?*
Gholamreza G. Dargahi-Noubary, Bloomsburg University of Pennsylvania (908-60-395)
- 9:45 AM (357) *Strong laws for L- and U-statistics.* Preliminary report.
Jonathan S.B. Aaronson, Tel Aviv University, Israel, **Robert M. Burton, Jr.**, Oregon State University, **Herold Dehling**, University of Groningen, The Netherlands, **David Gilat**, Tel Aviv University, Israel, **Theodore P. Hill***, Georgia Institute of Technology, and **Benjamin Weiss**, Hebrew University of Jerusalem, Israel (908-60-370)
- 10:00 AM (358) *Locally time-varying harmonizable spatially isotropic random fields.* Preliminary report.
Randall J. Swift, Western Kentucky University (908-60-340)
- 10:15 AM (359) *Ergodic sequences of stochastic matrices with application to Markov random fields.* Preliminary report.
Bruce W. Atkinson, Samford University (908-60-323)
- 10:30 AM (360) *Weak convergence of interacting systems of SDEs.*
P. Sundar*, Louisiana State University, Baton Rouge, and **A. Bose**, Carleton University (908-60-745)
- 10:45 AM (361) *Monotonic approach to central limits.*
Jonathan Kane, University of Wisconsin, Whitewater (908-60-133)
- 11:00 AM (362) *Path integral representations of the solutions of hyperbolic equations.*
Ram Vedantham, University of North Carolina, Wilmington (908-60-100)
- 11:15 AM (363) *Numerical solutions of stochastic PDE.*
Ruifeng Liu, Michigan State University (908-60-67)
- 11:30 AM (364) *Parameter estimation for a non-ergodic process.* Preliminary report.
Russell D. Rupp, Ridgecrest, California (908-60-08)
- 11:45 AM (365) *The joint determination of optimal stopping and optimal selection in a stochastic environment.*
Amy L. Biesterfeld, University of California, Los Angeles (908-60-312)
- NOON (366) *Change problems.* Preliminary report.
Prem N. Bajaj, Wichita State University (908-60-189)
- 9:30 AM (373) *Bounding the discriminants of fields that have rational Hilbert modular threefolds.*
H. G. Grundman, Bryn Mawr College (908-11-253)
- 9:45 AM (374) *Examples of genus 2 curves defined over the rationals and with CM.* Preliminary report.
Paul B. van Wamelen, Louisiana State University, Baton Rouge (908-11-650)
- 10:00 AM (375) *On the norm exponent of a quartic extension of a number field of class number one.*
Robert Lawrence Yest, Arizona State University (908-11-692)
- 10:15 AM (376) *Annihilators of scaled trace forms.*
Robert V. Perlis, Louisiana State University, Baton Rouge, and **Patricia Wright Beaulieu***, University of Southwestern Louisiana (908-11-715)
- 10:30 AM (377) *Average values of the class group of quadratic fields over finite fields.*
Zesen Chen, University of Massachusetts, Amherst (908-11-611)
- 10:45 AM (378) *New computations in connection with Stark's conjecture.*
Brett A. Tangedal, University of Vermont (908-11-91)
- 11:00 AM (379) *Three open problems (and some partial answers) relating permutation representations to Iwasawa Z_p towers.*
Robert V. Perlis and **Nancy Colwell Segal***, Louisiana State University, Baton Rouge (908-11-536)
- 11:15 AM (380) *Spherical functions on finite upper half planes.*
Steven C. Poulos, Xavier University (908-99-747)
- 11:30 AM (381) *The jacobian of non-split Cartan modular curves.*
Imin Chen, University of Oxford, England (908-11-77)

AMS Session on Ordinary Differential Equations, I

8:00 AM - 11:40 AM

- 8:00 AM (382) *Time is complex.*
Nora C. Hopkins, Indiana State University (908-34-506)
- 8:15 AM (383) *Radial solutions of $\Delta v + f(v) = 0$ in \mathbb{R}^N .* Preliminary report.
Joseph Anthony Iaia, University of North Texas (908-34-217)
- 8:30 AM (384) *Existence results for a class of steady-state diffusion-reaction problems.* Preliminary report.
Jackie B. Garner, University of Arkansas, Little Rock (908-34-309)
- 8:45 AM (385) *The dynamical system called Daisyworld.* Preliminary report.
Walter A. Pranger, DePaul University (908-34-279)
- 9:00 AM (386) *Effects of diffusion on the stability of competitive systems.*
Shair Ahmad and **M. R. M. Rao***, University of Texas, San Antonio (908-34-239)
- 9:15 AM (387) *Extension of the method of quasilinearization and cubic convergence.*
R. N. Mohapatra and **Kuppapalle Vajravelu***, University of Central Florida (908-34-330)
- 9:30 AM (388) *Stability of random neural networks.* Preliminary report.
Gangaram S. Ladde, University of Texas, Arlington, and **Masilamani Sambandham***, Morehouse College (908-34-401)
- 9:45 AM (389) *A method for solving the magnetic boundary problem by iteration using the Green's function.*
Joan Rohrer Hundhausen*, Colorado School of Mines, Golden, and **Boon Chye Low**, National Center for Atmospheric Research, Boulder, Colorado (908-45-357)

AMS Session on Number Theory

8:00 AM - 11:40 AM

- 8:00 AM (367) *Does the Riemann Hypothesis imply a "complete" Vinogradov 3-primes theorem?*
Gove W. Effinger, Skidmore College (908-11-64)
- 8:15 AM (368) *On digital sums and large digits of certain powers.*
Robert E. Kennedy* and **Curtis N. Cooper**, Central Missouri State University (908-11-579)
- 8:30 AM (369) *Number of solutions of a pair of quadratic forms over a finite field.* Preliminary report.
Laura Mann Schueller, University of Kentucky (908-11-684)
- 8:45 AM (370) *Multiplicities of the Euler ϕ -function.*
Jeffrey J. Holt*, Michigan Technological University, **Starlett D. Louis** and **Nikki J. Thompson**, Hampton University (908-11-474)
- 9:00 AM (371) *An algorithm for solving Legendre's equation.*
Patrick S. Mitchell, Southeastern Louisiana University (908-11-254)
- 9:15 AM (372) *Criterion for the equality of norm groups of idele groups.* Preliminary report.
Leonid Stern, Towson State University (908-11-55)

- 10:00 AM *Cubic spline method for non-linear singularity-perturbed initial value problems.*
(390) **Rajesh K. Bawa**, Longowal Institute of Engineering & Technology, India (908-99-419)
- 10:15 AM *Linearization of retarded differential equations.*
(391) **Zhivko S. Athanassov**, Bulgarian Academy of Science, Bulgaria (908-34-426)
- 10:30 AM *Predicting the optimum quotas for stochastic harvest control model.* Preliminary report.
(392) **Ahlam E. Tannouri** and **Samir Tannouri***, Morgan State University (908-34-636)
- 10:45 AM *Periodic solutions with prescribed energy for a singular Hamiltonian system.*
(393) **Thomas O. Maxwell**, Brigham Young University (908-34-494)
- 11:00 AM *Data dependence for nonlinear boundary value problems.*
(394) **Jeffrey A. Ehme**, Spelman College (908-34-772)
- 11:15 AM *Criteria of integrability of the generalized Riccati equation.*
▶ (395) **Mira Bhargava**, Hofstra University (908-34-737)
- 11:30 AM *Local properties of solutions of a differential equation via normed linear spaces.* Preliminary report.
(396) **Frederick D. Gyls-Colwell** and **Michael A. Karls***, Ball State University (908-34-557)

MAA Session on Planning Reformed Calculus Programs: Experiences and Advice, I

8:00 AM – 11:55 AM

- Organizer: **Martin E. Flashman**, Humboldt State University
- 8:00 AM *Implementation of a new curriculum: How the paradigm shift affects all aspects of instruction.*
▶ (397) **Barbara E. Reynolds**, Cardinal Stritch College and Brown University (908-00-1261)
- 8:15 AM *A taxonomy for creating writing assignments in mathematics.*
(398) **Thomas G. Trivison**, Skidmore College (908-00-1264)
- 8:30 AM *Implementing C4L.* Preliminary report.
▶ (399) **William E. Fenton**, Bellarmine College (908-00-1248)
- 8:45 AM *Establishing a departmental consensus for reform.*
(400) **James J. Reynolds**, Clarion University (908-00-1262)
- 9:00 AM *Close contact calculus at the University of Maryland, College Park.*
(401) **Denny Gulick**, University of Maryland, College Park (908-00-1254)
- 9:15 AM *Some errors to avoid in reforming a calculus program.*
(402) **John S. Meyer**, Muhlenberg College (908-00-1259)
- 9:30 AM *Restructuring calculus at Sam Houston State University.*
(403) **David Karl Ruch**, Sam Houston State University (908-00-1263)
- 9:45 AM *Students' retention in the light of calculus reform.*
(404) **Vesna Kilibarda**, University of Alaska, Juneau (908-00-1256)
- 10:00 AM *Departmental change: Working with other disciplines.* Preliminary report.
(405) **J. Curtis Chipman**, Oakland University (908-00-1246)
- 10:20 AM *Maxima and minima in designing the AUGMENT curriculum.*
(406) **Lawrence E. Copes**, Augsburg College (908-00-1247)

- 10:40 AM *Implementing a Mathematica-based calculus curriculum.*
▶ (407) **Francisco Alarcon***, **Charles H. Bertness** and **Rebecca A. Stoudt**, Indiana University of Pennsylvania (908-00-1240)
- 11:00 AM *Gaining college wide acceptance for reformed calculus.*
(408) **Robert P. Webber**, Longwood College (908-00-1265)
- 11:15 AM *Seven years of Project CALC at Duke University—approaching a steady state?*
(409) **Jack Bookman**, Duke University (908-00-1243)
- 11:30 AM *Calculus reform at the University of Northern Colorado.*
▶ (410) **Dean E. Allison**, University of Northern Colorado (908-00-1241)
- 11:45 AM *Process of calculus reform at UNCA: Students, faculty, administration, grants.*
▶ (411) **Sherry L. Gale**, University of North Carolina, Asheville (908-00-1251)

MAA Session on Creating an Active Learning Environment: Preparing Pre-service Teachers, I

8:00 AM – 11:50 AM

- Organizers: **Hubert J. Ludwig**, Ball State University
Kay Meeks Roebuck, Ball State University
- 8:00 AM Welcome; Introductory Remarks; Organizational Comments
- 8:05 AM *Computer applications in the teaching of mathematics—Version L.*
(412) **Hubert J. Ludwig**, Ball State University (908-00-1102)
- 8:20 AM *Patterns, functions, and recursion for the middle school teacher.*
(413) **Mary M. Sullivan***, Curry College, and **Connie M. Yarema**, East Texas State University (908-00-1113)
- 8:35 AM *Carousel numbers—a lead-in to number theory.*
▶ (414) **Gary B. Klatt**, University of Wisconsin, Whitewater (908-00-1100)
- 8:50 AM *MathKit lessons in a “teaching methods” course.*
(415) **Louise McNertney Berard**, Wilkes University (908-00-1093)
- 9:05 AM *Using technology to teach mathematics: A course for pre-service middle and secondary school teachers.*
▶ (416) **Michael B. Fiske**, Saint Cloud State University (908-00-1095)
- 9:20 AM *Creating an active learning environment: Preparing pre-service teachers with technology and discovery lessons at North Park College.*
▶ (417) **Leona L. Mirza**, North Park College (908-00-1104)
- 9:30 AM *Technology training of pre-service teachers.*
▶ (418) **Cathleen Maria Zucco**, Syracuse University (908-00-1116)
- 9:50 AM *Open-ended logo projects—A natural active learning environment.*
▶ (419) **Susann M. Mathews**, Wright State University, Dayton (908-00-1103)
- 10:10 AM *Teaching and learning mathematics with spreadsheets.*
(420) **Kay I. Meeks Roebuck**, Ball State University (908-00-1107)
- 10:25 AM *A course in mathematics and technology for prospective teachers.*
▶ (421) **Vincent P. Schielack, Jr.**, Texas A & M University, College Station (908-00-1109)

- 10:40 AM (422) *A teacher in-service course on technology.*
Carl R. Spitznagel, John Carroll University (908-00-1111)
- 10:55 AM (423) *NUMBERS—an interactive tutorial program.*
Kenneth E. Thomas, Andrews University (908-00-1114)
- 11:10 AM (424) *Technology as a tool: Modeling for preservice teachers.*
Blake Ellis Peterson, Oregon State University (908-00-1106)
- 11:25 AM (425) *Creating an active learning environment: Preparing pre-service teachers using faculty development workshops.*
William P. Fox, U. S. Military Academy (908-00-1097)
- 11:40 AM (426) *Ideas and idea sources for creating active learning environments for prospective elementary teachers.*
Dale R. Oliver* and **Phyllis Z. Chinn**, Humboldt State University (908-00-1105)

MAA Session on The Scholarship of Humanistic Mathematics, I

8:00 AM – 11:55 AM

Organizers: **Joan Countryman**, The Lincoln School, Providence, Rhode Island
Harald M. Ness, University of Wisconsin Centers-Fond du Lac
Alvin M. White, Harvey Mudd College

- 8:00 AM (427) *Humanistic mathematics*
Kazem Mahdavi, State University of New York, College at Potsdam (908-00-1288)
- 8:20 AM (428) *Measuring the relative effectiveness of military opponents.*
Thomas J. O'Reilly, Saint Joseph's University (908-00-1291)
- 8:40 AM (429) *The rhythm of problem-solving.*
Martin Vern Bonsangue, California State University, Fullerton (908-00-1272)
- 9:00 AM (430) *Mathematics and arts.*
Mihaela Anca Poplicher, University of New Hampshire (908-00-1292)
- 9:20 AM (431) *Integrating art, computing, and children's writing with mathematics.*
Deane E. Arganbright*, University of Papua New Guinea, Papua New Guinea, and **Susan Arganbright**, Gonzaga University (908-00-1270)
- 9:40 AM (432) *Calculus for liberal arts: A humanistic approach.*
Kathleen M. Shannon, Salisbury State University (908-00-1294)
- 10:00 AM (433) *Devising channels that nurture ingenuity and creativity in mathematics classes.*
Helen Christensen, Loyola College (908-00-1275)
- 10:20 AM (434) *Multicultural mathematics in upper division math courses.*
Michael Morelli, University of Nebraska, Lincoln (908-00-1290)
- 10:40 AM (435) *A capstone writing course in mathematics.*
Raymond F. Coughlin, Temple University (908-00-1278)
- 11:00 AM (436) *Student poems and stories on conic sections, set theory and more.*
Regina Baron Brunner, Cedar Crest College (908-00-1274)
- 11:20 AM (437) *History of mathematics in Jeopardy.*
Robert Lewand, Goucher College (908-00-1287)
- 11:40 AM (438) *The first CAMS project at Salisbury State University.*
Barbara A. Wainwright and **Homer W. Austin***, Salisbury State University (908-00-1271)

Employment Register Interviews

8:15 AM – 4:40 PM

AMS Special Session on Recursive and Feasible Mathematics, III

8:30 AM – 11:20 AM

Organizers: **Douglas Cenzer**, University of Florida
Jeffrey B. Remmel, University of California at San Diego

- 8:30 AM (439) *On the complexity of finding the obstruction set.*
William Gasarch, University of Maryland, College Park (908-03-162)
- 9:00 AM (440) *Feasible graphs with standard universe.*
Douglas Cenzer, University of Florida, and **Jeffrey B. Remmel***, University of California at San Diego, La Jolla (908-03-382)
- 9:30 AM (441) *Difference sets and computability.* Preliminary report.
Rodney G. Downey, Victoria University, New Zealand, **Zoltan Furedi**, **Carl G. Jockusch, Jr.*** and **Lee A. Rubel**, University of Illinois, Urbana-Champaign (908-03-517)
- 10:00 AM (442) *On a question of Los.* Preliminary report.
Theodore A. Slaman*, University of Chicago, and **W. Hugh Woodin**, University of California, Berkeley (908-03-656)
- 10:30 AM (443) *Approximate inference with generic oracles.*
Douglas Cenzer and **William R. Moser***, University of Florida (908-03-446)
- 11:00 AM (444) *Proof theoretic large cardinals.*
Edward R. Griffor, Uppsala University, Sweden (908-03-484)

AMS Special Session on Differential Geometry and Mathematical Relativity, II

8:30 AM – 11:50 AM

Organizer: **Gregory J. Galloway**, University of Miami, Coral Gables

- 8:30 AM (445) *Uniqueness problem of Schwarzschild-de Sitter spacetime.*
Abul K. Muhammad Masood-ul-Alam, University of Miami (908-04-416)
- 9:00 AM (446) *A uniqueness theorem for degenerate electro-vacuum black holes.*
Piotr T. Chrusciel, Université de Tours, France, and Polish Academy of Sciences, Poland (908-83-414)
- 9:30 AM (447) *Harmonic maps with prescribed singularities on unbounded domains.*
Gilbert A. Weinstein, University of Alabama, Birmingham (908-58-31)
- 10:00 AM (448) *On the 2 + 1 dimensional Einstein evolution equations.*
Lars Andersson*, Royal Institute of Technology, Sweden, and **Vincent E. Moncrief**, Yale University (908-83-211)
- 10:30 AM (449) *Existence of asymptotically hyperboloidal solutions of the Einstein constraint equations with nonconstant mean curvature.*
Jiseong Park, University of Oregon (908-83-511)
- 11:00 AM (450) *Collapsing regions and black hole formation.*
Gregory A. Burnett, University of Florida (908-83-30)
- 11:30 AM (451) *Topological censorship in cosmology.*
Kristin A. Schleich and **Donald M. Witt***, University of British Columbia (908-58-675)

AWM Emmy Noether Lecture

9:00 AM - 9:50 AM

- (452) *On some homogenization problems for differential operators.*
Olga A. Oleinik, Moscow State University, Moscow, Russia

AMS Special Session on Analytic Methods in Several Complex Variables, II

9:00 AM - 11:50 AM

Organizer: **F. Michael Christ**, University of California, Los Angeles

- 9:00 AM (453) *Local and global regularity for box-b and d-bar Neumann.*
David S. Tartakoff, University of Illinois, Chicago (908-35-492)
- 9:30 AM (454) *Remarks on the Bergman and Szegő kernels.*
Nicholas Hanges, Herbert H. Lehman College, City University of New York (908-32-545)
- 10:00 AM (455) *On an interesting one form on the boundary of a pseudoconvex domain.* Preliminary report.
Emil J. Straube, Texas A & M University, College Station (908-32-390)
- 10:30 AM (456) *An extension of Hormander's theorem for infinitely degenerate differential operators.*
Denis R. Bell*, University of North Florida, and **Salah-E Mohammed**, Southern Illinois University, Carbondale (908-35-298)
- 11:00 AM (457) *Subelliptic estimates for the d-bar-Neumann operator on piecewise strongly pseudoconvex variables.*
Mei-Chi Shaw*, University of Notre Dame, and **Joachim Michel**, University of Calais, France (908-32-473)
- 11:30 AM (458) *Global regularity of twisted Laplacians on pseudoconvex domains.*
Jeffery D. McNeal, Princeton University (908-32-586)

JPBM Session

9:00 AM - 10:00 AM

Taking advantage of Math Awareness Week (MAW).
Moderator: **Gerald J. Porter**, University of Pennsylvania
Organizers: **Richard H. Herman**, Joint Policy Board for Mathematics
Kathleen Holmay, Joint Policy Board for Mathematics

AMS Electronic Products and Services Presentation

9:00 AM - 10:00 AM

e-MATH on the World Wide Web.
Organizers: **Wendy A. Bucci**, American Mathematical Society
Ralph E. Youngen, American Mathematical Society

Book Sale and Exhibits

9:00 AM - 5:00 PM

MAA Invited Address

10:05 AM - 10:55 AM

- (459) *Creating opportunities for minorities in mathematics.*
Etta Z. Falconer, Spelman College (908-00-952)

AMS Invited Address

11:10 AM - NOON

- (460) *Ordinary differential equations which generate all knots and links.*
Philip John Holmes*, Princeton University, and **Robert W. Ghrist**, Cornell University, Ithaca (908-00-905)

AMS Colloquium Lectures: Lecture II

1:00 PM - 2:00 PM

- (461) *Modular forms, elliptic curves and Galois representations.*
Andrew J. Wiles, Princeton University

MAA Invited Address

2:15 PM - 3:05 PM

- (462) *Vector fields, flows, and invariant sets.*
Krystyna M. Kuperberg, Auburn University, Auburn (908-00-954)

AMS Special Session on Analytic Methods in Several Complex Variables, III

2:15 PM - 4:05 PM

- Organizer: **F. Michael Christ**, University of California, Los Angeles
- 2:15 PM (463) *An invariant sequence of sets attached to a real analytic CR manifold and applications.* Preliminary report.
M. Salah Baouendi, **P. Ebenfelt*** and **Linda Preiss Rothschild**, University of California at San Diego, La Jolla (908-32-469)
- 2:45 PM (464) *Obstruction to solvability of first order linear systems.*
Abdelhamid Meziani, Florida International University (908-35-262)
- 3:15 PM (465) *Global properties of a class of vector fields of infinite type.*
Shiferaw Berhanu, Temple University (908-32-186)
- 3:45 PM (466) *Holomorphic maps of real manifolds and algebraic sets in complex space.* Preliminary report.
M. Salah Baouendi*, **P. Ebenfelt** and **Linda Preiss Rothschild**, University of California at San Diego, La Jolla (908-32-662)

AMS Special Session on Knot Theory, III

2:15 PM - 4:10 PM

- Organizer: **Tim D. Cochran**, Rice University
- 2:15 PM (467) *Counting intersections of curves in Heegaard surfaces.* Preliminary report.
John P. Hempel, Rice University (908-57-429)
- 2:45 PM (468) *Free knots.*
William H. Kazez*, University of Georgia, and **David Gabai**, California Institute of Technology (908-57-266)

- 3:20 PM *Knot-theoretical constructions of Stein domains in complex surfaces.* Preliminary report.
(469) **Lee N. Rudolph***, Clark University, and **M. Boileau**, Université Paul Sabatier, France (908-32-472)
- 3:50 PM *Representations of knot groups, equivariant knot signature, and the Casson invariant.*
(470) **Christopher M. Herald**, McMaster University (908-57-317)

AMS Special Session on Diophantine Problems From Different Perspectives, I

2:15 PM - 4:05 PM

Organizers: **Henri Rene Darmon**, McGill University
Andrew J. Granville, University of Georgia

- 2:15 PM *Descent on curves.* Preliminary report.
(471) **William G. McCallum**, Institute for Advanced Study (908-14-787)
- 2:45 PM *The mean values of some Hecke L-series at some integers.*
(472) **Songjie Ren**, University of Georgia (908-11-268)
- 3:15 PM *Rational points on K3 surfaces in $\mathbb{P}^1 \times \mathbb{P}^1 \times \mathbb{P}^1$.*
(473) **Arthur Baragar**, University of Waterloo (908-14-797)
- 3:45 PM *Lang's conjecture and uniformity.*
(474) **Dan Abramovich**, Boston University (908-11-120)

AMS Special Session on Algebraic Groups and Invariant Theory, III

2:15 PM - 4:15 PM

Organizers: **Amassa C. Fauntleroy**, North Carolina State University
Aloysius G. Helminck, North Carolina State University

- 2:15 PM *Chevalley's restriction theorem for modules of covariants.*
▶ (475) **Abraham Broer**, University of Montreal (908-14-535)
- 2:40 PM *Polynomial representations, algebraic monoids, and subalgebras of Schur algebras.* Preliminary report.
(476) **Stephen R. Doty**, Loyola University of Chicago (908-20-667)
- 3:05 PM *Well-filtered algebras.* Preliminary report.
(477) **Istvan Agoston**, Hungarian Academy of Science, Hungary, **Vlastimil Dlab***, Carleton University, and **Erzsebet Lukacs**, Technical University of Budapest, Hungary (908-16-164)
- 3:30 PM *On the characters of certain Demazure modules.*
(478) **Yasmine B. Sanderson**, University Louis Pasteur, France (908-17-425)
- 3:55 PM *Loewy series of modular principal series representations for finite groups of Lie type.*
(479) **Cornelius Pillen**, University of South Alabama (908-20-633)

AMS Special Session on Differential Geometry and Mathematical Relativity, III

2:15 PM - 4:05 PM

Organizer: **Gregory J. Galloway**, University of Miami, Coral Gables

- 2:15 PM *Approach to the singularity in Gowdy spacetimes.*
(480) **Vincent E. Moncrief**, Yale University, **David Garfinkle*** and **Beverly K. Berger**, Oakland University (908-83-480)

- 2:45 PM *The stress-energy operator.*
(481) **Adam D. Helfer**, University of Missouri, Columbia (908-81-165)
- 3:15 PM *Characteristic classes for pseudo-Riemannian manifolds with transverse metric singularities.* Preliminary report.
(482) **Marek B. Kossowski**, University of South Carolina, Columbia (908-58-331)
- 3:45 PM *Signature change in general relativity.* Preliminary report.
(483) **Tevian Dray**, Oregon State University (908-83-574)

AMS Special Session on Nonselfadjoint Operator Algebras and Their Applications, III

2:15 PM - 4:05 PM

Organizers: **Timothy D. Hudson**, East Carolina University
Elias G. Katsoulis, East Carolina University

- 2:15 PM *Higher order Ext groups and the similarity problem.* Preliminary report.
(484) **Sarah H. Ferguson**, University of Houston (908-47-347)
- 2:45 PM *Extensions of operators.*
(485) **Warren R. Wogen**, University of North Carolina, Chapel Hill (908-47-343)
- 3:15 PM *From scaling function to wavelet.*
(486) **Xingde Dai***, University of North Carolina, Charlotte, and **Shijie Lu**, Zhejiang University, Peoples Republic of China (908-47-634)
- 3:45 PM *Mappings preserving invertible elements of Banach and C^* algebras.* Preliminary report.
(487) **Lawrence A. Harris***, University of Kentucky, and **Richard V. Kadison**, University of Pennsylvania (908-46-441)

MAA Minicourse #10: Part B

2:15 PM - 4:15 PM

Mathematical algorithms, models, and graphic representations using spreadsheets.

Organizers: **Deane E. Arganbright**, University of Papua New Guinea
Erich Neuwirth, University of Vienna
Robert S. Smith, Miami University, Oxford

MAA Minicourse #5: Part B

2:15 PM - 4:15 PM

Business calculus: A new real-data/model-building approach.

Organizers: **Iris B. Feta**, Clemson University
John L. Kenelly, Clemson University
Donald LaTorre, Clemson University

MAA Minicourse #7: Part B

2:15 PM - 4:15 PM

The historical development of the foundations of mathematics.

Organizer: **Robert L. Brabenec**, Wheaton College

MAA Minicourse #9: Part B

2:15 PM – 4:15 PM

*Calculus for the 21st century.*Organizers: **Lawrence C. Moore**, Duke University
David A. Smith, Duke University**AMS Session on Education, II**

2:15 PM – 3:55 PM

- 2:15 PM
▶ (488) *We reform with a little help from our friends—Erdős, Goldbach, and Pascal.*
Emelie Kenney*, **James R. Matthews**, Siena College, and **Lester A. Rubinfeld**, Rensselaer Polytechnic Institute (908-98-86)
- 2:30 PM
(489) *A concrete, collaborative course in algebra, or group exercises in group theory.*
Sharon E. Persinger, Bronx Community College, City University of New York (908-98-76)
- 2:45 PM
▶ (490) *Roles for research mathematicians in K-12 mathematics education.*
David Allen Singer, Case Western Reserve University, and **Susan L. Addington***, California State University, San Bernardino (908-98-117)
- 3:00 PM
▶ (491) *Writing to learn mathematics.*
Mahmoud Abu-Joudeh, Saint Paul's College (908-98-185)
- 3:15 PM
▶ (492) *Leading the way to systemic change—innovations in teacher preparation programs.*
Elizabeth G. Yanik, Emporia State University (908-98-379)
- 3:30 PM
(493) *Simulation and family income.*
David E. Tepper, Bernard M. Baruch College, City University of New York (908-98-544)
- 3:45 PM
▶ (494) *What affects women's decisions to pursue graduate degrees in mathematics?*
Kathleen L. Bonn, Southern Illinois University, Carbondale (908-98-393)

AMS Session on Ordinary Differential Equations, II

2:15 PM – 3:55 PM

- 2:15 PM
(495) *On asymptotic behavior of non-monotone solutions of the Berman equation.* Preliminary report.
Chunqing Lu, Southern Illinois University, Edwardsville (908-34-196)
- 2:30 PM
(496) *Unified economical model on time scale.*
Seenith Sivasundaram, Embry-Riddle Aeronautical University (908-34-177)
- 2:45 PM
(497) *Existence criteria for periodic boundary value problems with singular coefficients.* Preliminary report.
Josaphat A. Uvah, University of West Florida (908-34-160)
- 3:00 PM
(498) *Analytic solutions of a degenerated system of two nonlinear equations at an irregular type singularity.*
Po-Fang Hsieh, Western Michigan University (908-34-141)
- 3:15 PM
(499) *Singular perturbations in a non-linear viscoelasticity.*
James H. Liu, James Madison University (908-34-48)
- 3:30 PM
(500) *Positive solutions for nonlinear eigenvalue problems.*
Johnny L. Henderson*, Auburn University, Auburn, and **Haiyan Wang**, Michigan State University (908-34-13)
- 3:45 PM
(501) *Stability of invariant sets on time scales.*
Zahia Drici, Illinois Wesleyan University (908-34-804)

MAA Session on Standards for Introductory College Mathematics Courses Before Calculus, II

2:15 PM – 3:55 PM

Organizers: **Gregory D. Foley**, Sam Houston State University
Jon Wilkin, Northern Virginia Community College

- 2:15 PM
(502) *Mathematics for critical thinking: A general education mathematics course.*
Curtis C. McKnight and **Andy R. Magid***, University of Oklahoma (908-00-1322)
- 2:30 PM
(503) *Problem solving as a graduation requirement.*
James R. Bozeman* and **Daisy C. McCoy**, Lyndon State College (908-00-1304)
- 2:45 PM
▶ (504) *Projects for finite mathematics.*
Dale K. Hathaway, Olivet Nazarene University (908-00-1316)
- 3:00 PM
(505) *A standard for a terminal mathematics course in a liberal arts college.*
Julia Roman* and **Reginald Traylor**, Incarnate Word College (908-00-1324)
- 3:15 PM
▶ (506) *Explorations in geometry: A course for the liberal arts.*
Gregory A. Fredricks, Lewis & Clark College (908-00-1312)
- 3:30 PM
▶ (507) *Mathematical modeling in the liberal arts class.*
Craig M. Johnson, Marywood College (908-00-1318)
- 3:45 PM
▶ (508) *Sending secret messages: A how-to guide to cryptology.*
Steven Rex Benson, University of New Hampshire (908-00-1303)

MAA Session on Chaotic Dynamics and Fractal Geometry, II

2:15 PM – 4:10 PM

Organizers: **Denny Gulick**, University of Maryland, College Park
Jon W. Scott, Montgomery College

- 2:15 PM
▶ (509) *Sierpinski polygons and polyhedra.*
Steven J. Schlicker, Grand Valley State University (908-00-1065)
- 2:30 PM
▶ (510) *Creating landscapes with fractal geometry.*
Anne M. Burns, C. W. Post Center-Long Island University (908-00-1053)
- 2:50 PM
(511) *Hyperchaos.*
James A. Yorke, University of Maryland, College Park (908-00-1068)
- 3:25 PM
▶ (512) *Fractional Brownian motion and characterization of on-off intermittency.*
Mingzhou Ding, Florida Atlantic University (908-00-1054)
- 4:00 PM
▶ (513) *Extensions of Feigenbaum diagrams: There's more than just Cantor dust.*
Aaron David Klebanoff* and **John H. Rickert**, Rose-Hulman Institute of Technology (908-00-1060)

MAA Session on Constructivism Across the Curriculum, II

2:15 PM – 4:10 PM

Organizers: **David M. Mathews**, Central Michigan University
Keith E. Schwingendorf, Purdue University, North Central

- 2:15 PM *Constructivism in mathematics education—what does it mean?*
(514) **John Selden*** and **Annie Selden**, Tennessee Technological University (908-00-1086)
- 2:35 PM *The realization of a constructivist approach in the teaching of prospective elementary education teachers of mathematics.*
▶ (515) **David Feikes**, Purdue University, North Central (908-00-1075)
- 2:55 PM *A constructivist approach to a course for elementary education majors.*
▶ (516) **Anne E. Brown**, Indiana University, South Bend (908-00-1072)
- 3:15 PM *Constructivism in the AUGMENT program.*
(517) **Lawrence E. Copes**, Augsburg College (908-00-1073)
- 3:35 PM *Using visual aid, the Stella Octangula for the group of rotations of a cube.*
(518) **Saeja Oh Kim**, University of Massachusetts at Dartmouth (908-00-1082)
- 3:55 PM *A constructivist text for discrete mathematics.*
▶ (519) **William E. Fenton**, Bellarmine College (908-00-1076)

MAA Session on Active Learning Strategies for Statistics and Probability, II

2:15 PM – 4:10 PM

- Organizers: **Mary R. Parker**, Austin Community College
Allan J. Rossman, Dickinson College
- 2:15 PM *Some recommendation for teaching the reasoning of statistical inference.*
▶ (520) **Allan J. Rossman**, Dickinson College (908-00-1024)
- 2:30 PM *An appraisal of some active learning techniques in applied statistics courses.*
▶ (521) **John D. McKenzie, Jr.**, Babson College (908-00-1018)
- 2:45 PM *Some tips for helping students in introductory statistics classes carry out successful data analysis projects.*
(522) **Anne D. Sevin**, Framingham State College (908-00-1026)
- 3:00 PM *All for a penny: Statistical activities using coins.*
▶ (523) **Robin H. Lock**, Saint Lawrence University (908-00-1016)
- 3:15 PM *Brains, elasticities, and slime: An activity for teaching transformations.*
(524) **George W. Cobb**, Mount Holyoke College (908-00-1004)
- 3:30 PM *Using surveys and the CBL to bring real data into an applied statistics course.*
(525) **Randall F. Westhoff**, Bemidji State University (908-00-1031)
- 3:45 PM *Interactive statistics.*
▶ (526) **Martha Bilotti-Aliaga**, University of Michigan, Ann Arbor (908-00-1000)
- 4:00 PM *College credit for a high school statistics course.*
(527) **Mary R. Parker**, Austin Community College (908-00-1020)

JPBM Session

2:15 PM – 3:45 PM

- What the media look for in a math story.*
Moderator: **Carol S. Wood**, Wesleyan University
Organizers: **Richard H. Herman**, Joint Policy Board for Mathematics

Kathleen Holmay, Joint Policy Board for Mathematics

MAA Committee on the Teaching of Undergraduate Mathematics Panel Discussion

2:15 PM – 4:10 PM

- Making teaching more public.*
Organizer: **James R. C. Leitzel**, University of Nebraska, Lincoln
Panelists: **Linda H. Boyd**, DeKalb Community College
Steven Dunbar, University of Nebraska, Lincoln
Bonnie Gold, Wabash College
Miriam Leiva, University of North Carolina, Charlotte
Eli Passow, Temple University, Philadelphia

Young Mathematicians Network Panel Discussion

2:15 PM – 3:15 PM

- The training of teaching assistants.*
Organizer: **Kevin E. Charlwood**, University of Wisconsin, Milwaukee
Panelists: **Edward F. Aboufadel**, Southern Connecticut State University
Suzanne M. Lenhart, University of Tennessee-Knoxville
Michael J. McAsey, Bradley University

AMS Electronic Products and Services Presentation

3:00 PM – 4:00 PM

- The Internet and the World Wide Web.*
Organizers: **Wendy A. Bucci**, American Mathematical Society
Ralph E. Youngen, American Mathematical Society

MAA Panel Discussion

3:15 PM – 4:10 PM

- Case studies in effective undergraduate mathematics programs.*
Moderator: **Alan C. Tucker**, State University of New York, Stony Brook
Panelists: **Linda H. Boyd**, DeKalb Community College
David J. Lutzer, College of William & Mary

AMS Invited Address

3:20 PM – 4:10 PM

- (528) *Geometric graphs.*
Janos Pach, Hungarian Academy of Science, Hungary (908-00-902)

Joint Prize Session and Reception

4:25 PM – 7:00 PM

Reception for Two-Year Colleges

5:45 PM – 7:00 PM

MER Banquet

6:30 PM - 9:30 PM

MAA Session on Innovations in Teaching Linear Algebra, II

7:00 PM - 10:00 PM

Organizers: **Donald R. LaTorre**, Clemson University
David C. Lay, University of Maryland, College Park
Steven J. Leon, University of Massachusetts, Dartmouth

- 7:00 PM (529) *A national survey of linear algebra teaching.*
David C. Lay, University of Maryland, College Park (908-00-1143)
- 7:25 PM (530) *Elementary linear algebra: Whom are we teaching and what are we trying to accomplish.*
Charles R. Johnson, College of William & Mary (908-00-1140)
- 7:45 PM (531) *More linear algebra in the high school curriculum: A help or hindrance?*
A. Duane Porter, University of Wyoming (908-00-1146)
- 8:05 PM (532) *Reviewing prerequisite material in second course linear algebra.*
David H. Carlson, San Diego State University (908-00-1125)
- 8:25 PM (533) *Matrices in science and engineering.*
Gilbert Strang, Massachusetts Institute of Technology (908-00-1148)
- 8:50 PM (534) *The use of portfolios in teaching linear algebra.*
Preliminary report.
Luz Maria DeAlba, Drake University (908-00-1130)
- 9:10 PM (535) *Examples of group projects.*
Brian P. Hopkins, University of Washington (908-00-1139)
- 9:30 PM (536) *Reforming linear algebra and its effects.*
Jeffrey D. Farmer* and **Tabitha Young Mingus**, University of Northern Colorado (908-00-1133)
- 9:50 PM (537) *A computer-based linear algebra course emphasizing understanding of traditional concepts.*
Janet L. Beery* and **Alexander E. Koonce**, University of Redlands (908-00-1120)

MAA Session on The Uses of History in the Teaching of Mathematics

7:00 PM - 10:00 PM

Organizers: **Florence D. Fasanelli**, Mathematical Association of America
Victor J. Katz, University of District of Columbia
V. Frederick Rickey, Bowling Green State University

- 7:00 PM Introduction by V. Frederick Rickey
- 7:05 PM (538) *History and the reform of undergraduate mathematics.*
Alphonse Buccino, Contemporary Communications, Inc. (908-00-1345)
- 7:25 PM (539) *Using original sources in class.*
Gary S. Stoudt, Indiana University of Pennsylvania (908-00-1353)
- 7:40 PM (540) *Galileo and Maria Gaetana Agnesi examine infinitesimals.*
Fredric J. Zerla, University of South Florida (908-00-1354)

- 8:00 PM (541) *De Beaune's proof of the Pythagorean Theorem.*
C. Edward Sandifer* and **Cynthia B. Gubitose**, Western Connecticut State University (908-00-1352)
- 8:20 PM (542) *Euler's discovery of the gamma function in a math history course.*
Stacy G. Langton, University of San Diego (908-00-1349)
- 8:40 PM (543) *Problems and puzzles in history of mathematics research.*
Kim Plofker, Brown University (908-00-1351)
- 8:55 PM (544) *Benjamin Banneker and double position.*
Leon M. Cohen*, Hampden-Sydney College, **Kristen Alynne Haring**, University of North Carolina, Chapel Hill, **Joyce Janiga**, Paradise Valley Community College, **Kenneth L. Jones**, American University, **Laura B. Smith**, North Carolina Central University, and **Marian W. Smith**, Florida A&M University (908-00-1348)
- 9:15 PM (545) *The report of the Committee of Fifteen in 1912: How it affected the secondary curriculum.*
Steve Butcher, University of Central Arkansas, **Charles B. Pierre**, Clark Atlanta University, and **Harry B. Coonce***, Mankato State University (908-00-1347)
- 9:30 PM (546) *The historical development of mathematics examinations.*
Lilian Metlitzky, California Polytechnic State University, and **Agnes Tuska***, California State University, Fresno (908-00-1350)
- 9:45 PM (547) *The early history of the Cornell University Mathematics Department.*
Gary G. Cochell, Culver-Stockton College (908-00-1346)

MAA Committee on Participation of Women Presentations

7:00 PM - 9:00 PM

Are we there yet? Encouraging women in mathematics.

Organizer: **Carole B. Lacampagne**, U.S. Department of Education

MAA Poster Session

7:00 PM - 10:00 PM

Projects under the Instrumentation and Laboratory Improvement-Leadership in Laboratory Development programs.

Organizer: **Earl Fife**, Calvin College, Grand Rapids, Michigan

Reunion for Calculus Reform Workshop Participants

7:00 PM - 9:00 PM

Organizer: **Donald B. Small**, U. S. Military Academy

MAA Presentation

7:30 PM - 9:00 PM

Department chairs session: Encouraging departmental change.

Organizer: **James R.C. Leitzel**, University of Nebraska, Lincoln

Friday, January 12

Joint Meetings Registration

7:30 AM – 4:00 PM

AMS Special Session on Mathematics and Education Reform, I

8:00 AM – 10:50 AM

Organizers: **William Henry Barker**, Bowdoin College
Naomi Fisher, University of Illinois, Chicago
Kenneth C. Millett, University of California, Santa Barbara
Hugo Rossi, University of Utah
Philip D. Wagreich, University of Illinois, Chicago

- 8:00 AM (548) *A collaborative to promote excellence and diversity for future teachers.* Preliminary report.
William Burkley Jacob*, **Kenneth C. Millett**, University of California, Santa Barbara, and **Myriam Steinback**, Newton, Massachusetts (908-98-760)
- 8:30 AM (549) *Promoting success in undergraduate education.* Preliminary report.
William Burkley Jacob and **Kenneth C. Millett***, University of California, Santa Barbara (908-98-796)
- 9:00 AM (550) *Do we need Reform reform?*
Richard J. Cleary, Saint Michael's College (908-98-348)
- 9:30 AM (551) *The preparation of elementary school teachers: Thoughts of an elementary curriculum writer.*
Philip D. Wagreich, University of Illinois, Chicago (908-98-795)
- 10:00 AM (552) *What I learned through teacher enhancement.* Preliminary report.
Judith Roitman, University of Kansas (908-96-02)
- 10:30 AM (553) *Emerging changes in secondary school mathematics: Implications for transition to collegiate mathematics.*
James T. Fey, University of Maryland, College Park (908-97-142)

AMS Special Session on Diophantine Problems From Different Perspectives, II

8:00 AM – 11:45 AM

Organizers: **Henri Rene Darmon**, McGill University
Andrew J. Granville, University of Georgia

- 8:00 AM (554) *Dualities in Iwasawa Theory.* Preliminary report.
Li Guo, Institute for Advanced Study (908-11-272)
- 8:25 AM (555) *The Ehrhart polynomial of a lattice polytope.*
Ricardo L. Diaz*, University of Northern Colorado, and **Sinai Robins**, University of California at San Diego, La Jolla (908-11-226)
- 8:50 AM (556) *Rational periodic points of polynomials over \mathbb{Q} .*
E. V. Flynn, University of Liverpool, England, **Bjorn Poonen***, Mathematical Science Research Institute, and **Edward Frank Schaefer**, Santa Clara University (908-11-207)
- 9:15 AM (557) *Subgroups of groups of components.* Preliminary report.
Dino J. Lorenzini, University of Georgia (908-14-803)

- 9:40 AM (558) *The method of Coleman/Chabauty applied to algebraic points on curves.*
Matthew James Klassen, Pacific Lutheran University (908-11-315)
- 10:05 AM (559) *Quaternion covers of elliptic curves.*
Seon-In Kwon, McGill University (908-11-271)
- 10:30 AM (560) *On the degree of modular parametrizations II.* Preliminary report.
Matthias Flach, California Institute of Technology (908-11-147)
- 11:00 AM (561) *ϵ -factors and Galois module structure.*
Georgios Pappas, Princeton University (908-11-276)
- 11:25 AM (562) *Heegner points, p -adic L-functions and the Cerednik-Drinfeld uniformization.* Preliminary report.
Massimo Bertolini*, Universita di Pavia, Italy, and **Henri Rene Darmon**, Princeton University (908-11-205)

AMS Special Session on Geometry, Topology, and Analysis on Noncompact Manifolds, I

8:00 AM – 10:50 AM

Organizer: **Peter E. Haskell**, Virginia Polytechnic Institute and State University

- 8:00 AM (563) *Coarse geometry and index theory.*
Paul F. Baum* and **Nigel D. Higson**, Pennsylvania State University, University Park (908-46-471)
- 8:30 AM (564) *Transverse index and spectral invariants.*
Ronald G. Douglas, SUNY at Stony Brook (908-58-285)
- 9:00 AM (565) *Higher spectral flow and the cohomology of the gauge group.*
Jerry Kaminker, Indiana University-Purdue University, Indianapolis (908-46-672)
- 9:30 AM (566) *The R^k -equivariant index theorem and C^* -algebras of b -pseudodifferential operators.*
Richard B. Melrose, Massachusetts Institute of Technology, and **Victor Nistor***, Pennsylvania State University, University Park (908-46-788)
- 10:00 AM (567) *Remarks on the Baum-Connes conjecture.* Preliminary report.
James F. Davis*, Indiana University, Bloomington, and **Wolfgang Luck**, Johannes Gutenberg University, Germany (908-57-670)
- 10:30 AM (568) *Dirac-Schrödinger operators and equivariant index theory.*
Jeffrey Stephen Fox*, University of Colorado, Boulder, and **Peter E. Haskell**, Virginia Polytech Institute & State University (908-58-671)

AMS Special Session on Algebra, Algebra Cohomology, and Polynomial Identities, I

8:00 AM – 10:50 AM

Organizers: **Andy R. Magid**, University of Oklahoma
Lance W. Small, University of California at San Diego, La Jolla

- 8:00 AM (569) *Koszul algebras.* Preliminary report.
Edward L. Green, Virginia Polytech Institute & State University (908-16-231)
- 8:30 AM (570) *Toward a theory of Poisson algebras.*
Daniel R. Farkas, National Security Agency (908-17-289)
- 9:00 AM (571) *Making algebras with involution isomorphic.* Preliminary report.
Adrian R. Wadsworth, University of California at San Diego, La Jolla (908-16-233)

- 9:30 AM *Regularity of multiplicative invariants.*
(572) **Martin Lorenz**, Temple University (908-13-234)
- 10:00 AM *An embedding property of universal division algebras.*
(573) **Zinovy Reichstein**, Oregon State University, and **Nikolaus Vonessen***, University of Southern California (908-16-292)
- 10:30 AM *A universal element of K_2 of a ring.*
(574) **Bruce A. Magurn**, Miami University, Oxford (908-19-72)

MAA Minicourse #12: Part B

8:00 AM – 10:00 AM

The use of symbolic computation in probability and statistics.

Organizers: **Elliot Tanis**, Denison University
Zaven Karian, Denison University

MAA Minicourse #13: Part A

8:00 AM – 10:00 AM

Fibonacci and Catalan numbers.

Organizer: **Ralph P. Grimaldi**, Rose-Hulman Institute of Technology

MAA Minicourse #8: Part B

8:00 AM – 10:00 AM

Cooperative learning in undergraduate mathematics education.

Organizers: **Ed Dubinsky**, Purdue University, West Lafayette
Janet P. Ray, Seattle Central Community College
Barbara E. Reynolds, Cardinal Stritch College

AMS Session on Numerical Analysis, I

8:00 AM – 10:55 AM

- 8:00 AM *P^* -linear complementarity problems: Algorithms and equivalence.*
▶ (575) **Mihai Anitescu**, **Goran Lesaja*** and **Florian A. Potra**, University of Iowa (908-99-738)
- 8:15 AM *A statistical exploration of baseball's earned run average.*
▶ (576) **Chris Edwards**, University of Wisconsin, Oshkosh (908-62-145)
- 8:30 AM *Estimating a distribution function with orthogonal series.* Preliminary report.
(577) **Mehdi Razzaghi**, Bloomsburg University of Pennsylvania (908-62-156)
- 8:45 AM *Parameter estimation in a time series model.* Preliminary report.
(578) **B. B. Bhattacharyya**, North Carolina State University, and **Gary Douglas Richardson***, University of Central Florida (908-62-361)
- 9:00 AM *Model office.*
(579) **Nicholas Frangos**, Athens University of Economics & Business, Greece (908-62-554)
- 9:15 AM *Dependence and order in families of Archimedean copulas.*
(580) **Roger B. Nelsen**, Lewis & Clark College (908-62-07)
- 9:30 AM *Adaptive estimation in linear regression.* Preliminary report.
(581) **Hans-Yuergen Petersen**, University of Wisconsin, Milwaukee (908-62-595)

- 9:45 AM *Implementation of a semi-parametric estimator of random effects.*
(582) **Robert L. Gould**, University of California, Los Angeles (908-62-648)
- 10:00 AM *Application of non-homologous regression to ice-flow tracking.*
(583) **Robert J. McDevitt**, University of Virginia (908-62-690)
- 10:15 AM *Bayesian estimation of a change-point in failure rate.* Preliminary report.
(584) **Nancy L. Campbell**, John Carroll University (908-62-691)
- 10:30 AM *Numerical methods for the maximum likelihood estimation of Weibull parameters.*
▶ (585) **Pushpa L. Gupta**, **Ramesh C. Gupta** and **Sergey Jacob Lvin***, University of Maine, Orono (908-62-729)
- 10:45 AM *The exponential characteristic method for stiff systems—example: The point reactor kinetics equations.*
(586) **Kirk A. Mathews**, Air Force Institute of Technology (908-65-716)

AMS Session on Approximation Theory

8:00 AM – 11:10 AM

- 8:00 AM *Oscillation and stability in a delay model of a perennial grass.*
(587) **Richard C. DeVault***, **Edward A. Grove**, **Gerasimos Ladas**, University of Rhode Island, **R. Levins** and **C. Puccia**, Harvard School of Public Health (908-39-693)
- 8:15 AM *A note on the functional equation $M(fg) = M(f)M(g) - L(f)L(g)$ on $H(G)$.* Preliminary report.
(588) **N. R. Nandakumar**, Delaware State University (908-39-605)
- 8:30 AM *The 2×2 focal problem.* Preliminary report.
(589) **Betty J. Harmsen**, University of Nebraska, Omaha (908-39-327)
- 8:45 AM *Positive solutions of a difference equation.*
(590) **Allan C. Peterson**, University of Nebraska, Lincoln (908-39-308)
- 9:00 AM *Statistical limit superior and limit inferior.*
(591) **John A. Fridy***, Kent State University, Kent, and **Cihan Orhan**, Ankara University, Turkey (908-40-555)
- 9:15 AM *Sequentially generated densities and statistical convergence.* Preliminary report.
(592) **Jeannette L. Kline**, Ohio University, Chillicothe (908-40-362)
- 9:30 AM *Symmetrical distributions.*
▶ (593) **Larry Ericksen**, Millville, New Jersey (908-40-139)
- 9:45 AM *On a paper of Fridy about minimal rates of summability.*
(594) **Harry Ira Miller***, University of Tennessee, Chattanooga, and **Vanna Zanelli**, University Degli Studi at Modena, (908-40-174)
- 10:00 AM *Interactive surface modeling.* Preliminary report.
(595) **Emil-Adrian Cornea**, University of South Carolina, Columbia (908-41-746)
- 10:15 AM *Wavelet characterizations of Besov spaces in $L^p(\Omega)$, $0 < p \leq 1$.*
(596) **Ronald A. DeVore**, University of South Carolina, Columbia, **George Kyriazis**, University of Cyprus, Cyprus, and **Pinghua Wang***, University of South Carolina, Columbia (908-41-731)
- 10:30 AM *Biorthogonal multiwavelets.*
(597) **Jeffrey Allen Marasovich*** and **Douglas P. Hardin**, Vanderbilt University (908-41-721)

- 10:45 AM *Tensor product multiwavelets and image compression.*
(598) **David William Roach**, Vanderbilt University (908-41-639)
- 11:00 AM *A Paley-Wiener theorem for all two and three step nilpotent Lie groups.*
(599) **Robert R. Park**, University of California, Davis (908-42-810)

MAA Session on Innovations in Teaching Precollege Algebra Courses, I

8:00 AM – 11:45 AM

Organizer: **Mohammad H. Ahmadi**, University of Wisconsin-Whitewater

- 8:00 AM Introduction
- 8:05 AM *A laboratory approach to teaching precollege algebra.*
▶ (600) **Daniel Cyphert*** and **Matt J. Haines**, Spring Hill College (908-00-1164)
- 8:25 AM *Making mathematics come alive.*
▶ (601) **Arlene H. Kleinstein***, State University of New York Agricultural and Technical College, Farmingdale, and **Sylvia M. Svitak**, Queensborough Community College (CUNY) (908-00-1171)
- 8:50 AM *An introductory course in mathematics for liberal arts students.*
▶ (602) **Holly Peters Hirst*** and **James R. Smith**, Appalachian State University (908-00-1168)
- 9:10 AM *Using a graphics calculator to introduce real data explorations and writing exercises in elementary and intermediate algebra.*
(603) **Elaine M. Hubbard**, Kennesaw State College (908-00-1169)
- 9:30 AM *Project algebra: A new approach to teaching basic college algebra.*
▶ (604) **Jerry Currence**, University of South Carolina, Lancaster (908-00-1163)
- 9:50 AM *Analyzing the relationship between problem-solving behaviors and achievements of students in cooperative learning groups.*
(605) **Patrick F. Mwerinde*** and **Christine L. Ebert**, University of Delaware (908-00-1166)
- 10:10 AM *A segment approach to college mathematics classes.*
(606) **Ronnie C. Goolsby** and **Thomas W. Polaski***, Winthrop University (908-00-1173)
- 10:30 AM *Using cooperative learning and technology to teach problem solving to adults.*
(607) **Elizabeth Rezel**, Cardinal Stritch College (908-00-1174)
- 10:50 AM *Teaching intermediate algebra using cooperative groups.*
(608) **Emmett C. Dennis**, Southeastern Louisiana University (908-00-1165)
- 11:10 AM *Introduction to algebra for adult students.*
(609) **Katherine Safford**, Rutgers University (908-00-1175)
- 11:30 AM *Spreadsheets for applying the Harvard approach to precollege algebra.*
(610) **David Sher**, Nassau Community College (908-00-1176)

MAA Session on My Favorite ODE Solver and Why, I

8:00 AM – 10:40 AM

Organizers: **Robert L. Borrelli**, Harvey Mudd College
Courtney S. Coleman, Harvey Mudd College

- 8:00 AM *Taylor series solutions of ODEs using Mathematica.*
▶ (611) **George Edgar Parker**, James Madison University (908-00-1230)
- 8:15 AM *Using the Picard algorithm in an introductory course.*
(612) **James S. Sochacki**, James Madison University (908-00-1231)
- 8:30 AM *The use of MicroCalc by differential equation students.*
▶ (613) **Richard N. Barshinger**, Pennsylvania State University, University Park (908-00-1220)
- 8:45 AM *Using Mathematica to explore differential equations via graphics and data.*
▶ (614) **William D. Emerson**, Metropolitan State College of Denver (908-00-1223)
- 9:00 AM *The solver of choice at the University of Puget Sound.*
▶ (615) **Elly Claus-McGahan**, University of Puget Sound (908-00-1222)
- 9:15 AM *SYSTEMS, a public-domain software package.*
(616) **David O. Lomen**, University of Arizona (908-00-1226)
- 9:30 AM *Maple: A comprehensive tool for introductory ODEs.*
(617) **Douglas B. Meade**, University of South Carolina, Columbia (908-00-1228)
- 9:45 AM *VisualDSolve, a Mathematica package for exploring ODEs.*
▶ (618) **Edward W. Packel**, Lake Forest College (908-00-1229)
- 10:00 AM *PHASER: An animator/simulator for dynamical systems for IBM PCs.*
▶ (619) **Huseyin Kocak**, University of Miami (908-00-1225)
- 10:15 AM *Usefulness of Maple and MacMath in differential equations.*
▶ (620) **Allen R. Killpatrick**, University of Redlands (908-00-1224)
- 10:30 AM *The MODELS software package for ODEs.*
▶ (621) **Thomas G. Wangler**, Illinois Benedictine College (908-00-1233)

MAA Session on Planning Reformed Calculus Programs: Experiences and Advice, II

8:00 AM – 10:55 AM

Organizer: **Martin E. Flashman**, Humboldt State University

- 8:00 AM *A tale of two calculus reforms.*
▶ (622) **Daniel J. Hrozencik**, Westminster College (908-00-1255)
- 8:15 AM *Assessing calculus reform at a two-year college.*
(623) **Maria R. Brunett**, Montgomery College (908-00-1245)
- 8:30 AM *A comparison of calculus teaching methodologies: The need for evaluation in calculus reform.*
(624) **Susan L. Ganter**, Worcester Polytechnic Institute (908-00-1252)
- 8:45 AM *Evaluating calculus reform: Complex challenges of context and methodology.*
(625) **Joan Ferrini-Mundy*** and **Darien Lauten**, University of New Hampshire (908-00-1249)
- 9:00 AM *Two departments: A fictional tale of change and illusion.*
▶ (626) **Martin E. Flashman***, Humboldt State University, and **Susan Tappero**, Cabrillo College (908-00-1250)
- 9:15 AM *Where there is a strong will, there is a way.*
(627) **Claudia L. Pinter-Lucke**, California State Polytech University, Pomona (908-00-1260)
- 9:30 AM *Planning science reform at a small college.*
(628) **Betty Mayfield**, Hood College (908-00-1258)

- 9:45 AM *Attracting teachers to use computer algebra systems in the classroom.*
 ▶ (629) **Lisa Townsley Kulich**, Illinois Benedictine College (908-00-1257)
- 10:00 AM *Planning and implementation of calculus reform curricula: What worked and what we're still working on.*
 (630) **Janet L. Beery***, **Richard N. Cornez**, **Alexander E. Koonce**, **Allen R. Killpatrick** and **Mary E. Scherer**, University of Redlands (908-00-1242)
- 10:20 AM *Some formative and summative evaluations of a reform calculus program.*
 (631) **Morton Brown**, University of Michigan, Ann Arbor (908-00-1244)
- 10:40 AM *Cooperative teaching: Lessons from calculus reform at Occidental College.*
 (632) **Donald Y. Goldberg*** and **Alan P. Knoerr**, Occidental College (908-00-1253)

MAA Session on Assessment of Student Learning for Improving the Undergraduate Major in Mathematics, I

8:00 AM – 10:40 AM

Organizers: **Barbara T. Faires**, Westminster College
William A. Marion, Valparaiso University

- 8:00 AM Opening Remarks by Session Chair, Bill Marion
- 8:05 AM *A goal-driven mathematics major.*
 ▶ (633) **Annalisa Crannell*** and **Alan L. Levine**, Franklin & Marshall College (908-00-1035)
- 8:25 AM *Outcomes assessment in the B.S. statistics program at Iowa State University.*
 (634) **Richard A. Groeneveld**, Iowa State University (908-00-1036)
- 8:45 AM *Portfolio assessment of student learning in mathematics.*
 (635) **Laurie B. Hopkins**, Columbia College (908-00-1037)
- 9:05 AM *Improving the classroom learning climate with assessment.*
 ▶ (636) **Sandra Z. Keith**, St. Cloud State University (908-00-1038)
- 9:25 AM *Assessment of student progress for a liberal arts college.*
 (637) **Donald E. Miller**, Saint Mary's College (908-00-1039)
- 9:45 AM *Assessment: The first stages.*
 (638) **Catherine M. Murphy**, Purdue University, Calumet Campus (908-00-1040)
- 10:05 AM *Student assessment as learning.*
 (639) **Susan F. Pustejovsky*** and **Marie E. Pink**, Alverno College (908-00-1041)
- 10:25 AM *Assessment of the mathematics major at Towson State University.*
 (640) **Martha J. Siegel**, Towson State University (908-00-1042)

MAA Student Chapters Paper Session

8:00 AM – 10:55 AM

- Organizer: **Karen J. Schroeder**, Bentley College
- 8:00 AM *A fall gathering of North and South Carolina MAA student chapters.*
 (641) **Roger W. Allen, Jr.***, Francis Marion University, and **Stephen Lloyd Davis**, Davidson College (908-00-1360)
- 8:20 AM *MAA chapters vs. Pi Mu Epsilon chapters.*
 (642) **Prem N. Bajaj**, Wichita State University (908-00-1361)

- 8:40 AM *The good, the bad, the beautiful: Student activities in the Southern California section.*
 (643) **Barbara J. Beechler**, Pitzer College (908-00-1362)
- 9:00 AM *Monte Carlo music.*
 (644) **Michelle P. Benedict**, Augusta College (908-00-1363)
- 9:20 AM *Charting a charter chapter: Its first N(= 5) years.*
 (645) **Richard D. Jarvinen**, Winona State University (908-00-1364)
- 9:40 AM *Student conferences on careers and environmental applications.*
 (646) **Garry L. Johns**, Saginaw Valley State University (908-00-1365)
- 10:00 AM *Math over the Internet.*
 (647) **Tom Kelley**, Metropolitan State College of Denver (908-00-1366)
- 10:20 AM *Pi Mu Epsilon activities at Fairfield University.*
 (648) **Joan Wyzkoski Weiss**, Fairfield University (908-00-1367)
- 10:40 AM *Two math clubs, a week of events and a successful Math Awareness Week.*
 (649) **Ivy C. West**, Metropolitan State College of Denver (908-00-1368)

MAA Panel Discussion

8:00 AM – 9:20 AM

Research methods in mathematics education.

- Organizers: **John Selden**, Mathematics Education Research Company
Annie Selden, Tennessee Technological University
- Panelists: **James J. Kaput**, University of Massachusetts at Dartmouth
Ed Dubinsky, Purdue University
Stephen Monk, University of Washington

MAA Panel Discussion

8:00 AM – 9:20 AM

You're the author; what's next?

- Organizers: **Susanna Epp**, DePaul University
Gerald J. Porter, University of Pennsylvania
- Panelists: **Robert L. Devaney**, Boston University
William E. Hoffman, Worth Publishers
Barbara A. Holland, John Wiley & Sons
Kay Murray, Authors Guilds
Michael J. Sullivan, Chicago State University

AMS Invited Address

9:00 AM – 9:50 AM

- (650) *Geometry of real algebraic manifolds in complex space.*
Linda Preiss Rothschild, University of California at San Diego, La Jolla (908-00-906)

AMS Special Session on Mathematical Physics, I

9:00 AM – 10:50 AM

- Organizer: **Michael P. Loss**, Georgia Institute of Technology

- 9:00 AM *The phase diagram of the extended Hubbard model.*
(651) **C. Borgs***, University of Leipzig, Germany, **Jennifer Tour Chayes**, University of California, Los Angeles, **Jurg M. Frohlich**, Eidgen Technische Hochschule, Switzerland, **J. Jedrzejewski**, University of Wroclaw, Poland, **R. Kotecky**, Charles University, Czech Republic, and **D. Ueltschi**, Ecole Polytechnic Federale de Lausanne, Switzerland (908-81-628)
- 9:30 AM *Low-lying spectrum of quantum interfaces.*
(652) **Tohru Koma**, Gakushuin University, Japan, and **Bruno L. Nachtergaele***, Princeton University (908-82-166)
- 10:10 AM *The mathematics and physics of the second law of thermodynamics.*
(653) **Elliott H. Lieb**, Princeton University, and **Jakob Yngvason***, University of Iceland, Iceland (908-80-403)

Book Sales and Exhibits

9:00 AM – 5:00 PM

ASL Invited Address

9:10 AM – 10:10 AM

- (654) *Models of exponentiation.*
David E. Marker, University of Illinois, Chicago

MAA Panel Discussion

9:35 AM – 10:55 AM

Evaluation of the uses of computers in mathematics instruction.

Organizer: **Keith E. Schwingendorf**, Purdue University, North Central

Panelists: **M. Kathleen Heid**, Pennsylvania State University, University Park
George M. McCabe, Purdue University, North Central
David O. Tall, Warwick University

MAA Presentation

9:35 AM – 10:55 AM

Interactive texts: Works in progress.

Organizer: **Gerald J. Porter**, University of Pennsylvania

Presenters: **Dan Bach**, Diablo Valley College
Michael G. Branton, Stetson College
Margie A. Hale, Stetson College
Kyle T. Siegrist, University of Alabama, Huntsville

MAA Panel Discussion

9:35 AM – 10:55 AM

Project NEXt: Activities and lessons learned.

Organizers: **James R. C. Leitzel**, University of Nebraska, Lincoln
T. Christine Stevens, Saint Louis University

AMS Invited Address

10:05 AM – 10:55 AM

- (655) *Quantum computation.*
Peter W. Shor, AT&T Bell Laboratories, Murray Hill, New Jersey (908-00-900)

ASL Invited Address

10:20 AM – 10:50 AM

- (656) *Constructing strongly minimal sets via dimension functions.*
Kitty L. Holland, Northern Illinois University

ASL Contributed Papers

10:55 AM – 12:30 PM

AWM 25th Anniversary Special Lecture

11:10 AM – NOON

- (657) *Determinants of elliptic operators*
Kate Okikiolu, University of California at San Diego, La Jolla (908-00-961)

AWM 25th Anniversary Luncheon

NOON – 1:00 PM

AMS Colloquium Lectures: Lecture III

1:00 PM – 2:00 PM

- (658) *Modular forms, elliptic curves and Galois representations.*
Andrew J. Wiles, Princeton University

AMS Special Session on History of Mathematics, I

1:00 PM – 5:20 PM

Organizers: **Thomas Archibald**, Acadia University
Victor J. Katz, University of the District of Columbia

- 1:00 PM *Leonard Dickson's "History of the Theory of Numbers": An altruistic mission with professional gains.*
▶ (659) **Della Dumbaugh Fenster**, University of Richmond (908-01-152)
- 1:30 PM *Drawing the boundaries: Mathematical statistics in twentieth-century America.*
▶ (660) **Patti Wilger Hunter**, University of Virginia (908-01-04)
- 2:00 PM *Women and the Cambridge mathematical tripos examination.*
(661) **James J. Tattersall***, Providence College and U. S. Military Academy, and **Shawnee L. McMurran**, Providence College (908-01-53)
- 2:30 PM *The Euclid-Euler theorem.*
▶ (662) **William W. Dunham**, Muhlenberg College (908-01-260)
- 3:15 PM *The historical role of geometric curve drawing devices in the genesis of calculus.*
▶ (663) **David Dennis**, University of Texas, El Paso (908-01-43)
- 4:00 PM *The first classroom calculus text: Charles-René Reyneau's Analyse démontrée (1708). Preliminary report.*
▶ (664) **Shelley Costa**, Cornell University (908-01-79)
- 4:30 PM *Cauchy, existence proofs, and the problem of singular solutions.*
▶ (665) **W. Thomas Archibald**, Acadia University (908-01-256)
- 5:00 PM *On the scribal errors in Plimpton 322.*
(666) **Daniel E. Otero**, Xavier University (908-01-490)

AMS Special Session on Mathematics and Education Reform, II (Cosponsored by CRAFTY)

1:00 PM – 5:50 PM

Organizers: **William Henry Barker**, Bowdoin College
Naomi Fisher, University of Illinois, Chicago
Kenneth C. Millett, University of California, Santa Barbara
Hugo Rossi, University of Utah
Philip D. Wagreich, University of Illinois, Chicago

- 1:00 PM (667) *Current status and remaining agenda of the calculus reform movement.*
Alan C. Tucker, State University of New York, Stony Brook (908-98-135)
- 1:30 PM (668) *Calculus instruction: Opportunities for bridge-building.*
Deborah Hughes Hallett, Harvard University (908-98-700)
- 2:00 PM (669) *Calculus reform and the advanced placement program.*
Raymond J. Cannon, Jr., Baylor University (908-97-352)
- 2:30 PM (670) *"The Irrelevance of Calculus Reform", and the aftermath.*
George E. Andrews, Pennsylvania State University, University Park (908-96-68)
- 3:00 PM (671) *A history of one calculus reform project.*
William J. Davis, Ohio State University, Columbus (908-98-391)
- 3:30 PM (672) *The workshop approach: Abandoning lectures.*
Nancy Baxter Hastings, Dickinson College (908-98-354)
- 4:00 PM (673) *Next steps.*
Ronald G. Douglas, State University of New York, Stony Brook (908-98-284)
- 4:30 PM (674) *Calculus reform, anthropology-zoology.*
Franklin A. Wattenberg, Weber State University (908-98-294)
- 5:00 PM (675) *A mathematics technology classroom: Evolution of a calculus reform implementation.*
Anita J. Salem, Rockhurst College (908-98-383)
- 5:30 PM (676) *Writing to learn calculus: Why, what, how.*
David A. Smith, Duke University (908-98-701)

AMS Special Session on Quantum Information and Computation, I

1:00 PM – 5:30 PM

Organizers: **Charles H. Bennett**, IBM T. J. Watson Research Center, Yorktown Heights, New York
Peter W. Shor, AT&T Bell Laboratories, Murray Hill, New Jersey

- 1:00 PM (677) *Quantum information transmission primitives and reducibilities.*
Charles H. Bennett, IBM Research (908-81-704)
- 1:40 PM (678) *Quantum coding for pure states.*
Benjamin Schumacher, Los Alamos National Laboratory (908-81-454)
- 2:20 PM (679) *Quantum coding for mixed states. Preliminary report.*
Richard Jozsa, University of Plymouth, England (908-81-432)

3:00 PM (680) *Classical information capacity of a quantum channel.*
Michael D. Westmoreland, Denison University (908-81-137)

- 3:40 PM (681) *Purification of mixed entangled states and quantum channel capacity.*
John A. Smolin, University of California, Los Angeles (908-81-570)
- 4:20 PM (682) *Good quantum error correcting codes exist.*
A. R. Calderbank* and **Peter W. Shor**, A T & T Bell Laboratories (908-68-663)
- 5:00 PM (683) *Quantum identification.*
Claude Crepeau* and **Louis Salvail**, University of Montreal (908-68-616)

AMS Special Session on Stochastic Differential Equations and Applications, I

1:00 PM – 4:30 PM

Organizers: **R. W. R. Darling**, University of South Florida
Kandethody M. Ramachandran, University of South Florida

- 1:00 PM (684) *Stochastic differential equations driven by semimartingale random measures.*
Thomas G. Kurtz*, University of Wisconsin, Madison, and **Philip E. Protter**, Purdue University, West Lafayette (908-60-29)
- 1:40 PM (685) *Quadratic covariation and an extension of Itô's formula.*
Hans Follmer, Humboldt University, Berlin, Germany, **Philip E. Protter***, Purdue University, West Lafayette, and **Albert N. Shiryaev**, Steklov Institute (908-60-146)
- 2:10 PM (686) *Concerning the geometry of SDEs.*
Xue-Mei Li, University of Connecticut (908-60-447)
- 2:40 PM (687) *A loop group logarithmic Sobolev inequality.*
Bruce K. Driver*, University of California at San Diego, La Jolla, and **Terry M. Lohrenz**, Rice University (908-34-203)
- 3:10 PM (688) *Differentials of measure-preserving flows on Wiener space.*
Carolyn M. Cross, University of California at San Diego, La Jolla (908-60-431)
- 3:40 PM (689) *On smooth stable manifolds for SDE solutions.*
Ilya Gikhman, Institute of Applied Mathematics and Mechanics, National Academy of Sciences, Ukraine (908-60-181)
- 4:10 PM (690) *On the Stratonovich stochastic integral equation for semimartingales with anticipative initial conditions.*
Tsung-Lin Cheng and **Ching-Sung Chou***, National Central University, Taiwan, Republic of China (908-60-183)

AMS Special Session on Geometry, Topology, and Analysis on Noncompact Manifolds, II

1:00 PM – 5:50 PM

Organizer: **Peter E. Haskell**, Virginia Polytechnic Institute and State University

- 1:00 PM (691) *A parametrized index theorem for the algebraic K-theory Euler class.*
William G. Dwyer, **Michael S. Weiss*** and **Bruce Williams**, University of Notre Dame (908-57-674)
- 1:30 PM (692) *Asymptotic morphisms and equivariant index theory. Preliminary report.*
John D. Trout, Jr., Dartmouth College (908-58-318)
- 2:00 PM (693) *Boundary calculations in E-theory.*
Erik P. Guentner, Purdue University, West Lafayette (908-58-673)

- 2:30 PM *Coarse cohomology and ℓ_p -cohomology.*
(694) **Gabor Elek**, Purdue University, West Lafayette (908-58-89)
- 3:00 PM *The geometry of the Hochschild complex.*
(695) **Nicolas Teleman**, University of Ancona, Italy (908-58-769)
- 3:30 PM *Cutting and pasting of the ζ -determinant.*
(696) **Krzysztof P. Wojciechowski**, Indiana University-Purdue University, Indianapolis (908-58-572)
- 4:00 PM *Combinatorial differential topology.*
(697) **Robin Forman**, Rice University (908-57-629)
- 4:30 PM *Intersection numbers in the moduli space of holomorphic bundles on a Riemann surface.*
(698) **Lisa Claire Jeffrey**, McGill University (908-58-221)
- 5:00 PM *Wave-packet analysis of high-frequency eigenfunctions.* Preliminary report.
(699) **Alejandro Uribe***, University of Michigan, Ann Arbor, and **Thierry Paul**, University of Paris-Dauphine, France (908-58-551)
- 5:30 PM *Torus invariant presymplectic manifolds and polyhedrals sets with no rationality.* Preliminary report.
(700) **Elisa Prato**, University of Nice, France (908-58-202)

AMS Special Session on Representation Theory and Harmonic Analysis of Topological Groups, I

1:00 PM - 5:50 PM

Organizers: **Carolyn Pfeffer Johnston**, Florida Atlantic University
Gail D. L. Ratcliff, University of Missouri, St. Louis

- 1:00 PM *Geometry of the linear cycle space.*
(701) **Joseph A. Wolf**, University of California, Berkeley (908-22-149)
- 1:30 PM *Finite multiplicity, invariant differential operators, and the orbit method.*
(702) **Ronald L. Lipsman**, University of Maryland, College Park (908-22-102)
- 2:00 PM *Representations of direct limits of compact Lie groups.*
(703) **Loki Natarajan**, Tufts University, **Enriqueta Rodriguez-Carrington***, College of Staten Island, City University of New York, and **Joseph A. Wolf**, University of California, Berkeley (908-22-481)
- 2:30 PM *A Borel-Weil theorem for direct limits of finite dimensional compact Lie groups.* Preliminary report.
(704) **Loki Natarajan***, Tufts University, **Enriqueta Rodriguez-Carrington**, College of Staten Island, City University of New York, and **Joseph A. Wolf**, University of California, Berkeley (908-22-483)
- 3:00 PM *Orbit structures of multiplicity free representations.*
(705) **Andrew S. Leahy**, Knox College (908-22-660)
- 3:20 PM Break
- 4:00 PM *Factor representations of the diffeomorphism group.*
(706) **Robert P. Boyer**, Drexel University (908-22-515)
- 4:30 PM *Plancherel formulas for semi-direct product solvable homogenous spaces.* Preliminary report.
(707) **Bradley N. Currey**, Saint Louis University (908-22-302)
- 5:00 PM *Hua operators on non-symmetric domains in \mathbb{C}^n .*
(708) **Ewa Damek**, **Andrzej Hulanicki**, University of Wroclaw, Poland, and **Richard Cole Penney***, Purdue University, West Lafayette (908-16-582)

- 5:30 PM *The generalized Heisenberg fan.*
(709) **Chal Benson**, University of Missouri, St. Louis, **Joe W. Jenkins***, State University of New York, Albany, **Gail D. L. Ratcliff**, University of Missouri, St. Louis, and **Tefera Worku**, State University of New York, Albany (908-22-351)

AMS Special Session on Mathematical Physics, II

1:00 PM - 5:00 PM

Organizer: **Michael P. Loss**, Georgia Institute of Technology

- 1:00 PM *The birth of the infinite cluster.*
(710) **C. Borgs**, University of Leipzig, Germany, **Jennifer Tour Chayes***, University of California, Los Angeles, **Harry Kesten**, Cornell University, and **Joel H. Spencer**, Courant Institute of Mathematical Sciences, New York University (908-60-632)
- 1:30 PM *Lattice gases, large deviations, and the Navier-Stokes equations.*
(711) **Jeremy Quastel***, University of California, Davis, and **Horug-Tzer Yau**, Courant Institute of Mathematical Sciences, New York University (908-82-21)
- 2:00 PM *Entropy and the Euler scaling limit of the Boltzmann equation.*
(712) **Eric A. Carlen**, Georgia Institute of Technology, and **M. C. Carvalho***, University of Lisbon, Portugal (908-81-658)
- 2:30 PM *A simple model showing uniform behavior of resonances near an accumulation point.*
(713) **Christopher K. King***, Northeastern University, and **Roger Waxler**, State University of New York, Buffalo (908-81-584)
- 3:10 PM *Gaussian decay of the magnetic eigenfunctions.*
(714) **Laszlo Erdos**, Courant Institute of Mathematical Sciences, New York University (908-81-406)
- 3:40 PM *Counting eigenvalues using coherent states.*
(715) **W. Desmond Evans**, University of Wales, Wales, **Roger T. Lewis***, University of Alabama, Birmingham, **Heinz Siedentop**, University of Oslo, Norway, and **Jan Philip Solovej**, Aarhus University, Denmark (908-81-39)
- 4:10 PM *Asymptotic estimates for eigenfunctions and coherent states on Kähler manifolds.*
(716) **David Borthwick***, University of Michigan, Ann Arbor, **Thierry Paul**, University of Paris-Dauphine, France, and **Alejandro Uribe**, University of Michigan, Ann Arbor (908-58-436)
- 4:40 PM *Integral geodesic flows on homogenous space.*
(717) **Anthony Michael Bloch***, University of Michigan, Ann Arbor, **Roger W. Brockett**, Harvard University, and **Peter E. Crouch**, Arizona State University (908-70-121)

AMS Special Session on Algebra, Algebra Cohomology, and Polynomial Identities, II

1:00 PM - 5:50 PM

Organizers: **Andy R. Magid**, University of Oklahoma
Lance W. Small, University of California at San Diego, La Jolla

- 1:00 PM *Characters and Shirshov's Theorem.* Preliminary report.
(718) **Robert M. Guralnick**, University of Southern California (908-16-296)
- 1:30 PM *Infinitesimal Schur algebras of finite representation type.* Preliminary report.
(719) **Daniel Ken Nakano***, Utah State University, **Stephen R. Doty** and **Karl Michael Peters**, Loyola University of Chicago (908-20-291)

- 2:00 PM *Tame versus wild commutative Noetherian rings.*
(720) Preliminary report.
Lee C. Klingler, Florida Atlantic University, and
Lawrence S. Levy*, University of Wisconsin,
Madison (908-16-235)
- 2:30 PM *On the projective Schur subgroup of the Brauer
(721) group.*
Eli Aljadeff, Technion-Israel Institute of
Technology, Israel (908-17-288)
- 2:50 PM Break
- 3:30 PM *Subalgebras of Noetherian Hopf algebras.*
(722) Preliminary report.
Edward S. Letzter, Texas A & M University, College
Station (908-16-232)
- 4:00 PM *The center and the central Proj of the coordinate
(723) ring of quantum $n \times n$ matrices at roots of unity.*
Joanna M. Staniszkis, University of Michigan, Ann
Arbor (908-16-290)
- 4:30 PM *Finite quantum groups.*
(724) **Shlomi Gelaki**, Ben Gurion University of the Negev,
Israel (908-17-287)
- 5:00 PM *Subalgebras which appear in quantum Iwasawa
(725) decompositions.*
Gail R. Letzter, National Security Agency
(908-17-17)
- 5:30 PM *Embedding division algebras in crossed products.*
(726) **Burton I. Fein**, Oregon State University, **David J.
Saltman***, University of Texas, Austin, and **Murray
M. Schacher**, University of California, Los Angeles
(908-12-01)
- 2:15 PM *Dilations for polynomially bounded operators.*
(732) Preliminary report.
George Exner, Bucknell University, **Young Soo Jo**,
Keimyung University, Korea, and **Il Bong Jung***,
Kyungpook National University, Korea (908-47-455)
- 2:30 PM *Inverse spectral problems for operator-valued
(733) R -functions and non-selfadjoint Shturm-Liouville
operator on half-line.*
Sergey V. Belyi, University of South Florida, and **E.
R. Tsekanovskii***, State University of New York,
Buffalo (908-47-26)
- 2:45 PM *On operators λ -commuting with a compact
(734) operator.*
Vasile Lauric, Texas A & M University, College
Station (908-47-493)
- 3:00 PM *The necessity of Muckenhoupt's condition for
(735) unconditional basicity of reproducing kernels.*
Arcady Moiseevitch Minkin, Saratov State
University, Russia (908-47-452)
- 3:15 PM *On cyclic vectors on weighted Dirichlet spaces.*
(736) Preliminary report.
Farhad Jafari and **Richard F. Raposa***, University of
Wyoming (908-47-113)
- 3:30 PM *Noncommutative Hardy spaces.*
(737) **Michael Marsalli**, Illinois State University, and
Graeme Philip West*, University of Witwatersrand,
Republic of South Africa (908-47-35)
- 3:45 PM *Jordan operators which admit spectral synthesis.*
(738) Preliminary report.
James Paul Lesko, Bowling Green State University
(908-47-407)
- 4:00 PM *Reduced C^* -crossed products by semigroups of
(739) automorphisms.*
Sun Young Jang, University of Ulsan, Korea
(908-47-367)
- 4:15 PM *On semilinear elliptic generalized eigenvalue
(740) problems.*
Dan D. Pascali, Courant Institute of Mathematical
Sciences, New York University (908-47-338)
- 4:30 PM *Operators and multiwavelets.*
(741) **Vishnu Govind Kamat**, Texas A & M University,
College Station (908-47-694)
- 4:45 PM *Representations on gaps and related notions in
(742) reflexive lattices of subspaces.* Preliminary report.
Sean Bradley, University of Oregon (908-47-216)
- 5:00 PM *On chains of Hilbert spaces and distributional
(743) spectral theory generated by a family of commuting
normal operators.* Preliminary report.
Nikolaos Kodogianidis, Saint Leo College
(908-47-215)
- 5:15 PM *Ky Fan's best approximation and fixed points.*
(744) **Sankatha P. Singh***, Memorial University of
Newfoundland, and **Virindra M. Sehgal**, University
of Wyoming (908-47-60)
- 5:30 PM *Global behavior of solutions of
(745) $x_{n+1} = \max\{x_n^k, A\}/x_{n-1}$.*
E. J. Janowski, University of Rhode Island, **Vlajko Lj
Kocic***, Xavier University, **Gerasimos Ladas** and
George K. Tzanetopoulos, University of Rhode
Island (908-39-451)
- 5:45 PM *Some fixed point theorems for non-convex spaces.*
(746) **Farhad Jafari** and **Virindra M. Sehgal***, University
of Wyoming (908-99-818)

MAA Minicourse #14: Part A

1:00 PM – 3:00 PM

*Learning to write good test items that allow or
require the use of technology.*Organizers: **Rose C. Hamm**, College of Charleston
Jan I. VanDever, South Dakota State
University**MAA Minicourse #15: Part A**

1:00 PM – 3:00 PM

*Dynamic geometry with Cabri Geometer.*Organizer: **James R. King**, University of
Washington**AMS Session on Operator Theory**

1:00 PM – 5:55 PM

- 1:00 PM *Neutral equations with abstract Volterra operators.*
(727) **Constantin Corduneanu**, University of Texas,
Arlington (908-99-617)
- 1:15 PM *Mixing properties of linear operators in Hilbert
(728) spaces.*
E. Flytzanis, Athens School of Economics Business
Science, Greece (908-47-553)
- 1:30 PM *The operator of Foias and Williams: Some algebraic
(729) properties.*
Srdjan Petrovic, Indiana University, Bloomington
(908-47-603)
- 1:45 PM *Semigroups of centered operators.*
(730) **Ximena C. Catepillan***, Millersville University of
Pennsylvania, and **Waclaw Szymanski**, West
Chester University of Pennsylvania (908-47-502)
- 2:00 PM *Weyl's law of elliptic operators with correction form
(731) fractal boundary.*
Zhiqiang Wu, University of Kentucky (908-47-744)

AMS Session on Numerical Analysis, II

1:00 PM – 4:40 PM

- 1:00 PM *Numerical solution of the advection-diffusion
(747) equation.*
Dennis W. Quinn, Air Force Institute of Technology
(908-65-527)

- 1:15 PM *Recurrence formulas for the moments of box splines and an application to wavelets.* Preliminary report. **David A. Eubanks**, Coker College, **Patrick J. Van Fleet*** and **Jianzhang Wang**, Sam Houston State University (908-65-467)
- 1:30 PM *Particle modeling of liquid drop formation on a solid surface in 3—D.* Preliminary report. **Mark S. Korlie**, University of Texas, Arlington (908-65-136)
- 1:45 PM *On the global support of a scaling vector.* **David Karl Ruch***, **Wasin So** and **Jianzhang Wang**, Sam Houston State University (908-99-470)
- 2:00 PM *Implicitization of rational parametric surfaces.* Preliminary report. **Chih P. Hsu**, University of Texas, Arlington (908-65-322)
- 2:15 PM *Numerical weighted Sobolev descent for singular PDEs.* **William Ted Mahavier**, Nicholls State University (908-65-449)
- 2:30 PM *Two parameter SOR method; One more time.* **Saadat Moussavi**, University of Wisconsin, Oshkosh (908-65-307)
- 2:45 PM *A basic family of iteration functions for polynomial root finding and its characterizations.* **Bahman Kalantari***, Rutgers University, New Brunswick, **Iraj Kalantari**, Western Illinois University, and **Rahim Zaare Nahandi**, University of Tehran, (908-65-06)
- 3:00 PM *A high order multigrid difference scheme for biharmonic equation.* **Irfan Altas***, Charles Sturt University, Australia, **Ram Manohar**, University of Saskatchewan (908-65-591)
- 3:15 PM *On solving nonlinear complex equations.* Preliminary report. **Yixun Shi**, Bloomsburg University of Pennsylvania (908-65-727)
- 3:30 PM *Exchange edges in a shuffle exchange network.* **Neal Brand**, University of North Texas (908-68-734)
- 3:45 PM *Boundary surfaces of implicitly defined solids.* **Frederick A. Adkins, IV**, University of Iowa (908-68-587)
- 4:00 PM *Modeling aspects of AIDS with artificial neural networks.* **Emelie Kenney** and **Langdon White***, Siena College (908-68-84)
- 4:15 PM *Optimal mutation and crossover probability for genetic algorithms.* **Raymond N. Greenwell**, Hofstra University (908-68-116)
- 4:30 PM *A numerical integration scheme in adaptive quadrature.* **Yajun Yang**, State University of New York Agricultural and Technical College, Farmingdale (908-65-375)
- 1:30 PM *Average interpolation p-wavelets construed by Haar systems.* **Baiqiao Deng**, Columbus College (908-41-62)
- 1:45 PM *A refined way of Wiener-Levinson method in frequency analysis.* Preliminary report. **K. Pan**, Barry University (908-41-248)
- 2:00 PM *Two weight norm inequalities for the one-sided fractional maximal operator.* **David V. Cruz-Uribe**, Purdue University, West Lafayette (908-42-501)
- 2:15 PM *Cantor-Lebesgue type theorems, I.* **J. Marshall Ash** and **Gang Wang***, DePaul University (908-42-438)
- 2:30 PM *Cantor-Lebesgue type theorems, II.* **J. Marshall Ash*** and **Gang Wang**, DePaul University (908-42-439)
- 2:45 PM *Weighted norm inequalities for maximal convolution-type operators.* **Christoph J. Neugebauer**, Purdue University, West Lafayette, and **Victor Jacob Olesen***, Purdue University (908-42-433)
- 3:00 PM *Orthogonal algebraic polynomial Schauder bases of optimal degree.* **Theodore A. Kilgore***, Auburn University, Auburn, **Jurgen Prestin** and **Kathi Selig**, University of Rostock, Germany (908-41-761)
- 3:15 PM *Mathematical models for the temporal and geographic transmission of HIV and AIDS.* **Peter J. Costa**, University of Saint Thomas (908-92-273)
- 3:30 PM *Mathematical neuroscience: Gold mine for undergraduate research.* **Jan E. Holly**, R S Dow Neurological Sciences Institute (908-92-163)
- 3:45 PM *A general two-compartment model for mechanical ventilation.* **J. J. Marini**, University of Minnesota, St. Paul, **Philip S. Crooke, III** and **J. Derrick Head***, Vanderbilt University (908-92-567)
- 4:00 PM *Hierarchical games and applications.* **Alexey L. Sadovskii**, Texas A & M University, Corpus Christi (908-90-134)
- 4:15 PM *The limiting values of the connection weights for the elastic net method.* **Rahman Ghamasae*** and **Jeffrey B. Goldberg**, University of Arizona (908-90-748)
- 4:30 PM *A better draft: Fair division of the talent pool.* **Bryan Dawson**, Emporia State University (908-90-378)
- 4:45 PM *Estimation of groundwater contaminants.* **Sungkwon Kang**, Chosun University, Korea (908-86-111)
- 5:00 PM *Steady-state, inspiratory airflow simulation in rat nasal passages.* **Julia S. Howell Kimbell***, CIIT, **M. N. Godo**, Fluid Dynamics International, **E. A. Gross**, **D. R. Joyner**, **R. B. Richardson** and **K. T. Morgan**, CIIT (908-76-724)
- 5:15 PM *A numerical algorithm for the optimal decision, on asset/liability management.* **Lijia Guo**, Ohio State University, Columbus (908-99-759)
- 5:30 PM *A mathematical study of how mechanical forces affect biological pattern formation.* **Mei Zhu***, Lafayette College, and **James D. Murray**, University of Washington (908-92-774)
- 5:45 PM *A model for the development of antibiotic resistance bacteria.* Preliminary report. **Dennis Huthnance**, Bloomsburg University of Pennsylvania (908-92-356)

AMS Session on Applications: Life Sciences and Economics

1:00 PM – 5:55 PM

- 1:00 PM *Surface smoothing and narrowband non-Gaussian noise removal.* **W. Zheng*** and **Bjorn Jawerth**, University of South Carolina, Columbia (908-42-735)
- 1:15 PM *Orthogonal spline multiwavelets.* **George C. Donovan**, Princeton University, **Jeffrey S. Gerónimo**, Georgia Institute of Technology, and **Douglas P. Hardin***, Vanderbilt University (908-41-130)

AMS Session on Functional Analysis, I

1:00 PM – 6:10 PM

- 1:00 PM *Products of linear functionals*. Preliminary report. (782) **Raymond A. Ryan**, University College of Galway, Republic of Ireland, and **Barry Turett***, Oakland University (908-46-680)
- 1:15 PM *Eigenvalue and eigenfunction asymptotics for self-adjoint 4th-order ordinary differential operators*. (783) **Albert William Schueller**, University of Kentucky (908-46-681)
- 1:30 PM *Characterizations of non-linear abstract Carleman operators*. (784) **William Alan Feldman**, University of Arkansas, Fayetteville (908-46-725)
- 1:45 PM *A logarithmic Sobolev inequality for the real line*. (785) **J. Michael Pearson**, Mississippi State University (908-46-565)
- 2:00 PM *Unitary representations of gauge groups*. (786) **Ruth Huerfano***, Southwestern Oklahoma State University, and **Hans R. Fischer**, University of Massachusetts, Amherst (908-46-563)
- 2:15 PM *The first order cohomology group $H^1(\ell^1(S), X)$ for some $\ell^1(S)$ -bimodules*. (787) **Stephen J. Bowling*** and **John Duncan**, University of Arkansas, Fayetteville (908-46-558)
- 2:30 PM *A characterization of representable functionals on complex Banach*-algebras*. (788) **A. K. Gaur**, Duquesne University (908-46-326)
- 2:45 PM *On existence of invariant weak units in Banach Lattices*. (789) **Kanagarajah Prabakaran**, Southern University (908-46-510)
- 3:00 PM *The reciprocal Dunford Pettis property*. Preliminary report. (790) **Elizabeth Mary Bator**, University of North Texas (908-46-304)
- 3:15 PM *Using peak functions to prove the Banach-Stone theorem*. (791) **G. Beate Zimmer**, University of Illinois, Urbana-Champaign (908-46-468)
- 3:30 PM *Weak-appearing equivalents of the Hahn-Banach Theorem*. (792) **Eric Schechter**, Vanderbilt University (908-46-159)
- 3:45 PM *On the spectrum of Frobenius-Perron operators*. (793) **Jiu Ding**, University of Southern Mississippi (908-46-104)
- 4:00 PM *An application of a monotone convergence theorem for nets to the Radon-Nikodym property*. Preliminary report. (794) **Robert C. Stolz**, Lafayette College (908-46-124)
- 4:15 PM *$L_p(w)$ -spaces*. (795) **Tibor Szarvas**, University of South Carolina, Columbia (908-46-255)
- 4:30 PM *Normal structure of Musielak-Orlicz spaces*. (796) **Eleni Katirtzoglou**, University of Memphis (908-46-324)
- 4:45 PM *Rate of convergence of solutions of variational inequalities with weakly differential inverse-monotone operators*. (797) **Fengshan Liu***, Delaware State University, and **M. Zuhair Nashed**, University of Delaware (908-46-410)
- 5:00 PM *Asymptotically isometric copies of ℓ^1 in Banach spaces*. Preliminary report. (798) **Patrick N. Dowling***, Miami University, Oxford, **Christopher J. Lennard**, University of Pittsburgh, Pittsburgh, and **Barry Turett**, Oakland University (908-46-448)

- 5:15 PM *Invariance of the Wilansky property*. (799) **Maureen T. Carroll**, University of Scranton (908-46-466)
- 5:30 PM *A sufficient condition for Bishop's property(β) and two applications*. (800) **Thomas Len Miller**, **Vivien Glass Miller*** and **Robert Colman Smith**, Mississippi State University (908-47-719)
- 5:45 PM *Vectorially minimal projections*. (801) **A. Bacopoulos**, National Technical University of Athens, Greece (908-46-801)
- 6:00 PM *An n -dimensional Hahn-Banach extension theorem*. (802) **Bruce L. Chalmers**, University of California, Riverside (908-46-802)

AMS General Session

1:00 PM – 3:40 PM

- 1:00 PM *Conjectures on spectral properties of real symmetric Toeplitz matrices*. Preliminary report. (803) **William F. Trench**, Trinity University (908-15-793)
- 1:15 PM *V-valuations and V-monoids*. (804) **Laurie June Burton**, University of Oregon (908-13-789)
- 1:30 PM *A numerical method for finding sign-changing solutions to superlinear Dirichlet problem*. (805) **John M. Neuberger**, Mississippi State University (908-35-792)
- 1:45 PM *Smooth dependence on boundary matrices for first order differential equations*. (806) **Bonita A. Lawrence***, North Carolina Wesleyan College, and **Anjali G. Datta**, Tuskegee Institute of Technology (908-34-790)
- 2:00 PM *The explicit solution of the $\bar{\partial}$ -Neumann problem in the non-isotropic Siegel domain*. (807) **Jingzhi Tie**, University of Toronto (908-35-90)
- 2:15 PM *DeRham cohomology of the module of logarithmic forms of an arrangement of hyperplanes*. (808) **Jonathan J. Wiens**, University of Oregon (908-52-791)
- 2:30 PM *C-metacompact spaces*. Preliminary report. (809) **Elise M. Grabner** and **Gary Clem Grabner***, Slippery Rock University of Pennsylvania (908-54-82)
- 2:45 PM *Singular homology and cohomology for diagrams of topological spaces*. Preliminary report. (810) **Krzysztof Sarnowski**, University of Alaska, Fairbanks (908-55-815)
- 3:00 PM *Analysis of transient patterns*. (811) **Rebecca Tyson**, University of Washington (908-99-817)
- 3:15 PM *Szygies of surfaces*. (812) **B. P. Purnaprajna**, Brandeis University (908-14-295)
- 3:30 PM *Stiefel-Whitney currents*. (813) **Reese Harvey**, Rice University, and **John W. Zweck***, University of Nevada, Reno (908-58-71)

MAA Session on Interdisciplinary Programs with Undergraduate Mathematics

1:00 PM – 5:55 PM

- Organizers: **Louis J. Gross**, University of Tennessee
Jerry A. Johnson, University of Nevada, Reno
- 1:00 PM Introduction
- 1:05 PM *Mathematics across the curriculum at the University of Nevada*. (814) **Jerry A. Johnson**, University of Nevada, Reno (908-00-1206)

- 1:25 PM *Interdisciplinary quantitative curriculum development: Lessons from a project in the life sciences.*
(815) **Louis J. Gross**, University of Tennessee, Knoxville (908-00-1204)
- 1:45 PM *A course in mathematical biology.*
▶ (816) **William R. Derrick**, University of Montana (908-00-1202)
- 2:05 PM *Epidemics.*
▶ (817) **Una M. Bray**, Skidmore College (908-00-1200)
- 2:25 PM *Environmental modeling in an interdisciplinary setting.*
▶ (818) **Robert S. Cole**, Evergreen State College (908-00-1201)
- 2:45 PM *An interdisciplinary course to replace college algebra. Preliminary report.*
(819) **Benny Dan Evans**, Oklahoma State University (908-00-1203)
- 3:05 PM *Functioning in the real world: A precalculus experience with applications across the disciplines.*
(820) **Sheldon P. Gordon**, Suffolk Community College (908-00-1205)
- 3:40 PM *Mathematics for decision making.*
(821) **Frank H. Mathis**, Baylor University (908-00-1208)
- 4:00 PM *TEAM, an interdisciplinary course in mathematics and economics.*
(822) **J. Rody Borg** and **Marilyn Repsher***, Jacksonville University (908-00-1211)
- 4:20 PM *An interdisciplinary approach to teaching mathematics and composition.*
(823) **Joseph Kirtland**, Marist College (908-00-1207)
- 4:40 PM *Using mathematics to improve writing skills.*
▶ (824) **William J. O'Connor**, Incarnate Word College (908-00-1209)
- 5:00 PM *Team teaching an integrated mathematics and science course.*
▶ (825) **Richard E. Pfeifer**, San Jose State University (908-00-1210)
- 5:20 PM *Computational science in a liberal arts setting.*
(826) **Daniel Craig Slougher**, Furman University (908-00-1212)
- 5:40 PM *Modern, computer assisted, Fourier analysis.*
▶ (827) **James S. Walker**, University of Wisconsin, Eau Claire (908-00-1213)

MAA Session on Innovations in Teaching Linear Algebra, III

1:00 PM - 6:00 PM

Organizers: **Donald R. LaTorre**, Clemson University
David C. Lay, University of Maryland, College Park
Steven J. Leon, University of Massachusetts, Dartmouth

- 1:00 PM *Fractals and the geometry of linear transformations.*
▶ (828) **James A. Walsh**, Oberlin College (908-00-1150)
- 1:20 PM *Determinants of the tournaments.*
▶ (829) **Arthur T. Benjamin***, Harvey Mudd College, and **Clifford A. McCarthy**, Convex Supercomputers, Dallas, Texas (908-00-1121)
- 1:40 PM Panel on Interactive Textbooks:
(830) *Interactive linear algebra project.*
Elias Yacoub Deeba, University of Houston, Downtown (908-00-1155)
- (831) *The linear algebra modules project.*
Eugene A. Herman*, Grinnell College, **Michael D. Pepe**, Seattle Central Community College, **Robert T. Moore** and **James R. King**, University of Washington (908-00-1156)

- (832) *Linear algebra as a laboratory course.*
Gerald J. Porter*, University of Pennsylvania, and **David R. Hill**, Temple University (908-00-1157)
- 2:45 PM *Using Maple V in teaching linear algebra.*
(833) **Lisa O. Coulter**, Stetson University (908-00-1127)
- 3:05 PM *Teaching of numerical linear algebra at undergraduate levels.*
(834) **Biswa Nath Datta**, Northern Illinois University (908-00-1129)
- 3:25 PM *An algorithmic approach to linear algebra.*
(835) **Harold M. Edwards**, New York University-Courant Institute (908-00-1132)
- 3:45 PM *Multigrid graph paper.*
▶ (836) **Jean H. Bevis**, Georgia State University (908-00-1122)
- 4:05 PM *Software independent problems in linear algebra; why and how.*
▶ (837) **Melvin Henriksen**, Harvey Mudd College (908-00-1135)
- 4:25 PM *Linear algebra: An interactive laboratory approach with Mathematica.*
▶ (838) **John R. Wicks**, North Park College (908-00-1152)
- 4:45 PM *Eigenvectors and axes of symmetry.*
▶ (839) **Saeja Oh Kim**, University of Massachusetts at Dartmouth (908-00-1142)
- 5:00 PM *Some psychological foundations of teaching linear algebra with MATLAB and ATLAST materials.*
(840) **Mikhail Bouniaev**, Southern Utah University (908-00-1123)
- 5:20 PM *Visualizing linear transformations on the HP-48G.*
▶ (841) **Thomas W. Polaski**, Winthrop University (908-00-1145)
- 5:35 PM *Teaching abstract vector spaces with HP48G/GX.*
▶ (842) **Hasan A. Celik**, California State Polytech University, Pomona (908-00-1126)
- 5:50 PM *An averaging game with weights using Mathematica.*
(843) **Tilak Ananda De Alwis**, Southeastern Louisiana University (908-00-1131)

MAA Poster Session

1:00 PM - 5:15 PM

Interactive mathematics texts: Getting students involved.

Organizers: **Marvin Brubaker**, Messiah College
Ladnor D. Geissinger, University of North Carolina, Charlotte
Lester J. Senechal, Mount Holyoke College

AMS-MAA Workshop

1:00 PM - 3:00 PM

Teacher enhancement opportunities.

Organizers: **Ronald G. Douglas**, State University of New York, Stony Brook
Mary M. Lindquist, Columbus College

Presenters: **Spud Bradley**, National Science Foundation
Jean Klanica, Cherry Creek School District, Colorado
Barbara Reys, University of Missouri, Columbia
Judith Roitman, University of Kansas
Diane Spresser, National Science Foundation

Philip D. Wagreich, University of Illinois at Chicago

ASL Invited Address

2:00 PM - 2:30 PM

- (844) *Title to be announced.*
Randall Dougherty, Ohio State University, Columbus

AMS Special Session on Diophantine Problems From Different Perspectives, III

2:10 PM - 6:00 PM

Organizers: **Henri Rene Darmon**, McGill University
Andrew J. Granville, University of Georgia

- 2:10 PM *On the equation $|ax^n - by^n| = 1$.*
 (845) **Michael A. Bennett**, University of Michigan, Ann Arbor (908-11-270)
- 2:35 PM *Rank 0 quadratic twists of elliptic curves.*
 (846) **Ken Ono**, Institute for Advanced Study (908-11-204)
- 3:00 PM *Hecke algebras and arithmetic of jacobians of modular curves.*
 (847) **Loic Merel**, University of California, Berkeley (908-11-223)
- 3:30 PM *p -adic properties of Jacobi forms. Preliminary report.*
 (848) **Adriana Sofer**, Princeton University (908-11-269)
- 3:55 PM *On the paucity of non-diagonal solutions in diagonal diophantine systems.*
 (849) **Christopher M. Skinner**, Princeton University (908-11-799)
- 4:20 PM *Diophantine questions and metaplectic forms.*
 (850) **Daniel B. Lieman**, Columbia University (908-11-227)
- 4:50 PM *Computing Iwasawa modules of real quadratic number fields.*
 (851) **James Kraft***, Ithaca College, and **Rene Schoof**, University of Rome II, Italy (908-11-193)
- 5:15 PM *On the size of the Shafarevich-Tate group of elliptic curves over function fields.*
 (852) **C. S. Rajan**, McGill University (908-11-578)
- 5:40 PM *Fermat quotients for function fields.*
 (853) **James J. Sauerberg***, Union College, and **Lingsueh Shu**, University of Vermont (908-11-228)

MAA Retiring Presidential Address

2:15 PM - 3:05 PM

- (854) *Charting directions for a new century—A portrait of the MAA on its 100th birthday.*
Donald L. Kreider, Dartmouth College (908-00-953)

NAM Presentations by Recent Doctoral Recipients

2:15 PM - 4:00 PM

Moderator: **Stella Robertson Ashford**, Southern University

RMMC Board of Directors

2:15 PM - 4:10 PM

AMS Committee on Science Policy Panel Discussion

2:30 PM - 4:00 PM

Establishing priorities for mathematical research.
 Presenters: **John Bahcall**, Institute for Advanced Study
John C. Polking, Rice University
Jean E. Taylor, Rutgers University

ASL Invited Address

2:40 PM - 3:10 PM

- (855) *Title to be announced.*
David L. Reed, Duke University

MAA Minicourse #16: Part A

3:15 PM - 5:15 PM

Contemporary calculus through applications using the TI-82.

Organizers: **Kevin G. Bartkovich**, North Carolina School of Science & Medicine
Daniel J. Teague, North Carolina School of Science & Medicine

MAA Minicourse #17: Part A

3:15 PM - 5:15 PM

Using a laboratory approach to teach basic concepts of group theory.

Organizer: **Ellen Maycock Parker**, Depauw University

ASL Invited Address

3:20 PM - 4:20 PM

- (856) *Games, complexity classes, and approximation algorithms.*
Joan Feigenbaum, AT&T Bell Laboratories, Murray Hill, New Jersey

MAA Teaching Awards Presentations

3:20 PM - 4:50 PM

AMS Committee on Science Policy-JPBM-MAA Science Policy Committee Government Speaker

4:20 PM - 5:10 PM

- (857) *Realities and expectations in a time of change.*
William C. Harris, National Science Foundation

ASL Contributed Papers

4:30 PM - 5:15 PM

MAA Informal Discussion

5:00 PM - 6:20 PM

Actuarial education.

Organizer: **James W. Daniel**, University of Texas, Austin

NAM Banquet and Cox-Talbot Address

6:00 PM – 8:00 PM

- (858) *Some perspectives about mathematics and mathematics education.*
 Evelyn B. Granville, University of Texas, Tyler

MAA Session on Standards for Introductory College Mathematics Courses Before Calculus, III

7:00 PM – 9:55 PM

Organizers: **Gregory D. Foley**, Sam Houston State University
Jon Wilkin, Northern Virginia Community College

- 7:00 PM *An algebra curriculum project.*
 (859) **Lillie F. Crowley***, Lexington Community College, and **Darrell H. Abbey**, Maysville Community College (908-00-1309)
- 7:15 PM *Earth algebra/earth math: Precalculus with environmental focus.*
 ▶ (860) **Christopher Schaufele*** and **Nancy E. Zumoff**, Kennesaw State College (908-00-1325)
- 7:30 PM *CBL experiments in college algebra.*
 ▶ (861) **Jacquelyn Wozniak**, Brevard Community College (908-00-1330)
- 7:45 PM *What do our most successful college algebra students know about functions?*
 (862) **Marilyn P. Carlson**, Arizona State University (908-00-1306)
- 8:00 PM *Precalculus—A collaborative approach.*
 (863) **H. Louise Amick**, Washington College (908-00-1302)
- 8:15 PM *Precalculus: A study of course content, organization, and pedagogy.*
 ▶ (864) **Despina Stylianou**, Educational Development Center (908-00-1327)
- 8:30 PM *One attempt to implement the standards.*
 ▶ (865) **Dennis C. Ebersole**, Northampton Community College (908-00-1311)
- 8:45 PM *Contemporary precalculus through applications.*
 (866) **Jo Ann Lutz**, North Carolina School of Science and Mathematics (908-00-1321)
- 9:00 PM *Bridging the gap; using real-world projects, cooperative learning, and technology to motivate achievement in precalculus.*
Jane T. Upshaw, University of South Carolina, Beaufort (908-00-1329)
- 9:15 PM *The Ohio State C²PC project: A project ahead of its time whose time has come.*
 ▶ (868) **Franklin D. Demana***, Ohio State University, Columbus, and **Bert K. Waits**, University of Texas, Arlington (908-00-1310)
- 9:30 PM *Functioning in the real world: The math modeling/precalculus project.*
 (869) **Sheldon P. Gordon***, Suffolk Community College, and **Florence S. Gordon**, New York Institute of Technology (908-00-1314)
- 9:45 PM *Modelling and precalculus (MAP).*
 ▶ (870) **Jere Confrey***, **Susan Piliero** and **Alan Maloney**, Cornell University (908-00-1308)

MAA Session on Chaotic Dynamics and Fractal Geometry, III

7:00 PM – 10:00 PM

Organizers: **Denny Gulick**, University of Maryland, College Park
Jon W. Scott, Montgomery College

- 7:00 PM *Order and chaos in a cubic oscillator.*
 ▶ (871) **Larry G. Blaine**, Plymouth State College (908-00-1050)
- 7:20 PM *Indecomposable subcontinua in dynamical systems.*
 (872) **Judy Anita Kennedy***, University of Delaware, and **James A. Yorke**, University of Maryland, College Park (908-00-1059)
- 7:55 PM *Torus maps and closed queuing network models.*
 ▶ (873) **James A. Walsh***, Oberlin College, **G. R. Hall**, Boston University, and **Bruce Elenbogen**, University of Michigan, Dearborn (908-00-1067)
- 8:15 PM *Defining chaos.*
 ▶ (874) **Mario Umberto Martelli***, **Mai Dang** and **Tanya Ann Seph**, California State University, Fullerton (908-00-1062)
- 8:35 PM *Can Mother Nature integrate her own equations?*
 (875) **Timothy D. Sauer**, George Mason University (908-00-1064)
- 9:10 PM *Visualizing 2-D automata in 3-D and the hyperbolic plane.*
 ▶ (876) **John E. Pulsifer** and **Clifford A. Reiter***, Lafayette College (908-00-1063)
- 9:30 PM *Symmetric attractors in 3-space.*
 ▶ (877) **Gabriel F. Brisson**, **Kaj M. Gartz**, **Benton J. McCune** and **Kevin P. O'Brien***, Lafayette College (908-00-1052)

MAA Session on Active Learning Strategies for Statistics and Probability, III

7:00 PM – 9:55 PM

Organizers: **Mary R. Parker**, Austin Community College
Allan J. Rossman, Dickinson College

- 7:00 PM *Sampling + simulation=statistical understanding: Computer graphics simulations in introductory statistics.*
 ▶ (878) **Sheldon P. Gordon***, Suffolk Community College, and **Florence S. Gordon**, New York Institute of Technology (908-00-1009)
- 7:15 PM *Statistics made interesting for students with math anxiety.*
 ▶ (879) **K. L.D. Gunawardena**, University of Wisconsin, Oshkosh (908-00-1010)
- 7:30 PM *Group projects in probability and statistics.*
 (880) **Paul J. Laumakis**, U. S. Military Academy (908-00-1014)
- 7:45 PM *Learning strategies for statistics and probability.*
 ▶ (881) **William P. Fox**, U. S. Military Academy (908-00-1006)
- 8:00 PM *Using games and projects to teach probabilistic modeling.*
 (882) **Marilyn K. Pelosi***, **Richard S. Pelosi**, Western New England College, and **C. Edward Sandifer**, Western Connecticut State University (908-00-1022)
- 8:15 PM *The use of spreadsheets and group work in a business statistics course.*
 ▶ (883) **Ann E. Moskol**, Rhode Island College (908-00-1019)
- 8:30 PM *Tying up loose ends with probability.*
 ▶ (884) **Cathy S. Liebars**, Trenton State College (908-00-1015)
- 8:45 PM *What statistics should be used to rank students?*
 (885) **Paul L. Patterson, III***, Saint Louis University, and **Donald E. Miller**, Saint Mary's College (908-00-1021)
- 9:00 PM *Active learning in statistics and probability by exploring data.*
 ▶ (886) **Susann M. Mathews**, Wright State University, Dayton (908-00-1017)

- 9:15 PM *Using print and broadcast media in elementary statistics.*
(887) **Darrell J. Horwath**, John Carroll University (908-00-1012)
- 9:30 PM *The "hot-hands" project for statistics students.*
▶ (888) **Rexanne Bruno**, University of North Florida, **John R. Reay***, Western Washington University, **Eric G. Stade**, University of Colorado, Boulder, and **Pat Tarrant**, Santa Fe Community College (908-00-1023)
- 9:45 PM *Incorporating hands-on activities into a mathematical statistics course.*
(889) **Paul R. Coe**, Rosary College (908-00-1005)

MAA Session on The Scholarship of Humanistic Mathematics, II

7:00 PM – 9:55 PM

Organizers: **Joan Countryman**, The Lincoln School, Rhode Island
Harald M. Ness, University of Wisconsin Centers-Fond du Lac
Alvin M. White, Harvey Mudd College

- 7:00 PM *"The Shock of the New": A freshman honors seminar.*
▶ (890) **Leon M. Cohen*** and **Elizabeth J. Deis**, Hampden-Sydney College (908-00-1276)
- 7:20 PM *Symmetry: A link between art and mathematics.*
(891) **Catherine Gorini**, Maharishi International University (908-00-1283)
- 7:40 PM *Reform in mathematics education and Dewey's philosophy.*
(892) **Bernard A. Fleishman**, Rensselaer Polytechnic Institute (908-00-1280)
- 8:00 PM *The history of mathematics: The humanistic way.*
(893) **Dorothy W. Goldberg**, Kean College of New Jersey (908-00-1282)
- 8:20 PM *Solving problems and playing baseball.*
(894) **Kenneth J. Preskenis**, Framingham State College (908-00-1293)
- 8:40 PM *Non-supersaturated solutions: Problems and their educational uses.*
(895) **Stephen I. Brown**, State University of New York, Buffalo (908-00-1273)
- 9:00 PM *Curriculum development via literary and musical forms.*
(896) **Joel K. Haack**, University of Northern Iowa (908-00-1285)
- 9:20 PM *Use of small groups in beginning and intermediate algebra.*
▶ (897) **Frances A. Rosamond**, National University (908-00-1296)
- 9:40 PM *Algebraic models of marriage systems: Have mathematicians been insensitive to the needs of anthropologists?*
(898) **James M. Cargal**, Troy State University (908-00-1295)

MAA CUPM Subcommittee on Calculus Reform and the First Two Years Poster Session

7:00 PM – 10:00 PM

Innovations in freshman and sophomore mathematics instruction.

Organizer: **William Barker**, Bowdoin College

MAA Session on Innovations in Teaching Precollege Algebra Courses, II

7:20 PM – 9:25 PM

- Organizer: **Mohammad H. Ahmadi**, University of Wisconsin-Whitewater
- 7:20 PM *Using parametric equations to improve the teaching of precollege algebra courses.*
▶ (899) **Jane Swaggerty**, Incarnate Word College (908-00-1177)
- 7:40 PM *Algebra tutorial.*
(900) **Roosevelt Gentry**, Jackson State University (908-00-1167)
- 8:00 PM *College algebra: Traditional instruction versus instruction via video tape.*
(901) **Richard A. Mitchell**, University of Wisconsin, Stevens Point (908-00-1172)
- 8:20 PM *A successful method to teach precollege algebra courses.*
(902) **Jay M. Jahangiri**, Kent State University, Burton (908-00-1170)
- 8:40 PM *Telephones and algebra.*
(903) **Elizabeth B. Appelbaum**, Park College (908-00-1161)
- 8:55 PM *Some unusual absolute values.*
(904) **Robert E. Buck**, Slippery Rock University of Pennsylvania (908-00-1162)
- 9:10 PM *Collaborative learning approach in precollege algebra.*
(905) **Mohammad H. Ahmadi**, University of Wisconsin, Whitewater (908-00-1160)

MAA Student Lecture

7:30 PM – 8:20 PM

- (906) *Mathematics education and national concerns.*
Richard A. Tapia, Rice University (908-00-960)

Saturday, January 13

Joint Meetings Registration

7:30 AM – 2:00 PM

AMS Special Session on History of Mathematics, II

8:00 AM – 10:35 AM

- Organizers: **Thomas Archibald**, Acadia University
Victor J. Katz, University of the District of Columbia
- 8:00 AM *Notes on Oswald Teichmüller and his work on quasi-conformal mappings.*
▶ (907) **Vicki Hill**, American University (908-01-206)
- 8:30 AM *On the rearrangements of series—Another look at the works of Levy and Steinitz.*
▶ (908) **John J. Saccoman**, Seton Hall University (908-01-15)
- 9:00 AM *The binomial theorem and extensions. Preliminary report.*
(909) **Richard A. Askey**, University of Wisconsin, Madison (908-01-18)
- 9:30 AM *Roots and early highlights of the development of engineering mathematics.*
(910) **Erwin O. Kreyszig**, Carleton University (908-01-78)
- 10:15 AM *The genesis of the abstract ring concept.*
(911) **Israel Kleiner**, York University (908-01-14)

AMS Special Session on Mathematics and Education Reform, III

8:00 AM - 10:50 AM

Organizers: **William Henry Barker**, Bowdoin College
Naomi Fisher, University of Illinois, Chicago
Kenneth C. Millett, University of California, Santa Barbara
Hugo Rossi, University of Utah
Philip D. Wagreich, University of Illinois, Chicago

- 8:00 AM (912) *The template-problem dilemma and ways to avoid it.*
Al Shenk, University of California at San Diego, La Jolla (908-98-303)
- 8:30 AM (913) *Peer-facilitated cooperative learning in large classes: Integrating reading, writing, and discussion.* Preliminary report.
William E. Bonnice, University of New Hampshire (908-98-349)
- 9:00 AM (914) *Mathematics reform: Perspectives from the classroom.*
Gail F. Burrill, University of Wisconsin, Madison (908-97-283)
- 9:30 AM (915) *The MIDDLE MATH Project: Reshaping the preparation of teachers of middle grades mathematics.* Preliminary report.
Sidney L. Rachlin, East Carolina University (908-97-360)
- 10:00 AM (916) *A model course portfolio for peer review.* Preliminary report.
Steven R. Dunbar, University of Nebraska, Lincoln (908-98-412)
- 10:30 AM (917) *Mathematics education reform in spite of limited resources: Changes at a liberal arts college.*
Thomas H. Rousseau, Siena College (908-98-241)

AMS Special Session on Stochastic Differential Equations and Applications, II

8:00 AM - 11:00 AM

Organizers: **R. W. R. Darling**, University of South Florida
Kandethody M. Ramachandran, University of South Florida

- 8:00 AM (918) *Lyapunov exponents of linear stochastic functional differential equations: Examples and case studies.*
Salah-E Mohammed, Southern Illinois University at Carbondale (908-60-456)
- 8:35 AM (919) *Backwards SDE with random terminal time, and applications to elliptical PDE.*
R. W. R. Darling*, University of South Florida, and **Etienne C. Pardoux**, CMI, France (908-60-182)
- 9:00 AM (920) *Hypersurfaces in \mathbb{R}^n and the variance of exit times for Brownian motion.*
Kimberly K. J. Kinader*, Wright State University, and **Patrick McDonald**, New College (908-60-571)
- 9:25 AM (921) *Brownian motion and Riemannian geometry in the neighborhood of a submanifold I.* Preliminary report.
Martin Ngu Ndumu, University of Yaounde, Cameroon (908-58-132)
- 9:50 AM (922) *Stochastic integro-differential equations and applications.*
Sivapragasam Sathananthan, Tennessee State University (908-60-250)

- 10:15 AM (923) *Solving a system of nonlinear parabolic partial differential equations by a probabilistic method.*
Zusheng Rao*, University of South Florida, **Etienne Pardoux**, CMI, France, and **Frederic Pradeilles**, University of Provence, France (908-60-783)
- 10:40 AM (924) *Adapted solution of a degenerate backward SPDE, with applications.*
Jin Ma*, Purdue University, West Lafayette, and **Jiongmin Yong**, Fudan University, People's Republic of China (908-60-782)

AMS Special Session on Diophantine Problems From Different Perspectives, IV

8:00 AM - 10:25 AM

Organizers: **Henri Rene Darmon**, McGill University
Andrew J. Granville, University of Georgia

- 8:00 AM (925) *Effective estimates of the number of points of algebraic varieties over finite fields.* Preliminary report.
Siman Yat-Fai Wong, Institute for Advanced Study (908-11-210)
- 8:25 AM (926) *On distribution of solutions of unit equations.*
Milja R. Poe, Harvard University (908-11-200)
- 8:50 AM (927) *Towards removal of semistability conditions at 5.*
Brian D. Conrad, Princeton University (908-11-112)
- 9:15 AM (928) *The levels and weights of modular representations.*
Kevin Buzzard, University of California, Berkeley (908-11-224)
- 9:40 AM (929) *Rational points on elliptic curves and splitting quadratic forms.*
Jonathan Shick, Loyola University (908-11-742)
- 10:05 AM (930) *Special values of Goss' L-function and Bernoulli ideals.*
Lingsueh Shu, University of Vermont (908-11-222)

AMS Special Session on Geometry, Topology, and Analysis on Noncompact Manifolds, III

8:00 AM - 10:20 AM

Organizer: **Peter E. Haskell**, Virginia Polytechnic Institute and State University

- 8:00 AM (931) *Symplectic surgery and the equivariant index theorem.* Preliminary report.
Reyer Sjamaar, Cornell University (908-58-201)
- 8:30 AM (932) *Legendrian circular helix links.* Preliminary report.
Lisa M. Traynor, Bryn Mawr College (908-58-366)
- 9:00 AM (933) *Cordes algebras based on Schrödinger operators with rapidly increasing potentials.*
Houshang H. Sohrab, Towson State University (908-46-101)
- 9:30 AM (934) *L^2 Oka-Grauert theory.*
Mikhael Gromov, Institute des Hautes Etudes Sciences, France, **Gennadi M. Henkin**, University of Paris VI, France, and **Mikhail A. Shubin***, Northeastern University (908-32-462)
- 10:00 AM (935) *Gluing formulae for the index of families of Dirac operators.*
Liviu I. Nicolaescu, University of Michigan, Ann Arbor (908-47-757)

AMS Special Session on Representation Theory and Harmonic Analysis of Topological Groups, II

8:00 AM - 10:50 AM

Organizers: **Carolyn Pfeffer Johnston**, Florida Atlantic University

Gail D. L. Ratcliff, University of Missouri, St. Louis

- 8:00 AM (936) *A Lie-theoretic approach to Schur duality.*
Roe W. Goodman*, Rutgers University, New Brunswick, and **Nolan R. Wallach**, University of California at San Diego, La Jolla (908-20-477)
- 8:30 AM (937) *A nonspherical representation of the icosahedral graded Hecke algebra.*
Catherine E. Kriloff, Oklahoma State University (908-16-153)
- 9:00 AM (938) *The arithmetic of compact solvmanifolds.*
Jeffrey Stephen Fox, University of Colorado, Boulder (908-22-618)
- 9:20 AM Break
- 10:00 AM (939) *Functional equations of p -adic zeta integrals, and representations of the metaplectic group.*
W. Jay Sweet, Jr., Florida International University (908-22-169)
- 10:30 AM (940) *Quadratic base change for p -adic $SL(2)$ as a theta correspondence.* Preliminary report.
David C. Manderscheid, University of Iowa (908-22-238)

AMS Special Session on Algebra, Algebra Cohomology, and Polynomial Identities, III

8:00 AM – 10:50 AM

Organizers: **Andy R. Magid**, University of Oklahoma
Lance W. Small, University of California at San Diego, La Jolla

- 8:00 AM (941) *Non-commutative and non-cocommutative Hopf algebras arising from finite group algebras.* Preliminary report.
John F. P. Wen*, Florida State University, and **Roselyn E. Williams**, Florida A & M University (908-16-703)
- 8:30 AM (942) *Heisenberg algebras and coefficient rings.*
Horia C. Pop, University of Iowa (908-16-655)
- 9:00 AM (943) *L_∞ algebras and their cohomology.*
Michael Robert Penkava, University of California, Davis (908-17-286)
- 9:30 AM (944) *Frobenius extensions of subalgebras of Hopf algebras.*
Davida Fischman*, California State University, San Bernardino, **M. Susan Montgomery**, University of Southern California, and **Hans-Jurgen Schneider**, University Munchen, Germany (908-16-58)
- 10:00 AM (945) *Residue complex for quantum planes.*
Kaushal Ajitabh, University of Texas, Austin (908-14-479)
- 10:30 AM (946) *Generalized Massey products.* Preliminary report.
Lynelle M. Lang, University of California, Davis (908-17-87)

MAA Minicourse #15: Part B

8:00 AM – 10:00 AM

Dynamic geometry with Cabri Geometer.
 Organizer: **James R. King**, University of Washington

MAA Minicourse #18: Part A

8:00 AM – 10:00 AM

Training tools for mathematics TA teaching workshops.
 Organizer: **Marilyn McCollum**, North Carolina State University

AMS Session on General Topology

8:00 AM – 10:25 AM

- 8:00 AM (947) *Characterization of maximal ideals and ultrafilters in a complementary topology.*
Rahim G. Karimpour, Southern Illinois University, Edwardsville (908-54-306)
- 8:15 AM (948) *α -scattered spaces.* Preliminary report.
David A. Rose, Southeastern College of the Assemblies of God (908-54-585)
- 8:30 AM (949) *More on normality of products.*
Jamel A. Kammoun, Benedict College (908-54-612)
- 8:45 AM (950) *The semi-open set and the semi-regular set generated topologies.* Preliminary report.
Charles I. Dorsett, Louisiana Tech University (908-54-697)
- 9:00 AM (951) *The normability question.* Preliminary report.
Jamuna P. Ambasht, Benedict College (908-54-240)
- 9:15 AM (952) *Baire spaces and hyperspace topologies.*
Laszlo Zsilinszky, University of South Carolina, Columbia (908-54-597)
- 9:30 AM (953) *Weak astrality, weak purity, and quasi- (S_1) properties.* Preliminary report.
Gangadhar R. Hiremath, Talladega College (908-54-176)
- 9:45 AM (954) *Examples of generalized metacompact spaces.*
James C. Smith, Jr., Virginia Polytech Institute & State University (908-54-175)
- 10:00 AM (955) *Generalized ordered spaces with point-countable bases.* Preliminary report.
Harold R. Bennett, Texas Tech University, and **David J. Lutzer***, College of William & Mary (908-54-143)
- 10:15 AM (956) *Companions to the double sequence theorem of Nagata.*
Henry Hin-Lai Hung, Concordia University (908-54-47)

AMS Session on Commutative Algebra and Algebraic Geometry, I

8:00 AM – 10:55 AM

- 8:00 AM (957) *K -admissibility of $S_1 2, S_1 3, S_1 4, S_1 5$.*
Steven Liedahl*, University of Notre Dame, and **Zara Marija Girnius**, University of Cincinnati (908-11-776)
- 8:15 AM (958) *Explicit construction of $PSL(2, 7)$ -fields over $\mathbb{Q}(t)$ embeddable in $SL(2, 7)$ -fields.*
John R. Swallow, Davidson College (908-12-374)
- 8:30 AM (959) *Some computations for Witt groups of hyperelliptic curves.* Preliminary report.
Jonathan Shick, Loyola University (908-12-741)
- 8:45 AM (960) *The Dedekind-Mertens Lemma and certain graphs.* Preliminary report.
Alberto Corso*, **Volmer V. Vasconcelos**, Rutgers University, New Brunswick, and **Rafael H. Villarreal**, ESFM del IPN, Mexico (908-13-411)
- 9:00 AM (961) *Tor and torsion on a complete intersection.* Preliminary report.
David Allen Jorgensen, University of Nebraska, Lincoln (908-13-489)
- 9:15 AM (962) *Kernel of a divisor class group map.*
Claudia Maria Miller, University of Illinois, Urbana-Champaign (908-13-720)
- 9:30 AM (963) *Investigating torsion in tensor products using numerical semigroups.* Preliminary report.
Kurt D. Herzinger, University of Nebraska, Lincoln (908-13-521)

- 9:45 AM (964) *Generators of maximal ideals in the ring of integer-valued polynomials.* Preliminary report.
Scott Thomas Chapman*, Trinity University, and **William W. Smith**, University of North Carolina, Chapel Hill (908-13-188)
- 10:00 AM (965) *Stable range in formal power series with any number of indeterminates.*
Amir M. Rahimi, (908-13-81)
- 10:15 AM (966) *Dynamic feedback over commutative rings: The projective case.* Preliminary report.
Oswaldo Lezama*, University Nacional de Colombia, Colombia, and **Armando Rodado**, University Nacional de Columbia, (908-93-157)
- 10:30 AM (967) *Applications of Gröbner bases to linear codes.*
Jeanne Fitzgerald* and **Robert F. Lax**, Louisiana State University, Baton Rouge (908-94-602)
- 10:45 AM (968) *The rank of some families of elliptic surfaces.*
Lisa A. Fastenberg, Yale University (908-14-97)

AMS Session on Complex Analysis, I

8:00 AM – 10:55 AM

- 8:00 AM (969) *The Cardinal Series and Shannon's sampling theorem.*
Nasser Dastrange, Buena Vista College (908-26-281)
- 8:15 AM (970) *Weighted norm inequalities for fractional integrals with an application to mean convergence of Laguerre series.*
Elizabeth L. Kochneff, Eastern Washington University (908-26-28)
- 8:30 AM (971) *On decentralized realization of smooth functions.*
Pengyuan Chen, Gustavus Adolphus College (908-26-65)
- 8:45 AM (972) *Application of covering sets.* Preliminary report.
Kandasamy K. Muthuvel, University of Wisconsin-Oshkosh (908-26-187)
- 9:00 AM (973) *Reconstruction of some approximate antigradient.*
Xiao-Xiong Gan, Morgan State University (908-26-259)
- 9:15 AM (974) *An extension of the Hardy-Littlewood inequalities for power series and moments.*
Constantine Georgakis, DePaul University (908-26-533)
- 9:30 AM (975) *Sharpened versions of the Schwarz Lemma.*
Peter R. Mercer, Saint Mary's College of Maryland (908-30-442)
- 9:45 AM (976) *On two meromorphic functions that share pairs of small functions.* Preliminary report.
Ping Li* and **Chung-Chun Yang**, Hong Kong University of Science & Technology, Hong Kong (908-30-320)
- 10:00 AM (977) *Some harmonic slit mappings.* Preliminary report.
Michael John Dorff, University of Kentucky (908-30-305)
- 10:15 AM (978) *A generalization of Littlewood-Paley conjecture to m -th root transform of a class of close-to-convex functions.*
Massoud Jahangiri, Kent State University, Burton (908-30-336)
- 10:30 AM (979) *Convergence and zero distribution of Laurent-type rational functions.*
Nicholas Papamichael, **Nikolaos N. Stylianopoulos**, University of Cyprus, Cyprus, **Igor E. Pritsker***, Kent State University, Kent, and **Edward B. Saff**, University of South Florida (908-30-03)
- 10:45 AM (980) *Zero-free regions for sections of power series.* Preliminary report.
Faruk F. Abi-Khuzam, American University of Beirut (908-30-771)

AMS Session on Partial Differential Equations, I

8:00 AM – 10:55 AM

- 8:00 AM (981) *A linear variation of parameters formula and comparison theorems for three dimensional hyperbolic problems.*
Sudhakar Gurunath Pandit, Winston-Salem State University (908-35-341)
- 8:15 AM (982) *On connection between acoustics and quantum mechanics.*
Ivan Victorovich Andronov, Saint Petersburg University, **B. Belinskiy*** and **Jerald P. Dauer**, University of Tennessee, Chattanooga (908-35-522)
- 8:30 AM (983) *Over specified parabolic boundary value problem.* Preliminary report.
Morteza Shafii-Mousavi, Indiana University, South Bend (908-35-282)
- 8:45 AM (984) *Some persistence results in a diffusive food-chain model.*
Wei Feng and **Chenhong Lu***, University of North Carolina, Wilmington (908-35-311)
- 9:00 AM (985) *Constructive solutions of boundary problems via sampling kernels.* Preliminary report.
Peter A. McCoy, U. S. Naval Academy and Radar Division, U. S. Naval Research Lab, Washington, D. C. (908-35-325)
- 9:15 AM (986) *The effect of bridge impedance $Z = M + iR$ and mistuning on mode frequencies in musical instruments using courses of several strings.*
David R. Peterson, University of Central Arkansas (908-35-464)
- 9:30 AM (987) *Dynamics of boundary controlled convection-reaction-diffusion equations.*
Victor I. Shubov*, Texas Tech University, **D. A. Gilliam** and **Christopher I. Byrnes**, Washington University (908-35-486)
- 9:45 AM (988) *Group classification for generalized Burgers equations.*
S. K. Rai*, Texas A & M International University, and **Chelluri C. A. Sastri**, Dalhousie University (908-35-491)
- 10:00 AM (989) *Existence of solutions of degenerate quenching problems.*
Lan Ke and **Shiying Ning***, University of Southwestern Louisiana (908-35-497)
- 10:15 AM (990) *A semilinear elliptic equation at a critical exponent.*
Alexandra Kurepa, North Carolina A & T State University (908-35-601)
- 10:30 AM (991) *Boundary identifiability of residual stress via Dirichlet to Neumann map.*
Robert L. Robertson, University of Kentucky (908-35-604)
- 10:45 AM (992) *Stability for the polyharmonic obstacle problem.* Preliminary report.
Ronald F. Vandenhousten, University of Kentucky (908-35-640)

AMS Session on Algebraic Topology

8:00 AM – 10:55 AM

- 8:00 AM (993) *Invariant differential forms on compact nilmanifolds.*
Necdet Guner, University of Wisconsin, Madison (908-55-236)
- 8:15 AM (994) *Cohomology of the Euclidian Bianchi groups.*
Ethan J. Berkove, University of Wisconsin, Madison (908-55-524)
- 8:30 AM (995) *On the Bredon cohomology of $B_G U$.*
Yimin Yang, University of Minnesota, Morris (908-55-56)

- 8:45 AM *The knot slice problem via the eta invariant.*
(996) **Carl F. Letsche**, Pennsylvania State University, Altoona (908-57-388)
- 9:00 AM *Fixed points of boundary-preserving maps of punctured surfaces.*
(997) **Jeanine Kay Nolan**, University of Nevada, Reno (908-55-685)
- 9:15 AM *The clasp number of alternating knots.* Preliminary report.
(998) **Helmut Doll***, Bloomsburg University of Pennsylvania, and **Edith N. Starr**, Vassar College (908-57-418)
- 9:30 AM *Computer implementation of an improved braid conjugacy algorithm.* Preliminary report.
(999) **John F. Pedersen**, University of South Florida (908-57-73)
- 9:45 AM *Symmetry of knot invariants and Lie superalgebras.*
(1000) **Arkady Vaintrob**, University of Utah (908-57-74)
- 10:00 AM *Homology manifold transversality.* Preliminary report.
(1001) **Heather M. Johnston**, University of Pennsylvania (908-57-600)
- 10:15 AM *A connectivity property of geometric cell complexes.*
(1002) **Steven W. Knox**, University of Illinois, Urbana-Champaign (908-57-610)
- 10:30 AM *Normals in a Minkowski plane.*
(1003) **Kathleen Marie Hann**, California State University Hayward (908-52-559)
- 10:45 AM *Mean curvature preserving isometrics between surfaces in R^3 .* Preliminary report.
(1004) **Georgi I. Kamberov**, University of Massachusetts, Amherst (908-53-115)

AMS Session on Differential Geometry

8:00 AM – 10:55 AM

- 8:00 AM *Least-area partitions of R^n .* Preliminary report.
▶ (1005) **Frank Morgan**, Williams College (908-49-168)
- 8:15 AM *Constrained optimization methods for PDEs.* Preliminary report.
(1006) **John Gregory*** and **Kathleen A. Pericak-Spector**, Southern Illinois University, Carbondale (908-49-61)
- 8:30 AM *Numerical solution of time-delay optimal control problems with inequality constraints.*
(1007) **Mohammad A. Kazemi**, University of North Carolina, Charlotte (908-49-328)
- 8:45 AM *On the cell-averaging spectral Chebyshev solution of a nonlinear controlled dynamical system.*
(1008) **Gamal Elnagar**, University of South Carolina, Spartanburg (908-49-329)
- 9:00 AM *A new method for Lagrange problems in the calculus of variations.* Preliminary report.
▶ (1009) **Geza Schay**, University of Massachusetts, Boston (908-49-495)
- 9:15 AM *Automatic controls for nonlinear dynamical systems with Lipschitzian trajectories.*
(1010) **Reza R. A. Ahangar***, Piedmont College, and **Ebrahim Salehi**, University of Nevada, Las Vegas (908-49-800)
- 9:30 AM *The group structure of a pyramidal puzzle.*
▶ (1011) **Darren Glass***, Rice University, **Matina Donaldson**, Reed College, and **Tiffany Maher**, Oklahoma State University, Stillwater (908-52-422)
- 9:45 AM *De Rham cohomology of the module of logarithmic forms for an arrangement of hyperplanes.*
(1012) **Jonathan J. Wiens**, University of Oregon (908-52-500)
- 10:00 AM *Mistilings of the plane with rectangles.*
▶ (1013) **Manjul Bhargava**, Harvard University (908-52-736)

- 10:15 AM *Transverse matchings on a finite planar set.*
(1014) **Mark J. Nielsen**, University of Idaho (908-52-718)
- 10:30 AM *Representations of the Lie group of automorphisms of an almost r -paracontact manifold of P -Sasakian type, II.*
(1015) **Andrew Bucki**, Oklahoma School of Science & Mathematics (908-53-651)
- 10:45 AM *1-type submanifolds of HP^m and OP^2 .* Preliminary report.
(1016) **Ivko M. Dimitric**, Pennsylvania State University, Uniontown (908-53-750)

MAA Session on Creating an Active Learning Environment: Preparing Pre-service Teachers, II

8:00 AM – 10:55 AM

- Organizers: **Hubert J. Ludwig**, Ball State University
Kay Meeks Roebuck, Ball State University
- 8:00 AM *Re-forming elementary teachers' beliefs.*
▶ (1017) **Janet Lea Heine Barnett**, University of Southern Colorado (908-00-1091)
- 8:15 AM *Problem solving for pre-service elementary teachers: How to fit mathematics, pedagogy, and technology into 10 weeks.*
▶ (1018) **Susan L. Addington**, California State University, San Bernardino (908-00-1090)
- 8:30 AM *Hands-on data analysis.*
(1019) **David C. Flaspohler***, Xavier University, and **Ann L. Dinkheller**, Project Discovery (908-00-1096)
- 8:45 AM *Integrating mathematics and methods.*
(1020) **Susan R. Beal***, Saint Xavier University, and **Mark Klepsis**, Sam Houston State University (908-00-1092)
- 9:00 AM *Mathematical modeling with secondary education emphasis.*
▶ (1021) **Thomas E. Kelley**, Metropolitan State College of Denver (908-00-1099)
- 9:15 AM *Modern algebra—A discovery approach for pre-service teachers.*
▶ (1022) **John J. Koker**, University of Wisconsin, Oshkosh (908-00-1101)
- 9:30 AM *Using problem solving to encourage active learning.*
(1023) **Marie P. Sheckels*** and **Sandra White**, Mary Washington College (908-00-1110)
- 9:45 AM *Role playing: An active learning strategy.*
(1024) **Debra Rothermel*** and **Cathy Ann Godbois**, Harrisburg Area Community College, Lancaster Campus (908-00-1108)
- 10:00 AM *Preparing preservice elementary teachers to teach mathematics through modeling.*
(1025) **Jane T. Upshaw**, University of South Carolina, Beaufort (908-00-1115)
- 10:15 AM *Changing the mathematics courses for elementary teachers: Examples, suggestions and insights.*
(1026) **Susan Gay**, University of Kansas (908-00-1098)
- 10:30 AM *Combining content and methods for pre-service elementary teachers.*
▶ (1027) **Robert P. Stutts**, Columbia College (908-00-1112)
- 10:45 AM *Visualization activities involving manipulatives and active group learning.*
(1028) **Regina Baron Brunner**, Cedar Crest College (908-00-1094)

MAA Poster Session on Research by Undergraduate Students

8:00 AM – 10:55 AM

- Organizer: **Judith Palagallo**, University of Akron

AMS Committee on Education Panel Discussion

8:30 AM – 10:00 AM

Does calculus reform really work?

Moderator: **John H. Ewing**, American Mathematical Society

Panelists: **George E. Andrews**, Pennsylvania State University

Morton Brown, University of Michigan

John C. Polking, Rice University

NAM William W.S. Claytor Lecture

9:00 AM – 9:50 AM

(1029) *The mathematics of queueing networks.*

William A. Massey, AT&T Bell Laboratories, Murray Hill, New Jersey

ASL Invited Address

9:00 AM – 10:00 AM

(1030) *Glimm-Effros type dichotomies.*

Gregory Hjorth, California Institute of Technology

AMS Special Session on Mathematical Physics, III

9:00 AM – 10:30 AM

Organizer: **Michael P. Loss**, Georgia Institute of Technology

9:00 AM (1031) *Spectral analysis of nonselfadjoint operators generated by damped hyperbolic equations and applications to control theory and energy decay estimates.*

Marianna A. Shubov, Texas Tech University (908-80-389)

9:30 AM (1032) *Differential equations methods for the Monge-Kantorovich mass transfer problem.*

Craig Evans, University of California, Berkeley, and **Wilfrid Gangbo***, Georgia Institute of Technology (908-49-263)

10:10 AM (1033) *Extremals of zeta functions of Laplacians.*

Richard Snyder Laugesen*, University of Michigan, Ann Arbor, and **Carlo Morpurgo**, University of Texas, Austin (908-58-465)

AWM Workshop

9:00 AM – 5:00 PM

Book Sales and Exhibits

9:00 AM – NOON

NAM Panel Discussion

10:00 AM – 10:50 AM

Affirmative action and underrepresented American minorities in mathematics at the graduate and professional levels.

Moderator: **Robert E. Bozeman**, Morehouse College

MAA Invited Address

10:05 AM – 10:55 AM

(1034) *Having fun with linear algebra: Applications to combinatorics and geometry.*

Laszlo Babai, University of Chicago and Eötvös University, Hungary (908-00-950)

ASL Invited Address

10:10 AM – 10:40 AM

(1035) *Definability, automorphism, and the countably enumerable sets.*

Peter A. Cholak, University of Notre Dame

ASL Contributed Papers

10:50 AM – 12:25 PM

AMS-MAA Invited Address

11:10 AM – NOON

(1036) *It's as easy as abc.*

Andrew J. Granville, University of Georgia (908-00-908)

MAA Business Meeting

12:05 PM – 12:30 PM

AMS Business Meeting

12:35 PM – 1:00 PM

AMS Special Session on History of Mathematics, III

1:00 PM – 4:50 PM

Organizers: **Thomas Archibald**, Acadia University
Victor J. Katz, University of the District of Columbia

1:00 PM (1037) *Newton and mathematical language.*

▶ **John G. Fauvel**, Open University, United Kingdom (908-01-122)

1:30 PM (1038) *Marshall Islands stick charts: A case in ethnomathematics.* Preliminary report.

Marcia Ascher, Ithaca College (908-01-107)

2:00 PM (1039) *Archival record of minority mathematicians.*

▶ **Florence D. Fasanelli**, Mathematical Association of America (908-01-402)

2:30 PM (1040) *Discovery of a lost factoring machine.*

Jeffrey Outlaw Shallit, University of Waterloo (908-01-12)

3:00 PM (1041) *On the origins of Riemann's concept of curvature.*

Paul R. Wolfson, West Chester University of Pennsylvania (908-01-108)

3:30 PM (1042) *Some medieval Indian approximation formulas.*

Kim Plofker, Brown University (908-01-151)

4:00 PM (1043) *Some observations on the history of mathematics in Mexico, 1930 – 1950.*

▶ **Alejandro R. Garcíadiego**, University Nacional Autónoma de México, México (908-01-261)

4:30 PM (1044) *Dimitrii Fedorovich Egorov and the "True Orthodox Church."*

Charles Edwin Ford, Saint Louis University (908-01-05)

AMS Special Session on Quantum Information and Computation, II

1:00 PM – 4:10 PM

Organizers: **Charles H. Bennett**, IBM T. J. Watson Research Center, Yorktown Heights, New York

Peter W. Shor, AT&T Bell Laboratories, Murray Hill, New Jersey

1:00 PM (1045) *Gates and circuits for quantum computers.*

▶ **David P. DiVincenzo**, IBM (908-81-427)

- 1:40 PM *Quantum cryptoanalysis of hidden linear forms.*
(1046) **Dan Boneh*** and **R. J. Lipton**, Princeton University (908-68-421)
- 2:20 PM *Computations with quantum gate arrays.*
(1047) **Richard Cleve**, University of Calgary (908-68-400)
- 3:00 PM *On the simulation of quantum computations.*
(1048) **R. J. Lipton**, Princeton University (908-68-423)
- 3:40 PM Discussion

AMS Special Session on Stochastic Differential Equations and Applications, III

1:00 PM – 4:20 PM

Organizers: **R. W. R. Darling**, University of South Florida
Kandethody M. Ramachandran, University of South Florida

- 1:00 PM *On the chance of rogue waves at sea.* Preliminary report.
(1049) **Benjamin S. White**, Exxon Research & Engineering (908-60-516)
- 1:30 PM *Stability of model ecosystems under Markovian structural perturbations.*
(1050) **Gangaram S. Ladde**, University of Texas, Arlington (908-60-178)
- 2:00 PM *Stochastic linearizations of point dissipative nonlinear systems.*
(1051) **James A. Reneke**, Clemson University (908-93-194)
- 2:30 PM *Stochastic homogenization of elliptic boundary value problems with L^p -data.*
(1052) **Kevin T. Andrews** and **Steve J. Wright***, Oakland University (908-35-44)
- 3:00 PM *Direct averaging method for stochastic differential games.*
(1053) **Kandethody M. Ramachandran**, University of South Florida (908-93-350)
- 3:30 PM *Moving boundary problem and a class of diffusion processes.*
(1054) **Weian Zheng**, University of California, Irvine (908-60-41)
- 4:00 PM *Stochastic effect in curvature driven flows.*
(1055) **Nung Kwan Aaron Yip**, Princeton University (908-49-45)

AMS Special Session on Diophantine Problems From Different Perspectives, V

1:00 PM – 1:50 PM

Organizers: **Henri Rene Darmon**, McGill University
Andrew J. Granville, University of Georgia

- 1:00 PM *Arithmetic intersection in a Siegel threefold.*
(1056) Preliminary report.
Fernando Rodriguez-Villegas, Princeton University (908-11-267)
- 1:30 PM *The iterative method in Waring's problem for number fields.*
(1057) **Morley A. Davidson**, Institute for Advanced Study (908-11-225)

AMS Special Session on Representation Theory and Harmonic Analysis of Topological Groups, III

1:00 PM – 5:20 PM

Organizers: **Carolyn Pfeffer Johnston**, Florida Atlantic University
Gail D. L. Ratcliff, University of Missouri, St. Louis

- 1:00 PM *Algebraic methods towards higher-order probability inequalities.*
(1058) **Donald St P Richards**, University of Virginia (908-43-460)
- 1:30 PM *C^* -algebras associated to lattices in Heisenberg Lie groups.*
(1059) **Soo-Teck Lee** and **Judith A. Packer***, National University of Singapore, Singapore (908-46-214)
- 2:00 PM *Completely bounded multilinear forms on groups.*
(1060) **Guanghua Zhao**, Fayetteville State University (908-43-369)
- 2:30 PM *Harmonic analysis questions coming from quantization.* Preliminary report.
(1061) **Marc A. Rieffel**, University of California, Berkeley (908-20-230)
- 2:50 PM Break
- 3:30 PM *Quasi-regular representations and the geometry of nilmanifolds.*
(1062) **Ruth Gornet**, Texas Tech University (908-58-583)
- 4:00 PM *Sampling of representation coefficients, frames, and wavelet theory.*
(1063) **Karlheinz U. Grochenig**, University of Connecticut (908-42-806)
- 4:30 PM *Legendre polynomials, simultaneously symmetric functions, and cocycles of an irrational rotation.* Preliminary report.
(1064) **Lawrence W. Baggett**, University of Colorado, Boulder, **Herbert Antonio Medina**, Loyola Marymount University, and **Kathy Donovan Merrill***, Colorado College (908-43-576)
- 5:00 PM *An invariant theorem and its applications.* Preliminary report.
(1065) **Hongming Ding**, Saint Louis University (908-22-275)

MAA Minicourse #13: Part B

1:00 PM – 3:00 PM

Fibonacci and Catalan numbers.
Organizer: **Ralph P. Grimaldi**, Rose-Hulman Institute of Technology

MAA Minicourse #16: Part B

1:00 PM – 3:00 PM

Contemporary calculus through applications using the TI-82.
Organizers: **Kevin G. Bartkovich**, North Carolina School of Science & Medicine
Daniel J. Teague, North Carolina School of Science & Medicine

MAA Minicourse #17: Part B

1:00 PM – 3:00 PM

Using a laboratory approach to teach basic concepts of group theory.
Organizer: **Ellen Maycock Parker**, Depauw University

AMS Session on Commutative Algebra and Algebraic Geometry, II

1:00 PM – 3:25 PM

- 1:00 PM *Projective normality of varieties of small degree.*
(1066) **Alberto Alzati**, University of Milan, Italy, **Marina Bertolini**, University Degli Studi di Milan,, and **GianMario Besana***, University of Wisconsin, Eau Claire (908-14-385)

- 1:15 PM *Deformations of Lie superalgebras and PBW theorems.*
(1067) **Yi Ming Zou**, University of Wisconsin, Milwaukee (908-17-813)
- 1:30 PM *The first degeneracy locus of the map $S : \text{Sec}(\otimes_{X/\mathbb{A}^1}^\infty) \rightarrow \otimes_{\mathcal{H}/\mathbb{A}^1}^\infty$ for an algebraic surface X .*
(1068) **Mark E. Huijbregtse**, Skidmore College (908-14-450)
- 1:45 PM *Degenerations of mixed Hodge structures.*
(1069) **Eric C. Gaze**, University of Massachusetts, Amherst (908-14-528)
- 2:00 PM *Lifting of deformations for tetragonal curves.*
(1070) **James N. Brawner**, Saint John's University (908-14-643)
- 2:15 PM *Curves on the torus and Klein bottle.*
(1071) **Anatoly Korchagin**, Brooklyn, New York (908-14-781)
- 2:30 PM *A uniform property for finite sets of points in projective space.*
(1072) **Lakshmi V. Modali**, Syracuse University (908-14-642)
- 2:45 PM *Algebraic geometric codes over rings.*
(1073) **Judy Leavitt Walker**, University of Illinois, Urbana-Champaign (908-94-560)
- 3:00 PM *Asymptotic prime-power divisibility of binomial, generalized binomial, and multinomial coefficients.*
(1074) **John M. Holte**, Gustavus Adolphus College (908-05-245)
- 3:15 PM *Motivic complexes from automorphisms.*
(1075) **Mark Edward Walker**, University of Illinois, Urbana-Champaign (908-19-647)
- 2:45 PM *A complex strongly extreme point which is not an analytic denting point.*
(1083) **Patrick N. Dowling**, Miami University, Oxford, **David Hu**, El Paso Community College, and **Douglas Mupasiri***, University of Northern Iowa (908-28-722)
- 3:00 PM *Asymptotic measures, Morse-Smale diffeomorphisms, and residue lemmas.*
(1084) **Donna K. Molinek**, Davidson College (908-28-504)
- 3:15 PM *Boundary behavior of harmonic mappings.*
(1085) **Paul Greiner**, University of Michigan, Ann Arbor (908-33-376)
- 3:30 PM *Global meromorphic solutions of partial differential equations. Preliminary report.*
(1086) **Peichu Hu*** and **Chung-Chun Yang**, Hong Kong University of Science & Technology, Hong Kong (908-32-739)
- 3:45 PM *Quadruple product of ultraspherical functions.*
(1087) **Mihr Jahanian Shah**, Kent State University, Trumbull Campus (908-33-154)
- 4:00 PM *Gram polynomials and Kummer's function.*
(1088) **Roger W. Barnard***, Texas Tech University, **G. Dahlquist**, Royal Institute of Technology, Sweden, **Kent Pearce**, Texas Tech University, **Lothar Reichel**, Kent State University, Kent, and **Kendall Clyde Richards**, Southwestern University (908-33-688)
- 4:15 PM *Sieved orthogonal polynomials.*
(1089) **Blaise P. DeSesa**, Rowan College of New Jersey (908-33-342)
- 4:30 PM *Animating Teichmüller spaces and Kleinian groups*
(1090) **Paul R. McCreary**, University of Illinois (908-99-723)

AMS Session on Complex Analysis, II

1:00 PM - 4:40 PM

- 1:00 PM *Geometric properties inherited by approximating Cesàro sums.*
(1076) **Joseph A. Cima**, University of North Carolina, Charlotte, **Roger W. Barnard** and **Kent Pearce***, Texas Tech University (908-30-696)
- 1:15 PM *Two-point distortion theorems for bounded univariant functions. Preliminary report.*
(1077) **William Ma***, Pennsylvania College of Technology, and **David Minda**, University of Cincinnati (908-30-552)
- 1:30 PM *Asymptotics of the zeros of relativistic Hermite polynomials.*
(1078) **Matthew He***, Nova Southeastern University, and **Paolo E. Ricci**, University of Rome La Sapienza, Italy (908-30-40)
- 1:45 PM *Weighted norm inequalities for conjugate A-harmonic tensors.*
(1079) **Shusen Ding**, Florida State University (908-30-192)
- 2:00 PM *On a sequence of polynomials related to the Bieberbach-Milin problem.*
(1080) **Arcadii Z. Grinshpan*** and **Mourad E.H. Ismail**, University of South Florida (908-30-83)
- 2:15 PM *Pleating coordinates for the deformation space of a 2-cusped hyperbolic 3-manifold.*
(1081) **Kavita G. Bhatia**, University of Oklahoma (908-99-424)
- 2:30 PM *Growth extension and John domains. Preliminary report.*
(1082) **Navah Langmeyer**, University of Michigan, Ann Arbor (908-30-798)

AMS Session on Partial Differential Equations, II

1:00 PM - 4:25 PM

- 1:00 PM *Spectral gaps and rates to equilibrium for diffusions.*
(1091) **Robert G. Smits**, Purdue University, West Lafayette (908-35-682)
- 1:15 PM *Regularity of solutions of linear parabolic equations with singular lower order coefficients.*
(1092) **Qi Zhang**, Purdue University, West Lafayette (908-35-687)
- 1:30 PM *Location of inhomogeneities in elastic materials.*
(1093) **John L. Tolle**, University of Kentucky (908-35-732)
- 1:45 PM *On the forced nonlinear Schrödinger equation.*
(1094) **Charles Bu**, Wellesley College (908-35-705)
- 2:00 PM *A sign-changing solution for a sublinear elliptic boundary value problem.*
(1095) **Alfonso Castro**, University of North Texas (908-35-708)
- 2:15 PM *Optimal control of a surface runoff watershed model.*
(1096) **K. Renee Deaton Fister**, University of Tennessee, Knoxville (908-35-191)
- 2:30 PM *Quenching for a diffusive equation with a concentrated singularity.*
(1097) **Keng Deng***, University of Southwestern Louisiana, and **Catherine A. Roberts**, Northern Arizona University (908-35-190)
- 2:45 PM *Numerical solution of degenerate boundary value problems modeling anisotropic elastic plates and shells.*
(1098) **Camille A. McKayle*** and **Robert Griffith Root**, Lafayette College (908-35-123)
- 3:00 PM *Quenching for the heat equation with a concentrated or a nonlocal nonlinear source term.*
(1099) **Catherine A. Roberts**, Northern Arizona University (908-35-103)

- 3:15 PM *Nonlinear elliptic problems and mixed Fem solutions.*
(1100) **Kumud S. Altmayer**, University of South Florida (908-35-94)
- 3:30 PM *Student self-enrichment of concept image.*
(1101) Preliminary report.
George Exner*, Bucknell University, and **Claudia R. Thompson**, College of Wooster (908-35-95)
- 3:45 PM *Quasi-periodic solutions of fixed frequencies for the forced Duffing equations without Diophantine restrictions.*
(1102) **Melvyn S. Berger**, University of Massachusetts, Amherst, and **Lu Ping Zhang***, University of California, Irvine (908-34-332)
- 4:00 PM *Asymptotic results for the m -lambda function.*
(1103) Preliminary report.
John C.D Diamantopoulos, (908-34-405)
- 4:15 PM *Effects of initial data on the number of quenching points.*
(1104) **Chiu Yeung Chan** and **Hon-Hung T. Liu***, University of Southwestern Louisiana (908-99-819)

AMS Session on Manifolds

1:00 PM – 4:10 PM

- 1:00 PM *Eigenvalue comparisons in graph theory.*
(1105) **Gregory Quenell**, Oberlin College (908-53-257)
- 1:15 PM *Elastic curves in hyperbolic 2-space.*
(1106) **Daniel H. Steinberg**, Case Western Reserve University (908-53-125)
- 1:30 PM *On free reductions and deformations of two complexes in four manifolds.*
(1107) **Paul J. Kapitzka**, University of Illinois, Urbana-Champaign (908-57-649)
- 1:45 PM *A tight polyhedral immersion of the real projective plane with one handle.*
(1108) **Davide P. Cervone**, University of Minnesota, Minneapolis (908-57-532)
- 2:00 PM *Visualizing Smale flows in the 3-sphere.*
(1109) **Michael C. Sullivan**, Northwestern University (908-57-36)
- 2:15 PM *An unavoidable tangle approach to four-twist reduction of knots.* Preliminary report.
(1110) **Kenneth Wayne Meerdink**, University of Idaho (908-57-562)
- 2:30 PM *Algebraic and geometric convergence for Kleinian groups.*
(1111) **Timothy D. Comar**, University of Michigan (908-57-70)
- 2:45 PM *Nonextendable homeomorphisms.* Preliminary report.
(1112) **James Lee Kassebaum**, Montana State University-Bozeman (908-58-372)
- 3:00 PM *Dual grassmannians, bispectrality and the KP hierarchy.*
(1113) **Alex Kasman**, University of Georgia (908-58-437)
- 3:15 PM *Subharmonics for superquadratic Hamiltonian systems via the iteration method of the Maslov-type index.*
(1114) **Tixiang Wang***, University of Connecticut, Groton, and **Qihua Fei**, Nanjing University, Peoples Republic of China (908-58-249)
- 3:30 PM *Manifold structure on space of sections through function algebra.*
(1115) **Palanivel Manoharan**, Kent State University, East Liverpool (908-58-50)
- 3:45 PM *Stability and fractal structure of cells in locally isometric maps.*
▶ (1116) **Arek Jozef Goetz**, University of Illinois, Chicago (908-58-728)

- 4:00 PM *Singular perturbations and chaos-integrability transition.*
▶ (1117) **Alexander Tovbis**, West Virginia University (908-58-523)

AMS Session on Associative Algebras

1:00 PM – 4:40 PM

- 1:00 PM *Joint spectral radius and Hölder regularity of wavelets.*
(1118) **Mohsen Maesumi**, Lamar University (908-15-37)
- 1:15 PM *Iterates of semiring circulants.* Preliminary report.
(1119) **Rohan Hemasinha*** and **Kuiyuan Li**, University of West Florida (908-15-63)
- 1:30 PM *Simple multilinear algebras, rectangular matrices and Lie algebras.*
(1120) **Xiaorong Shen***, Merrimack College, and **J. D.H Smith**, Iowa State University (908-15-525)
- 1:45 PM *Irreducible representations of centralizer algebras.*
(1121) **Robert E. Leduc***, University of North Dakota, Grand Forks, and **Arun Ram**, University of Sydney, Australia (908-16-709)
- 2:00 PM *Square-free rings and their quivers.* Preliminary report.
(1122) **Barbara K. D'Ambrosia**, John Carroll University (908-16-531)
- 2:15 PM *Orphan polynomials in $\mathcal{D}[x]$.*
(1123) **Elizabeth S. Allman**, Bates College (908-16-208)
- 2:30 PM *τ -Smooth modules.* Preliminary report.
(1124) **Heakyung Lee***, Winthrop University, and **Peter L. Vachuska**, University of Wisconsin, Washington County Center (908-16-170)
- 2:45 PM *Hochschild cohomology of monomial algebras.*
(1125) Preliminary report.
Michael J. Bardzell, Virginia Polytechnic Institute and State University (908-16-161)
- 3:00 PM *On the chain conditions of the endomorphism ring and of a flat module.* Preliminary report.
(1126) **Soon-Sook Bae**, University of Iowa (908-16-155)
- 3:15 PM *An algorithm to test whether a finitely presented algebra is Noetherian.* Preliminary report.
(1127) **Xenia H. Kramer**, New Mexico State University, Las Cruces (908-16-119)
- 3:30 PM *Lie isomorphisms of prime rings satisfying S_4 .*
(1128) **Philip S. Blau**, University of Massachusetts, Amherst (908-17-543)
- 3:45 PM *State transformers and modes of computation.*
(1129) **Bruce F. Carpenter**, Wolfram Research (908-18-712)
- 4:00 PM *Radical semigroups.*
(1130) **Rekha Bai**, (908-20-686)
- 4:15 PM *The semigroup of ultrafilters near 0.*
(1131) **Neil B. Hindman**, Howard University (908-22-310)
- 4:30 PM *Rewriting reduction and pruning reduction on Munn trees.*
(1132) **Kaicheng Wang**, University of Nebraska, Lincoln (908-20-588)

MAA Session on Assessment of Student Learning for Improving the Undergraduate Major in Mathematics, II

1:00 PM – 2:20 PM

Organizers: **Barbara T. Faires**, Westminster College
William A. Marion, Valparaiso University

1:00 PM Opening Remarks by William A. Marion

- 1:05 PM *Assessment of the program of the mathematical sciences major at Northern Illinois University.*
(1133) **Linda R. Sons**, Northern Illinois University (908-00-1043)
- 1:25 PM *Revitalizing the math major at CLU: A status report.*
(1134) **Terrence GL Tong*** and **Sandra C. Lofstock**, California Lutheran University (908-00-1044)
- 1:45 PM *Assessing the mathematics major.*
(1135) **Janice B. Walker**, Xavier University (908-00-1045)
- 2:05 PM *Assessment toward an integrated core curriculum.*
(1136) **Richard Douglas West**, U. S. Military Academy (908-00-1046)

- 3:05 PM *Using MathKit lessons in first-year mainstream calculus.*
(1148) **Anthony D. Berard, Jr.**, King's College (908-00-1180)
- 3:30 PM *ODE animations.*
(1149) **Michael G. Branton**, Stetson University (908-00-1182)
- 3:55 PM *ODE labs.*
(1150) **Margie A. Hale**, Stetson University (908-00-1185)
- 4:20 PM *The free Mathwright library of workbooks on the Internet.*
(1151) **Ladnor D. Geissinger**, University of North Carolina, Chapel Hill (908-00-1184)
- 4:45 PM *CD-ROM curriculum for college algebra and trig.*
(1152) **Lawrence O. Cannon***, **Robert Heal** and **A. Gibbons**, Utah State University (908-00-1183)

MAA Session on The Scholarship of Humanistic Mathematics, III

1:00 PM – 2:55 PM

Organizers: **Joan Countryman**, The Lincoln School, Rhode Island
Harald M. Ness, University of Wisconsin Centers-Fond du Lac
Alvin M. White, Harvey Mudd College

- 1:00 PM *Humanistic experiences in learning mathematics.*
▶ (1137) **Robert B. Davis**, Rutgers University, New Brunswick (908-00-1279)
- 1:20 PM *Mathematics as a non-literary form of communication.*
(1138) **Mark Klempis**, Sam Houston State University (908-00-1286)
- 1:40 PM *Mathematics and poetry.*
▶ (1139) **JoAnne S. Growney**, Bloomsburg University (908-00-1284)
- 2:00 PM *Beckettian mathematics.*
▶ (1140) **Paul R. Manning**, Oratory Preparatory School (908-00-1289)
- 2:20 PM *Using political cartoons in teaching critical mathematics literacy.*
(1141) **Marilyn Frankenstein**, University of Massachusetts, Boston (908-00-1281)
- 2:40 PM *The humanism of mathematical investigations.*
▶ (1142) **Lawrence E. Copes**, Augsburg College (908-00-1277)

MAA Session on Interactive Mathematics Texts in the Classroom—A MathKit Perspective

1:00 PM – 5:05 PM

Organizer: **James E. White**, University of North Carolina, Chapel Hill

- 1:00 PM *Interactive math texts throughout the undergraduate curriculum.*
(1143) **Samad Mortabit**, Saint Andrews Presbyterian College (908-00-1189)
- 1:25 PM *Mathwright workbooks for multivariable calculus and linear algebra.*
(1144) **Michael D. Pepe**, Seattle Central Community College (908-00-1190)
- 1:50 PM *Writing Mathwright workbooks for a finite math course.*
▶ (1145) **Dan Kalman**, American University (908-00-1188)
- 2:15 PM *Using MathKit as a cognitive research tool.*
▶ (1146) **Angela C. Hare**, American University (908-00-1186)
- 2:40 PM *MathKit in the freshman math class.*
(1147) **Charles E. Hofmann, III***, Dresher, Pennsylvania, and **Roseanne S. Hofmann**, Dresher, Pennsylvania (908-00-1187)

MAA CCIME Poster Session

1:00 PM – 5:30 PM

Technology and mathematics curricular reform.
Organizer: **Marcelle Bessman**, Jacksonville University

MAA Student Workshop

1:00 PM – 3:00 PM

Soap bubbles and salt crystals.
Organizer: **Frank A. Morgan**, Williams College

MAA Panel Discussion

1:00 PM – 2:20 PM

Coordinating mathematics and science education.
Organizer: **Lida K. Barrett**, U. S. Military Academy
Panelists: **Sylvia Bozeman**, Spelman College
Lynn Kiaer, Rose-Hulman Institute of Technology
James H. Lightbourne, NSF
Richard West, U. S. Military Academy

MAA Panel Discussion

1:00 PM – 2:20 PM

The job market for new Ph.D.s.
Organizers: **Curtis D. Bennett**, Bowling Green State University
Annalisa Cranell, Franklin-Marshall College
Panelists: **Ronald M. Davis**, Anoka-Ramsey Community College
Paul Humke, St. Olaf College
Donald E. McClure, Brown University
James F. Ramaley, Ziff-Davis Publishing
James R. Schatz, National Security Agency

MAA Panel Discussion

1:00 PM – 2:20 PM

Tracking reform in undergraduate mathematics education.
Panelists: **Alfredo de los Santos**, Maricopa Community College
Raymond L. Johnson, University of Maryland, College Park

James R. C. Leitzel, University of Nebraska, Lincoln

Presenters: **John A. Dossey**, Illinois State University

Carolyn Mahoney, California State University, San Marcos

Curtis McKnight, University of Oklahoma

Kenneth J. Travers, University of Illinois, Urbana-Champaign

NAM Business Meeting

1:00 PM – 1:50 PM

ASL Contributed Papers

2:00 PM – 5:20 PM

AMS Invited Address

2:15 PM – 3:05 PM

- (1153) *Pell's equation and elliptic curves: From Fermat to Wiles.*
Henri Rene Darmon, McGill University (908-00-903)

MAA-Consortium for Ordinary Differential Equations Experiments Panel Discussion

2:35 PM – 3:55 PM

ODEs 2000.

Organizer: **Courtney Coleman**, Harvey Mudd College

Panelists: **David C. Arney**, U. S. Military Academy
Robert Borelli, Harvey Mudd College
Robert L. Devaney, Boston University
Frank Giordano, U. S. Military Academy
John H. Hubbard, Cornell University, Ithaca
David O. Lomen, University of Arizona

MAA Panel Discussion

2:35 PM – 3:55 PM

Quantitative literacy foundation courses.

Organizer: **Robert L. Bernhardt**, East Carolina University

Panelists: **Harvey Carruth**, University of Tennessee
Lucy Deephouse, Trinity College
David Ferguson, State University of New York, Stony Brook
Linda Sons, Northern Illinois University

MAA Minicourse #14: Part B

3:15 PM – 5:15 PM

Learning to write good test items that allow or require the use of technology.

Organizers: **Rose C. Hamm**, College of Charleston
Jan I. VanDever, South Dakota State University

MAA Minicourse #18: Part B

3:15 PM – 5:15 PM

Training tools for mathematics TA teaching workshops.

Organizer: **Marilyn McCollum**, North Carolina State University

MAA Session on My Favorite ODE Solver and Why, II

4:10 PM – 5:10 PM

Organizers: **Robert L. Borrelli**, Harvey Mudd College

Courtney S. Coleman, Harvey Mudd College

- 4:10 PM *MacMath: From the beginning of ODE solver time.*
 ▶ (1154) **Beverly H. West**, Cornell University (908-00-1234)
 4:30 PM *Why I like and use differential systems.*
 ▶ (1155) **John C. Cantwell**, Saint Louis University (908-00-1221)
 4:45 PM *Interactive differential equations.*
 ▶ (1156) **Jean M. McDill**, California Polytechnic State University (908-00-1227)
 5:00 PM *Examples from "Interactive Differential Equations".*
 ▶ (1157) **Steven H. Strogatz**, Cornell University (908-00-1232)

MAA Panel Discussion

4:10 PM – 5:30 PM

Orientation and supervision of part-time instructors.

Organizer: **Suzanne M. Lenhart**, University of Tennessee

Panelists: **Betty Anne Case**, Florida State University
Stephen B. Rodi, Austin Community College

MAA Panel Discussion

4:10 PM – 5:30 PM

The Ph.D. in mathematics education: Program structures and professional opportunities for graduates.

Organizers: **Joan Ferrini-Mundy**, University of New Hampshire

Henry O. Pollak, Teachers College/Columbia University

Panelists: **Eileen F. Donoghue**, Teachers College/Columbia University
John A. Dossey, Illinois State University
Bradford R. Findell, University of New Hampshire
Richard M. Grassl, University of Northern Colorado
Paul E. Kehle, Indiana University

AMS Banquet

6:30 PM – 10:00 PM

Lance W. Small
 AMS Associate Secretary
 La Jolla, California

Donovan H. Van Osdol
 MAA Associate Secretary
 Durham, New Hampshire

1996 AMS-SIAM Summer Seminar in Applied Mathematics

The Mathematics of Stochastic Manufacturing Systems

College of William & Mary, Williamsburg, Virginia

June 17-22, 1996

The twenty-sixth AMS-SIAM Summer Seminar in Applied Mathematics will be held June 17-22, 1996. The seminar will be sponsored by the American Mathematical Society and the Society for Industrial and Applied Mathematics. It is anticipated that the seminar will be partially supported by grants from federal agencies. The proceedings will be published by the AMS in the *Lectures in Applied Mathematics* series.

Manufacturing, one of the major economic activities in creating human wealth, is facing a rapidly growing challenge in the global marketplace. At the forefront of this interdisciplinary area, the research in mathematical and computational sciences has become indispensable in the development of new technology and the improvement of existing technical and management practices.

Most modern manufacturing systems are large and complex. Due to the uncertainty in the marketplace and the complexity of the systems, many conventional techniques and traditional intuitive approaches have become unsatisfactory. Very recently mathematical modeling and mathematical methods, together with other methodologies such as simulation and artificial intelligence, have been employed to study, analyze, and control manufacturing systems. The introduction of automation and the development of computer technology have greatly facilitated the operations of the underlying systems. These new developments, in turn, actuate much more sophisticated mathematical tools to treat uncertainty and complexity. As a result, the research in this area has come to a stage that requires not only knowledge of management sciences and basic engineering but also that of the advanced mathematics. In fact, mathematics has been playing and will continue to play a major role in the development of contemporary manufacturing.

Our environment offers unprecedented challenges and opportunities. In recent years, there has been rapid progress in mathematical research of manufacturing systems. Many important results have been obtained, including modeling of manufacturing systems, hierarchical control for large and complex systems, Markov chains, queueing networks and heavy traffic limit, numerical methods for approximation, singular perturbed systems, scheduling for manufacturing

systems, risk sensitive control, and stochastic optimization methods among others. These theoretical findings have had significant impact on various applications. The applications, conversely, bring about new and exciting theoretical discoveries.

The purpose of the conference is to bring together researchers from mathematical sciences, management sciences, and engineering, as well as from industry, to review and update the recent advances of mathematics in stochastic manufacturing systems. It will facilitate the interactions for mathematicians, operations researchers, and engineers with the industrial world. It will also help to publicize and spread recent progress to the manufacturing community.

The organizing committee includes **John Birge**, University of Michigan, Ann Arbor; **Wendell Fleming**, Brown University; **Bozenna Pasik-Duncan**, University of Kansas; **Marty Reiman**, AT&T Bell Laboratories; **George Yin**, Wayne State University (chair); and **Qing Zhang**, University of Georgia (cochair).

A partial list of main speakers who have accepted invitations to speak includes: **John Birge**, **Wendell Fleming**, **Avner Friedman**, **Paul Glasserman**, **Alain Haurie**, **Thomas Kurtz**, **P. R. Kumar**, **Harold Kushner**, **Bozenna Pasik-Duncan**, **Suresh Sethi**, **Ruth Williams**, and **David Yao**. In addition to the plenary talks and other invited talks, a panel discussion is also planned.

All participants will be required to pay a nominal registration fee. Everyone interested in receiving an invitation to attend should send the following information before March 1, 1996, to the AMS-SIAM Summer Seminar Conference Coordinator, AMS Meetings and Conferences Department, P.O. Box 6248, Providence, RI 02940; or by e-mail to d1s@ams.org. Please type or print the following:

1. Full name and mailing address.
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3. E-mail address if available.
4. Anticipated arrival and departure dates.
5. Your scientific background relevant to the topic of the seminar; please indicate if you are a student or if you received your Ph.D. on or after 7/1/90.
6. Financial assistance requested (please estimate cost of travel); indicate if support is not required and if interested in attending even if support is not offered.
7. Indicate if you would like to be included on a list of those desiring a roommate for the seminar. If yes, please indicate if you are male or female and list any other pertinent information (e.g., smoking/nonsmoking).

Special encouragement is extended to junior scientists to apply. A special pool of funds expected from federal agencies has been earmarked for this group. Other participants who wish to apply for support funds should so indicate; however, funds available are very limited, and individuals who can obtain support from other sources are urged to do so. Advanced graduate students are encouraged to participate.



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Application for Membership 1996

(January–December)

Date 19

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- 28 Measure and integration
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- 43 Abstract harmonic analysis
- 44 Integral transforms, operational calculus
- 45 Integral equations
- 46 Functional analysis
- 47 Operator theory
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- 53 Differential geometry
- 54 General topology
- 55 Algebraic topology
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- 68 Computer science
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- 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
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- 90 Economics, operations research, programming, games
- 92 Biology and other natural sciences, behavioral sciences
- 93 Systems theory; control
- 94 Information and communication, circuits

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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 \$90; for those whose annual professional income is \$45,000 or more, the dues are \$120.

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 \$77; for those whose annual professional income is above \$45,000, the dues are \$102.

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 \$180.

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1996 Dues Schedule (January through December)

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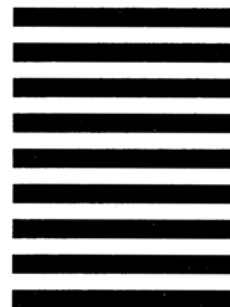


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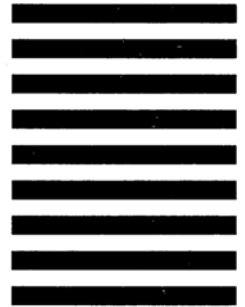


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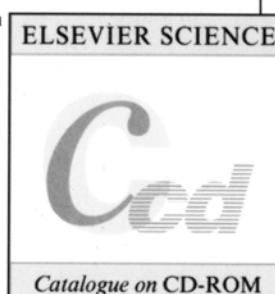
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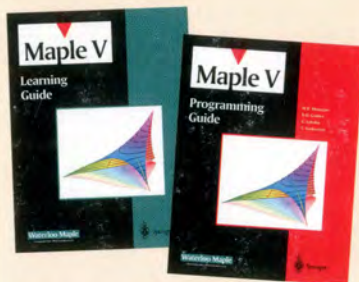
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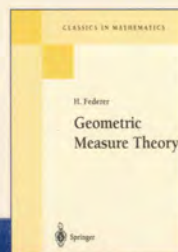
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