Salt Lake City Meeting (August 5–8)—Page 761

Notices
of the
American Mathematical Society

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Calendar of AMS Meetings

THIS CALENDAR lists all meetings which have been approved by the Council prior to the date this issue of *Notices* was sent to the press. The summer and annual meetings are joint meetings of the Mathematical Association of America and the American Mathematical Society. The meeting dates which fall rather far in the future are subject to change; this is particularly true of meetings to which no numbers have yet been assigned. *Programs* of the meetings will appear in the issues indicated below. *First* and *supplementary* announcements of the meetings will have appeared in earlier issues.

ABSTRACTS OF PAPERS presented at a meeting of the Society are published in the journal *Abstracts of papers presented to the American Mathematical Society* in the issue corresponding to that of the *Notices* which contains the program of the meeting. Abstracts should be submitted on special forms which are available in many departments of mathematics and from the headquarter's office of the Society. Abstracts of papers to be presented at the meeting must be received at the headquarters of the Society in Providence, Rhode Island, on or before the deadline given below for the meeting. Note that the deadline for abstracts for consideration for presentation at special sessions is usually three weeks earlier than that specified below. For additional information, consult the meeting announcements and the list of organizers of special sessions.

MEETING #	DATE	PLACE	ABSTRACT DEADLINE	ISSUE
836	August 5–8, 1987*	Salt Lake City, Utah	EXPIRED	August
837	October 30–November 1, 1987	Lincoln, Nebraska	August 17	October
838	November 14–15, 1987	Los Angeles, California	August 18	October
839	January 6–9, 1988** (94th Annual Meeting)	Atlanta, Georgia	October 8	January
	March 18–19, 1988	East Lansing, Michigan		
	August 8–12, 1988 (AMS Centennial Celebration)	Providence, Rhode Island		
	January 11–14, 1989 (95th Annual Meeting)	Phoenix, Arizona		
	January 17–20, 1990 (96th Annual Meeting)	Louisville, Kentucky		

* Preregistration/Housing deadline was June 1.

** Preregistration/Housing deadline is November 6.

DEADLINES

Advertising (*Oct.* 1987 *Issue*) *Sept.* 2, 1987 (*Nov.* 1987 *Issue*) *Sept.* 30, 1987 (*Jan.* 1988 *Issue*) *Nov.* 11, 1987
News/SMIC (*Oct.* 1987 *Issue*) *Aug.* 17, 1987 (*Nov.* 1987 *Issue*) *Sept.* 14, 1987 (*Jan.* 1988 *Issue*) *Oct.* 20, 1987
Advertising (*Dec.* 1987 *Issue*) *Oct.* 21, 1987

Other Events Sponsored by the Society

June 14–July 25, 1987, Joint Summer Research Conference in the Mathematical Sciences, University of Colorado, Boulder, Colorado. Details: February issue, page 351.

July 19–August 15, 1987, Joint Summer Research Conference in the Mathematical Sciences, Cornell University, Ithaca, New York. Details: February issue, page 351.

July 6–24, 1987, Summer Research Institute on Theta Functions, Bowdoin College, Brunswick, Maine. Details: February issue, page 354.

January 5–6, 1988, AMS Short Course: Computational Complexity Theory, Atlanta, Georgia.

February 1988, Symposium on Some Glimpses of Contemporary Mathematics (on the occasion of the Centenary of the American Mathematical Society), Boston, Massachusetts.

May/June 1988, International Symposium in Honor of John von Neumann, Hofstra University, Hempstead, New York.

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Notices
of the American Mathematical Society

Volume 34, Number 5, August 1987

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Notices: highlights

John Polking, the outgoing Director of the Division of Mathematical Sciences at the NSF, speaks openly in an interview with *Notices*. He gives his opinions on a number of issues, including the state of current funding and the prospects of future funding from the NSF, the controversy over defense funding, the crisis in mathematics education, and the role of the research mathematician at the NSF. Page 731.

Commentary on Defense Funding continues with statements from members of the mathematical community regarding this important issue. Page 737.

The AMS Centennial Research Fellowship program is described, and the request for applications is announced. Page 741.

The U.S.A. Mathematical Olympiad winners are honored at a dinner in Washington and begin preparation for the International Mathematical Olympiad in July. Page 742.

For Your Information contains two reports on the state of the mathematics profession. The first summarizes a report on American Graduate Mathematics Enrollments prepared for CBMS, and the second contains excerpts from an NSF survey on R&D expenditures at academic institutions. Page 748.

The Salt Lake City Summer Meeting promises to be an excellent meeting in one of the most beautiful locations in the country. The Colloquium Lectures will be given by Edward Witten on the mathematical applications of quantum field theory. In addition, there will be eight invited addresses and six special sessions to serve as the core for an outstanding scientific program. The 1987 Steele Prizes will be awarded prior to the Business Meeting. Page 761.

AMS Reports and Communications contains the current list of AMS Officers and Committee Members and a report from the Chairman of the AMS Committee on Human Rights of Mathematicians. Page 827.

An Interview with John Polking

In July 1987, John Polking left his position as Director of the Division of Mathematical Sciences (DMS) at the National Science Foundation. He has returned to Rice University, where he was professor of mathematics before coming to the NSF in 1984.

Polking's three years at the DMS were eventful ones, marked by the 1984 publication of the David Report (*Renewing U.S. Mathematics: Critical Resource for the Future*, National Academy Press) and the energetic leadership of NSF Director Erich Bloch. Before leaving the DMS, Polking was kind enough to grant an interview with *Notices* to give his reactions to some crucial issues facing the mathematical community. The following are excerpts from a conversation on May 18 between Polking and *Notices* Staff Writer Allyn Jackson.

Notices: *Having been at the NSF for three years, you have witnessed the foundation's reaction to the David Report. How has the NSF's attitude toward mathematics changed?*

Polking: I think that the David Report and other representations that have been made to the National Science Foundation by a number of people including Ed David, myself, the chairmen of the NSF Advisory Committee for the Mathematical Sciences, the Board on Mathematical Sciences (BMS) have caused an increased appreciation among the people at the foundation who are in policy positions that the funding for mathematics is really out of balance with that available to other sciences. So in other words, the David Report has made the point it was supposed to make.

Notices: *What is [NSF Director Erich] Bloch's attitude toward mathematics?*

Polking: It's difficult to say. He's been very supportive of mathematics and of the requests that we've made. He gave us significant increases at times when most other divisions were getting very small increases, if any increase at all. There was one year when the foundation as a whole had a decrease in its total budget for the previous year. That was a result of the Gramm-Rudman cuts, and that year he protected the DMS from the cuts. We had, as a result, about an 8-1/2 percent increase when the budget of the foundation as a whole was decreasing. We had made the point that mathematics was underfunded. We had made it very cogently. We pointed out to him at the time what we could do with the extra funds that would be significant in alleviating some of the problems that we have.

Notices: *The National Science Board, Bloch, and other NSF policy makers have supported significant increases in mathematics since the David Report. Do you believe they will continue to support such increases?*

Polking: Not on the basis of the David Report alone. I think that the David Report still paints a picture that indicates that the funding for mathematics is out of balance with respect to the other parts of science and engineering, but we're going to have to go beyond that in our requests for further increases in funding. We're going to have to approach the science itself and point out why mathematics and mathematical research are important. We're not going to forget the David Report, because it still has a valid message. But we're going to have to go beyond it. The David Report probably should be updated. The Board on Mathematical Sciences should look at it and come up with a report saying how far we've come in achieving the goals set forth in the David Report. That I think could be useful.

Notices: *What do you think it was about the David Report that made it so influential?*

Polking: I think it was the fact that it addressed things in terms that anybody could understand, namely, in terms of the minimal level of support that was needed for the discipline, in terms of the number of people that should be supported, the number of graduate students, the number of postdocs, the amount of money needed for equipment. All of these things were addressed in the David Report, and they weren't addressed in terms of new scientific initiatives that might be nice for the mathematics community to undertake. The other reports that have come up subsequently in physics and in chemistry have been more along that line. They spelled out a very attractive list of projects that they would do if they had the money. The David Report was completely different. The David Report addressed the problem totally in terms of the pipeline needs—the needs for people—and that, I think, was the key thing.

Notices: *Do you think there was also a question of timing with the David Report?*

Polking: Well, actually, in terms of timing, the David Report came out at a bad time. It came out after the budget for the National Science Foundation and the federal budget for scientific research had been increasing for five years. And

it came out just at the time that concern was developing within the federal government about the size of the budget deficits. It came out at a time when the funding for scientific research at the federal level was increasing very little, and in some years was even decreasing. So from that point of view, it was ill-timed. If it had come out three years before, or five years before, it would have been very timely, and we might have gotten a lot more out of it. If it had come out right now, in a time when the Office of Management and Budget and the Reagan Administration have agreed to double the size of the foundation in the next five years, we would have gotten more out of it. I think now would have been a good time for the David Report to come out. In some sense it came out at just the wrong time.

Notices: *Can you comment on the NSF's initiative to establish more research centers?*

Polking: Yes, I can. The initiative is part of the long-range planning of the National Science Foundation over the next five years, and it's a major component of the plan to increase the size of the foundation by 100 percent. I think that the notion of research centers, specifically centers for science and technology, is a good one. The thing that most people forget when they talk about the science and technology centers is that these represent a relatively small part of the increase as we look forward over the next five years. The centers are to be balanced with increases in support for individual disciplines—increases in support for individual investigators, for graduate students, postdocs, for equipment, and so on. It's the one item in the budget that's gotten the biggest play, yet it is only one of many aspects of the plan.

Also, it's necessary that some of this activity go on. The definition, if there is a definition, is that the centers should be interdisciplinary in character, be aimed at problems of national importance, be located at universities, and have significant industrial participation. There is a feeling in the United States that there is not enough emphasis on interdisciplinary activity and that it's very difficult for truly interdisciplinary research to get the proper support. That's because the universities are split into scientific departments which are administratively independent and in general very independent in their actions. The same is true with the foundation. In the foundation, we have the various disciplines represented in different divisions which operate independently. And it's not as easy as it should be to get the support for a truly interdisciplinary project. The notion of science and technology centers is an effort to get around this. A certain amount of this activity is not only a good idea, but it's essential to the way we do things in this country. Unfortunately, most people assume that the foundation is going to go 100 percent or at least to a very large extent in the direction of this activity. I think that the foundation has to maintain a good balance between this kind of activity and the support for individual investigators, and I think it will.

Notices: *Do you think the centers will divert funds away from individual investigator grants?*

Polking: Let's answer that question this way. First of all, as I just said, it is not the plan of the foundation to do that. The centers are meant to be complementary to individual research. However, in the budgetary process, there is always the possibility that when you propose something new, you will be told to do what's new, but to take it out of existing funds. That's a very real concern, but if we allow that concern to stop us from proposing new things, the effect will be that we don't propose new things and we never get new funds. We have to take chances in the budgetary process all the time, and in this particular case I think it's well worth the effort and well worth the risk.

Notices: *The centers proposed by the NSF involve interdisciplinary research. How do you think mathematicians will adapt to such a research environment?*

Polking: Mathematicians should look upon this as a great opportunity because mathematics interacts with almost every discipline. So mathematicians should be part of almost every center. If they're not, I think it means that mathematicians themselves have not taken the initiative, in their own universities, to get themselves involved in these projects. I think that there will be more opportunities than the average mathematician realizes to do just that. Mathematicians should start thinking in those terms. That's half of my answer. That's for the centers that are not specifically or centrally involved with mathematics. It is certainly possible, within the framework we see now for centers, to have centers which have mathematics as a central theme, but are interdisciplinary in character. We have been approached by groups in several areas already. I don't think it would be appropriate for me to tell you who they are or what they are proposing, but the ideas are percolating throughout the mathematics community, and I imagine that as time goes on, as the concept of centers is considered more and more, we'll get more and more ideas of the same kind. It is possible to conceive of such centers and I think that we'll get a number of such proposals.

Notices: *Erich Bloch has obtained presidential support for his move to double the NSF budget by 1992. How do you think the DMS will fare as the NSF budget increases?*

Polking: Let me just say this: it's not a foregone conclusion that the budget for DMS will double during that five-year period if the NSF budget doubles. We're going to have to work at it, to make sure that mathematics is represented in an effective way at the foundation, that the needs and opportunities in the mathematical sciences are put forward in a convincing manner, in order

to get anything approaching a doubling for DMS in that time frame. Now, in my own thinking, the budget for the DMS should be doubled just in order to "catch up," if you like, to be in balance with the funding for other disciplines. So, since other disciplines are going to double, hopefully, in the next five years, mathematics should double beyond that. Consequently, the budget for DMS should be quadrupled in the next five years. If you would like to ask me what I think the prospects of that are, I would say not very good, but certainly more than doubling should be our goal.

***Notices**: Bloch has obtained support for doubling the NSF budget by tying basic research to economic competitiveness. Do you think mathematicians will be able to successfully justify funding of mathematics research in this new climate?*

Polking: We have to understand what Bloch means when he ties basic research to economic competitiveness. As he sees it, the NSF contributes to economic competitiveness in two ways. First of all, the development of new knowledge: mathematicians have no problem there. We are always developing new mathematical knowledge. What we need to do in addition is effect in a more efficient manner the transfer of that knowledge from the universities to industry. It seems to me that we should devise mechanisms for doing just that. In mathematics, we have taken a significant step in this direction with the establishment of the Institute for Mathematics and its Applications at Minnesota. The second way in which the NSF contributes to economic competitiveness is through the training of technically-qualified individuals. No matter what science or engineering discipline you're talking about, mathematics is a big part of the educational process. I think that, with respect to economic competitiveness, we have to emphasize these two points in anything that we do: that new mathematical knowledge is important and is as important as other parts of science or technology; and that mathematics is important for the education of scientists and engineers.

***Notices**: You mentioned the Institute for Mathematics and its Applications. Do you see that institute as being a prototype for math research centers?*

Polking: Well, that's a possibility. I would imagine that the math research centers that will be formed in the future will have a slightly different character than the Institute for Math and its Applications has. I think that the new centers would have permanent people involved, whereas the two institutes that the NSF runs at the present time do not. The new centers would also have a large visitor component, of course. This will be an important characteristic of an institute in any of the theoretical sciences, because communication of ideas between people is one of the key elements in the development of any theoretical science. In addition, I would think that any center in the mathematical sciences would be involved in more than just research. Research at the highest level would certainly be the most important activity of such a center, but there would also be components involved with training and education in the mathematical sciences. By education, I mean the education of new mathematicians, which would involve programs at the centers for undergraduate and graduate students, and possibly even summer programs for high school students. By training, I mean the training of people who are already mathematicians, have been mathematicians for some time, but who want to go to the center on sabbatical for scientific enhancement. All of these components should be part of any center in the mathematical sciences. In several ways, what I have described is different than what exists currently at MSRI or IMA.

***Notices**: Many see the shortage of professional mathematicians as the most important problem facing the field. What will the DMS do to address this problem?*

Polking: In the DMS, we have recognized, for at least the last three years and probably longer, that this is the most important problem. The recognition of that problem has caused us to put our emphasis on increasing support for graduate students and for young people. We have made real progress in this direction, but we still have a long way to go. In 1986, we were able to support one full-time equivalent graduate student for every four investigators. This is still far short of the one for two ratio recommended by the David Report, and the one for one ratio that is standard in other fields. However, there is another consideration that is important in order to attract young people into the mathematical sciences, and that is increasing the number of investigators supported. I can't think of anything that is more discouraging to a prospective mathematician than to realize that the person that he looks up to, his favorite teacher, is not supported for the research that he does. This consideration has to be kept in mind in the future as well.

***Notices**: What do you think about the NSF system of using rotators from academia to fill staff positions?*

Polking: Everyone agrees that the rotator program is an extremely good one for the NSF as a whole. It's the best way for us to get up-to-date information about what's going on in the universities, about what's going on in the sciences. It's been the tradition at the NSF since its beginning to depend fairly heavily on rotators to fill staff positions. So, I'm all for it. In my time here, we have had extremely well-qualified people working as rotators. I have been very pleased with the way it's worked, and even though I recognize that it's becoming harder, especially in some areas, to find people to do the job, I would

hope that more people would consider it as part of their career plans.

Notices: *Moving on to another subject, do you have any comments on the current controversy about DOD funding in mathematics?*

Polking: I have a lot of comments. I just don't know where to begin. These motions, which were put before the AMS at the business meeting in San Antonio, and which the Society will be discussing over the next six months or so, I consider to be, well, misguided and disruptive. If you read them very carefully, you will find that there are many different issues involved in the seemingly simple statements of these propositions. All of these issues are important, and bringing them together like this will confuse the eventual outcome. To me, there is one overriding issue: the funding level for mathematics is about half of what it should be. Under those circumstances, why are we saying that one of the agencies, a very significant agency, the Department of Defense, is not a suitable place to get funds? It seems to me that we are in no position, realistically, to turn our back on any source of funds. I think, furthermore, that any official attempt of the AMS to do that would affect in a deleterious way our efforts to increase funding at all of the agencies. That kind of selectivity on the part of the mathematical community sends the message very clearly that the problems with respect to funding for research in the mathematical sciences are not as bad as we have been saying up till now. It would affect any attempts that the mathematics community makes to increase the funding at the agencies like the Department of Energy, National Institutes for Health, maybe even the NSF. The way the motions are written, what is given the highest emphasis are things such as American foreign policy. These things are important in other contexts, but in this context, I think they are really secondary and should not be part of our considerations.

Notices: *How do you think that controversy might affect funding of mathematics at the NSF?*

Polking: Over the past five years or so, we have worked very hard to increase the funding for mathematics at all the agencies. I know for a fact that those efforts have worked to our benefit in approaching the people in the National Science Foundation for increased funding in mathematics. If we had made the effort three years ago only to increase funding for mathematics at the National Science Foundation, the budget for the DMS would be much smaller than it is now.

Notices: *And why is that?*

Polking: It's a natural phenomena in any agency that it does not want to be the only agency funding that particular science. It does not want the sole responsibility in a situation where there are other actors. They don't want the sole responsibility for any science. If you look around at other disciplines, you will notice that the disciplines which have the best funding are those which have several sources of funding. If you look within the mathematical sciences, I think you will find the same phenomena. So from that point of view, I think you have to conclude that it's to our advantage to seek out other sources of funding besides just the National Science Foundation.

Notices: *Why is the controversy over military funding particularly intense right now?*

Polking: Well, you know, I wonder if that's really true. I know that it's true on the East Coast, but when I go to the Midwest and I talk to people, in many cases they are not even aware of what's going on. They seem not really disturbed by what's going on. So I wonder how hot the issue is outside the East Coast. I know that it's an issue in other disciplines as well, but in other disciplines it's an issue that is not being addressed by the scientific societies.

Notices: *Do you think the role of the NSF in supporting mathematics research is different from the role of the other government agencies?*

Polking: It certainly is. For one thing, we are the only agency that supports mathematics in its full breadth. For most of the core areas in mathematics, we are the sole source of support. Certainly the military agencies are more mission-oriented. They clearly define the kind of mathematics that they'll support. But within that definition, I don't see that it really affects their funding in any fundamental way. Furthermore, I am convinced that the definition of their mission can be changed. I think that, with the expenditure of some effort, the mission agencies could be convinced, for example, to fund more core mathematics. I believe this because, after three years at the NSF, I see more and more clearly that the applications of mathematics depend in increasingly significant ways upon what's going on in the core areas of mathematics. The connection between applications and core mathematics could be drawn in such a way as to convince the DOD agencies to fund more of the core areas of mathematics. That will require a lot of work and a lot of patience.

Notices: *Turning to another topic, would you like to comment on the state of mathematics and science education? What is the NSF's role in this area?*

Polking: I guess it won't come as any surprise if I say there is a crisis in mathematics and science education. What is the NSF doing to address the problem? Well, the NSF's Directorate for Science and Engineering Education is putting a lot of effort into teacher programs and curriculum programs at the precollege level. I don't know what the effect of those programs has been or will be, but I know that many of the things they're doing seem well conceived.

There are other things that the NSF is doing to address the problem of mathematics and science

education. Starting this year we're beginning a program in undergraduate science and engineering education. This program is being set up and run primarily through the research divisions, which is where I think it belongs. The fact that it's run through the research divisions brings the activities of research and education more closely together, and I think that is a good goal. Right now, that program is limited to what we call the Research Experiences for Undergraduates, the budget for which is at a very low level. The division budgeted $380,000 for that program this past year, although we spent more than that. That program should probably be much bigger, probably by a factor of four or five.

We are also planning a program for next year in curriculum renewal, emphasizing calculus. I think that is a good program because the way calculus is being taught needs to be looked at very carefully. There are two aspects to this. First of all, I think the demands on the course have changed over the past few years, principally as a result of the increased use of computation in all areas of science and technology. Second, I think that there are new opportunities to do things more effectively in calculus, again as a result of the availability of computers with enhanced graphics and symbolic manipulation capability. All of these things need to be looked at very carefully, and we need to foster projects which will try out different ideas in this regard. These are things the NSF can do and probably will do in the next year. I can think of a lot of other things; for example, in the area of curriculum renewal, the NSF could sponsor conferences and workshops which would bring together people who have tried out innovative ideas in a particular course. I can anticipate some sabbatical support for people who are primarily educators to come and learn what has happened in mathematics since last they were in school. I can foresee a lot of things along this line, but whether they are done or not really depends on the availability of funds. In mathematics, we must keep clearly in mind that the funding for the research effort is still very, very low, and must have the highest priority.

Notices: *Do you see any other ways that the DMS, as a research division, can help in improving mathematics education?*

Polking: Well, I have had a suggestion made to me that I think is sort of interesting. It was suggested to me that we ought to fund research mathematicians who want to get involved in mathematics education, maybe at the precollege level. We would provide money for a mid-career fellowship for such people to spend time at increasing their skills and involvement in precollege mathematics education. They might get involved with some of the good programs that are going on around the country at various places, like at Berkeley or Chicago. This would provide the opportunity for somebody who, for whatever reason, no longer wants to be involved in research, to go into something else, and to do it in a meaningful way, rather than just starting from scratch and having to pick it up on his own. Such a fellowship would be well worth the money put into it.

Notices: *Some people think that mathematicians wouldn't be particularly effective at helping at precollege teaching.*

Polking: There are a number of projects, including the Sally project at Chicago—the projects being carried out by Hassler Whitney at the Institute for Advanced Study—and various others around the country, where research mathematicians are definitely involved in trying to understand the problems of precollege education in mathematics. It may indeed be true that mathematicians are not specially qualified to do this, that it takes somebody who is more trained in the cognitive sciences perhaps, or who's trained in educational matters rather than mathematics itself. But I don't think that the research mathematical training that mathematicians have in any way works to disqualify them from getting involved in this kind of activity. I think that they are as capable of getting involved effectively in these activities as anyone else, in fact more capable.

I think that the general public, and this includes Congress, holds mathematicians responsible for the state of mathematics education at all levels. This is a sort of political reality that we have to meet head on by accepting that responsibility. We are beginning to do a good job at the national level through such entities as the Mathematical Sciences Education Board at the National Academy of Sciences, but the really important work is at the local level. It is there that mathematicians should get more involved.

The efforts of mathematicians to get involved with mathematics education can only increase the awareness that the general public has of mathematicians and of what mathematicians do. After all, mathematics education is something that is worthy of publicity at a level way beyond the average research that goes on in mathematics. And it seems to me that through mathematics education mathematicians can begin to educate the general public as to what actually is going on in mathematics. So it's an opportunity, I think, as well as the responsibility that I already described it as.

Notices: *But many mathematicians say it's impossible to explain what mathematics is all about to the general public.*

Polking: Yes, it's difficult. If it were easy, it would be done, I think, almost routinely. I think, however, it can be done. Mathematicians tend to be too precise. They don't want to lie in the smallest way, but if you're going to explain something as complicated, say, as Donaldson's work on four-manifolds to somebody in the general public, there's no way you can tell

the total truth. So you have to be willing to lie. I'm reminded of a set of lectures by the physicist Richard Feynman in which he admits to his public in the first lecture that he's going to lie to them in the sense that he's not going to tell the whole truth and that he's going to make things simpler than they really are. I think mathematicians are a little bit unwilling to do that. In fact, I've had mathematicians complain to me when I have done this in their presence. They come up to me afterwards and they say things like "Gee, I thought you understood that," or, "You weren't telling the whole truth. The real thing is...," and they would start to explain it to me. But I think the simple fact is that if we allow ourselves to give the general idea without telling all the truth, then we can write expository articles.

Notices: *Have you observed any common misconceptions that mathematicians have about what goes on at the DMS, at the NSF, or in the government in general?*

Polking: Yes. I think most mathematicians, like most people not in the government, have a relatively low opinion of government officials and government bureaucrats. My experience at the National Science Foundation has been in exactly the opposite direction. I am very, very much impressed with the quality of the people who work in the National Science Foundation and in the Division of Mathematical Sciences in particular. They just do not fit the standard stereotypes; they are dedicated and hard working and also knowledgeable in their fields. That is a misconception that I would like to put to rest.

Notices: *Have you enjoyed your time at the NSF?*

Polking: For the most part, yes. I'm glad I came, but I'll be glad to be getting back to the university [Rice University], too. There were times when I did not enjoy what I was doing, there were times when the work was hard and demanding, but for the most part I am glad I did it.

Notices: *What are your plans after you leave?*

Polking: What are my plans? I'm going to go and take the best job there is in the whole world! I'm going to be a professor of mathematics at a good university!

Notices: *Are you looking forward to getting back to teaching?*

Polking: Oh, yes. I very much miss teaching. That's one of the things that I really missed, the contact with the young people, the students.

Notices: *How have you changed in your time at the NSF and what have you learned?*

Polking: My hair is grayer, my stomach is bigger, my wind is not as good as it used to be! I've become a little wiser about the way the world works, I think. I've learned a lot about the way the government works. Different experiences are always broadening, as this experience has been.

Notices: *Your successor is Judy Sunley. What qualities or experience does she have that will help her in this position?*

Polking: I think that she is very well qualified for the job. She's been at the foundation in the division for about eight years, I believe. She was a Program Officer in Algebra and Number Theory for a number of years, she was Acting Section Head for Mathematical Sciences before computer science was split off, and she has been my Deputy now for three years. She knows how the NSF operates, she is well known within the foundation, and she is highly respected. She knows the mathematics community very well. I think that she is very well qualified, and I am confident that she will do an excellent job.

Commentary on Defense Funding

As recommended by the Committee on Science Policy (see *Notices*, April 1987, page 448), this section of the *Notices* has been instituted to provide a forum through which the mathematical community may comment on the two motions presented at the January 1987 AMS Business Meeting (see *Notices*, January 1987, page 76, and February 1987, pages 398–399).

Items to be considered for this section should be sent to the Managing Editor of *Notices*, Commentary on Defense Funding, American Mathematical Society, P.O. Box 6248, Providence, RI 02940 and should be limited to approximately 1,000 words.

Peter D. Lax
New York University
Courant Institute
of Mathematical Sciences

Underlying the arguments of supporters of Motions 1 and 2 are the following suppositions:

1. Mathematicians are the best judges of the kind of mathematics the federal government ought to support, and the level of that support;

2. It would be preferable if all support for mathematics came from the NSF;

3. Mathematicians should have nothing to do with the DOD, on moral grounds.

These assumptions are unwarranted; I wish to give reasons why:

1. Mathematics is an integral part of science, and so are large parts of its agenda, and its priorities. Judgement on these issues is a shared responsibility of mathematicians and scientists. Similarly, judgements on the needs of society for mathematics are a joint concern of mathematicians and the representatives of society: congressmen, administrators, and bureaucrats. If we approach them with the attitude, "Give us the money, plenty of it, and we will do the job as we see fit," we will be laughed out of court.

2. The DOD, and also the DOE in its many incarnations, have a long history of supporting science and mathematics, longer than that of NSF. Their impact on mathematics must be judged on the record. The record shows that the quality of research supported has been excellent overall. More to the point, as noted by Wendell Fleming in the April issue of the *Notices*, DOD has provided much needed diversification; it has played a leading role in the development of applied mathematics in general, and the theory of partial differential equations, probability theory, and statistics in particular. The DOE has provided outstanding leadership in fostering the study and use of computational methods.

The other side of the coin is described by Singer in the same issue of the *Notices*; peer review, as practiced by the NSF, is very conservative; it makes controversial choices and new initiatives very difficult.

3. For a pacifist, departments of defense ought not even exist, much less have commerce with decent people. Otherwise the verdict of immorality cannot be sustained. The gravest charge against the DOD is the war in Vietnam; but the DOD did not start that war, any more than it initiated the new look at Strategic Defense. Both policies originated in the White House, as they must under our Constitution.

A few months ago six former Secretaries of Defense issued a public statement in favor of a *strict* interpretation of the ABM treaties; this shows that the DOD does not monolithically oppose arms control.

The most serious consequence of the position adopted by supporters of Motions 1 & 2 has been pointed out by Seymour Parter: the segregation of scientists into two separate communities, one consisting of academics, pure in heart, dedicated to truth and beauty; the other a race of Niebelungen, dwelling in the underground caves of national laboratories, shaping weapons for the Evil Empire. Were this ever to come about, the DOD would receive very one-sided advice, and the public very one-sided information; both would be a great misfortune for the country.

Once we acknowledge that it is wise for academic scientists to be influential participants in the scientific aspects of the military programs of the DOD that are carried out at national laboratories, any objection on moral grounds to participation in general research sponsored by the DOD at universities falls away.

Motions 1 & 2 are dividing the mathematical community; many feel that mathematicians are shooting themselves in the foot. Applied mathematicians, whose support comes in large part from the DOD, feel stabbed in the back; they deeply resent being branded unethical by a self-appointed Mathematical Moral Majority and regard the exercise as a childish attempt to place control of the distribution of federal support in the hands of pure mathematicians.

That is the least likely outcome. The most likely is a much narrower applied focus of support by the DOD, reversing a current trend that took shape under the urging of *both pure and applied mathematicians*. A second likely outcome is that the NSF, seeing that applied mathematics is not safe in the hands of pure mathematicians, will create a separate Division of Computational and Applied Mathematics.

Bill Thurston writes: "Although most people desire to act in the best interest of society, many do not think through clearly what this means." Well put!

Jørgen Harmse
Massachusetts Institute of Technology

Saunders Mac Lane (**Letters to the Editor**, April 1987 *Notices*) considers that the effect of SDI on stability is a matter of international politics, but there is a notion of stability which is entirely technical. By increasing the feasibility of a preemptive first strike by whoever possesses it, any system which comes near the goals advocated in the "Star Wars" speech would greatly increase the risk that a crisis lead to nuclear war.

On the question of goals, Professor Mac Lane pointed out that there is dispute among the proponents of the initiative. Nevertheless there is one main stated objective which is almost certainly unattainable, and whose pursuit is extremely dangerous. Confusion over aims should make us more rather than less cautious in any support for SDI.

Michael M. Dediu
Dediu Computer Consultants

I agree with Professor Seymour V. Parter's conclusion (June 1987 *Notices*):

"... I oppose both motions. Moreover, should either pass, I would resign from the AMS at once. I sincerely hope that won't happen."

SEARCH FOR AN EXECUTIVE DIRECTOR
for the
AMERICAN MATHEMATICAL SOCIETY

Position: The post of Executive Director of the American Mathematical Society will become vacant on a date to be established in 1988 upon the retirement of William J. LeVeque from that position. The Executive Director is employed by the Trustees of the Society, who now seek a replacement. Employment could begin at a date of mutual convenience in 1988 and might include overlap with the term of the incumbent, though this is not a requirement. The central office of the Society is in Providence, R.I.

Duties: The duties of the position are summarized in Article VI of the bylaws of the Society as follows:

Section 1. There shall be an Executive Director who shall be a paid employee of the Society. He shall have charge of the central office of the Society, and he shall be responsible for the general administration of the affairs of the Society in accordance with the policies that are set by the Board of Trustees and by the Council.

Section 2. The Executive Director shall be appointed by the Board of Trustees with the consent of the Council. The terms and conditions of his employment shall be fixed by the Board of Trustees.

Section 3. The Executive Director shall work under the immediate direction of a committee consisting of the President, the Secretary, and the Treasurer, of which the President shall be chairman ex officio. The Executive Director shall attend meetings of the Board of Trustees, the Council, and the Executive Committee, but he shall not be a member of any of these bodies. He shall be a voting member of the Committee to Monitor Problems in Communication but shall not be its chairman.

Note: In the above statement, "he" is the sexless third person singular pronoun, used to avoid the awkwardness of repeated "he or she" or the barbarism "he/she."

The purpose of the Society is described in this quotation from the charter:

> The particular business and objects of the Society are the furtherance of the interests of mathematical scholarship and research.

The Society accomplishes its purpose through meetings and conferences and through publication. There is a diversity of other activity.

The annual budget of the Society exceeds thirteen million dollars, about one fifth being in the general fund and four fifths in the publication fund. There are about 150 employees in Providence and 75 in Ann Arbor. Mathematical Reviews is a semi-autonomous operation in Ann Arbor under the direction of the Executive Editor.

There are about eight general meetings per year and as many as twelve to fifteen specialized conferences.

The Society publishes at least sixteen journals of various kinds. It publishes about a dozen series of books. All of the operations, except for the printing of a couple of journals with very large print runs, are done in-house.

Both the office operations and the publication program are highly computerized.

Qualifications: Candidates should have a Ph.D. in mathematics (or the equivalent), published research beyond the Ph.D., and significant administrative experience. Desirable qualifications include experience in mathematical publication, fiscal management, and computer utilization.

Applications: A search committee, with Frederick W. Gehring as Chairman, has been formed to seek and review candidates. Persons who wish to be considered or to make a nomination should provide supporting documentation to

Professor F. W. Gehring
Department of Mathematics
University of Michigan
Ann Arbor, MI 48109

before 1 September 1987 to receive full consideration.

FINAL CALL FOR U. S. PAPERS
17th INTERNATIONAL CONGRESS OF THEORETICAL AND APPLIED MECHANICS

Grenoble France
August 21-27, 1988

INFORMATION FOR AUTHORS RESIDING IN THE U. S. A.

The United States National Committee for Theoretical and Applied Mechanics invites the submission of papers on any aspect of fluid or solid mechanics to be considered for presentation at the above Congress. Limited funds to partially cover travel expenses are available. Preference for funds will be given to younger authors. The deadlines below are *arrival* dates and must be strictly adhered to.

1. The submitting author should prepare an **Extended Summary** of about 500 words and an **Abstract** of 100 - 150 words. The Abstract must be typed double space on a single page; the page should also contain the title of the paper and the full name and complete address of the author(s). The author is also invited to prepare a copy of the presentation **Slides** or an outline of the **Poster**. The quality of these may be taken into account in the selection process. Finally, the author should prepare a **statement of preference** for lecture session or poster session.

2. By January 8, 1988 **2** copies of the Abstract, **2** copies of the Summary, **1** copy each of the Statement of Preference and the Slides or Poster, and (if travel support is required) a request for a **travel support form** should be received by

Dr. R. M. Christensen
Chairman, U. S. Papers Committee
Lawrence Livermore Laboratory
P. O. Box 808 L-338
Livermore, CA 94550

3. By February 8, 1988 **6** copies of the Abstract, **6** copies of the Summary, and **1** copy each of the Statement of Preference and the Slides or Poster should be received by

Professor D. Caillerie
Secretary ICTAM 1988
Institut de Mecanique de Grenoble
Domain Universitaire--B. P. 68
38402 Saint Martin D'Heres Cedex, FRANCE

May 11, 1987

Salem Prize Awarded to David and Journé

The Salem Prize for 1987 was awarded to Guy David and Jean-Lin Journé, of the Centre National de la Recherche Scientifique (France), for their joint work on Calderón-Zygmund operators. The prize, established in 1968, is given every year to a young mathematician who is judged to have done an outstanding work in the field of interest of Raphaël Salem, primarily on Fourier series and related topics. Past recipients are Nicholas Varopoulos (1968), Richard Hunt (1969), Yves Meyer (1970), Charles Fefferman (1971), Thomas Körner (1972), E. M. Nikisin (1973), Hugh Montgomery (1974), William Beckner (1975), M. R. Herman (1976), S. B. Bockarëv (1977), Björn E. Dahlberg (1978), Gilles Pisier (1979), Stylianos Pichorides (1980), Peter Jones (1981), Alexei B. Aleksandrov (1982), Jean Bourgain (1983), Carlos Kenig (1984), Th. H. Wolff (1985), and N. G. Makarov (1986). The jury consisted of L. Carleson, Y. Katznelson, Y. Meyer, and E. M. Stein.

AMS Centennial Research Fellowship Invitation for Applications, 1988–1989 Deadline December 1, 1987

In recognition of the Centennial Celebration of the Society, the Council has approved changing the name of the research fellowship program to the American Mathematical Society Centennial Research Fellowship.

These fellowships are open to individuals five to ten years past the Ph.D. degree (or equivalent), regardless of age, but below the academic rank of professor. Applicants should have received the Ph.D. degree between January 1, 1978, and December 31, 1983. Moreover, the vita must include the equivalent of at least three full years postdoctoral teaching or industrial experience, i.e., nonfellowship years.

The stipend has been set by the Trustees of the Society at $30,000 for nine months of full-time research or its equivalent. In addition, there will be an expense allowance of $1,000. Applicants must be citizens or permanent residents of a country in North America. Fellowships may be held at any institution the fellow selects or at more than one in succession. There is flexibility in the choice of time interval(s) and the manner in which the fellow may draw funds. For instance, given the opportunity, a fellow may elect to hold a half-time academic appointment with a teaching responsibility not exceeding one course per term while holding the fellowship at one-half stipend over a two-year period. The fellow should consult with the Secretary of the Society to learn whether the arrangement proposed is acceptable to the Society.

The number of fellowships to be awarded is small and depends on the amount of money contributed to the program. The Trustees have arranged a matching program from general funds

Council of Scientific Society Presidents

Resolution Adopted by the Council of Scientific Society Presidents in Support of Science

May 13, 1987

The Council of Scientific Society Presidents (CSSP) applauds the intent of the federal government to double the budget of the National Science Foundation over the next five years. In an age of rapid scientific and technological change, this investment is important. It will improve our international standing and competitiveness in basic science, science and mathematics education, and science applications.

We not only applaud the intent, but emphasize that there is a critical need for more support. This need exists in part because of variables which could place at risk the funds available for individual investigators who constitute the major continuing source of intellectual innovation and scientific advance. Briefly:

1. Allocations for technological development, though necessary, will divert funds from individual investigator-initiated basic science grant sources to mission-oriented research unless additional funds are made available.

2. The deplorable state of the nation's scientific facilities on university campuses mandates an investment by the federal government, which should not come at the expense of individual investigators.

3. Proposed big scientific projects will require a massive outlay in funds. In the absence of increased total support for science in the United States, the demands of these big science projects would limit, or even reduce, the support available for individual investigators.

Thus, CSSP strongly urges a doubling of the NSF budget within the next five years not only to assure a continuing strong base of science support but also to assure that the many new demands placed on current very limited resources do not jeopardize prospects for individual investigators. Particularly at risk are the younger scientists who are trying to develop their careers.

in such fashion that funds for at least one fellowship are guaranteed. Because of the generosity of the AMS membership this past year, it was possible to award two fellowships for 1987–1988; however, in the several preceding years, it was not financially possible to award more than one fellowship.

The deadline for receipt of applications is **December 1, 1987**. Awards will be announced in February 1988, or earlier if possible.

For application forms, write to William J. LeVeque, Executive Director, American Mathematical Society, P.O. Box 6248, Providence, RI 02940. (It should be noted that completed application and reference forms should **NOT** be sent to this address, but to the address given on the forms.)

U.S. Math Olympiad Winners Announced

Eight students have won Olympiad medals in the Sixteenth U.S.A. Mathematical Olympiad (USAMO), the final round of the high school segment of the American Mathematics Competitions. The three-stage national competition involved more than 350,000 students.

The USAMO winners are Matthew M. Cook, Evanston, Illinois, Evanston Township High School; Samuel K. Vandervelde, Amherst, Virginia, Amherst County High School; Ravi D. Vakil, Etobicoke, Ontario, Martingrove Collegiate Institute; Jeremy A. Kahn, New York, New York, Hunter College High School; Daniel J. Bernstein, Bellport, New York, Bellport Senior High School; William A. Schneeberger, Oklahoma City, Oklahoma, Putnam City High School; Elizabeth Lee Wilmer, Scarsdale, New York, Stuyvesant High School; and Rocky Lee, Scarborough, Ontario, Woburn Collegiate Institute.

On June 2, 1987, the winners were honored in Washington, DC, at the USAMO Award Ceremony at the National Academy of Sciences. Following the ceremony, the medalists, together with sixteen other students who did well in the USAMO, participated in an intensive four-week training session at the U.S. Military Academy at West Point. The training session produces a U.S. team of six students to compete in the 1987 International Mathematical Olympiad (IMO), which will be held in Havana, Cuba, July 5–15.

The annual American Mathematics Competitions begin with the American High School Mathematics Examination, a multiple choice test given to more than 350,000 students across the U.S. and Canada. Three weeks later, 1,000–3,000 of the top scorers participate in the American Invitational Mathematics Examination, which consists of fifteen short-answer questions. This examination produces fifty to one hundred competitors for the USAMO, a three and a half hour examination consisting of five essay questions.

Romania initiated the IMO in 1959, and the U.S. has participated in the competition since 1974. Typically, thirty to thirty-five nations send teams to the IMO. The U.S. team has usually placed among the top three nations, and in 1977, 1981, and 1986, it earned first place honors.

Mathematical History

The AMS Centennial Celebration in 1988 provides an opportunity for the Society to highlight the role mathematics has played in the development of science and technology. One activity planned in this connection is the publishing of books and articles of a historical nature. The publication of such manuscripts is a departure from the Society's traditional involvement with research-oriented material and, therefore, assistance from the mathematical community is requested in acquiring historical works. The Society is also interested in locating existing manuscripts about twentieth-century mathematicians and historical accounts, which could be incorporated into a collection of reprints. A committee has been appointed for this project: Peter Duren, University of Michigan, Chairman; Richard Askey, University of Wisconsin; and Uta Merzbach, Smithsonian Institution.

If you are planning to write or are currently writing a manuscript on the history of mathematics, or if you have information about existing manuscripts, you are invited to contact Ms. Mary C. Lane, Director of Publication, P. O. Box 6248, Providence, RI 02940, for further details about this activity. Information and manuscripts may also be forwarded directly to the committee members.

Fulbright Scholar Awards 1988–1989 Competition

The Council for International Exchange of Scholars reminds faculty and scholars that the competition for the 1988–1989 Fulbright grants is in progress.

Fulbright Awards are granted in virtually all disciplines, and scholars in all academic ranks are eligible to apply. Applications are also encouraged from retired faculty and independent scholars.

The basic eligibility requirements for a Fulbright Award are U.S. citizenship; Ph.D. or comparable professional qualifications; university or college teaching experience; and, for selected assignments, proficiency in a foreign language.

Application deadlines for the awards are: **September 15, 1987** (for Africa, Asia, Europe, the Middle East, and lecturing awards to Mexico, Venezuela, and the Caribbean); **January 1, 1988** (for Administrators' Awards in Germany and Japan, the Seminar in German Civilization; the

Request for Photos

In conjunction with the Centennial of the American Mathematical Society, which is to be celebrated in Providence in 1988, the AMS would like to set up an exhibit of group photos from meetings and similar items of interest.

If anyone has memorabilia of this kind which they would like to give or loan to the AMS, please write to William J. LeVeque, Executive Director, American Mathematical Society, P.O. Box 6248, Providence, RI 02940.

NATO Research Fellowships, and the Spain Research Fellowships); and **February 1, 1988** (for the France, Italy, and Germany Travel-Only Awards).

For applications, call or write the Council for International Exchange of Scholars, Eleven Dupont Circle NW, Washington, DC 20036-1257, 202-939-5401.

Milnor to Give Pitcher Lectures

The next series of Everett Pitcher Lectures will be held October 28–30, 1987, on the campus of Lehigh University in Bethlehem, Pennsylvania. They will be delivered by Professor John Milnor of the Institute for Advanced Study. The title of his lectures is *Iterated Polynomial Maps.*

The lectures are open to the public and are held in honor of Everett Pitcher, Secretary of the AMS, who served in the Mathematics Department at Lehigh from 1938 until 1978, retiring as Distinguished Professor of Mathematics. Further information can be obtained by writing Pitcher Lecture Series, Department of Mathematics, Lehigh University, Bethlehem, PA 18015, or by calling 215-758-3753.

Newly Elected Members of the American Academy

The following mathematical scientists have been elected to the American Academy of Arts and Sciences: CARL-WILHELM DE BOOR, University of Wisconsin at Madison; AVNER FRIEDMAN, Purdue University; DANIEL GORENSTEIN, Rutgers University; ALAN J. HOFFMAN, International Business Machines Corporation; PETER J. HUBER, Harvard University; ALBERT MEYER, Massachusetts Institute of Technology; PAUL C. RABINOWITZ, University of Wisconsin at Madison; STEPHEN STIGLER, University of Chicago; and ALBERT W. TUCKER, Princeton University. VLADIMIR I. ARNOLD, University of Moscow, was elected a foreign honorary member.

National Chairmen's Colloquium 1987

The primary foci of the 1987 National Mathematics Chairmen's Colloquium in Washington, DC, October 9–10, will be the national emphasis on post-secondary mathematics education and structure and the emergence of centers and groups in mathematical research. In addition, staff members of the federal funding agencies in mathematics will give current and detailed information about their programs to the department chairmen.

The Board on Mathematical Sciences (BMS), in conjunction with the Mathematical Sciences Education Board (MSEB), is undertaking a major study of post-secondary mathematical sciences ["Mathematical Sciences in the Year 2000: Assessment for Renewal in U.S. Colleges and Universities" (MS2000)]. This study is envisioned as having an impact similar to the David Report, but with a broad focus on talent, curriculum, and resources in the full range of post-secondary mathematics. An important part of MS2000 is a project, in cooperation with the MAA, to prepare material and encourage a national dialogue concerning the renewal of calculus instruction in the U.S.

Active participation of department chairmen will be an integral part of these projects. Suggestions and comments will be solicited by the two sponsoring boards throughout the process, and the eventual impact of these studies will be highly dependent on the role taken by the broad mathematics community and especially by the mathematics chairmen.

The colloquium will begin on Friday, October 9, with concurrent special sessions to include: federal issues in statistical sciences; computational facilities and support in mathematical sciences departments; background preparation for calculus renewal; and related federal education funding issues. A banquet on Friday evening will include a speaker of national interest. Saturday's program will include short reports from funding agencies about new programs and emphases and reports of other national concerns, including Mathematics Awareness Week. A major focus will be on preparation for the renewal of calculus and the proposed NSF program and grant solicitation. In addition, the framework for the MS2000 project will be presented for discussion. Ample opportunity will be provided for chairmen to interact and discuss mutual concerns.

Chairmen and their representatives are encouraged to contact the BMS office (202-334-2421) for further information, registration, and forms. Program material will be available prior to the meeting for the participants. Last year's meeting attracted over 150 registrants, and broader participation is anticipated this year. Input into program matters is encouraged through either of the program organizers (Ronald Douglas and Frank Gilfeather, or the BMS office.

Symposium on the Future of Calculus

A major meeting on the future of calculus with broad participation from the mathematical, scientific, and engineering communities is being planned by the Mathematical Association of America and the National Research Council for late October. Those wishing to receive information or to participate should write to: Peter L. Renz, Associate Director, Mathematical Association of America, 1529 Eighteenth Street, Washington, DC 20036.

CATEGORIES OF HIGHEST WEIGHT MODULES: APPLICATIONS TO CLASSICAL HERMITIAN SYMMETRIC PAIRS

Thomas J. Enright and Brad Shelton
(Memoirs of the AMS, Number 367)

The category of highest weight representations is of special interest within the full set of representations of a real semisimple Lie group. This book describes the structure of the generalized Verma modules as well as the Kazhdan-Lusztig data for the simple modules in this category for the classical groups. In particular, the authors give explicit formulas for composition factors of generalized Verma modules and Kazhdan-Lusztig polynomials.

Contents

Categories of highest weight modules
- Reduction of singularities
- The Zuckerman derived functors
- An equivalence of categories
- A second equivalence of categories

Highest weight modules for Hermitian symmetric pairs
- Statement of the main results
- Wall shifting
- Induction from lower rank
- Projective resolutions and Ext
- Kazhdan-Lusztig polynomials
- Decompostions of $U(u^-)$-free self-dual g-modules

1980 *Mathematics Subject Classification*: 22
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Prepayment required. Order from AMS, P.O. Box 1571, Annex Station, Providence, RI 02901-9930, or call 800-556-7774 to use VISA or MasterCard.

PROCEEDINGS OF THE 1986 ANNUAL SEMINAR ON OSCILLATION, BIFURCATION, AND CHAOS

F. V. Atkinson, W. F. Langford, and A. B. Mingarelli, Editors
(Conference Proceedings of the Canadian Mathematical Society, Volume 8)

The year 1986 marked the sesquicentennial of the publication in 1836 of J. Sturm's classic memoir on boundary value problems for second order equations. In July 1986, the Canadian Mathematical Society sponsored the International Conference on Oscillation, Bifurcation, and Chaos, held at the University of Toronto. This volume contains the proceedings of this conference.

Distinguished by the breadth of its perspective and by its treatment of applications, this volume contains nearly 50 papers on parametrized linear and nonlinear differential equations. The book is divided, as the conference was, into two parts. Part 1, in honor of the Sturm sesquicentennial, deals with spectral theory and oscillation theory for linear second order equations, eigenvalue problems and their extensions, including Hamiltonian systems. Part 2 is devoted to nonlinear differential equations and addresses problems in multiparameter bifurcation theory, normal forms, invariant tori, and chaotic dynamics. Several of the papers deal with bifurcations in delay-differential equations.

In addition, both parts of the book present significant applications of recent theoretical advances to such diverse fields as population dynamics, chemical reactions, geology, and mechanical engineering. In this way, these proceedings reflect the dynamics of the conference, which fostered mutually beneficial interactions between linear and nonlinear theory as well as between theory and applications.

Requiring a basic knowledge of the qualitative theory of differential equations, this book is aimed at mathematicians and students working in any area of differential equations, as well as researchers interested in applying recent results in oscillation and bifurcation theory to other disciplines. Readers will gain a broad perspective on current research in this area from both the Sturmian and dynamical systems points of view, as well as an understanding of new results useful for application and of directions for future research.

1980 *Mathematics Subject Classifications*:
34, 58; 35, 70, 92, and others
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Grants to Assist Innovative Small Businesses

The NSF announced the award of 151 grants totaling $6 million to small businesses to promote research geared to the development of innovative commercial products and processes.

The 151 grants were made through the NSF's three-phase Small Business Innovation Research Program (SBIR). The awards are for Phase I research, providing firms with up to $40,000 for six months to explore the technical feasibility of promising ideas.

Awards went to 123 firms in 31 states, including 75 first-time recipients. The firms range in size from 1 to 401 employees. Sixteen companies received more than one award. The funded projects were selected from 1,195 proposals received during the 1986 SBIR solicitation.

The most promising projects to emerge from Phase I will receive approximately $200,000 from NSF for two years of Phase II research. Private investors fund Phase III product development, manufacturing, and marketing efforts. Cumulative private investment for Phase III projects resulting from SBIR now totals $200,000,000, nearly ten times NSF expenditures for associated Phases I and II. SBIR funds projects in all of NSF's research divisions on important scientific and engineering problems.

Copies of the 1987 SBIR solicitation can be obtained from the National Science Foundation, Forms and Publications Office, 1800 G Street, NW, Room 232, Washington, DC 20550.

Of the 151 awards for 1986, the following fifteen awards were made in the areas of mathematical sciences, computer research, and advanced scientific computing. The winning firms, their locations, and project titles are:

Creare, Inc., Hanover, New Hampshire, *Adaptive Grid Generation from Harmonic Maps on Riemannian Groups*; Daniel H. Wagner Associates, Paoli, Pennsylvania, *Stochastic Modeling of an Improved Fertility Diagnosis*; KMS Fusion, Inc., Ann Arbor, Michigan, *The Streamline Diffusion Method in Computational Fluid Dynamics*; Principia Supervectus, Inc., Seattle, Washington, *Integration of Stochastic Differential Equations on Supercomputers*; Bonneville Scientific, Inc., Salt Lake City, Utah, *High Speed Galium Arsenide Design Tool*; Decision Science Consortium, Inc., Falls Church, Virginia, *An Integrated Framework for Knowledge Representation and Acquisition*; Quantech, Inc., Gaithersburg, Maryland, *Statistical Design of Experiments Aided by Artificial Intelligence*; Quintus Computer Systems, Inc., Palo Alto, California, *An Object-Oriented Prolog System for Simulation*; Spaceborne, Inc., La Canada, California, *A High-Speed Differential CMOS Logic Circuit for VLSI Applications*; Tractell, Inc., Dayton, Ohio, *Hardware Self-Diagnoses Using On-Component Links to Expert Systems*; Ketron, Inc., Arlington, Virginia, *Mathematical Programming and Supercomputers*; Northwest Research Associates, Inc., Bellevue, Washington, *A Visual Analysis System for Very Large, Multidimensional Data Sets*; Scientific Computing Associates, Inc., New Haven, Connecticut, *Software for Solving Large, Sparse Linear Systems of Equations on Message-Passing Multiprocessors*; Scientific Computing Associates, Inc., New Haven, Connecticut, *Software for Solving Large, Sparse Linear Systems of Equations on Shared, Global Memory Multiprocessors*; Scientific Computing Associates, Inc., New Haven, Connecticut, *Software for Solving Large, Sparse Linear Systems of Equations in a Vector Processing Environment.*

–NSF News Release

NSF Seeks Proposals for the 1989 Regional Conference Series in Mathematical Sciences

The National Science Foundation is seeking proposals from host institutions in the U.S. for five-day regional conferences. Each conference is to feature a distinguished lecturer who will deliver ten lectures on a subject of current research interest in the mathematical sciences. It is expected that the lecturer will give two lectures per day during the five days, with the remaining time available for study, informal discussion, and exchange of ideas.

All institutions having at least some research competence in the area of its proposal are eligible and encouraged to apply. The conference should be planned for a summer week in 1989 (not earlier than May 1) or held during a recess in the succeeding academic year.

The host institution is responsible for arranging conference details, hotels, and social events during the five-day conference. Participants in the conference will receive allowances for travel and subsistence under the host institution's grant from the NSF.

The principal lecturer receives from the Conference Board a fee for delivering his/her lectures and a second fee for organizing these lectures into a substantial expository monograph. The monograph will be submitted to the NSF for approval and published by one of three organizations: the American Mathematical Society, the Society for Industrial and Applied Mathematics, or in con-

junction, the American Statistical Association and the Institute of Mathematical Statistics.

Proposals (twenty) by prospective institutions should be sent directly to the Data Support Service Section, National Science Foundation, 1800 G Street, NW, Washington, DC 20550. Proposals must follow the guidelines issued by CBMS. The deadline for proposals for 1989 conferences is **April 1, 1988**. Please address all inquiries and requests for information sheet/guidelines to: Conference Board of the Mathematical Sciences, 1529 18th Street, NW, Washington, DC 20036, or call 202-293-1170.

Postdoctoral Research Fellowships

NSF Postdoctoral Research Fellowships in the mathematical sciences will be offered only to persons who 1. are U.S. citizens or nationals as of January 1, 1988; 2. will have earned by the beginning of their fellowship tenure a doctoral degree in one of the mathematical sciences; 3. will have held the doctorate for no more than five years as of January 1, 1988; and 4. will not previously have held any other NSF postdoctoral fellowship.

For copies of the application brochure or further information, contact the Special Projects Program, Division of Mathematical Sciences, National Science Foundation, Washington, DC 20550, 202-357-9764; or the American Mathematical Society at 401-272-9500.

The deadline for applications is **November 16, 1987**.

NSF-NATO Postdoctoral Fellowship Awarded

The recipients of the NSF-NATO Postdoctoral Fellowships in the mathematical and computer sciences were announced in the **NSF News & Reports** section of the June 1987 *Notices*. One recipient was inadvertently omitted from that list. RONALD K. PERLINE of Drexel University will be attending Eigenössiche Technische Hochshule in Switzerland. His field of study is geometry.

Visiting Professorships for Women

The Visiting Professorships for Women program is designed to provide opportunities for women to advance their careers in the disciplines of science and engineering and to provide greater visibility of women scientists and engineers employed in industry, government, and academic institutions. The program addresses the need to make full use of the scientific and technical resources of the nation.

In addition to research and teaching, the visiting professors will be available to offer advice and to act as mentors to women students and faculty and will engage in other interactive activities to increase the visibility of women scientists in the academic environment. Proposals will be evaluated on the basis of their plans for such activities, as well as the scientific merit of the proposed research.

The deadline for applications is **October 1, 1987**. For further information about guidelines and eligibility, contact the Program Director for Visiting Professorships for Women, National Science Foundation, Washington, DC 20550. Telephone: 202-357-7734.

Cornell to Receive Supercomputer Upgrade

The NSF supercomputer center at Cornell University will receive the most powerful supercomputer IBM produces, the IBM 3090-600E. The $20 million system is donated by IBM and is among the first of the new IBM machines to be installed.

The supercomputer center, known as the Theory Center, already has an IBM 3090-400, which will be upgraded to the IBM 3090-600E in July. According to Theory Center Director Kenneth G. Wilson, "The IBM commitment comes at a critical time for the Theory Center. With over 200 projects now depending on our facilities, we have found that current IBM 3090-400 is now fully utilized."

Having six processors, each with vector facility, the IBM 3090-600E has about 60% more processing power than the 3090-400. The new system will have a memory of 768 million bytes, and another 512 million bytes of expanded storage is scheduled for delivery in the first quarter of 1988.

Because it is committed to advancing supercomputing, particularly in the area of IBM compatibility, the Theory Center was especially interested in the 3090-600E, which offers extensive parallel capability in a mass-produced product.

The Theory Center was founded in 1985 with a $30 million commitment for equipment and services from IBM and a $21.9 million grant from the NSF. Other major support has come from the state of New York and Cornell University.

Telephone Number Changed for Adams and Boyle

A list of the names and telephone numbers of the Program Directors at the NSF's Division of Mathematical Sciences appeared in the April 1987 issue of *Notices*, page 498. Since then, the telephone number of William Adams and Ann Boyle, Program Directors for Algebra and Number Theory, has been changed to 202-357-3686.

Positions Open in NSF

NSF's Division of Computer and Computation Research in the Directorate for Computer and Information Science and Engineering is seeking

qualified applicants for the position of assistant, associate, or program director for the Computer Systems Architecture program. The position is in the excepted service and will be filled on a permanent basis, or on a one- or two-year rotational or temporary basis. Alternatively, the assignment will be made under the provisions of the Intergovernmental Personnel Act (IPA). Individuals must be nominated by their home institution for IPA assignment.

Applicants must have a Ph.D. or equivalent professional experience and training in computer sciences, or a related field, and successful scientific research experience beyond the Ph.D. as follows: three to four years for the assistant program director; four to six years for the associate program director; and six to eight years for the program director. A broad general knowledge of computer research and some administrative experience are also required. For technical information about these positions, contact Kent Curtis, Division Director, Computer and Computation Research at 202-357-9747, or by net mail to: CURTIS/NSF CS.CSNET@CSNETRELAY. –NSF *Bulletin*

Institutional Infrastructure Program Expansion

The Directorate for Computer and Information Science and Engineering (CISE), through the Division of Computer and Computation Research, is considering expanding the Institutional Infrastructure Program (formerly the Coordinated Experimental Computer Research Program or CER). This expansion would be designed for units with smaller concentrations of excellence than those in the regular Institutional Infrastructure Program. Awards would be expected to consist of five-year continuing grants ranging from approximately $200,000 to $350,000 per year. Support would be provided for equipment, maintenance, support staff, and other appropriate costs. Eligibility would be limited to U.S. institutions with Ph.D. degree-granting departments that have not received CER or regular Institutional Infrastructure grants but have active research programs in areas of computer science, information science, or computer engineering supported in the CISE directorate. The deadline date for proposals to this expansion would be **December 15, 1987**. Contact Harry Hedges (202-357-7349), Division of Computer and Computation Research.

–NSF *Bulletin*

JORDAN ALGEBRAS IN ANALYSIS, OPERATOR THEORY, AND QUANTUM MECHANICS

Harald Upmeier

This book is based on the CBMS Regional Conference held at the University of California, Irvine, on July 15–19, 1985. In recent years Jordan algebras have found interesting applications in seemingly unrelated areas of mathematics such as operator theory, the foundations of quantum mechanics, complex analysis in finite and infinite dimensions, and harmonic analysis on homogeneous spaces. The author describes some relevant results and puts them in a general framework, based on the concepts of JB-algebra and JB^*-triple.

Contents: JB-algebras and JB^*-triples; Bounded symmetric domains and JB^*-triples; Siegel domains and Cayley transformations; Geometry of Jordan structures and quantum mechanics; Derivations and dynamical systems; Kernel functions and harmonic analysis; Harmonic functions and Hua operators; Toeplitz operators and Toeplitz C^*-algebras; Index theory for multivariable Toeplitz operators; Quantization of curved phase spaces.

1980 *Mathematics Subject Classifications*: 17, 32, 46, 47, 43, 58, 81
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Report of the Committee on American Graduate Mathematics Enrollments

Conference Board on Mathematical Sciences

The following is a summary of a report by the Conference Board of the Mathematical Sciences (CBMS). Alarmed by anecdotal reports about the decreasing fraction of mathematics graduate students who are U.S. citizens, the CBMS appointed a committee on American Graduate Mathematics Enrollment in May 1986. The committee consists of Joe Kohn, Princeton University; Betty Lichtenberg, University of South Florida; Willard Miller, University of Minnesota; and Barry Simon, Committee Chairman, California Institute of Technology.

The charge to the committee includes the following:

- to determine if there is a problem by examining available statistics, and, if necessary, to collect additional statistics;
- to examine the effects of the problem, if one exists;
- to make recommendations about how to cope with any possible problems.

The committee obtained some of the data for the study from the National Science Foundation, which provided information for the years 1977 to 1984. The rest of the data was solicited from the top thirty-nine institutions in mathematics as listed in the last AMS survey; all but one of the institutions responded. However, for some of the years, the report says, some institutions did not supply any data.

Table I. NSF Data on Graduate Enrollments

	1977	1980	1984
U.S. Citizens			
All S/E Disciplines	197,716	198,429	199,693
Mathematics	7,910	6,648	6,710
Physical Sciences	17,809	17,174	18,187
Foreign			
All S/E Disciplines	38,448	50,730	64,452
Mathematics	2,455	3,254	4,513
Physical Sciences	4,696	5,744	7,479
% Foreign			
All S/E Disciplines	16.3%	20.4%	24.4%
Mathematics	23.7%	32.9%	40.2%
Physical Sciences	20.9%	25.1%	29.1%

Table 1 shows NSF data for three selected years in three categories: all areas of science and engineering (S/E), mathematics (including statistics), and physical sciences (not including mathematics). Table 2 breaks down the 1984 data by field.

Table II. NSF Data on 1984 Graduate Enrollments by Field

	Total	Foreign	% Foreign
Engineering	56,862	23,946	42.1%
Physics	9,911	3,765	38.0%
Chemistry	14,996	3,567	23.8%
Mathematics	11,223	4,513	40.2%
Computer Science	11,448	4,507	39.4%
Biological Science	37,554	5,896	15.7%
Economics	8,976	3,522	39.2%

The report notes a "clear and quite dramatic" trend toward a consistently higher percentage of foreign students in mathematics than in the physical sciences, or than in science and engineering overall. However, Table 2 shows that the situation is just "as bleak in several other areas." The report pointed out that the drop in the number of mathematics graduate students with U.S. citizenship was accompanied by a slight rise in the total number of graduate students.

Tables 3 and 4 contain data collected by the committee from the top thirty-nine institutions.

Table III. Foreign Graduate Enrollments in Mathematics

Year	% of First Year Students	% of All Students
1977	22.4%	19.6%
1978	24.9%	18.2%
1979	25.7%	22.6%
1980	32.1%	27.1%
1981	39.4%	27.7%
1982	32.1%	32.5%
1983	36.8%	39.2%
1984	38.2%	41.1%
1985	46.7%	44.6%
1986	46.2%	45.8%

Referring to Table 3, the report noted that the problem is worsening. In addition, of the thirty-five schools that provided information about first year students in 1986, half indicated that 50% or more of their first year students were foreign. The report observed, not surprisingly, that the steady increase in the fraction

of foreign graduate students is mirrored in the steady increase of foreign postdoctoral fellows and untenured faculty.

Table IV. Foreign Nontenured Personnel in Mathematics

Year	% of Nontenured Faculty	% of Postdoctoral Fellows
1977	26.9%	27.6%
1978	32.5%	26.3%
1979	32.6%	38.9%
1980	28.4%	43.9%
1981	32.8%	25.0%
1982	34.9%	27.0%
1983	36.1%	29.2%
1984	37.3%	35.1%
1985	36.3%	39.7%
1986	45.6%	59.6%

Analysis

New talent. The report notes that mathematics has influenced many aspects of our modern technological civilization, from the security of bank transactions, to elementary particle physics, to the development of computer algorithms. In the post-World War II period, the emergence of the United States as the premier power in mathematical research produced an explosive growth in the field. The report goes on to say that, because those who entered the field in the 1950s will be retiring in the next fifteen years, mathematics will be facing severe manpower shortages. All predictions suggest that the average age of tenured faculty in mathematics will increase. This trend, the report says, is "not healthy in a field in which research accomplishments are dominated by the young." Warning that continued American leadership in the mathematical sciences is central to the long term prosperity of the nation, the report points out that the current prognosis for the vitality of the field is bleak.

Teaching. For foreign graduate students, postdoctoral fellows, and faculty, language barriers can present teaching problems. In mathematics, the report says, teaching assistantships have traditionally been a major source of support for graduate students, and the bulk of postdoctoral positions involve teaching. Even when the teachers have excellent written and oral skills in English, the report maintains, their accents can make them very difficult for students to understand. There have even been cases in which undergraduates brought suit against their schools because their instructors had inadequate English skills, and, in several states, legislative action is being considered.

The report urges that adequate instruction in English be made available to foreign students. Fluency examinations as a precondition of acceptance to graduate school are rejected in the report on the grounds that administering them abroad is too complicated and that the results are difficult to quantify.

Why has it happened? The report says that the mathematics community has failed to attract many of the very best potential mathematicians and conjectures three reasons for this failure:

- Salaries in academia are lower than in competing areas such as law, medicine, and business.
- Society as a whole has become more materialistic.
- Students introduced early to computers are often likely to study programming rather than mathematics.

Recommendations

The report urged a more detailed follow-up study, under the auspices of the National Research Council, to examine the full spectrum of manpower problems in the mathematical sciences, including the lack of women and minority mathematics students. Some specific suggestions are:

- studying the educational and career paths of those who do well on the various national high school examinations, such as the Putnam examination;
- studying the distribution of foreign mathematics graduate students by country of origin, and investigating how many have permanent residence status;
- studying the extent to which the increase in the percentage of foreign students is due to a decrease in the number of American students or due to an overall growth in the number of students;
- studying the extent of the problem in statistics. The committee received anecdotal evidence that the situation is worse in statistics than in the mathematical sciences as a whole;
- adding more schools to the top thirty-nine used by the committee in this study.

The report also gave recommendations to rectify the language barriers that cause teaching problems.

- First year foreign students should be given positions that only involve grading until they demonstrate spoken fluency.
- Mathematics departments need to convince the administrations at their institutions to offer formal instruction in English for incoming graduate students. Receiving such instruction may mean delaying slightly the schedule for meeting other requirements that may be more academically significant.
- Mathematics departments must insist that their instructors be fluent in spoken English. Too often postdoctoral fellows are hired on the basis of their mathematical potential without regard to language difficulties that might affect their teaching.

Early on in the study, the committee noted a dearth of mathematics programs for bright high

school students. While a few programs do exist, the report says that they are not an adequate solution to a national problem. The chairman of the committee visited the NSF to try to convince some key people of the importance of a program for high school students.

Subsequently, the report says, the education directorate at the NSF proposed such a program, which is included in the budget proposed to the Congress by the Office of Management and Budget. Entitled the "Junior Scholars Program" and budgeted at $3.9 million, it would allow about 1,500 students to attend summer institutes in the summer of 1988. The report applauded this initiative, but noted that because the program addresses all sciences, the funding is inadequate and needs to be increased in the future.

Academic R&D Expenditures Expected to Continue Substantial Growth through FY 1986

The following are excerpts from a report that contains the findings of the National Science Foundation's Survey of Scientific and Engineering Expenditures at Universities and Colleges, FY 1985, in conjunction with estimates for 1986 from the series "National Patterns of Science and Technology Resources, 1986." The survey was mailed to a stratified sample of approximately 400 universities and colleges selected from the 566 institutions granting a graduate science or engineering (S/E) degree and/or performing at least $50,000 in separately budgeted research and development (R&D) activities. The sample, designed to provide national R&D expenditures estimates for the academic sector, included all doctorate-granting institutions with certainty. These institutions accounted for 98 percent of all academic R&D spending in S/E fields in FY 1985. R&D expenditures for nonrespondent or nonsampled institutions estimated by NSF accounted for 6 percent of total academic R&D spending in FY 1985. All R&D expenditures in this report refer to FY spending levels.

Sources of Support

Expenditures by universities and colleges for separately budgeted R&D activities in science and engineering totaled $9.5 billion in 1985, up nearly 12 percent (8 percent in constant dollars) over 1984 (Table 1). Spending was estimated to reach more than $10.5 billion in 1986, an increase averaging 8 percent per year in real terms during the 1984–1986 period.[1] This was double the average annual rate of about 4 percent between 1977 and 1984. Federally financed academic R&D spending rose 11 percent (8 percent in constant dollars) to more than $6 billion in 1985, continuing the significant growth seen in 1984 after 2 years of barely keeping pace with inflation. The average yearly real-dollar rise of 9 percent in R&D obligations from federal agencies in 1984 and 1985 was expected to result in continued spending increases through 1986. In that year, expenditures from federal sources were estimated to reach $6.8 billion (Chart 1).[2]

All R&D expenditures from nonfederal sources combined—$3.5 billion in 1985—increased 12 percent over 1984 levels, or 8 percent in real-dollar terms. Support from industry ($538 million in 1985) grew 14 percent in constant dollars and its share of total academic R&D spending increased to nearly 6 percent, up from 3 percent in the mid-seventies. This gradually increasing share is consistent with the average annual rise in real terms of 11 percent recorded over the 1977–1985 period. The total amount of industrial R&D support to higher education institutions is understated in that the $538 million reported for research projects in 1985 does not include scholarships, donations of equipment, summer employment of faculty and students, etc., which constitute a more complete picture of university/industry interactions.

R&D spending out of institutions' own funds ($1.6 billion) and the "all other sources" category ($704 million) showed real growth of 10 percent and 8 percent, respectively, in 1985. State and local government funding ($666 million in 1985) showed the slowest rate of growth of all sources, up 3 percent in constant dollars, compared to little or no average yearly real-dollar gains during the 1977–1984 period (Chart 2).

Character of Work

Academic spending for basic research, accounting for two-thirds of total R&D expenditures, rose

[1] National Science Foundation, "National Patterns of Science and Technology Resources: 1986" (NSF 86-309) (Washington, DC, 1986), table 1, p. 33.

[2] Ibid.

13 percent to $6.4 billion in 1985, continuing the rapid growth that began in 1984 after 2 years of almost no real-dollar gains. This corresponded to increases in funding from both federal ($4.3 billion) and nonfederal sources ($2.1 billion), up 12 percent and 14 percent, respectively. Two agencies, NIH and NSF, accounted for approximately 70 percent of Federal basic research support.[3] The 1985 federal budget provided for a continued real-dollar increase in academic basic research support, which should result in further gains in total 1986 expenditures.[4]

Applied research and development expenditures in higher education institutions totaled $3.1 billion in 1985, an increase of 9 percent (5 percent in real terms) over 1984. This represents the second consecutive year of real-dollar gains following little or no growth in the early eighties. Federal obligations allocated to applied research and development in 1985 were expected to result in additional spending increases through 1986 in real terms.

Fields of Science and Engineering

R&D spending increases in most major S/E fields in 1985 far exceeded the 1984–1985 inflation rate of 3 percent (Table 2). The fastest growth occurred in the computer sciences, up 25 percent, continuing average annual gains exceeding 20 percent that began in the midseventies (Chart 3). This rapid rate of growth, while not surprising in a field experiencing dynamic change, should not distort the fact that academic R&D expenditures in the computer sciences ($278 million in 1985) continued to account for a very small portion, 3 percent, of total R&D spending. Engineering and the physical sciences each grew between 14 percent and 15 percent in 1985 followed by the life sciences at 12 percent. Engineering expenditures accounted for a 15-percent share of total R&D spend at higher education institutions in 1985. The most rapid increases in engineering subfields occurred in electrical and mechanical engineering, up 15 percent to 16 percent each over 1984 levels. Spending in the social sciences in 1985 kept pace with inflation for the first time since 1981.

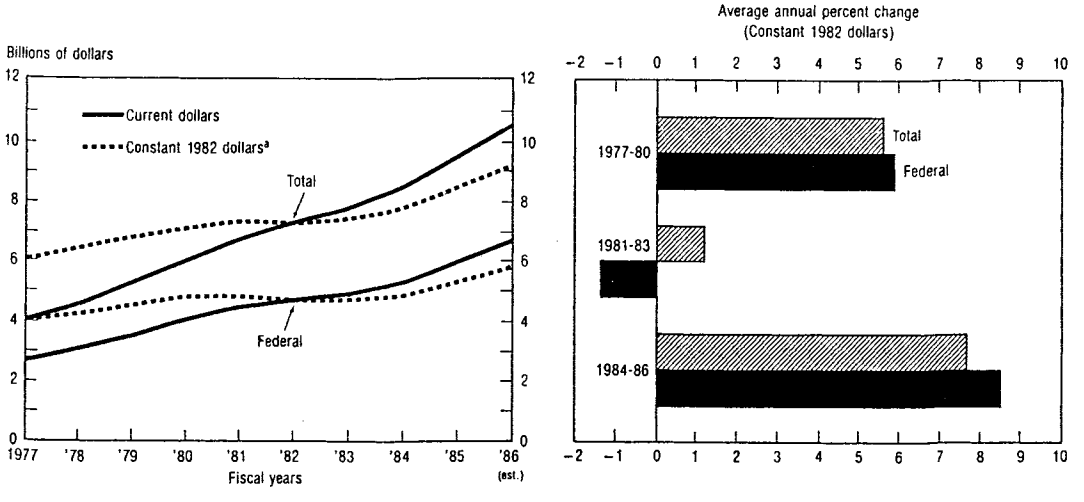
Research Equipment Expenditures

Separately budgeted expenditures by higher education institutions for S/E research equipment jumped 26 percent (22 percent in constant dollars) in 1985 to a total of $655 million. Expenditures for research equipment represent all such items purchased under sponsored research awards from current funds and constituted a 7-percent share of the R&D total in 1985. The fastest gains occurred in engineering and the physical and computer sciences, continuing trends seen since 1981 when data were first collected. Equipment spending in the computer sciences in 1985 constituted 14 percent of total expenditures in this field, compared to an 8-percent share in 1981 (Chart 4).

[3] National Science Foundation, *Federal Funds for Research and Development, Fiscal Years 1984, 1985, and 1986*, Volume XXXIV (Detailed Statistical Tables) (Washington, DC, 1985), table C-34, p. 52.

[4] National Science Foundation, *Federal Funds for Research and Development, Fiscal Years 1985, 1986, and 1987*, Volume XXXV (Detailed Statistical Tables) (Washington, DC, 1986), table C-1, pp. 1–2.

Chart 1. Total and federally financed R&D expenditures at universities and colleges



[a]Based on GNP implicit price deflator.
SOURCE: National Science Foundation

Table 1. R&D expenditures at universities and colleges by source of funds and character of work

[Dollars in millions]

Source and character	Current dollars			Constant 1982 dollars[1]		
	Fiscal year 1984	Fiscal year 1985	Percent change	Fiscal year 1984	Fiscal year 1985	Percent change
Total	$8,503	$9,504	11.8	$7,854	$8,486	8.0
By source of funds:						
Federal Government	5,388	6,003	11.4	4,976	5,360	7.7
State and local governments	626	666	6.4	578	595	2.8
Industry	458	538	17.5	423	480	13.6
Institutional funds	1,398	1,593	13.9	1,291	1,422	10.2
All other sources, n.e.c	633	704	11.2	585	629	7.5
By character of work:						
Basic research	5,638	6,377	13.1	5,207	5,694	9.3
Applied research & development	2,865	3,127	9.1	2,646	2,792	5.5

[1]Based on GNP implicit price deflator.
SOURCE: National Science Foundation

Table 2. Total and federally financed R&D expenditures at universities and colleges by field

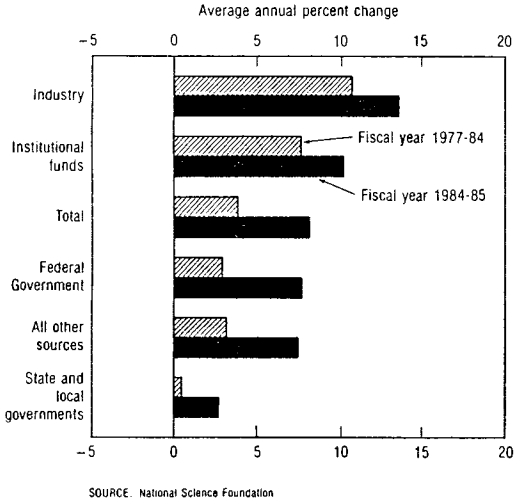
[Dollars in millions]

Science/engineering field	Total			Federal		
	Fiscal year 1984	Fiscal year 1985	Percent change	Fiscal year 1984	Fiscal year 1985	Percent change
Total	$8,503	$9,504	11.8	$5,388	$6,003	11.4
Engineering	1,206	1,383	14.7	779	858	10.1
Total, all sciences	7,297	8,121	11.3	4,609	5,145	11.6
Physical sciences	997	1,137	14.0	779	883	13.4
Environmental sciences	650	707	8.8	452	481	6.4
Mathematical sciences	124	129	4.0	91	96	5.5
Computer sciences	223	278	24.7	162	193	19.1
Life sciences	4,607	5,138	11.5	2,794	3,139	12.3
Psychology	147	162	10.2	98	108	10.2
Social sciences	371	387	4.3	147	156	6.1
Other sciences, n.e.c.	177	182	2.8	86	90	4.7

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

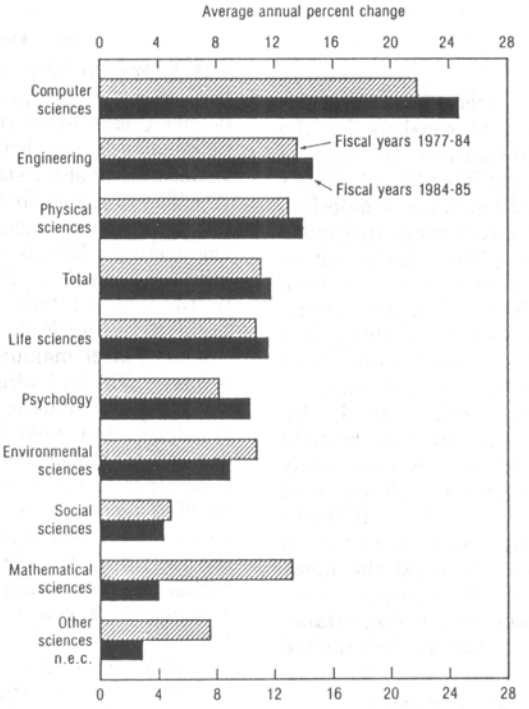
Chart 2. R&D expenditures at universities and colleges by source of funds

(Constant 1982 dollars)



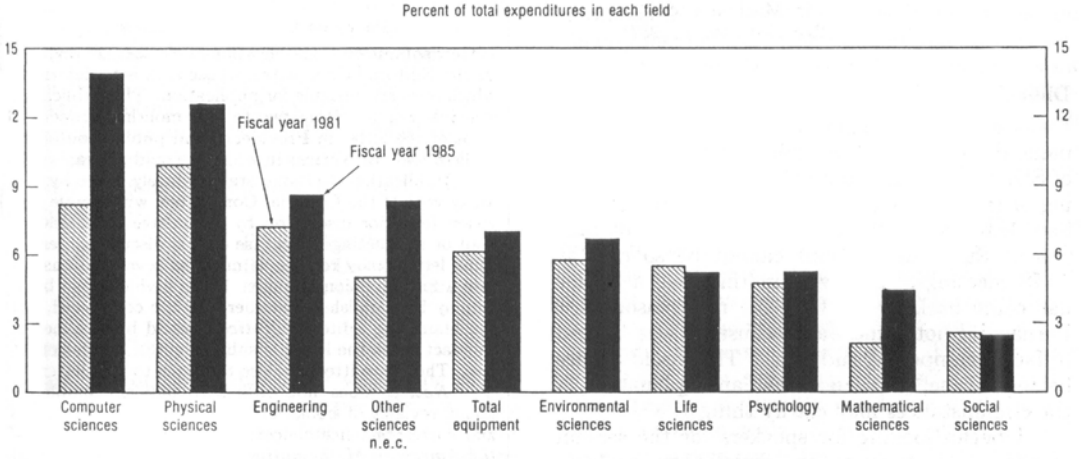
SOURCE: National Science Foundation

Chart 3. R&D expenditures at universities and colleges by field



SOURCE: National Science Foundation

Chart 4. Expenditures from current funds for research equipment at universities and colleges by field



SOURCE: National Science Foundation

Letters to the Editor

Lack of Women Speakers

We wish to express our concern that there are no women among the list of speakers for the symposium on The Mathematical Heritage of Hermann Weyl. Given the breadth of Weyl's contributions and the intention of the symposium "to provide a stimulus to the younger generation of mathematicians by indicating the cohesive nature of modern mathematical ideas as looked at from the vantage point of Weyl's ideas," it is surprising that the Organizing Committee was unable to find a woman whose mathematical contributions were consonant with their goals for the conference.

The dearth of women speakers at the International Congress of Mathematicians brought to the attention of the mathematical community the extent to which women are still excluded from important professional activities. It is our expressed hope that Organizing Committees of future conferences will bear in mind the many women making significant contributions in all areas of mathematics, as well as the importance of having women represented among their invited speakers.

Rhonda J. Hughes
Bryn Mawr College
President, Association for Women in Mathematics

Linda Keen
Herbert H. Lehman College, CUNY
Past-President, Association for Women in Mathematics
(Received May 1, 1987)

Difficulties with Organizing an SDI Panel

I was recently in charge of trying to organize a panel discussion on the subject of "The Question of SDI Software Reliability" for the Winter Meeting of the Society at the end of January 1987, in San Antonio. In the end the panel did not take place. Such cancellations cannot be so rare at AMS meetings. However, in this case a rumor has come back to me that the real reason that Parnas did not come was because he was "afraid to face a competent audience." This could hardly be more false, and I feel that an explanation of the circumstances may clarify things.

I began looking for speakers for the session as soon as I received the official okay, early in September. My plan was to have a speaker representing the (or at least a) position of those working on SDI, and a speaker representing the position of those who feel that a trustworthy system cannot be built to do the necessary tasks. Following a suggestion of Richard Garwin, I was happy to keep the number of speakers to two in order to provide the possibility of a deeper presentation than the ones usually heard at debates in which many people try to express themselves in short statements.

The first person I contacted was David Parnas, a computer scientist specializing in software engineering who has an extensive background in military software. Parnas had been appointed to the original "SDIO Panel on Computing in Support of Battle Management," but had later resigned, after making a detailed criticism of the project. He had already taken part in several major public debates on the subject (at MIT, Stanford, and before a major Software Engineering conference—before audiences at least as competent in the field as a potential AMS audience). I felt he would be an ideal member of the panel, and I was very pleased that he accepted the invitation to participate. Parnas was quite enthusiastic about appearing and made a number of suggestions of very worthy "opponents" for the debate.

After this first success, my task became harder. I began with a number of names from whom I solicited participation or, failing that, suggestions for good participants. These names included such luminaries as the current Chairman of the "SDIO Panel on Computing...," and Dr. Edward Teller himself, as well as Dr. Frederick Seitz and a number of less visible but solid workers in the field. Everyone refused. Some told me that they had other commitments on the date, and

Policy on Letters to the Editor

Letters submitted for publication in *Notices* are reviewed by the Editorial Committee, whose task is to determine which ones are suitable for publication. The publication schedule requires from two to four months between receipt of the letter in Providence and publication of the earliest issue of *Notices* in which it could appear.

Publication decisions are ultimately made by majority vote of the Editorial Committee, with ample provision for prior discussion by committee members, by mail or at meetings. Because of this discussion period, some letters may require as much as seven months before a final decision is made. Letters which have been, or may be, published elsewhere will be considered, but the Managing Editor of *Notices* should be informed of this fact when the letter is submitted.

The committee reserves the right to edit letters.

Notices does not ordinarily publish complaints about reviews of books or articles, although rebuttals and correspondence concerning reviews in *Bulletin of the American Mathematical Society* will be considered for publication.

Letters should be typed and in legible form or they will be returned to the sender, possibly resulting in a delay of publication.

Letters should be mailed to the Editor of *Notices*, American Mathematical Society, P.O. Box 6248, Providence, RI 02940, and will be acknowledged on receipt.

some said that they had already done too much of that sort of thing. Most gave me names to try (though some refused even to do that). After a considerable effort produced no acceptances, I solicited (in the name of the President of the Math Society) help from the SDI office in Washington. In addition to contacting their "Speakers Bureau" (who never bothered to answer my letter) I spoke directly with Lieutenant Colonel David Audley, who assured me that he would find someone for me, but did not.

Finally, time ran out on my efforts, and I reconciled myself to the panel becoming a lecture by Parnas; at least he would have time to develop his ideas, and I felt that we would have a very lively discussion in which the opposing ideas would be brought out as well. Parnas himself was sorry not to have an "opponent," but on the other hand felt pleased that he would have a mathematical audience before which to develop his ideas, and with which to have discussion.

However, about forty-eight hours before the event, Parnas called to warn me that he had had an adverse reaction to an antibiotic his doctor had given him because of a long-standing low-level infection, and that unless he recovered quickly he would be unable to travel. A day later, he was still quite ill, and said with great regret that he could not come. Ron Douglas, the Chairman of the Science Policy Committee, read an announcement for me at the Science Policy Committee meeting the night before the event was to have taken place, saying that Parnas could not come because of illness. Of course the cancellation was also announced by the AMS in the usual way.

I am sorry that this event did not take place, as I think that the uses of mathematics (in the broadest sense) in SDI present plenty of controversy, which should be much more widely and seriously discussed than they are. I look forward, however, to next year: The Council has given its approval to a lecture or panel at each Winter Meeting, hosted by the Science Policy Committee, on some "Social Use of Mathematics" (George Carrier's talk on the "Nuclear Winter" in New Orleans in 1986 was, informally, the first of this series).

David Eisenbud
Brandeis University
(Received May 6, 1987)

Refereeing Complaint

I want to complain about the way some of my papers have been rejected, especially by AMS journals. For example, my last paper took eight months before I got an opinion on it, and the paper itself took about that long to produce. But the referee's "report" was just a short collection of banal adjectival phrases, like "too long," or "not up to the standards of the *Transactions*." Of course subjective factors must enter into the referee's report, but it needs to have some *objective* content too, citing chapter and verse, like pointing out actual errors, or where an easier or shorter method could secure the same or better results, or how such and such a result follows from a specific item in the literature, and so on. I am tired of getting *unsupported* opinions that read as though they took five minutes to write, and that could have been written by *anyone* with a slight command of ordinary adjectives. Reports like the one above show virtually no evidence of the paper having been *read* at all, much less by a trained *mathematician*. The author is powerless before such arbitrary abuses of the referee's power. I urge all editors to require their referees to give reports heavier in substance and lighter in offhand opinions.

Lee A. Rubel
University of Illinois
at Urbana-Champaign
(Received April 20, 1987)

Academic Dependence on Research Funding

Funding in itself and its profound influence today in decision making that affects our academic careers is the issue at hand. It is not one of military funding vs. agency funding. True, the choice to become a recipient of funds remains a personal one. But it may in fact be the only choice if an individual is to remain viable within the system, regardless of the source. The extent to which mathematical research has become dependent upon federal spending has been expressed as a concern, but not because of its measure as a loss of focus by our academic institutions on their commitment to research and scholarly activities in order that we may fulfill our professional responsibilities.

Thirty years ago, there was a movement to establish an *annual salary base* in order that no faculty member could be excused from having sufficient time for either research or scholarly work on the basis of needing summer support for supplemental income. Research was identified with time, not salary. Time was considered as a critical prerequisite for the development of maturity in a young mathematician and retaining the vitality of a mature mathematician. Outside funds were to be channelled into long term benefits such as establishing chairs and individual faculty awards that could justify reduced teaching loads during the academic year, all of which was to be under departmental control. This approach may have been somewhat idealistic. Nevertheless, progress apparently was being made toward achieving these goals. Even in small private colleges, summers were to be meant for scholarly work and revitalization.

Did the worst fears of those who were apprehensive at that time about external salary support for research become reality? Well, where do we stand today? The mathematical community seemingly has adopted the axiom that there is a

direct correlation between funding and research at a point in recent history when teaching loads have never been lighter, lighter for the obvious reason. Summer teaching/funding has become an accepted norm. Administrations de facto uphold the concept of an academic year salary. NSF supports this view by permitting fringe benefits as part of the salary package. For either promotion or tenure, not just the research is evaluated but also the quality of the sources of the funding (e.g., local funding is "seed money"), the quality of the proposals submitted ("Did any receive special recognition by a grantor?"), the percentage of the proposals funded, and the number of significant grantors who funded proposals versus those who were not. That 50+% overhead is always overhead. Academic year salary adjustments reflect this contribution. Suggestions to either realign research interests or to participate in interdisciplinary projects in order to secure grant monies are not uncommon. The inappropriateness of such an action on the individual's career development is never questioned. The role of institutional support for research and scholarly activities has been reversed.

Are we really better off?

MAA President Lynn Steen's comments on a related matter in the article "Beyond the David Report" focuses attention on the key point: "Even more vexing, perhaps, are the issues of federal vs. institutional responsibility for research and teaching. Why shouldn't colleges and universities that proclaim a commitment to scholarship and research be expected to support the major cost of research at their own institutions?"

Is our answer a conditioned response?

Homer Bechtell
University of New Hampshire
(Received April 24, 1987)

Peer Review—Not as the Magna Carta Prescribed

There is a pervasive lack of overview throughout the mathematical community that encourages people to work on narrow technical questions of interest to few others. Too many excellent mathematicians burn out after a few years of research. Perhaps the most common reason is that, after years of effort, they find that almost no one is paying attention, at least not at a level that justifies the immense effort that research requires. The mathematical community has not given any guidance to these people when they were writing on questions of narrow interest, questions the authors felt were justified because of the excellence of other people who were looking at similar questions. Mathematics is a singular field in that introductions to papers need not describe why the author has written the piece. In other fields, if the introduction does not satisfy you, you can flip to the discussion section. Mathematicians are not disposed to explain why they have written anything. The fact is that mathematicians have a great deal to offer to each other and to scientists.

The term "peer review" has a resonant sound to the ear of a native speaker of English. We are taught from an early age that the Magna Carta guaranteed trial by a jury of one's peers (at least for the nobles). If I were accused of plagiarism, the University of Maryland might have me tried by a jury of my peers: the faculty of the University. The jury would weigh these views and pronounce a decision based on their understanding with measures of common sense and fairness added.

Compare that process to refereeing. Out of perhaps 10,000 active research mathematicians in the United States, very few can referee a typical proposal; in some cases it might be one percent or less, and editors of journals sometimes find it difficult to find even one referee for a paper that might contain fine results. The refereeing process is an essential component in determining the validity and originality of a work. The most difficult question is where the paper or proposal fits into the literature and whether or not the ideas are essentially new. The referees may comment on the past work of the author and whether it deviates only slightly from what's already in print. The referees are therefore technical experts. If they also form a jury, as is essentially the case at the National Science Foundation, it is a jury of experts, not of peers. The program directors have a difficult and delicate job and can overrule the experts only on rare occasion and with great trepidation, as a judge will rarely throw out a decision of a jury. Their power lies mainly in borderline cases where the jury of experts has not spoken clearly. If the program directors were to try to get a true cross section of mathematics researchers to evaluate proposals, they would get almost all returned with the comments that the panel could not evaluate them.

To get a paper or proposal accepted, it is generally best to write so that only experts will think they can evaluate the work. Speak in common language and you are likely to have a random referee rejecting the work for all kinds of annoying reasons. But this is the kind of chance that we should be taking and that we should have to take. The literature is developing a style intelligible only to relatively few. Papers abound aimed at reasonably technical difficulties that are fascinating puzzles for the experts, and the author who tries to speak to a broader audience will likely be told he or she is including information known to "everyone." That usually means all experts who have spent several years in the field, at most a small percentage of the mathematical community and "everyone" probably includes no one outside the mathematical community.

Is a research paper worth publishing? Who plays the peer review role in arbitrating questions of taste? Editors of journals can, but must do

so with caution. Recall the rejections you have gotten or those that have been received by your colleagues. It is rare that an author will believe the rejection was a proper response. Spurned authors get very angry. The editor who rejects a paper explicitly on his or her own judgement is delivering a direct and personal insult.

My conclusion is that the mathematical community has abandoned peer review in favor of expert review. Nonetheless we need true peer review, review by mathematicians who are not expert in the field. There should always be an extra referee who provides peer review, and it should be a mark against the paper or proposal if only people in the field can understand the general directions of the work.

The effect of no true peer reviewing for taste and general interest has the effect of splintering mathematics into baronies. Saunders Mac Lane wrote an article in the *Mathematical Intelligencer* (vol. 8, no. 4, 1986, pp. 74–75) about an area I will call X. He suggested that in X there were important, fundamental questions of interest to a wide spectrum of mathematicians, but the X experts were writing papers on technical questions of interest only to themselves. You will have to refer to the article to see what area X was for Mac Lane. You may feel you can identify an X yourself.

In the past several years we have seen quite a few famous problems become solved. Some seem like truly magnificent milestones of human achievement. My personal favorite is the classification of simple finite groups. Others seem like they were very tough puzzles, famous only because they were around a long time and were worked on by famous people. The intricate web of logic in these is no more important and no more thrilling than a similar web in a grandmaster game of chess.

As a field trying to attract the best of the youth of the nation, we have encountered a formidable competitor, the ultimate field for those who love logical twists and fascinating puzzles: computer science. Writing programs can be enthralling (and financially rewarding) and in many colleges the numbers of majors in computer science dwarfs those in mathematics and physics. We stand for eternal truth and beauty while computer science is primarily a field of engineering. If we are to compete, we must stand above puzzle solving, and peer review is one place to start.

James A. Yorke
University of Maryland,
College Park
(Received April 3, 1987)

OPERATOR THEORY, ANALYTIC FUNCTIONS, MATRICES, AND ELECTRICAL ENGINEERING

J. William Helton
with the assistance of Joseph A. Ball, Charles R. Johnson, and John N. Palmer
(CBMS Regional Conference Series, Number 68
Supported by the National Science Foundation)

Intended for functional analysts, control theorists, and possibly researchers in Lie groups, this book presents some interesting connections between mathematics and engineering without relying on an engineering background. It provides a unified approach to deriving basic results in several seemingly diverse topics: Nevanlinna-Pick interpolation, H^∞ approximation, Weiner-Hopf factorization with various symmetry constraints, commutant lifting, and the Kdv equation. The first three of these topics play a substantial role in the engineering problem of designing systems to meet frequency domain specifications. Several of the chapters introduce this problem from the point of view of functional analysis and then proceed to the modern subject of robust control. Other topics treated are certain types of matrix approximation and optimization of very general nonlinear sup-norm objective functions over H^∞. The book requires a background in functional analysis and complex analysis equivalent to a first course in these subjects.

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I Engineering motivation
Engineering background
Engineering problems

II Analytic function theory
Fractional maps and Grassmannians
Representing shift invariant subspaces
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Further applications
Matrix analogs and generalizations

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Optimization, matrix inequalities, and matrix completions
The spectrum of a matrix with respect to an algebra

IV The general H^∞ optimization problem
Nonlinear H^∞ optimization

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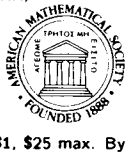

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Queries

Edited by Hans Samelson and Stuart Antman

QUESTIONS ARE WELCOMED from AMS members regarding mathematical matters such as details of, or references to, vaguely remembered theorems, sources of exposition of folk theorems, or the state of current knowledge concerning published or unpublished conjectures. This is not intended as a problem corner, except for occasional lists of problems collected at mathematical meetings.

REPLIES from readers will, when appropriate, be edited into a composite answer and published in a subsequent column. All answers received will be forwarded to the questioner.

QUERIES and RESPONSES should be typewritten if at all possible and sent to Queries Column, American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940.

Queries

378. Nicholas J. Lord (3 Coronation Road, Yateley, Camberley, Surrey (GU17 7TH), England). I would be greatly interested in any information about the following query. The equation itself is quite an old one; an elementary solution is the key point. Is there an elementary proof that the equation $(1+1^2)(1+2^2)\cdots(1+n^2) = m^2$ has no integer solutions for $n > 3$?

379. Aurel Spătaru (Centre of Mathematical Statistics, 174 Stirbei Voda St., 77104 Bucharest, Romania). Let $f_n : [0,1) \to [0,1)$ be given by $f_n(x) = \frac{1}{n}\sum_{i=0}^{n-1}\{2^i x\}^i$. Does $f_n \to 0$ a.e. with respect to Lebesgue measure? This problem arises from ergodic theory.

380. Seung Jin Bang (Department of Mathematics, College of Natural Sciences, Seoul National University, Seoul 151, Korea). Can one give any counterexamples of the following facts? Let X, Y, and Z be topological spaces. (a) If $X \times Y$ is homeomorphic to $X \times Z$, and X is not discrete, then Y is homeomorphic to Z. (b) If $X \times X$ is homeomorphic to $Y \times Y$, then X is homeomorphic to Y.

381. Seung Jin Bang (Department of Mathematics, College of Natural Sciences, Seoul National University, Seoul 151, Korea). Let A be a $n \times n$ matrix and let $\operatorname{adj} A$ denote the adjoint of A. It is well known that $A(\operatorname{adj} A) = (\det A)I$. This implies that if $\operatorname{rank} A = n$, then $\operatorname{rank}(\operatorname{adj} A) = n$. Is it possible to have any other relations between $\operatorname{rank} A$ and $\operatorname{rank}(\operatorname{adj} A)$?

FREE GROUP RINGS

Narain Gupta

(Contemporary Mathematics, Volume 66)

This book deals with some aspects of linear techniques in combinatorial group theory having their origin in the work of Wilhelm Magnus in the 1930s. The central theme is the identification and properties of those subgroups of free groups which are induced by certain ideals of the integral group rings of free groups. This subject has been developed extensively, and the author seeks to present, in contemporary style, a systematic and comprehensive account of some of its developments. Included in the book are a solution of the Fox subgroup problem and an up-to-date development of the dimension subgroup problem. Aimed at graduate students and researchers in combinatorial group theory, the book requires a familiarity with the general terminology of free groups and group rings.

Contents

Magnus embeddings and free differential calculus

Applications of Magnus embedding

Fox subgroups of free groups

Dimension subgroups

Generalized Magnus embeddings

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Council Nominations for Vice-Presidents and Members-at-Large

Two vice-presidents and five members-at-large of the Council will be elected by the Society in a contested election in the fall of 1987.

The vice-presidents will serve for a term of two years effective January 1, 1988. The Council has nominated three candidates for the position. They are:

James G. Glimm
Barry Simon
William P. Thurston

The five members-at-large will serve for a term of three years. The Council nominated seven candidates. They are:

Richard W. Beals
Johnny E. Brown
Robion C. Kirby
Albert Marden
Diana Frost Shelstad
Donald Solitar
Harold M. Stark

The Council plans to name a fourth candidate for vice-president and additional candidates for member-at-large to bring their number to at least ten.

The deadline for petitions proposing additional nominations is July 6. Such proposals will not reach the Council for action by mail ballot until after that date.

President's Candidates for the Nominating Committee 1988 and 1989

Four members of the Nominating Committee are to be elected in the fall of 1987. Continuing members are:

M. Salah Baouendi
Paul C. Fife
Carl Pomerance
William P. Ziemer

President G. D. Mostow has named four of the eight candidates for the other four places. They are:

Bernard M. Dwork
Jane P. Gilman
Robert Louis Griess
Leonard L. Scott

There is, so far, one candidate by petition:

Ronald A. DeVore

If nominations by petition have not appeared bringing the total number of candidates to at least eight, it will be brought up to eight by the president.

Bethlehem, Pennsylvania

Everett Pitcher
Secretary

AMERICAN MATHEMATICAL SOCIETY
FOUNDED 1888

A NEW APPROACH TO THE LOCAL EMBEDDING THEOREM OF CR-STRUCTURES FOR $n \geq 4$

Takao Akahori
(Memoirs of the AMS, Number 366)

This book is aimed at researchers in complex analysis, several complex variables, or partial differential equations. Kuranishi proved that any abstract strongly pseudo convex CR-structure of real dimension ≥ 9 can be locally embedded in a complex euclidean space. For the case of real dimension $= 3$, there is the famous Nirenberg counterexample, but the cases of real dimension $= 5$ or 7 were left open. The author of this book establishes the result for real dimension $= 7$ and, at the same time, presents a new approach to Kuranishi's result.

Contents

An a priori estimate for D_b^{ψ}

Some estimates for $\Box_b^{\psi}$

An a priori estimate for D_b^f-complex with respect to t_f

Some estimates for $\Box_b^f$

The smoothing operator

The algorithm for constructing a sequence of embeddings

The local embedding theorem

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Election Information

The ballots for election of members of the Council and Board of Trustees of the Society for 1988 will be mailed on or shortly after September 10, in order for members to receive their ballots well in advance of the November 10 deadline. Prior to casting their ballots members are urged to consult the following articles and sections of the Bylaws of the Society: article I, section 1; article II, sections 1, 2; article III, sections 1, 2, 3; article IV, sections 1, 2, 4; article VII, sections 1, 2, 5. The complete text of the Bylaws appears on pages 822–827 of the November 1985 issue of *Notices*. A list of the members of the Council and Board of Trustees serving terms during 1987 appears in the **AMS Reports and Communications** section of this issue.

SUGGESTIONS FOR 1988 NOMINATIONS

Each year the members of the Society are given the opportunity to propose for nomination the names of those individuals they deem both qualified and responsive to their views and needs as part of the mathematical community. Candidates will be nominated by the Council to fill positions on the Council and Board of Trustees to replace those whose terms expire December 31, 1988. See the **AMS Reports and Communications** section of this issue for the list of current members of the Council and Board of Trustees. Members are requested to write their suggestions for such candidates in the appropriate spaces on the form in the next column.

REPLACEMENT BALLOTS

This year ballots for the AMS election will be mailed September 10, 1987, or within a day or two thereafter. The deadline for receipt of ballots in Providence is November 10, 1987.

There has been a small but recurring and distressing problem concerning members who state that they have not received ballots in the annual election. It occurs for several reasons, including failure of local delivery systems on university or corporate properties, failure of members to give timely notice of changes of address to the Providence office, failures of postal services, and other human errors.

To help alleviate this problem, the following replacement procedure has been devised: A member who has not received a ballot by October 10, 1987, or who has received a ballot but has accidentally spoiled it, may write after that date to the Secretary of the AMS, Post Office Box 6248, Providence, RI 02940, asking for a second ballot. The request should include the individual's member code and the address to which the replacement ballot should be sent. Immediately upon receipt of the request in the Providence office, a second ballot, which will be indistinguishable from the original, will be sent by first class or air mail. It must be returned in an inner envelope, which will be supplied, on the outside of which is the following statement to be signed by the member:

The ballot in this envelope is the only ballot that I am submitting in this election. I understand that if this statement is not correct then no ballot of mine will be counted.

_____

signature

Although a second ballot will be supplied on request and will be sent by first class or air mail, the deadline for receipt of ballots will not be extended to accommodate these special cases.

SUGGESTIONS FOR 1988 NOMINATIONS

Council and Board of Trustees

President-Elect (1)

_____

Vice President (2)

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_____

Associate Secretaries (2)

_____

_____

Member of the *Bulletin* Editorial Committee (1)

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Member of the *Colloquium* Editorial Committee (1)

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Member of the *Mathematical Reviews* Editorial Committee (1)

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Member of the *Mathematics of Computation* Editorial Committee (1)

_____

Members of the *Proceedings* Editorial Committee (5)

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Members of the *Transactions* and *Memoirs* Editorial Committee (4)

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Members of the Committee to Monitor Problems in Communication (2)

_____

_____

Members-at-large of the Council (5)

_____

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Member of the Board of Trustees (1)

_____

The completed form should be addressed to AMS Nominating Committee, Post Office Box 6248, Providence, RI 02940, to arrive no later than **November 10, 1987**.

Salt Lake City Meetings, August 5 - 8, 1987

Program

The August 1987 Joint Mathematics Meetings, including the 90th Summer Meeting of the AMS, the 66th Summer Meeting of the Mathematical Association of America, the 1987 Annual Meeting of Pi Mu Epsilon, and the 1987 Summer Meeting of the Association for Women in Mathematics, will be held August 5 - 8, 1987 (Wednesday - Saturday), at the University of Utah, Salt Lake City. Sessions will take place on the campus of the university. Please note that no AMS Short Course is planned for Salt Lake City.

The members of the Local Arrangements Committee are C. Edmund Burgess (chairman), E. Allan Davis, William J. LeVeque (ex-officio), Deanne Randall, Kenneth A. Ross (ex-officio), Hugo Rossi (ex-officio), Peter C. Trombi, and Carolyn Tucker.

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AMS Abstracts	
For consideration for special sessions	**Expired**
Of contributed papers	**Expired**
MAA Abstracts	
Of contributed papers	**Expired**
Preregistration and Housing	**Expired**
MAA Minicourse Preregistration	**Expired**
Summer List of Applicants	**Expired**
Motions for AMS Business Meeting	**Expired**
Housing Cancellations (90% refund)	**August 4**
MAA Banquet (50% refund)	**July 31**
Preregistration cancellations (50% refund)	**August 4**
Snowbird Outing (50% refund)	**August 3**

90th Summer Meeting of the AMS
August 5 - 8, 1987

Colloquium Lectures

There will be a series of four Colloquium Lectures presented by EDWARD WITTEN of the Joseph Henry Laboratory, Princeton University. The tentative title of his lecture series is *Mathematical applications of quantum field theory.* The lectures will be given at 1:15 p.m. daily, Wednesday - Saturday, August 5 - 8.

Prize Session

The 1987 Leroy P. Steele Prizes will be awarded at 4:05 p.m. on Friday, August 7.

Invited Addresses

By invitation of the Program Committee, there will be eight fifty-minute invited addresses. The names of the speakers, their affiliations, the titles, and the times and days of their talks follow:

DONALD G. ARONSON, University of Minnesota, Minneapolis, *Regularity of flows in porous media*, 10:10 a.m. Wednesday;

EDWARD W. FORMANEK, Pennsylvania State University, *The invariants and polynomial identities of n x n matrices*, 8:00 a.m. Friday;

DAVID JERISON, Massachusetts Institute of Technology, *The Yamabe problem for CR manifolds*, 3:35 p.m. Saturday;

STEVEN KERCKHOFF, Stanford University, *Polygonal billiards and the geometry of Teichmuller geodesics*, 8:00 a.m. Wednesday;

PAUL C. ROBERTS, University of Utah, *Intersection theory and commutative algebra*, 9:05 a.m. Wednesday;

KAREN VOGTMANN, Cornell University, *Comparing* $\mathrm{Aut}(\mathbf{Z} * \cdots * \mathbf{Z})$ *with* $\mathrm{Aut}(\mathbf{Z} \oplus \cdots \oplus \mathbf{Z})$, 9:05 a.m. Friday;

BRIAN C. WHITE, Stanford University, title to be announced, 1:15 p.m. Saturday;

ROBERT LEE WILSON, Rutgers University, *Classification of restricted simple Lie algebras*, 2:30 p.m. Saturday.

Special Sessions

By invitation of the same committee, there will be six special sessions of selected twenty-minute papers. The topics of these special sessions, the names and affiliations of the mathematicians arranging them, and the days and times they will meet are as follows:

Nonlinear evolution equations, DONALD G. ARONSON and HANS OTHMER, University of Utah. 11:00 a.m. and 2:30 p.m. Wednesday and 8:00 a.m. Thursday.

Geometric methods in group theory, KENNETH S. BROWN, Cornell University. 1:00 p.m. Friday and 9:00 a.m. Saturday.

Ring theory and invariant theory, EDWARD W. FORMANEK. 8:00 a.m. Thursday, 12:30 p.m. Friday and 8:00 a.m. Saturday.

Discrete geometry and convexity, JACOB GOODMAN, City College, CUNY, and ERWIN LUTWAK, Polytechnic University of New York. 11:00 a.m. and 2:30 p.m. Wednesday and 8:00 a.m. Thursday.

Geometry and analysis on CR manifolds, JOHN M. LEE, Harvard University. 1:00 p.m. Friday and 8:00 a.m. Saturday.

Commutative algebra and algebraic geometry, PAUL C. ROBERTS. 11:00 a.m. and 2:30 p.m. Wednesday and 8:00 a.m. Thursday.

Contributed Papers

There will be sessions for contributed papers on Wednesday afternoon, Friday afternoon, and Saturday morning.

Late papers will not be accepted.

Other AMS Sessions

Committee on Science Policy Discussion

The AMS Committee on Science Policy will sponsor a discussion on Wednesday, August 5, from 5:30 p.m. to 7:30 p.m.

Council Meeting

The Council of the Society will meet at 5:00 p.m. on Tuesday, August 4.

Committee on the Agenda for Business Meetings

The Society has a Committee on the Agenda for Business Meetings. The purpose is to make Business Meetings orderly and effective. The committee does not have legal or administrative power. It is intended that the committee consider what may be called "quasi-political" motions. The committee has several possible courses of action on a proposed motion, including but not restricted to

(a) doing nothing;

(b) conferring with supporters and opponents to arrive at a mutually accepted amended version to be circulated in advance of the meeting;

(c) recommending and planning a format for debate to suggest to a Business Meeting;

(d) recommending referral to a committee;

(e) recommending debate followed by referral to a committee.

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

The committee consists of M. Salah Baouendi, Everett Pitcher (chairman), and Carol L. Walker.

In order that a motion for the Business Meeting of August 7, 1987, receive the service offered by the committee in the most effective manner, it should have been in the hands of the secretary by July 7, 1987.

Everett Pitcher, Secretary

Business Meeting

The Business Meeting of the Society will take place immediately following the Steele Prize Session at 4:05 p.m. on Friday, August 7. The secretary notes the following resolution of the Council: Each person who attends a Business Meeting of the Society shall be willing and able to identify himself as a member of the Society. In further explanation, it is noted that *each person who is to vote at a meeting is thereby identifying himself as and claiming to be a member of the American Mathematical Society.* For additional information on the Business Meeting, please refer to the box titled Committee on the Agenda for Business Meetings.

See page 784 for two motions on the agenda.

66th Summer Meeting of the MAA
August 5–8, 1987

Hedrick Lectures

The 35th Earle Raymond Hedrick Lectures will be given by WILLIAM P. THURSTON of Princeton University. The title of this series is *Two and three dimensional geometry.* These lectures will be given at 11:15 a.m. on Thursday, Friday, and Saturday, August 6–8.

Invited Addresses

There will be seven invited fifty-minute addresses. The names of the speakers, their affiliations, times and days of their talks, and titles follow:

EDWARD G. EFFROS, University of California, Los Angeles, *Why the circle is connected: An introduction to quantized topology*, 9:05 a.m. Thursday.

AARON L. FOGELSON, University of Utah, *Mathematical aspects of blood clotting*, 1:15 p.m. Friday.

JOHN P. HEMPEL, Rice University, *Three manifolds–does the present theory cover all of them?* 3:20 p.m. Wednesday.

CHARLES R. JOHNSON, College of William and Mary, *Modern research trends in matrix analysis*, 9:05 a.m. Saturday.

ERWIN LUTWAK, Polytechnic University of New York, *Larger bodies with smaller cross-sectional areas*, 2:30 p.m. Friday.

PAUL J. STEINHARDT, University of Pennsylvania, *Quasicrystals: A new state of matter*, 2:15 p.m. Wednesday.

WALTER TAPE, University of Alaska, Fairbanks, *Topology of mirages*, 8:00 a.m. Thursday.

Minicourses

Seven Minicourses are being offered by MAA. The names and affiliations of the organizers, the topics, the dates and times of their meetings, and the enrollment limitations of each are as follows:

Minicourse #1: *Applied mathematics via classroom experiments* is being organized by HERBERT R. BAILEY, Rose-Hulman Institute

of Technology. Part A is scheduled from 9:00 a.m. to 11:00 a.m. on Wednesday, August 5, and Part B from 7:00 p.m. to 9:00 p.m. on Wednesday, August 5. Total enrollment for this MAA Minicourse is limited to 80 persons.

This Minicourse is based on a junior level applied mathematics course which has been developed to encourage students to combine their knowledge of physics, calculus, and differential equations. Students are asked to derive and solve the equations that model simple classroom experiments. For example, the first experiment is to let a ball bounce until it stops. The problem is to relate "percent rebound" and "time to stop bouncing". The student must combine the concepts of time of fall and summation of geometric series. The full course includes five units: I – The Chain, II – Rotation, III – Fluid Flow, IV – Heat Flow, and V – Calculus of Variations. The Minicourse will begin with a brief description of each unit including demonstrations of most of the experiments. Participants will then be asked to work through some of the units either individually or in small groups. Each participant will be given a writeup and a solution manual for each of the units. The writeups include review sections covering the necessary mathematics and physics.

Minicourse #2: *Using computer spreadsheet programs in calculus, differential equations, and combinatorics* is being organized by DONALD R. SNOW, Brigham Young University. Part A is scheduled from 7:00 p.m. to 9:00 p.m. on Tuesday, August 4, and Part B from 7:00 p.m. to 9:00 p.m. on Wednesday, August 5. Total enrollment for this MAA Minicourse is limited to 30 persons.

Computer spreadsheet programs such as Lotus 1-2-3 can be used in many places in mathematics where a table or matrix format occurs. Examples in Calculus include the evaluation and graphing of functions illustrating parameter changes, illustrations of limits of sequences or functions, approximate integration, summation of series, and for iteration processes such as Newton's method for root finding. In differential equations the applications include computation of approximate solutions from the corresponding difference equations and graphing allowing comparison with exact solutions. In combinatorics the uses include computation of tables such as Pascal's triangle and generalizations, r-permutations, Stirling number tables, and other recurrence relation problems, difference tables, and determining and expanding generating functions for various sequences such as the Fibonacci and Lucas numbers.

This Minicourse will begin with an introduction to Lotus 1-2-3 on the IBM PC. Student copies of Lotus which will handle all of the above problems can now be purchased very inexpensively. Participants will have hands-on experience using Lotus with some of the above examples and will receive a disk containing the worksheets (but not Lotus itself) which they can use in their own classes or research.

Minicourse #3: *A microcomputer linear algebra course using Linear-Kit* is being organized by HOWARD ANTON, Drexel University. Part A is scheduled from 9:00 a.m. to 11:00 a.m. on Wednesday, August 5, and Part B from 3:30 p.m. to 5:30 p.m. on Wednesday, August 5. Total enrollment for this MAA Minicourse is limited to 30 persons.

Linear-Kit is a powerful microcomputer package which can do linear algebra operations in either exact rational arithmetic (without the distraction of round-off error) or floating point arithmetic (facilitating study of computational aspects). Its data storage and retrieval capabilities lend themselves to self-paced courses.

The Minicourse will consist of (1) a "hands-on" session on the use of Linear-Kit, (2) a problem-solving session, making application of Linear-Kit, (3) a session on design of courses to meet various needs, and (4) a summary session devoted to discussion and perhaps design of a new computer-based linear algebra course. Microcomputers will be used extensively by participants, but prior experience is **not** required.

Minicourse #4: *A survey of educational software* is being organized by DAVID P. KRAINES, Duke University, and VIVIAN KRAINES, Meredith College. Part A is scheduled from 8:00 a.m. to 9:55 a.m. on Thursday, August 6, and Part B from 8:00 a.m. to 9:55 a.m. on Friday, August 7. Total enrollment for this MAA Minicourse is limited to 30 persons.

The variety and the quality of software for IBM compatible computers has been increasing steadily. The objective of this Minicourse is to allow the participants to experiment with a representative collection of the better programs in calculus, linear algebra, differential equations, and other mathematical subjects. A variety of classroom applications will be demonstrated from a number of different computer packages. At the end of each two hour session, the participants will have the opportunity for "hands-on" use of some of these programs. Handouts will provide information on other educational software on the market or under development. No computer experience is required.

Minicourse #5: *Introduction to computer graphics* is being organized by JOAN P. WYZKOSKI, Fairfield University. Part A is scheduled from 1:30 p.m. to 3:30 p.m. on Friday, August 7, and Part B from 8:00 a.m. to 9:55 a.m. on Saturday, August 8. Total enrollment for this MAA Minicourse is limited to 30 persons.

Graphs and illustrations of geometrical objects are useful tools in the teaching of mathematics. Computer graphics simplifies the production of these teaching aids. This Minicourse will present some of the mathematical techniques used to produce realistic pictures on graphics display

devices. Some of the topics to be discussed are curve and surface sketching, 2D and 3D transformations, perspective drawing, and hidden line removal. Suggestions will be given for the use of these techniques to complement mathematics instruction. Since personal computers will be available for demonstrations and in-class implementations, programming experience is necessary.

Minicourse #6: *A calculus lab course using MicroCalc* is being organized by HARLEY FLANDERS, University of Michigan, Ann Arbor. Part A is scheduled from 7:00 p.m. to 9:00 p.m. on Friday, August 7, and Part B from 2:30 p.m. to 4:30 p.m. on Saturday, August 8. Total enrollment for this MAA Minicourse is limited to 30 persons.

This will be a hands-on introduction to MicroCalc, a commercially available interactive package of about 30 programs designed to stimulate mathematical experimentation, minimize the drudgery of calculation, and test results of hand calculation. The programs include extensive graphing capability, symbolic differentiation, and function editing, including composition. Part of each session will be devoted to working out projects and experiments. Take-home demo disks of MicroCalc will be given to the students.

Minicourse #7: *For all practical purposes* is being organized by SOLOMON A. GARFUNKEL, COMAP, Inc. Part A is scheduled from 1:30 p.m. to 3:30 p.m. on Friday, August 7, and Part B from 1:30 p.m. to 3:30 p.m. on Saturday, August 8. Total enrollment for this MAA Minicourse is limited to 40 persons.

This course deals with introducing contemporary applications throughout the undergraduate curriculum. Materials presented will include tapes from the soon-to-be-released PBS telecourse *For all practical purposes* as well as print modules from the UMAP series. Applications will cover a wide variety of fields with special emphasis on discrete mathematics and applications to management science and decision making.

Please note the new procedure for registering for MAA Minicourses. Participants interested in attending any of the MAA Minicourses should have completed the MAA Minicourse Preregistration Form.

The MAA Minicourses are open only to persons who have registered for the Joint Mathematics Meetings and paid the Joint Meetings registration fee.

If the only reason for registering for the Joint Mathematics Meetings is to gain admission to a MAA Minicourse, this should have been indicated by checking the appropriate box on the MAA Minicourse Preregistration Form. Then, if the MAA Minicourse is fully subscribed, full refund can be made of the Joint Mathematics Meetings preregistration fee(s). Otherwise, the Joint Meetings preregistration will be processed, and then be subject to the 50 percent refund rule. PREREGISTRATION FORMS FOR THE JOINT MATHEMATICS MEETINGS SHOULD HAVE BEEN MAILED TO PROVIDENCE PRIOR TO THE DEADLINE OF JUNE 1.

The registration fee for MAA Minicourses #2–#6 is $40 each. The registration fee for MAA Minicourses #1 and #7 is $30 each.

Contributed Papers

Contributed papers were accepted on five topics in collegiate mathematics for presentation in contributed paper sessions at the MAA Summer Meeting in Salt Lake City. The topics, organizers, their affiliations, and days they will meet are:

- *Teaching strategies involving computers* (CHRIS AVERY, DeAnza College), 7:30 a.m. Friday, August 7.
- *In search of the lean and lively calculus*, KATHERINE A. FRANKLIN, Los Angeles Pierce College, 9:00 a.m. Wednesday, August 5.
- *The teaching of mathematics and computer science in one department*, ZAVEN KARIAN, Denison University, 10:00 a.m. Wednesday, August 5.
- *New models for the mathematical preparation of teachers*, BRUCE E. MESERVE, Pleasant Hill, TN, 1:30 p.m. Saturday, August 8.
- *Using computer algebra in the classroom*, WARREN PAGE visiting Ohio State University, 1:30 p.m. Saturday, August 8.

The deadline for submitting papers for these sessions was **May 27. Late papers will not be accepted.**

Undergraduate Student Paper Session

Undergraduate Student Papers are scheduled on Friday, August 7, at 1:30 p.m.

Other MAA Sessions

The Committee on the Mathematical Education of Teachers (COMET) is sponsoring a panel discussion on *New directions in teacher education – pros and cons.* The session is scheduled from 8:30 a.m. to 9:55 a.m. on Friday, August 7. The participants are HENRY L. ALDER, University of California, Davis (moderator), ALPHONSE BUCCINO, University of Georgia, SHIRLEY A. HILL, University of Missouri, Kansas City, KATHERINE P. LAYTON, Beverly Hills High School, and BILLY E. RHOADES, Indiana University.

The Committee on Placement Examinations (COPE) is sponsoring a panel discussion on *Using placement examinations to create order in freshman placement.* The moderator is JOHN G. HARVEY, University of Wisconsin, Madison. Other participants include LINDA H. BOYD, DeKalb College; JOAN R. HUNDHAUSEN, Colorado School of Mines; BERNARD A. MADISON, University of Arkansas, Fayetteville; and BILLY E. RHOADES, Indiana University. The session

will take place at 2:30 p.m. on Saturday, August 8.

The Mathematical Sciences Education Board and the Board on Mathematical Sciences of the National Research Council are sponsoring a panel discussion on *The mathematical sciences in the year 2000: Assessment for renewal in U.S. colleges and universities.* The moderator is BERNARD L. MADISON, University of Arkansas. Participants include LIDA K. BARRETT, Northern Illinois University; FRANK L. GILFEATHER, University of Nebraska; and LYNN A. STEEN, St. Olaf College. The panel is scheduled for 9:30 a.m. to 11:00 a.m. on Wednesday, August 5.

The Committee on the Participation of Women is sponsoring a panel discussion on Friday, August 7, from 8:30 a.m. to 9:55 a.m. on *What are the problems? What are the solutions?* The moderator is PATRICIA C. KENSCHAFT, Montclair State College. Participants include DAVID W. BALLEW, Western Illinois University; DONALD W. BUSHAW, Washington State University; PAUL J. CAMPBELL, Beliot College; DEBORAH T. HAIMO, University of Missouri at St. Louis; RHONDA J. HUGHES, Bryn Mawr College; PETER L. RENZ, Mathematical Association of America; and MARJORIE L. STEIN, U. S. Postal Service.

Audio-Visual Equipment

Rooms where MAA sessions will be held are equipped with one overhead projector and screen. (Invited 50-minute speakers are automatically provided with two overhead projectors.) Blackboards are also available in most of these rooms, but speakers are urged to use the overhead projector for maximum visibility by the audience.

Films

The MAA Film Program will take place on Friday, August 7, at 7:00 p.m. The program includes *Hypothesis testing, inferential statistics, Part II*; *Regular homotopies in the plane, Part II*; *Symmetries of the cube.* The program will also include some COMAP films.

Business Meeting

The Business Meeting of the MAA will take place at 2:30 p.m. on Thursday, August 6. The 1987 Carl B. Allendoerfer, Lester R. Ford, and George Pólya Awards for expository writing will be presented. Six Certificates of Meritorious Service and the Merten M. Hasse Prize will also be presented. This meeting is open to all members of the Association.

Board of Governors

The MAA Board of Governors will meet at 9:00 a.m. on Tuesday, August 4. This meeting is open to all members of the Association.

Section Officers

There will be a Section Officers' Meeting at 4:30 p.m. on Wednesday, August 5.

Banquet for 25-year Members

The MAA is planning its twelfth annual banquet for individuals who have been members of the Association for twenty-five years or more. The banquet will be preceded by a reception from 6:15 p.m. to 6:45 p.m. on Wednesday evening, August 5 in the Tanner Dining Room of the Alumni House. Dinner will be served at 7:00 p.m. The menu includes fresh strawberries, hearts of palm salad with vinaigrette dressing, beef Wellington, parsley potatoes, broccoli spears with hollandaise sauce, rolls, muffins, butter, chocolate mousse cake, and beverages. State law prohibits the serving of alcoholic beverages; therefore, no alcoholic beverages will be served at this function.

Please note that all tickets for this banquet should have been purchased through preregistration, since a guarantee must be given to the caterer. Tickets are $17 each; the price includes the gratuity. Interested participants should have completed the appropriate section of the preregistration form. In the event of cancellations, a 50% refund of the amount paid for the ticket will be made if notification is received in Providence prior to July 31. After that date, no refund can be given.

Joint AMS - MAA Sessions

By invitation of the AMS-MAA Joint Program Committee (Judith V. Grabiner, Reuben Hersh, Paul H. Rabinowitz (chairman), and John M. Smith), the following speakers will address the joint meeting of the AMS and MAA on the history and development of mathematics. The names of the speakers, their affiliations, and one of their titles are:

ROBERT FINN, Stanford University and Max-Planck Institut, title to be announced, 10:10 a.m. Thursday.

MICHAEL STARBIRD, University of Texas, Austin, *R H Bing's mathematical vitality.* 10:10 a.m. Friday.

Activities Of Other Organizations

The **Association for Women in Mathematics** (AWM) will sponsor a panel discussion at 8:30 a.m. on Thursday, August 6, on *Gender and science.* Speakers include PATRICIA C. KENSCHAFT, Montclair State College; MARY BETH RUSKAI, University of Lowell; and MARTHA K. SMITH, University of Texas at Austin, moderator. The AWM Membership Meeting will follow at 9:30 a.m. The AWM Party will be held on Thursday evening, August 6.

The **Interagency Commission for Extramural Mathematics Programs** (ICEMAP) will present a session at 11:15 a.m. on Wednesday, August 5. This meeting is being coordinated by JAGDISH CHANDRA, Director, Mathematical Sciences Division, U.S. Army Research Office, who is the

current chairman of ICEMAP. The session will feature presentations by key representatives from the funding agencies such as NSF, DOE, AFOSR, ARO, ONR, NSA, and DARPA on funding trends and new initiatives in Mathematical Sciences Programs at their agencies.

The **Joint Policy Board for Mathematics** (JPBM) Committee for Mathematics Department Heads has organized a National Meeting of Department Heads at 7:45 p.m. on Wednesday, August 5. This session will feature a presentation organized by BERNARD MADISON, University of Arkansas, on *Faculty renewal and talent flow: Linked, critical, and at risk.* This will be followed by Birds-of-a-Feather sessions on *The Ph.D. college teacher: An endangered species?* organized by JOHN FULTON, Clemson University, including a large department session presented by FRANK GILFEATHER, University of Nebraska; and a small department session presented by LYNN A. STEEN, St. Olaf College. COLIN BENNETT, University of South Carolina, will organize a second Birds-of-a-Feather session *Does calculus belong in a university wide core curriculum?*

The Committee for Department Chairs of the JPBM will also cosponsor a workshop for department chairs with the American Council on Education (ACE) on Tuesday, August 4, from 9:00 a.m. to 5:00 p.m. Participants who are interested in this workshop should see **News and Announcements** in the April issue of *Notices.*

Pi Mu Epsilon (ΠΜΕ) will hold its annual meeting on Wednesday, Thursday, and Friday, August 5 - 7. A reception will be held on Wednesday, August 5, at 7:00 p.m. The Council will meet at noon on Thursday, August 6. On Friday, August 7, the Dutch Treat Breakfast will be at 8:00 a.m., the Banquet at 6:15 p.m., and the J. Sutherland Frame Lecture will be given at 8:30 p.m. by CLAYTON DODGE, University of Maine. The title of the lecture is *Reflections of a problems editor.* There will also be sessions for contributed papers on Thursday morning and Friday morning and afternoon.

The **National Science Foundation** (NSF) will sponsor a presentation on *Research and education activities in the mathematical sciences* at 4:25 p.m. on Wednesday, August 5.

Other Events or Items Of Interest

Book Sales

Books published by the AMS and MAA will be sold at discounted prices somewhat below the cost for the same books purchased by mail. **These discounts will be available only to registered participants wearing the official meeting badge.** VISA and MASTERCARD credit cards will be accepted for book sale purchases at the meeting. The book sales will be open the same days and hours as the exhibits and are located in the Center Ballroom in the A. Ray Olpin University Union Building.

Petition Table

At the request of the AMS Committee on Human Rights of Mathematicians, a table will be made available in the meeting registration area at which petitions on behalf of named individual mathematicians suffering from human rights violations may be displayed and signed by meeting participants acting in their individual capacities.

Signs of moderate size may be displayed at the table, but must not represent that the case of the individual in question is backed by the Committee on Human Rights unless it has, in fact, so voted. Volunteers may be present at the table to provide information on individual cases, but notice must be sent at least seven (7) days in advance of the meeting to the Meetings Department in Providence (telephone 401-272-9500). Since space is limited, it may also be necessary to limit the number of volunteers present at the table at any one time. The Committee on Human Rights may delegate a person to be present at the table at any or all times, taking precedence over other volunteers.

Any material which is not a petition (e.g., advertisements, résumés) will be removed by the staff. **When registration closes, any material on the table will be discarded, so individuals placing petitions on the table should be sure to remove them prior to the close of registration.**

Exhibits

The book and educational media exhibits will be open from 1:00 to 5:00 p.m. on Wednesday, August 5, 9:00 a.m. to 3:00 p.m. on Thursday, August 6, 9:00 a.m. to 5:00 p.m. on Friday, August 7, and from 9:00 a.m. to noon on Saturday, August 8. All participants are encouraged to visit the exhibits during the meeting.

Summer List of Applicants

At the direction of the AMS-MAA-SIAM Committee on Employment Opportunities, which is charged with operation of the Employment Register and with the publication of *Employment Information in the Mathematical Sciences*, the Society will publish a Summer List of mathematical scientists seeking employment for distribution at the Salt Lake City meeting.

Copies of the 1987 summer list of applicants will be available at the Transparencies section of the registration desk for $4. Following the meeting, they may be purchased from the AMS office in Providence for $6. This list should prove useful to employers who have last-minute openings in the latter part of the summer or in the fall.

The deadline for receipt of applicant forms to appear in this summer list was June 1.

Instead of an Employment Register at the Summer Meeting in Salt Lake City, there will be an opportunity for posting of both applicant résumé forms and employers' announcements of open positions in or near the main meeting registration area. There will be no special room

set aside for interviews. No provisions will be made by the Society for interviews: arrangements will be the responsibility of each employer and applicant. Messages may be left in the message box located in the registration area.

Special applicant and employer forms will be available at the Transparencies section of the registration desk both for applicants to post résumés and for employers to post forms announcing positions.

Applicants who submit an applicant form, but do not plan to attend the meeting, will appear on the printed list only. There is no provision made for posting résumés for participants who do not attend the meeting. No printed lists of employers or applicants who register at the meeting will be available after the meeting.

Accommodations

University Housing

Participants desiring confirmed reservations for on-campus housing **must preregister** and send payment in full for housing to the Mathematics Meetings Housing Bureau **prior to the June 1, 1987 deadline**. Participants in the Joint Mathematics Meetings may occupy residence hall rooms at the University of Utah during the period August 4 to August 9 only. **All must check out by August 9.** A limited number of rooms on campus will be available for those participants who do not preregister but plan on attending the Salt Lake City meetings and registering on site. Rooms will be assigned at the Meetings Registration Desk during registration hours and at the check-in desks of designated residence halls (see below) after meeting registration hours. Onsite payments for residence hall rooms can be made with cash, personal checks, travelers' checks, and credit cards (VISA and MasterCard only).

Participants requesting housing on the University of Utah campus will be assigned to one of three residence halls: Austin Hall, Ballif Hall, or Van Cott Hall. (Please refer to the section below titled Room Rates.)

Families with children will be allowed to stay in the dormitories; however, there is a maximum of one child per room. Sleeping bags for children five years and younger staying with **both** parents will be permitted at a child rate. Any child occupying a bed in a room with a parent must pay the adult rate. (See section on **Hotel Accommodations** below for alternate housing for families.)

Residence halls at the University of Utah have three floors; however, there are no elevators. It is expected that helpers will be available at the check-in desks to assist with luggage. Of the three residence halls assigned to the meetings, Austin Hall is the only air-conditioned building. Handicapped persons will be assigned to Austin and Van Cott Halls. Sleeping rooms are good size, very well maintained, and contain two single beds, desks, chairs, and closets. Some rooms have reading lamps; others have overhead lamps. Rooms will be prepared for occupancy in advance. In addition to bed linen, pillow, and blanket, participants will receive a towel, soap, and glass (exchangeable upon request at the check-in desk). Participants are advised to bring their own washcloths and hangers. There is no daily maid service in the sleeping rooms.

There are two bathrooms with showers on each floor; one for each gender. Walls separate shower stalls and curtains screen the interiors. Hooks are placed on the outside of stall dividers where robes can be hung. Each hall is equipped with washers ($.50) and dryers ($.25); however there is no provision for purchasing detergents. Vending machines are available for soft drinks, candy, and ice cream in each residence hall.

No pets are allowed in the residence halls. Alcoholic beverages are not permitted. Smoking is permitted in participants' rooms only. The hallways as well as the rooms are equipped with heat sensors.

Check-In Locations and Times

A check-in desk will be maintained in the lobby of each residence hall. These desks will be staffed from 7:00 a.m. to midnight seven days per week. Telephone numbers for assistance will be posted on the door of each hall for those participants arriving after midnight. Phones are located outside of each main entrance. Parking stickers for nearby university lots may be purchased at the residence hall check-in desks for a daily rate of $1.50. (Parking is free on Saturday.)

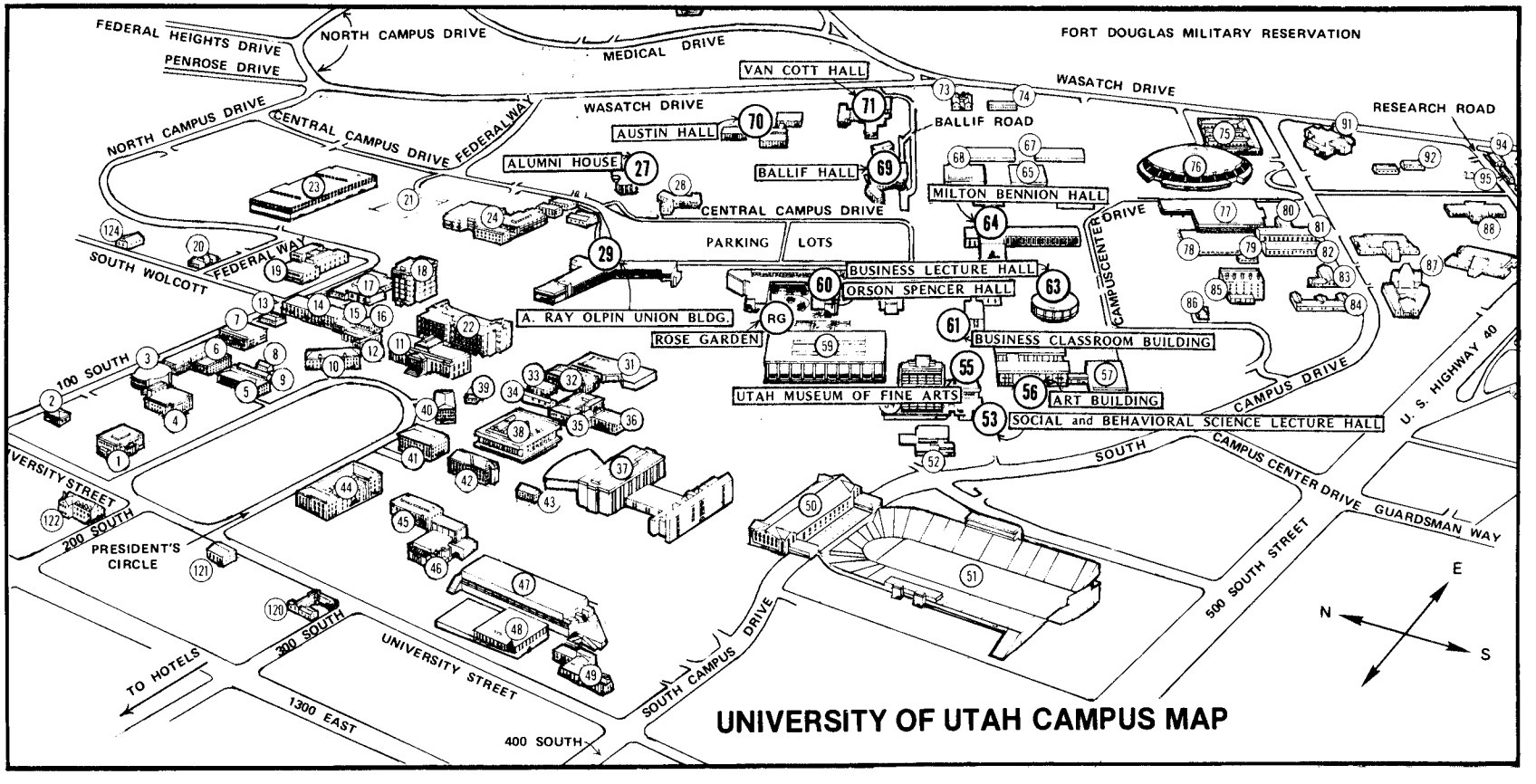
Directions to the residence halls are as follows:

BALLIF HALL - Take 400 South (South Campus Drive) to traffic light on 1900 East (Wasatch Drive), turn left onto Wasatch Drive, proceed 3/10 mile and turn left on Ballif Road (130 South) and take immediate left.

VAN COTT HALL - Same directions as above, except go straight on Ballif Road instead of taking an immediate left.

AUSTIN HALL - Same directions as above, except go 4/10 mile and turn left on Austin Road (100 South).

At the time of check-in, participants assigned rooms through the Mathematics Meetings Housing Bureau will present their receipt which will enable them to receive two keys: one for the outside door and one for the room. Those participants being assigned a room directly by the check-in desk (only **after** meeting registration hours) will be required to fill out a housing form, thus enabling them to receive keys. Spouses desiring a room key must follow this procedure also. **Please note that, although there is no deposit required for keys, a penalty of $25 will be imposed for each key lost or not returned.** It is the responsibility of the Mathematics Meetings

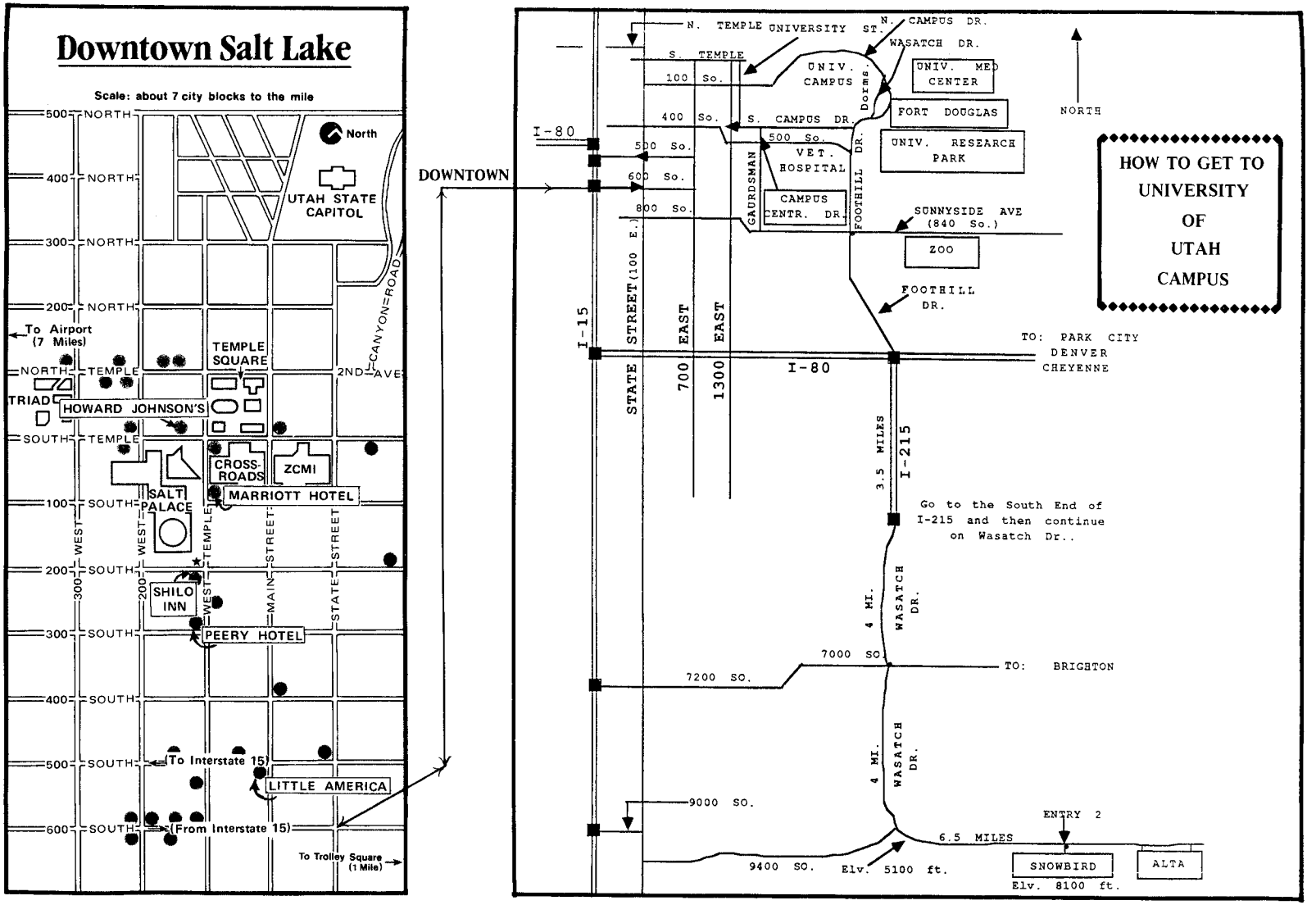


UNIVERSITY OF UTAH CAMPUS

27–ALUMNI HOUSE
29–A. RAY OLPIN UNION BLDG.
53–SOCIAL and BEHAVIORAL SCIENCE LECTURE HALL
55–UTAH MUSEUM of FINE ARTS
56–ART BLDG.
60–ORSON SPENCER HALL
61–BUSINESS CLASSROOM BLDG.
63–BUSINESS LECTURE HALL
64–MILTON BENNION HALL
69–BALLIF HALL
70–AUSTIN HALL
71–VAN COTT HALL
RG–ROSE GARDEN

OTHER KEY BUILDINGS

19–Kennecott Research Center
23–Joseph Merrill Engineering Bldg.
37–Henry Eyring Bldg.
47–Law Library
50–Einar Nielsen Fieldhouse
51–Rice Stadium
57–Sculpture Bldg.
59–Marriott Library
76–Special Events Center


Downtown Salt Lake
Scale: about 7 city blocks to the mile
North
UTAH STATE CAPITOL
CANYON ROAD
To Airport (7 Miles)
TEMPLE SQUARE
2ND AVE
TRIAD
HOWARD JOHNSON'S
CROSS-ROADS
ZCMI
SALT PALACE
MARRIOTT HOTEL
SHILO INN
PEERY HOTEL
To Interstate 15
LITTLE AMERICA
From Interstate 15
To Trolley Square (1 Mile)
500 NORTH
400 NORTH
300 NORTH
200 NORTH
NORTH TEMPLE
SOUTH TEMPLE
100 SOUTH
200 SOUTH
300 SOUTH
400 SOUTH
500 SOUTH
600 SOUTH
WEST TEMPLE
MAIN STREET
STATE STREET
DOWNTOWN
N. TEMPLE
S. TEMPLE
100 So.
400 So.
500 So.
600 So.
800 So.
I-80
I-15
UNIVERSITY ST.
N. CAMPUS DR.
WASATCH DR.
UNIV. CAMPUS
UNIV. MED CENTER
Dorms.
FORT DOUGLAS
S. CAMPUS DR.
500 So.
VET. HOSPITAL
UNIV. RESEARCH PARK
GAUDSMAN
CAMPUS CENTR. DR.
FOOTHILL DR.
SUNNYSIDE AVE (840 So.)
ZOO
FOOTHILL DR.
NORTH
HOW TO GET TO UNIVERSITY OF UTAH CAMPUS
STATE STREET (100 E.)
700 EAST
1300 EAST
TO: PARK CITY
DENVER
CHEYENNE
I-80
3.5 MILES
I-215
Go to the South End of I-215 and then continue on Wasatch Dr..
4 MI.
WASATCH DR.
7000 SO.
TO: BRIGHTON
7200 SO.
4 MI.
WASATCH DR.
9000 SO.
ENTRY 2
6.5 MILES
9400 SO.
Elv. 5100 ft.
SNOWBIRD
Elv. 8100 ft.
ALTA

Housing Bureau to collect this penalty. Therefore, it is requested that proper caution be exercised to avoid this charge. At checkout, all keys must be returned to the main desk in the lobby. Should the clerk not be present, please ensure that your name is left at the check-in desk with the key.

Room Rates

The following rates apply for residence hall accommodations at the University of Utah. Please note that there is no room tax applicable to these rates.

There is a $5 daily rate for a child five years of age and younger in the same room with parents, provided a sleeping bag is used. Children six years of age and older must occupy a bed and are subject to the adult rate. The university allows a maximum of three occupants only in each room. Should a family with two children request accommodations, two rooms would be required and the double rate applies in each case. A family of three (with a child six years of age and older) would require one double room at the double rate plus a second room for the third occupant at the single rate. Adult rates are as follows:

Residence Hall	Type	Singles (1 person)	Doubles (2 persons)
Austin	a/c	$13	$19 (or $9.50 p/p)
Ballif	no a/c	$12	$17 (or $8.50 p/p)
Van Cott	no a/c	$12	$17 (or $8.50 p/p)

Note: Van Cott Hall has three double-bedded rooms per apartment with six apartments per floor; one bath per apartment.

Changes/Cancellations

Please make all changes to or cancellations of residence hall reservations with the Housing Bureau in Providence **before August 4, 1987, in order to receive a 90% refund of housing payment.** After that date, refunds for cancellations or no shows will equal 90% of the amount paid minus one night's room charge. No cancellations can be made between 5:00 p.m. on Tuesday, August 4, and 4:00 p.m. on Thursday, August 6, after which changes or cancellations may be called in to Penny Pina at the Telephone Message Center number in Salt Lake City. Changes in reservations may be made at any time by notifying the Housing Bureau in Providence.

Food Services

The A. Ray Olpin University Union Building offers a variety of food services from fast foods to full dinners on a cash basis in the Union Terrace (see below). The average prices for meals would be: $3.50 for breakfast, $4.50 for lunch, and $5.50 for dinner. Serving hours and locations are as follows:

Breakfast	Cafe	6:30 a.m.–10:30 a.m.
Lunch	Deli	11:00 a.m.–2:00 p.m.
	Cafe	10:30 a.m.–2:00 p.m.
	Foreign Exchange	11:00 a.m.–2:00 p.m.
	Panorama Rm.	11:30 a.m.–2:00 p.m.
Dinner	Int'l Side of Foreign Exchange	5:00 p.m.–7:00 p.m.
	Cafe	6:00 p.m.–8:00 p.m.

Servings are generous, well prepared, and reasonably priced. Choices for breakfast would include eggs to order any style, cold or hot cereals, biscuit sandwiches, and assorted beverages. Lunch and dinner include Italian pasta, stuffed baked potatoes, grilled and fried sandwiches, Mexican cuisine and other ethnic specialties (alternating daily), fresh baked pizza, salads, fresh vegetables, fresh fruit, pies, and cakes.

For those participants who wish to go off campus to get their meals, please be advised that there are only a few restaurants within walking distance. Among these are a pizza parlor and a seafood restaurant.

Hotel Accommodations

Since most of the hotels in Salt Lake City are not within easy walking distance of the campus, it is recommended that participants planning to stay in a hotel be prepared to provide their own transportation to the university campus. The hotels listed below are approximately 2 – 3 miles from the extreme western end of campus. Buses frequently connect the University with downtown. Wait at any of the well marked bustops along Main or State Streets between 400 South and South Temple and inquire of the driver. Buses stop on campus on the "U" in front of the Park building (about 1450 East 200 South), and on the "Business" loop just South of the Business Lecture Hall. Currently, the average taxi fare for a distance of approximately three miles is $5.15 regardless of the number of passengers. The following is a partial list of hotels and their approximate distance from the University of Utah campus. Rates are subject to a 9-3/4% state room tax. Rates quoted are firm.

Little America–2 1/2 miles to extreme west of campus

500 South Main
Salt Lake City, UT 84101
801-363-6781
800-453-9450

Single occupancy	$59
Double occupancy	$59
Triple occupancy	$59
Quadruple occupancy	$59

Full service hotel. Swimming pool, health spa, shopping mall, restaurant, lounge, free parking. Rooms have queen and king-size beds. All major credit cards accepted.

TIMETABLE

The purpose of this timetable is to provide assistance to preregistrants in the selection of arrival and departure dates. The program, as outlined below, is based on information available at press time.

JOINT MATHEMATICS MEETINGS

Tuesday, August 4	**American Mathematical Society**	**Mathematical Association of America**
9:00 a.m. – 4:00 p.m.		BOARD OF GOVERNORS' MEETING
4:00 p.m. – 8:00 p.m.	REGISTRATION Center Ballroom, OU	
5:00 p.m. – 10:00 p.m.	COUNCIL MEETING	
7:00 p.m. – 9:00 p.m.		MAA – MINICOURSE #2 (Part A) *Using computer spreadsheet programs in calculus, differential equations, and combinatorics* Donald R. Snow
Wednesday, August 5	**AMS**	**MAA**
7:30 a.m. – 4:00 p.m.	REGISTRATION Center Ballroom, OU	
8:00 a.m. – 8:50 a.m.	INVITED ADDRESS *Polygonal billiards and the geometry of Teichmuller geodesics* Steven Kerckhoff	
9:00 a.m. – 11:00 a.m.		MAA – MINICOURSE #1 (Part A) *Applied mathematics via classroom experiments* Herbert R. Bailey
9:00 a.m. – 11:00 a.m.		MAA – MINICOURSE #3 (Part A) *A microcomputer linear algebra course using Linear-Kit* Howard Anton
9:00 a.m. – noon		MAA – CONTRIBUTED PAPER SESSION *In search of the lean and lively calculus* Katherine A. Franklin
9:05 a.m. – 9:55 a.m.	INVITED ADDRESS *Intersection theory and commutative algebra* Paul C. Roberts	

Salt Lake City Marriott (Headquarters)–2 1/4 miles to extreme west of campus

75 South West Temple
Salt Lake City, UT 84101
801-531-0800

Single occupancy	$52
Double occupancy	$52
Triple occupancy	$62
Quadruple occupancy	$62

Full service hotel. Swimming pool, free parking, restaurant, lounge. All major credit cards accepted.

Peery Hotel–2 1/2 miles to extreme west of campus

110 West 300 South
Salt Lake City, UT 84101
801-521-4300
1-800-331-0073 (toll free for room reservations only)

Single occupancy	$45
Double occupancy	$55

N/C for child in same room with parents.

Full service hotel. Continental breakfast included in rates, jacuzzi, fitness room, restaurant, lounge, free parking. Rooms have queen-size beds only. All major credit cards accepted.

Shilo Inn–2 1/4 miles to extreme west of campus

206 South West Temple
Salt Lake City, UT 84101
801-521-9500
1-800-222-2244 (toll free for room reservations only)

Single occupancy	$41
Double occupancy	$41
Triple occupancy	$45
Quadruple occupancy	$49

Children 12 years and younger are free in same room with parents.

Rollaways–$6 additional.

Full service hotel. Free parking, continental breakfast included in rates, swimming pool, public laundry, restaurant, lounge. Rooms have double or queen-size beds. All major credit cards accepted.

Howard Johnson's at Temple Square–2 miles to extreme west of campus

122 West South Temple
Salt Lake City, UT 84101
801-521-0130

Single occupancy	$34
Double occupancy	$39
Triple occupancy	$44
Quadruple occupancy	$49

Children 14 years and younger are free in same room with parents.

Full service hotel. Free parking, jacuzzi, exercise room, 24-hour restaurant. All major credit cards accepted.

Registration At The Meetings

Meeting preregistration and 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 their meeting badge, if so requested. **Badges are required to obtain discounts at the AMS and MAA Book Sales, to cash a check with the meeting cashier, and to attend sessions scheduled in the Fine Arts Auditorium. (If a preregistrant should arrive too late in the day to pick up his/her badge, he/she may show the acknowledgment received from the Mathematics Meetings Housing Bureau as proof of registration.)** The fees for Joint Meetings registration at the meetings (listed below) are 30 percent higher than the preregistration fees.

Joint Mathematics Meetings

Member of AMS, MAA, ΠΜΕ	$ 77
Emeritus Member of AMS, MAA	$ 21
Nonmember	$117
Student/Unemployed	$ 21

MAA Minicourses
(if openings available)

Minicourses #2–#6	$40 each
Minicourses #1 & #7	$30 each

Registration fees may be paid at the meetings in cash, by personal or traveler's checks, or by VISA or MASTERCARD credit card. Canadian checks must be marked for payment in U.S. funds.

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

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

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

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

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

Registration Dates, Times, and Locations

Joint Mathematics Meetings
[and MAA Minicourses (until filled)]
Center Ballroom, A. Ray Olpin University Union Building

TIMETABLE

Wednesday, August 5	American Mathematical Society	Mathematical Association of America and Other Organizations
9:30 a.m. – 11:00 a.m.		MAA – PANEL DISCUSSION *The mathematical sciences in the year 2000: Assessment for renewal in U.S. colleges and universities* Lida K. Barrett Frank L. Gilfeather Bernard L. Madison (moderator) Lynn A. Steen
10:00 a.m. – 11:35 a.m.		MAA – CONTRIBUTED PAPER SESSION *The teaching of mathematics and computer science in one department* Zaven Karian
10:10 a.m. – 11:00 a.m.	INVITED ADDRESS *Regularity of flows in porous media* Donald G. Aronson	
11:00 a.m. – 1:00 p.m.	SPECIAL SESSIONS *Discrete geometry and convexity I* Room 201, Bu L	
11:00 a.m. – 11:50 a.m.	*Nonlinear evolution equations I*	
11:00 a.m. – 12:35 p.m.	*Commutative algebra and algebraic geometry I*	
11:15 a.m. – 12:05 p.m.	INTERAGENCY COMMISSION FOR EXTRAMURAL MATHEMATICS PROGRAMS (ICEMAP)	
1:00 p.m. – 5:00 p.m.	AMS EXHIBIT AND BOOK SALE	MAA BOOK SALE
1:15 p.m. – 2:15 p.m.	COLLOQUIUM LECTURE I *Mathematical applications of quantum field theory* Edward Witten	
2:15 p.m. – 3:05 p.m.		MAA – INVITED ADDRESS *Quasicrystals: A new state of matter* Paul J. Steinhardt
2:30 p.m. – 5:45 p.m.	SPECIAL SESSIONS *Discrete geometry and convexity II*	
2:30 p.m. – 4:20 p.m.	*Nonlinear evolution equations II*	
2:30 p.m. – 5:45 p.m.	*Commutative algebra and algebraic geometry II*	
2:30 p.m. – 4:40 p.m.	SESSIONS FOR CONTRIBUTED PAPERS *Algebra*	
2:30 p.m. – 4:25 p.m.	*Analysis*	

Tuesday, August 4	4:00 p.m. to	8:00 p.m.
Wednesday, August 5,	7:30 a.m. to	4:00 p.m.
Thursday, August 6	7:30 a.m. to	2:00 p.m.
Friday, August 7	7:30 a.m. to	4:00 p.m.
Saturday, August 8	7:30 a.m. to	3:00 p.m.

Registration Desk Services

Assistance, Comments and Complaints

A log for registering participants' comments or complaints about the meeting is kept at the Transparencies section of the registration desk. All participants are encouraged to use this method of helping to improve future meetings. Comments on all phases of the meeting are welcome. If a written reply is desired, participants should furnish their name and address.

Participants with problems of an immediate nature requiring action at the meeting should see the Director of Meetings, who will try to assist them.

Audio-Visual Equipment and Assistance

A member of the AMS/MAA staff will be available to advise or consult with speakers on audio-visual usage.

Most rooms where sessions will be held are equipped with an overhead projector, screen, and blackboard. Speakers are strongly urged to use the overhead projector rather than the blackboard for their presentation in order to obtain maximum visibility by all members of the audience of the material being presented.

Baggage and Coat Check

Provision will be made for participants checking out of the residence halls or motels early to leave baggage in the meeting registration area while it is open.

Check Cashing

The meeting cashier will cash personal or travelers' checks up to $50, upon presentation of the official meeting registration badge, provided there is enough cash on hand. Canadian checks must be marked for payment in U.S. funds. It is advisable that participants bring travelers' checks with them. When funds are low the meetings cashier will not be able to cash checks, and travelers' checks can be easily cashed at local banks, restaurants, or hotels.

Local Information

This section of the desk will be staffed by members of the Local Arrangements Committee and other volunteers from the Salt Lake City mathematical community.

Lost and Found

See the meeting cashier during the meeting. After the meeting, all lost articles not claimed will be turned over to the Department of Mathematics.

Information Table

The information table at Joint Meetings of the AMS and MAA is set up in the registration area for the dissemination of information of a nonmathematical nature of possible interest to the members. The administration of the information table is in the hands of the AMS-MAA Joint Meetings Committee, as are all arrangements for such joint meetings. The following rules and procedures apply.

1. Announcements submitted by participants should ordinarily be limited to a single sheet no more than $8\frac{1}{2}'' \times 14''$.

2. A copy of any announcement proposed for the table is to be sent to: H. Hope Daly, American Mathematical Society, Post Office Box 6248, Providence, Rhode Island 02940 to arrive at least one week before the first day of the scientific sessions.

3. The judgment on the suitability of an announcement for display rests with the Joint Meetings Committee. It will make its judgments on a case by case basis to establish precedents.

4. Announcements of events competing in time or place with the scheduled scientific program will not be accepted.

5. Copies of an accepted announcement for the table are to be provided by the proponent. Announcements are not to be distributed in any other way at the meeting (for example, not by posting or personal distribution of handbills).

6. It may be necessary to limit the number of events or the quantity of announcements distributed at a meeting.

7. At the close of registration, the table will be swept clean. A proponent who wishes the return of extra copies should remove them.

Mail

All mail and telegrams for persons attending the meetings should be addressed as follows: Name of Participant, c/o Joint Mathematics Meetings, Department of Mathematics, University of Utah, Salt Lake City, Utah 84112. Mail and telegrams so addressed may be picked up at the mailbox in the registration area during the hours the registration desk is open. U.S. mail not picked up will be forwarded after the meeting to the mailing address given on the participant's registration record.

Personal Messages

Participants wishing to exchange messages during the meeting should use the mailbox mentioned above. Message pads and pencils are provided. It is regretted that such messages left in the box cannot be forwarded to participants after the meeting is over.

TIMETABLE

Wednesday, August 5	American Mathematical Society	Mathematical Association of America and Other Organizations
3:20 p.m. – 4:10 p.m.		MAA – INVITED ADDRESS *Three manifolds–does the present theory cover all of them?* John P. Hempel
3:30 p.m. – 5:30 p.m.		MAA – MINICOURSE #3 (Part B) *A microcomputer linear algebra course using Linear-Kit* Howard Anton
4:25 p.m. – 5:25 p.m.	NATIONAL SCIENCE FOUNDATION *Research and education activities in the mathematical sciences*	
4:30 p.m. – 6:30 p.m.		MAA – SECTION OFFICERS' MEETING
5:30 p.m. – 7:30 p.m.	COMMITTEE ON SCIENCE POLICY	
6:15 p.m. – 10:00 p.m.		MAA – BANQUET FOR 25-YEAR MEMBERS
7:00 p.m. – 9:00 p.m.		MAA – MINICOURSE #1 (Part B) *Applied mathematics via classroom experiments* Herbert R. Bailey
7:00 p.m. – 9:00 p.m.		MAA – MINICOURSE #2 (Part B) *Using computer spreadsheet programs in calculus, differential equations, and combinatorics* Donald R. Snow
7:00 p.m. – 9:00 p.m.		PI MU EPSILON – RECEPTION
7:45 p.m. – 9:45 p.m.	NATIONAL MEETING OF DEPARTMENT HEADS	
7:45 p.m.	PRESENTATION: Faculty renewal and talent flow: Linked, critical, and at risk Bernard Madison	
8:45 p.m.	SESSION I: Birds-of-a-Feather The Ph.D. college teacher: An endangered species? John Fulton (organizer) Frank Gilfeather Lynn A. Steen	
8:45 p.m.	SESSION II: Does calculus belong in a university wide core curriculum? Colin Bennett	

Telephone Messages

A telephone message center will be located in the registration area to receive incoming calls for participants. The center will be open from August 4 through 8, during the hours that the Joint Mathematics Meetings registration desk is open. Messages will be taken and the name of any individual for whom a message has been received will be posted until the message has been picked up at the message center. The telephone number of the message center will be provided later.

Transparencies

Speakers wishing to prepare transparencies in advance of their talk will find the necessary materials and copying machines at this section of the registration desk. A member of the staff will assist and advise speakers on the best procedures and methods for preparation of their material. There is a modest charge for these materials.

Visual Index

An alphabetical list of registered participants, including local addresses and arrival and departure dates, is maintained in the registration area.

Miscellaneous Information

Athletic Facilities

The university has two large sport complexes: HPER and the E. Nielsen Fieldhouse. The HPER Complex has several basketball, badminton, volleyball, racquetball, and handball courts. There are weightlifting rooms and an olympic size swimming pool. The Fieldhouse has seven indoor tennis courts, racquetball and squash courts, an indoor track, and weightlifting facilities. These facilities will be made available to registered participants who pay a $3 fee. The fee entitles the participant to a temporary pass, good for one week. The pass can be purchased at HPER East 214 during business hours. Participants should bring their meeting badges when purchasing the pass. The hours that the various facilities will be available to participants is determined quarterly and a schedule will be given to those who purchase a pass. In addition to these facilities, the university also has a golf course and many outdoor tennis courts which are open to the general public.

Book Stores

The University of Utah Bookstore on campus is open from 8:00 a.m. to 5:00 p.m., Monday through Friday. The bookstore will be closed Saturday. The Sam Weller Book Store is located at 254 South Main (downtown).

Camping and RV Facilities

The closest commercial campgrounds, about five miles west of the campus by bus or automobile, are KOA Salt Lake City Campground, 1400 West North Temple, Salt Lake City, UT 84116 (801-355-1192) and Campground VIP, 1350 West North Temple, Salt Lake City, UT 84116 (801-328-0224). It is suggested that people interested in these campgrounds contact them several weeks in advance for information and reservations.

For those who desire locations that are more isolated and primitive, there are four campgrounds (Spruces, Redman, Tanner's Flat, Albion) under the supervision of the National Forest Service in the nearby Wasatch Mountains, all within about 25 miles of the campus, at altitudes of 7,000–10,000 feet. These do not accept reservations, but spaces are usually available for people arriving on weekdays from Monday through Thursday. The procedure is to select a vacant camp site and then pay a fee at a registration box at the entrance. These campgrounds are in the watershed for the Salt Lake City water supply and no pets are permitted. People interested in these four campgrounds should write for a map and further information from the Department of Mathematics, University of Utah, Salt Lake City, UT 84112.

Child Care

There are several state licensed childcare facilities in the vicinity of the University of Utah. A list of some recommended centers follows. Reservations should be made directly with the center of your choice at least two weeks in advance.

Taylor-Wright Childcare Center
801-363-4332
1063 East 200 South
Salt Lake City, UT 84102
Director: Anne Taylor
Ages: 2–13. Hours: 6:30 a.m.–6:00 p.m.
Rates: Daily–$11; half-day, up to 5 hours–$7.50, hourly–$1.90

Tutor Time Child Care/Learning Centers (2 locations)
801-363-5437
560 East 200 South
Salt Lake City, UT 84102
Assistant Director: Verlene Beck
and
505 Wakara (in Research Park, just south of the university)
Salt Lake City, UT 84113
801-582-3423
Director: Helen Villamor
Ages: 6 weeks to age 12
Hours: 6:30 a.m.–6:30 p.m. (evening hours possible if there is sufficient demand)
Rates: up to age 2, $2 per hour; age 3 and up $1.50 per hour

For Children Only (2 locations)

TIMETABLE

Thursday, August 6	American Mathematical Society	Mathematical Association of America and Other Organizations
7:30 a.m. – 2:00 p.m.	REGISTRATION Center Ballroom, OU	
8:00 a.m. – 8:50 a.m.		MAA – INVITED ADDRESS *Topology of mirages* Walter Tape
8:00 a.m. – 9:50 a.m.	SPECIAL SESSIONS *Discrete geometry and convexity III*	
8:00 a.m. – 10:00 a.m.	*Nonlinear evolution equations III*	
8:00 a.m. – 9:50 a.m.	*Commutative algebra and algebraic geometry III*	
8:00 a.m. – 10:00 a.m.	*Ring theory and invariant theory I*	
8:00 a.m. – 9:55 a.m.		MAA – MINICOURSE #4 (Part A) *A survey of educational software* David P. Kraines Vivian Kraines
8:30 a.m. – 9:30 a.m.		ASSOCIATION FOR WOMEN IN MATHEMATICS PANEL DISCUSSION *Gender and science* Patricia Kenschaft Mary Beth Ruskai Martha K. Smith (moderator)
8:30 a.m. – 9:55 a.m.		ΠΜΕ – CONTRIBUTED PAPER SESSIONS
9:00 a.m. – 3:00 p.m.	AMS EXHIBIT AND BOOK SALE	MAA BOOK SALE
9:05 a.m. – 9:55 a.m.		MAA – INVITED ADDRESS *Why the circle is connected: An introduction to quantized topology* Edward G. Effros
9:30 a.m. – 10:00 a.m.		AWM – MEMBERSHIP MEETING
10:10 a.m. – 11:00 a.m.	AMS-MAA INVITED ADDRESS *Title to be announced* Robert Finn	
11:15 a.m. – 12:15 a.m.		MAA – THE EARLE RAYMOND HEDRICK LECTURES: LECTURE I *Two and three dimensional geometry* William P. Thurston

560 East 200 South
Salt Lake City, UT 84102
801-355-5437
Director: Bianca Candelaria
and
1400 South 1100 East
Salt Lake City, UT 84105
801-467-5730
Director: Bianca Candelaria

Ages and rates: 0 – 24 months – $3.50 per hour, $14 per day; 2 year olds – $2 per hour, $10 per day; age 3 to 8 – $1.75 per hour, $9 per day.

If you wish to have an individual babysitter (high school or college age student), call the Arts and Sciences office at Westminster College 801-488-4166, 9:00 a.m. – 4:00 p.m., no later than July 28.

Crib Rental

Portacribs and metal cribs (standard size) can be rented from **Progressive Rental** (about four miles south of campus), 2253 East 3300 South, 801-487-4601. Portacribs cost $17.50 per week. Metal cribs cost $20 per week. Tax is 5.75%. They will deliver for a charge of $13 each way. Cribs can be reserved from July 1 on.

Handicapped

Most (not all) university facilities are accessible to the handicapped. People with special requirements for campus housing should have made these clear when submitting preregistration forms. People with special questions regarding handicapped access should contact Deanne Randall, Department of Mathematics, University of Utah, Salt Lake City, UT 84112 (801-581-6851).

Libraries

The Marriott Library is the main library on campus. The Mathematics Research Library is located in Room 121 of the John Widstoe Building. Summer hours for these libraries will be announced later.

The main branch of the Salt Lake City Public Library is located at 200 East 500 South, downtown.

The new Genealogical Library of the Latter Day Saints (LDS Mormon) Church is located at 35 North West Temple. The library is open to the public and there is no fee for using the research facilities for genealogical purposes. The library houses the world's largest collection of genealogical records. The hours are Monday 7:30 a.m. to 6:00 p.m., Tuesday through Friday 7:30 a.m. to 10:00 p.m., and Saturday 7:30 a.m. to 5:00 p.m.

Local Information

Salt Lake City is the main city in a valley populated by nearly a million people. The city is laid out like the (xy)-plane, with the LDS Temple at the origin. Locations are identified with reference to this coordinatization like this: "351 South 700 East" means a building which is between three and four blocks south of the x-axis (South Temple Street), and on the street which is seven blocks east of the negative y-axis (Main Street). While walking around the city, keep in mind that seven blocks make a mile (more or less). There is a free trolley (called the Brigham Street Trolley) which regularly wends its way around the main locations in downtown: this is an easy (but not speedy) way to get around. Bus service between downtown and the university is very good during the daylight hours. There are many routes which originate along Main or State Streets and pass by the university.

The novice homemaker visiting Italy will eat insipid food until he discovers that salt is sold in the tobacco stores. Similarly, in Utah, the visitor goes dry until he becomes familiar with the local customs. First of all, beer is sold in all supermarkets and most drugstores. Wine and liquor are to be found in outlets of the state monopoly called "Utah State Stores." These stores are open from 11:00 a.m. until 7:00 p.m. except on Sundays, and any other day that passes for a holiday. Now, to find the locations of these establishments is easy: just look in the blue pages of your copy of the White Pages under "ALCOHOLIC BEVERAGE CONTROL DEPARTMENT – Liquor Stores." You will discover that none of these addresses has anything to do with the nice coordinate system described above; why one of these stores is on something called "Kentucky Avenue!" The stores closest to the university are these: 1615 Foothill Boulevard is really "1615 South 2300 East," and 416 6 Avenue is at "416 East 300 North." The university is at 200 South 1500 East, so both of these are more than a mile away. Salt Lake City does have two outlets which have a remarkably good selection of wines, champagnes, and liqueurs; the one closest to the university (and downtown) is at 250 South 300 East.

One of the advantages of our quaint method of liquor distribution is that all restaurants and hotels are required to accept the contents of brown bags (of course they'll get you on the cost of the glass to put it in – but don't fret, the total is still more reasonable than in most cities). Now, if you you've forgotten your brown bag, don't worry; there is almost always a liquor store on the premises which can provide you with minibottles and splits of wine after 4:00 p.m. So you see, once you learn the language, it's just like back home. More about restaurants will appear in the Program distributed at the meeting.

As a city of moderate size, Salt Lake City has a moderate amount of things going on. Brochures on events taking place during the month of August will be available at the Local Information Section of the Meeting Registration Desk. But the most interesting thing about Salt Lake City is its

TIMETABLE

Thursday, August 6	American Mathematical Society	Mathematical Association of America and Other Organizations
noon - 2:00 p.m.		ΠME - COUNCIL LUNCHEON
1:15 p.m. - 2:15 p.m.	COLLOQUIUM LECTURE II *Mathematical applications of quantum field theory* Edward Witten	
2:30 p.m. - 3:20 p.m.		MAA - BUSINESS MEETING
3:30 p.m. - 9:30 p.m.	SNOWBIRD OUTING	
8:00 p.m. - 10:00 p.m.		AWM - PARTY

Friday, August 7	American Mathematical Society	Mathematical Association of America and Other Organizations
7:30 a.m. - 9:45 a.m.		MAA - CONTRIBUTED PAPER SESSION *Teaching strategies involving computers* Chris Avery
7:30 a.m. - 4:00 p.m.	REGISTRATION Center Ballroom, OU	
8:00 a.m. - 8:50 a.m.	INVITED ADDRESS *The invariants and polynomial identities of n x n matrices* Edward W. Formanek	
8:00 a.m. - 9:00 a.m.		ΠME - DUTCH TREAT BREAKFAST
8:00 a.m. - 9:55 a.m.		MAA - MINICOURSE #4 (Part B) *A survey of educational software* David P. Kraines Vivian Kraines
8:30 a.m. - 9:55 a.m.		MAA - COMMITTEE ON THE MATHEMATICAL EDUCATION OF TEACHERS (COMET) PANEL DISCUSSION *New directions in teacher education - pros and cons* Henry L. Alder (moderator) Alphonse Buccino Shirley A. Hill Katherine P. Layton Billy E. Rhoades

Tram at Snowbird

environment. There are very many good hikes (or climbs) for all abilities within minutes of the campus. In fact, one can walk just to the east of the campus into foothills reaching an elevation of about 7500 feet. Here again, more information will be available at the meeting.

The most famous landmark, the Great Salt Lake, will be a disappointment to all. At its best it is foul and brackish water which allows its occupants to bob around like corks. Alas, this summer it is at flood stage and at its worst: it is not even particularly buoyant.

Following closely behind in national – if not local – interest is the headquarters of the LDS faith. This is located at the center of coordinates – about two miles west of the university. The Visitor's Center is open for almost all the daylight hours (save Sunday). The Mormon Tabernacle is on the grounds, and features an organ, and the Tabernacle choir. There are organ recitals on Monday through Friday at noon, and Saturday and Sunday at 4:00 p.m. The choir has a public rehearsal on Thursday at 8:00 p.m., and a public radio broadcast on Sunday at 9:30 a.m.

There are several attractions which may be of interest to families. There are the Utah Museums of Fine Arts and Natural History on campus. Hogle Zoo is on the very eastern end of the city on Sunnyside Avenue (900 South). North of Hogle Zoo is Pioneer State Park, commemorating the Mormon migration to Utah. Liberty Park, between 500 and 700 East, and 900 and 1300 South, is a pleasant place to walk around or picnic. It contains the Tracy Aviary, as well as a small pond with pedal boats. On State Street just north of 100 South is the Hansen Planetarium.

Salt Lake City lies within one day's drive (an average of 300 miles) of ten national parks (Arches, Bryce Canyon, Canyonlands, Capitol Reef, Grand Canyon, Grand Teton, Great Basin, Mesa Verde, Yellowstone, and Zion's). For further information, write to the National Park Service, 125 South State, Salt Lake City, UT 84111.

For scenic air tours, contact Interwest Scenic Tours, P. O. Box 22063, Salt Lake City, UT 84122.

Medical Services

The following medical care facilities are located close to the university.

Instacare

Provides quick service walk in care, emergency or otherwise

1355 Foothill Drive

Hours 7 days per week Monday through Sunday 9:00 a.m. to 9:00 p.m.

Telephone: 321-2495

University Medical Center (East of Dormitories)

50 North 18th East

TIMETABLE

Friday, August 7	American Mathematical Society	Mathematical Association of America and Other Organizations
8:30 a.m. – 9:55 a.m.		MAA – COMMITTEE ON THE PARTICIPATION OF WOMEN PANEL DISCUSSION *What are the problems? What are the solutions?* David W. Ballew Donald W. Bushaw Paul J. Campbell Deborah T. Haimo Rhonda J. Hughes Patricia C. Kenschaft (moderator) Peter L. Renz Marjorie L. Stein
9:00 a.m. – 9:55 a.m.		ΠME – CONTRIBUTED PAPER SESSIONS
9:00 a.m. – 5:00 p.m.	AMS EXHIBIT AND BOOK SALE	MAA BOOK SALE
9:05 a.m. – 9:55 a.m.	INVITED ADDRESS *Comparing* Aut($\mathbf{Z} * \cdots * \mathbf{Z}$) *with* Aut($\mathbf{Z} \oplus \cdots \oplus \mathbf{Z}$) Karen Vogtmann	
10:10 a.m. – 11:00 a.m.	AMS-MAA INVITED ADDRESS *R H Bing's mathematical vitality* Michael Starbird	
11:15 a.m. – 12:15 a.m.		MAA – THE EARLE RAYMOND HEDRICK LECTURES: LECTURE II *Two and three dimensional geometry* William P. Thurston
12:30 p.m. – 3:50 p.m.	SPECIAL SESSIONS *Ring theory and invariant theory II*	
1:00 p.m. – 3:50 p.m.	*Geometry and analysis on CR manifolds I*	
1:00 p.m. – 3:50 p.m.	*Geometric methods in group theory I*	
1:00 p.m. – 2:25 p.m.	SESSIONS FOR CONTRIBUTED PAPERS *Differential equations*	
1:15 p.m. – 2:15 p.m.	COLLOQUIUM LECTURE III *Mathematical applications of quantum field theory* Edward Witten	
1:15 p.m. – 2:05 p.m.		MAA – INVITED ADDRESS *Mathematical aspects of blood clotting* Aaron L. Fogelson

24 Hour a day service
Telephone **Emergency:** 581-2291

Holy Cross Hospital
24 Hour a day service
1045 East 100 South
Telephone **Emergency:** 350-4630

Paramedics
Emergency: 911

LDS Hospital
8th Avenue and C Street
24 Hour a day service
Telephone **Emergency:** 321-1180

Parking

Parking stickers for those participants not residing on campus will be available for purchase at the Meetings Registration Desk for $1.50 per day or $4.50 for August 5–8. These stickers will allow parking in all campus lots.

Smoking

Please note that smoking is not allowed in any of the buildings or public areas on the University of Utah campus, except for specially designated areas; for example, certain areas of the cafeterias in the Union building.

Social Event

On Thursday afternoon and evening there will be an outing including buffet dinner and sightseeing at Snowbird Ski and Summer Resort, at an altitude of 8,100 feet in the Wasatch Mountains about 25 miles from the university campus. This activity is highly recommended for everyone who attends the meeting. Buses, arranged by courtesy of the Department of Mathematics, will leave from Olpin Union Building at 3:30 p.m.–4:00 p.m. and reach the resort in about 45 minutes. (People with automobiles may wish to drive instead. Please check at the Local Information section of the registration desk for driving instructions.) The schedule will enable people to have some time for sight-seeing before the Western Barbecue Buffet is served on the Plaza between 6:00 p.m.–7:00 p.m. (There is a sheltered area in case of rain.) Those who desire may buy tickets on the Plaza to ride the tram to the top of Hidden Peak, at an elevation of 11,000 feet. This is truly a spectacular vantage point from which, on a clear day, forest and mountains can be seen in all directions at distances of at least 50 miles. With time for sight-seeing at the top, about an hour should be planned for this. People who eat early should have time for the tram ride after dinner. Wildflowers should be in abundance in early August, and there will likely be some lingering snowdrifts. People who do not wish to ride the tram may enjoy the scenery from the Plaza or walk among the nearby mountain streams, trees, and wildflowers. Suitable warm clothing is recommended for this occasion. The first bus will leave the resort at about 7:30 p.m. and the last one at 8:30 p.m. for the return trip to the campus.

The buffet menu includes barbecued chicken and spareribs, five different salads, a relish tray, corn on the cob, baked beans, baked potatoes, chef's selection of vegetables, rolls, butter, two desserts, and soft beverages (Beer can be purchased at the Birdfeeder on the Plaza.) There is no special menu for vegetarians since the above selections suffice; however, one should indicate if a vegetarian meal is wanted to insure that a substantial amount of vegetables will be available. Tickets are $15 per person for adults and $9 per person for children (12 years old and younger).

Those planning to attend the outing should have purchased their tickets through preregistration, since a guarantee must be given. Interested participants should have completed the appropriate section of the preregistration form. In the event of cancellations, a 50% refund of the amount paid for the ticket will be made if notification is received in Providence prior to August 3. After that date, no refund can be given.

Travel

In August, Salt Lake City is on Mountain Daylight Saving Time. The city is served by most major U.S. airlines; in particular, the hub of Western Airlines (recently merged with Delta). The airport lies about six miles west of downtown Salt Lake. There is regular bus service during daylight hours to downtown at $1.50. A cab to downtown should cost about $10, and to the university, it might run about $14.

For some years now, the AMS-MAA Joint Meetings Committee has engaged a travel agent for the January and August Joint Meetings in an effort to ensure that everyone attending these meetings is able to obtain the best possible airfare. This service is presently being performed by Meetings, Incentives, Conventions of America, Inc. (MICA); their advertisement can be found elsewhere in this meeting announcement. Although any travel agent can obtain Supersaver or other such published promotional fares, only MICA can obtain the special additional 5 percent discount over and above these fares, and the 35–40 percent off regular coach fare. The latter, of course, is financially beneficial only when one does not qualify for one of the promotional fares. Participants should pay particular attention to the cancellation policies stated in the ad. Winners of the the two free tickets in San Antonio were David Buchanan and Ramesh Sharma.

If you drive to Salt Lake City you will arrive on I-15 (North or South) or I-80 (East or West). If you are coming from the west, you will intersect I-15 west of the city. Take the 6th South exit and proceed according to the following instructions.

Coming from the north or south on I-15, take the 6th South exit, heading East. If you want to go to the downtown hotels, turn left on West Temple, and proceed until you see your hotel. If you are heading for the university, proceed along

TIMETABLE

Friday, August 7	American Mathematical Society	Mathematical Association of America and Other Organizations
1:30 p.m. – 3:30 p.m.		MAA – MINICOURSE #5 (Part A) *Introduction to computer graphics* Joan P. Wyzkoski
1:30 p.m. – 3:30 p.m.		MAA – MINICOURSE #7 (Part A) *For all practical purposes* Solomon A. Garfunkel
1:30 p.m. – 2:45 p.m.		MAA – UNDERGRADUATE STUDENT PAPER SESSION
2:00 p.m. – 4:00 p.m.		ΠΜΕ – CONTRIBUTED PAPER SESSIONS
2:30 p.m. – 3:20 p.m.		MAA – INVITED ADDRESS *Larger bodies with smaller cross-sectional areas* Erwin Lutwak
4:05 p.m. – 6:05 p.m.	STEELE PRIZE SESSION AND BUSINESS MEETING	
6:15 p.m. – 8:15 p.m.		ΠΜΕ – BANQUET
7:00 p.m. – 9:00 p.m.		MAA – FILM PROGRAM *Hypothesis testing, inferential statistics, Part II* *Regular homotopies in the plane, Part II* *Symmetries of the cube* COMAP films
7:00 p.m. – 9:00 p.m.		MAA – MINICOURSE #6 (Part A) *A calculus lab course using MicroCalc* Harley Flanders
8:30 p.m. – 9:30 p.m.		ΠΜΕ – J. SUTHERLAND FRAME LECTURE *Reflections of a problems editor* Clayton Dodge
Saturday, August 8	**AMS**	
7:30 a.m. – 3:00 p.m.	REGISTRATION Center Ballroom, OU	
8:00 a.m. – 12:20 p.m.	SPECIAL SESSIONS *Ring theory and invariant theory III*	
8:00 a.m. – 12:20 p.m.	*Geometry and analysis on CR manifolds II*	

6th South until you reach 7th East; turn left (north) and proceed to 1st South. Turn right (east) and proceed until you reach University Avenue; then follow the map to your destination.

Coming from the east, you enter the Salt Lake Valley via Parley's Canyon. Take the Foothill Drive exit (old route US 40, now Utah 186) and follow this main artery (which changes name several times) for about seven miles to the university (which will be well marked and lie to the right), or nine miles to the downtown area.

Weather

Salt Lake City lies at an altitude of approximately 4,500 feet at the foot of the Wasatch mountains on the eastern rim of the great basin. The climate is that of a desert: very little humidity, much sunshine, and a large daily variation in temperature. The average high in August is about 88 degrees F, and the low near 60. During the day the sun will be quite warm, but otherwise the weather should be very pleasant. In particular, the evenings could be cool, and some sort of outer wear is advisable. By mid-August the late summer thundershowers begin to come; we could see one during the meeting. This could be a spectacle, but of brief duration. Otherwise, there will be little inclement weather.

Business Meeting in Salt Lake City

The Business Meeting of 22 January 1987 passed a procedural motion calling for two motions to be placed on the agenda of the Business Meeting of Friday, 7 August 1987. The text of the motions is as follows:

Motion 1. Many scientists consider SDI (commonly referred to as Star Wars) incapable of achieving its stated goals and dangerously destabilizing. Participation by universities and professional organizations lends a spurious scientific legitimacy to it. Therefore the AMS will lend no support to the Star Wars program. In particular, no one acting as a representative of the AMS shall participate in efforts to obtain funding for Star Wars research or to mediate between agencies granting Star Wars research money and those seeking to apply for it.

Motion 2. The AMS is concerned about the increasing militarization of support for mathematics research. There is a tendency to distribute this support through narrowly focussed (mission-oriented) programs which circumvent normal peer review procedures. This tendency, unless checked, may skew and ultimately injure mathematics in the United States. Therefore those representing the AMS are requested to direct their efforts towards increasing the fraction of non-military funding for mathematics research, as well as towards increasing total research support.

When the procedural motion passed, there was a request that the Business Meeting in Salt Lake City be informed that the vote was "close."

Everett Pitcher
Secretary

Bethlehem, Pennsylvania

TIMETABLE

Saturday, August 8	American Mathematical Society	Mathematical Association of America
8:00 a.m. – 9:55 a.m.		MAA – MINICOURSE #5 (Part B) *Introduction to computer graphics* Joan P. Wyzkoski
9:00 a.m. – 12:20 p.m.	SPECIAL SESSIONS *Geometric methods in group theory II*	
9:00 a.m. – noon	AMS EXHIBIT AND BOOK SALE	MAA BOOK SALE
9:05 a.m. – 9:55 a.m.		MAA – INVITED ADDRESS *Modern research trends in matrix analysis* Charles R. Johnson
9:30 a.m. – 11:25 a.m.	SESSIONS FOR CONTRIBUTED PAPERS *Topology and geometry*	
11:15 a.m. – 12:15 a.m.		MAA – THE EARLE RAYMOND HEDRICK LECTURES: LECTURE III *Two and three dimensional geometry* William P. Thurston
1:15 p.m. – 2:15 p.m.	COLLOQUIUM LECTURE IV *Mathematical applications of quantum field theory* Edward Witten	
1:15 p.m. – 2:05 p.m.	INVITED ADDRESS *Title to be announced* Brian C. White	
1:30 p.m. – 3:30 p.m.		MAA – MINICOURSE #7 (Part B) *For all practical purposes* Solomon A. Garfunkel
1:30 p.m. – 3:00 p.m.		MAA – CONTRIBUTED PAPER SESSION *Using computer algebra in the classroom* Warren Page
1:30 p.m. – 3:15 p.m.		MAA – CONTRIBUTED PAPER SESSION *New models for the mathematical preparation of teachers* Bruce E. Meserve
2:30 p.m. – 3:20 p.m.	INVITED ADDRESS *Classification of restricted simple Lie algebras* Robert Lee Wilson	

SPECIAL AIRFARES
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MICA, the official travel management firm for the Joint Mathematics Meeting to be held in Salt Lake City, August 5-8, 1987, has arranged for special discounts aboard American Airlines.

Save 5% off all published promotional fares, meeting all restrictions, or 35-40% off regular roundtrip coach fares, with a 7-day advance purchase.

It is possible to receive an even lower airfare depending on your individual circumstances.

Sample Airfares to Salt Lake City
(Quoted 2/11/87 and subject to change)

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New York	$900.00	$585.00	$245.00
Chicago	$740.00	$444.00	$207.00
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Please Note: The lowest published promotional fares require a Saturday night stay, are subject to an airline change/cancellation penalty, and must be purchased at least 30 days prior to departure.

Make your reservations today! MICA reservationists can obtain the lowest available airfare on any airline, and help you with car rental arrangements.

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Saturday, August 8	American Mathematical Society	Mathematical Association of America
2:30 p.m. – 4:00 p.m.		MAA – COMMITTEE ON PLACEMENT EXAMINATIONS PANEL DISCUSSION *Using placement examinations to create order in freshman placement* John G. Harvey (moderator) Linda H. Boyd John R. Hundhausen Bernard A. Madison Billy E. Rhoades
2:30 p.m. – 4:30 p.m.		MAA – MINICOURSE #6 (Part B) *A calculus lab course using MicroCalc* Harley Flanders
3:35 p.m. – 4:25 p.m.	INVITED ADDRESS *The Yamabe problem for CR manifolds* David Jerison	

THE MAXIMAL SUBGROUPS OF CLASSICAL ALGEBRAIC GROUPS

Gary M. Seitz
(Memoirs of the AMS, Number 365)

Aimed at researchers in group theory, this book classifies the maximal closed connected subgroups of the classical algebraic groups over algebraically closed fields of positive characteristic, with the main result being a description of all closed connected overgroups of the irreducible closed connected subgroups of the classical algebraic groups. These results extend Dynkin's earlier work with groups over fields of characteristic 0. By presenting a detailed analysis of group embeddings, the author seeks to overcome the various difficulties present in the representation theory of algebraic groups in positive characteristic. Therefore, readers will obtain an understanding not only of the maximal subgroups of the classical algebraic groups, but also of methods for studying embeddings of linear groups. Because the arguments involve both representation theory and group theory, readers should be familiar with the structure and representations of algebraic groups.

Contents

Preliminary lemmas

Q-levels and commutator spaces

Embeddings of parabolic subgroups

The maximal rank theorem

The classical module theorem

Modules with 1-dimensional weight spaces

The rank 1 theorem

Natural embeddings of classical groups

Component restrictions

V_1X is usually basic

$X = A_n$

$X = B_n, C_n, D_n, n \neq 2$

$X = B_2, C_2$, and G_2

$X = F_4$ $(p > 2)$, E_6, E_7, E_8

Exceptional cases for $p = 2$ or 3

Embeddings and prime restrictions

The main theorems

1980 *Mathematics Subject Classification*: 20
ISBN 0-8218-2427-9, LC 87-1161
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Program of the Sessions

The time limit for each contributed paper in the AMS sessions is ten minutes. In AMS special sessions, the time limit varies from session to session and within sessions. To maintain the schedule, time limits will be strictly enforced.

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

Abstracts of papers presented in MAA sessions at this meeting will be found in a colored insert in the program given to registrants.

Abstracts for talks other than AMS and MAA are not available.

For papers with more than one author, an asterisk follows the name of the author who plans to present the paper at the meeting.

Tuesday, August 4, 1987, 9:00 a.m.

MAA Board of Governors

Tuesday, August 4, 1987, 5:00 p.m.

AMS Council

Tuesday, August 4, 1987, 7:00 p.m.

MAA Minicourse #2: Part A

7:00 – 9:00 *Using computer spreadsheet programs in calculus, differential equations, and combinatorics.* DONALD R. SNOW, Brigham Young University

Wednesday, August 5, 1987, 8:00 a.m.

AMS Invited Address

8:00 – 8:50 (1) *Polygonal billiards and the geometry of Teichmuller geodesics.* STEVEN P. KERCKHOFF, Stanford University (836-58-121)

Wednesday, August 5, 1987, 9:00 a.m.

MAA Minicourse #1: Part A

9:00 – 11:00 *Applied mathematics via classroom experiments.* HERBERT R. BAILEY, Rose-Hulman Institute of Technology

Wednesday, August 5, 1987, 9:00 a.m.

MAA Minicourse #3: Part A

9:00 – 11:00 *A microcomputer linear algebra course using Linear-Kit.* HOWARD ANTON, Drexel University

Wednesday, August 5, 1987, 9:00 a.m.

MAA Session In Search of the Lean and Lively Calculus

9:00 – 9:20 (2) *Calculus as a general education requirement in the new calculator age.* JOHN W. KENELLY, Clemson University

9:25 – 9:45 (3) *Not so lean, but just as lively: Calculus for the engineering and science major.* DONALD HARTIG, California Polytechnic State University

9:50 – 10:10 (4) *Estimation where the discrete meets the continuous.* MARTIN E. FLASHMAN, Humboldt State University

10:15 – 10:25 (5) *On making calculus interesting or How to motivate Johnny in calculus II.* ROLAND MCDANIEL, Lee College

10:30 – 10:40 (6) *An "upside-down" approach to a lean and lively calculus.* ERIC W. HART, Maharishi International University

10:45 – 10:55 (7) *Calculus: Too much too soon.* SATISH C. BHATNAGAR, University of Nevada, Las Vegas

11:00 – 11:10 (8) *Differential calculus reformulated.* ROBERT M. MCLEOD, Kenyon College

11:15 – 11:25 (9) *Limitless calculus.* PAUL FJELSTAD, St. Olaf College

11:30 – 11:40 (10) *Re-emphasizing conceptual, numerical and geometric ideas in calculus.* SHELDON P. GORDON, Suffolk County Community College

11:40 – 12:00 Discussion period

Wednesday, August 5, 1987, 9:05 a.m.

AMS Invited Address

9:05 - 9:55 (11) *Intersection theory and commutative algebra.* PAUL C. ROBERTS, University of Utah (836-13-109)

Wednesday, August 5, 1987, 9:30 a.m.

MAA Panel Discussion

9:30 - 11:00 *The mathematical sciences in the year 2000: Assessment for renewal in U.S. colleges and universities.*

Wednesday, August 5, 1987, 10:00 a.m.

MAA Session on The Teaching of Mathematics and Computer Science in One Department

10:00 - 10:15 (12) *Discrete mathematics: A two-way street between mathematics and computer science.* N. S. ASAITHAMBI, Mississippi State University

10:20 - 10:35 (13) *Experiences in the division of mathematics and science of Notre Dame College of St. John's University.* MICHAEL F. CAPOBIANCO, St. John's University, Staten Island

10:40 - 10:55 (14) *Secrets of a successful joint department.* BILL E. BOMPART, Augusta College

11:00 - 11:15 (15) *Mathematics and computer science: A combined major.* ERNEST J. MANFRED, United States Coast Guard Academy

11:20 - 11:35 (16) *The special needs of computer science faculty and programs.* DAVID W. BALLEW*, Western Illinois University, JUDITH L. GERSTING, Indiana University-Purdue University, Indianapolis, F. D'ANN FUQUAY, Mercer University, and BRUCE KLEIN, Grand Valley State College

Wednesday, August 5, 1987, 10:10 a.m.

AMS Invited Address

10:10 - 11:00 (17) *Regularity of flows in porous media.* DONALD G. ARONSON, University of Minnesota, Minneapolis (836-35-119)

Wednesday, August 5, 1987, 11:00 a.m.

AMS Special Session on Discrete Geometry and Convexity, I

11:00 - 11:20 (18) *The densest packing of equal circles in a parallel strip.* ZOLTÁN FÜREDI, Massachusetts Institute of Technology and AT&T Bell Laboratories, Murray Hill, New Jersey (836-52-112) (Sponsored by Jacob E. Goodman)

11:25 - 11:45 (19) *Bonnesen-style inequalities for $n > 2$ and applications.* J. R. SANGWINE-YAGER, Saint Mary's College (836-52-94)

11:50 - 12:10 (20) *Inequalities involving points and lines.* Preliminary report. GEORGE PURDY, University of Cincinnati (836-51-113) (Sponsored by Frank R. Chung)

12:15 - 12:35 (21) *On a functional connected with the Gauss curvature problem.* Preliminary report. VLADIMIR OLIKER, Emory University (836-53-88)

12:40 - 1:00 (22) *A trinity of orthoschemes.* H. S. M. COXETER, University of Toronto (836-52-11)

Wednesday, August 5, 1987, 11 a.m.

AMS Special Session on Nonlinear Evolution Equations, I

11:00 - 11:20 (23) *Traveling wave solutions arising from a combustion model.* Preliminary report. DAVID TERMAN, Ohio State University, Columbus (836-35-29)

11:30 - 11:50 (24) *A reaction diffusion model for intercellular communication in Dictyostelium discoideum.* PETER MONK*, University of Delaware, and HANS OTHMER, University of Utah (836-35-14)

Wednesday, August 5, 1987, 11:00 a.m.

AMS Special Session on Commutative Algebra and Algebraic Geometry, I

11:00 - 11:20 (25) *The grade of the order ideal of a kth syzygy.* E. GRAHAM EVANS, JR.* and PHILLIP A. GRIFFITH, University of Illinois, Urbana-Champaign (836-13-60)

11:25 - 11:45 Discussion period

11:50 - 12:10 (26) *Buchsbaum curves in $\mathbf{P}^3$.* A. V. GERAMITA*, Queen's University, and J. MIGLIORE, Drew University (836-13-61)

12:15 - 12:35 (27) *Cohen-Macaulay unions of regular varieties.* Preliminary report. SERGEY YUZVINSKY, University of Oregon (836-13-59)

Wednesday, August 5, 1987, 11:15 a.m.

Interagency Commission for Extramural Mathematics Programs (ICEMAP)

Wednesday, August 5, 1987, 1:15 p.m.

AMS Colloquium Lectures: Lecture I

1:15– 2:15 (28) *Mathematical applications of quantum field theory, I.* EDWARD WITTEN, Princeton University

Wednesday, August 5, 1987, 2:15 p.m.

MAA Invited Address

2:15– 3:05 (29) *Quasicrystals: A new state of matter.* PAUL J. STEINHARDT, University of Pennsylvania

Wednesday, August 5, 1987, 2:30 p.m.

AMS Special Session on Discrete Geometry and Convexity, II

2:30– 2:50 (30) *Simplicial arrangements associated with the 24-cell.* Preliminary report. JOHN E. WETZEL, University of Illinois, Urbana-Champaign (836-51-92)

2:55– 3:15 (31) *Processes of points induced by higher dimensional networks.* PAUL GOODEY, University of Oklahoma, and RALPH HOWARD*, University of South Carolina, Columbia (836-52-34)

3:20– 3:40 (32) *The Polya algorithm on convex sets.* ALAN EGGER and ROBERT HUOTARI*, Idaho State University, and DAVID LEGG and DOUGLAS TOWNSEND, Indiana University-Purdue University, Ft. Wayne (836-52-23)

3:45– 4:05 (33) *Hadwiger's transversal theorem in higher dimensions.* JACOB E. GOODMAN*, City College, City University of New York, and RICHARD POLLACK, Courant Institute of Mathematical Sciences, New York University (836-52-111)

4:10– 4:30 (34) *Shadows of convex polytopes and related problems.* BERNARD CHAZELLE, Princeton University, HERBERT EDELSBRUNNER*, University of Illinois, Urbana-Champaign, and LENIDAS GUIBAS, Stanford University (836-52-93) (Sponsored by Jacob E. Goodman)

4:35– 4:55 (35) *Leibniz rules in integral geometry.* RALPH ALEXANDER, University of Illinois, Urbana-Champaign (836-52-41)

5:00– 5:20 (36) *Embedding graphs into a geometric graph.* FAN R. K. CHUNG, Bell Communications Research, Morristown, New Jersey (836-05-53)

5:25– 5:45 (37) *Convex oddities.* CLINTON M. PETTY, University of Missouri, Columbia (836-52-33)

Wednesday, August 5, 1987, 2:30 p.m.

AMS Special Session on Nonlinear Evolution Equations, II

2:30– 2:50 (38) *A mathematical model of sudden cardiac death syndrome.* JAMES P. KEENER, University of Utah (836-35-26) (Sponsored by Hans G. Othmer)

3:00– 3:20 (39) *Diffusive effects on dispersion for a system of reaction diffusion equations.* JACK D. DOCKERY, Utah State University (836-35-20)

3:30– 3:50 (40) *Numerical computation of heteroclinic orbits.* Preliminary report. EUSEBIUS DOEDEL, California Institute of Technology (836-65-18) (Sponsored by Hans G. Othmer)

4:00– 4:20 (41) *Finite element approximation of a wave-front for a reaction-diffusion equation.* Preliminary report. SAT NAM S. KHALSA, Iowa State University (836-65-76) (Sponsored by Clifford Bergman)

Wednesday, August 5, 1987, 2:30 p.m.

AMS Special Session on Commutative Algebra and Geometry, II

2:30– 2:50 (42) *Nonexistence of inverse flips.* Preliminary report. JÁNOS KOLLÁR, University of Utah (836-14-50)

2:55– 3:15 Discussion period

3:20– 3:40 (43) *On the number of generators of modules over polynomial rings.* GENNADY LYUBEZNIK, University of Chicago (836-13-58)

3:45– 4:05 (44) *Tightly closed ideals and invariant theory.* MELVIN HOCHSTER*, University of Michigan, Ann Arbor, and CRAIG L. HUNEKE, Purdue University, West Lafayette (836-13-55)

4:10– 4:30 (45) χ_∞ *of finite free complexes.* S. P. DUTTA, University of Illinois, Urbana-Champaign (836-13-103)

4:35– 4:55 Discussion period

5:00– 5:20 (46) *Reductions and general elements.* Preliminary report. JUDITH D. SALLY, Northwestern University (836-13-104)

5:25– 5:45 (47) *Birational extensions of 2-dimensional normal local domains.* Preliminary report. WILLIAM J. HEINZER, Purdue University, West Lafayette (836-13-57)

Wednesday, August 5, 1987, 2:30 p.m.

AMS Session on Algebra

2:30– 2:40 (48) *On the Riemann hypothesis.* K. U. LU, California State University, Long Beach (836-11-02)

2:45– 2:55 (49) *A generalization of a result by C. Ramus.* CURTIS N. COOPER* and ROBERT E. KENNEDY, Central Missouri State University (836-11-116)

3:00– 3:10 (50) *Applications of a generalization of a result by C. Ramus.* ROBERT E. KENNEDY* and CURTIS N. COOPER, Central Missouri State University (836-11-117)

3:15– 3:25 (51) *Asymptotic distribution and independence of sequences of g-adic integers.* JAU-SHYONG SHIUE*, University of Nevada, Las Vegas, and K. NAGASAKA, University of the Air, Japan (836-11-54)

3:30– 3:40 (52) *On commutator laws in groups.* IAN D. MACDONALD*, Lafayette College, and B. H. NEUMANN, Universitat Bielefeld, West Germany (836-20-68)

3:45– 3:55 (53) *Maximal total subsemigroups of Lie groups.* JIMMIE LAWSON, Louisiana State University, Baton Rouge (836-22-44)

4:00– 4:10 (54) *Recurring-sequence tiling II.* JOSEPH ARKIN*, Spring Valley, New York, DAVID C. ARNEY, United States Military Academy, GERALD E. BERGUM, South Dakota State University, STEFAN A. BURR, City College, City University of New York, and BRUCE J. PORTER, United States Military Academy (836-05-04)

4:15– 4:25 (55) *A necessary and sufficient condition for circularity.* MATTHEW C. MODISETT, University of Arizona (836-05-115)

4:30– 4:40 (56) *Modules satisfying ACC on a certain type of colons.* CHIN-PI LU, University of Colorado, Denver (836-13-90)

Wednesday, August 5, 1987, 2:30 p.m.

AMS Session on Analysis

2:30– 2:40 (57) *An extended Poisson sum formula for general integral transforms and aliasing error bound for the generalized sampling theorem.* ABDUL J. JERRI, Clarkson University (836-41-102)

2:45– 2:55 (58) *Ky Fan type theorem for multifunctions and applications.* V. M. SEHGAL, University of Wyoming, and S. P. SINGH*, Memorial University (836-47-106)

3:00– 3:10 (59) *Discussion of Buffon's needle problem: Continuity considerations.* PREM N. BAJAJ, Wichita State University (836-60-73) (Sponsored by Douglas G. Burkholder)

3:15– 3:25 (60) *Extremal properties of conditional entropy in quantum statistical mechanics.* MARY BETH RUSKAI, University of Lowell (836-82-49)

3:30– 3:40 (61) *Measure spaces, games in characteristic form, and economies.* MIGUEL PAREDES, Pan American University (836-90-87)

3:45– 3:55 (62) *The factorization of unitary operators on tensor products.* BERNARD BANKS, California State Polytechnic University (836-81-46)

4:00– 4:10 (63) *Higher order perturbation of Chebyshev polynomials.* Preliminary report. ATTILA MÁTÉ*, Brooklyn College, City University of New York, and PAUL NEVAI, Ohio State University, Columbus (836-42-51)

4:15– 4:25 (64) *Convergence of sequence of iterates in linear spaces.* Preliminary report. KANHAYA L. SINGH, Fayetteville State University (836-46-124)

Wednesday, August 5, 1987, 3:20 p.m.

MAA Invited Address

3:20– 4:10 (65) *Three manifolds–does the present theory cover all of them?* JOHN P. HEMPEL, Rice University

Wednesday, August 5, 1987, 3:30 p.m.

MAA Minicourse #3: Part B

3:30– 5:30 *A microcomputer linear algebra course using Linear-Kit.* HOWARD ANTON, Drexel University

Wednesday, August 5, 1987, 4:25 p.m.

National Science Foundation: Research and Education Activities in the Mathematical Sciences

Wednesday, August 5, 1987, 4:30 p.m.

MAA Section Officers

Wednesday, August 5, 1987, 5:30 p.m.

AMS Committee on Science Policy

Wednesday, August 5, 1987, 7:00 p.m.

MAA Minicourse #1: Part B

7:00- 9:00 *Applied mathematics via classroom experiments.* HERBERT R. BAILEY, Rose-Hulman Institute of Technology

Wednesday, August 5, 1987, 7:00 p.m.

MAA Minicourse #2: Part B

7:00- 9:00 *Using computer spreadsheet programs in calculus, differential equations, and combinatorics.* DONALD R. SNOW, Brigham Young University

Wednesday, August 5, 1987, 7:45 p.m.

Joint Policy Board for Mathematics: National Meeting of Department Heads

Thursday, August 6, 1987, 8:00 a.m.

MAA Invited Address

8:00- 8:50 (66) *Topology of mirages.* WALTER TAPE, University of Alaska, Fairbanks

Thursday, August 6, 1987, 8:00 a.m.

AMS Special Session on Discrete Geometry and Convexity, III

8:00- 8:20 (67) *Projections of polytopes.* PAUL FILLIMAN, Western Washington University (836-52-89)

8:30- 8:50 (68) *Metric projections and the Fell topology.* GERALD BEER, California State University, Los Angeles (836-52-27)

9:00- 9:20 (69) *Stabbing convex sets in two dimensions.* HERBERT EDELSBRUNNER, University of Illinois, Urbana-Champaign, and MICHA SHARIR*, New York University and Tel Aviv University, Israel (836-51-80) (Sponsored by Erwin Lutwak)

9:30- 9:50 (70) *Stability problems for packings of convex bodies.* Preliminary report. H. GROEMER, University of Arizona (836-52-35)

Thursday, August 6, 1987, 8:00 a.m.

AMS Special Session on Nonlinear Evolution Equations, III

8:00- 8:20 (71) *Random evolution models of cell movement.* Preliminary report. STEVEN R. DUNBAR, University of Nebraska, Lincoln (836-92-25)

8:25- 8:45 (72) *An invariance principle for monotone dynamical systems.* PETER W. BATES, Brigham Young University (836-35-21)

8:50- 9:10 (73) *Monotonicity in reaction: Diffusion systems with time delays.* HAL L. SMITH, Arizona State University (836-35-16) (Sponsored by Hans G. Othmer)

9:15- 9:35 (74) *Delayed onset of oscillations after slow passage through a Hopf bifurcation.* JOHN RINZEL* and STEVEN M. BAER, National Institutes of Health, Bethesda, Maryland, and THOMAS ERNEUX, Northwestern University (836-34-13)

9:40-10:00 (75) *Invariant manifolds for semilinear equations in the presence of symmetry.* Preliminary report. ROBERT GARDNER, University of Massachusetts, Amherst (836-35-08)

Thursday, August 6, 1987, 8:00 a.m.

AMS Special Session on Commutative Algebra and Algebraic Geometry, III

8:00- 8:20 (76) *Uniform bound problem for regular local rings.* Preliminary report. BERNARD JOHNSTON, University of Utah (836-13-114)

8:30- 8:50 (77) *Some applications of mixed multiplicities to Rees algebras.* Preliminary report. JUGAL VERMA, Purdue University, West Lafayette (836-13-62)

9:00- 9:20 (78) *Descent in dimension two and non-split Gorenstein modules.* DANA WESTON, University of Missouri, Columbia (836-13-86)

9:30- 9:50 (79) *Finite free resolutions of algebras of killing tensors.* Preliminary report. R. PETER DELONG, Hughes Aircraft Company, Fullerton, California (836-70-31)

Thursday, August 6, 1987, 8:00 a.m.

AMS Special Session on Ring Theory and Invariant Theory, I

8:00 - 8:20 (80) *Prime ideals in hereditary PI-rings.* EFRAIM P. ARMENDARIZ* and C. R. HAJARNAVIS, University of Texas, Austin (836-16-07)

8:25 - 8:45 (81) *Invariant and trace identities.* ALLAN BERELE, DePaul University (836-16-06) (Sponsored by Jeff M. Bergen)

8:50 - 9:10 (82) *Invariants of Hopf algebras acting on division rings.* Preliminary report. JEFFREY BERGEN*, DePaul University, and MIRIAM COHEN, Ben-Gurion University (836-16-65)

9:15 - 9:35 (83) *Constructive geometric invariant theory for certain non-reductive groups.* FRANK D. GROSSHANS, West Chester University (836-20-69)

9:40 - 10:00 (84) *The kernel of K_0 under finite projective extensions.* Preliminary report. ROBERT M. GURALNICK, University of Southern California (836-13-19)

Thursday, August 6, 1987, 8:00 a.m.

MAA Minicourse #4: Part A

8:00 - 9:55 *A survey of educational software.* DAVID P. KRAINES, Duke University and VIVIAN KRAINES, Meredith College

Thursday, August 6, 1987, 8:30 a.m.

AWM Panel Discussion

8:30 - 9:30 *Gender and science.*

Thursday, August 6, 1987, 8:30 a.m.

ΠME Contributed Paper Sessions

Thursday, August 6, 1987, 9:05 a.m.

MAA Invited Address

9:05 - 9:55 (85) *Why the circle is connected: An introduction to quantized topology.* EDWARD G. EFFROS, University of California, Los Angeles

Thursday, August 6, 1987, 9:30 a.m.

AWM Membership Meeting

Thursday, August 6, 1987, 10:10 a.m.

AMS-MAA Invited Address

10:10 - 11:00 (86) *Title to be announced.* ROBERT FINN, Stanford University and Max-Planck Institut, Germany

Thursday, August 6, 1987, 11:15 a.m.

MAA Earle Raymond Hedrick Lectures: Lecture I

11:15 - 12:15 (87) *Two and three dimensional geometry, I.* WILLIAM P. THURSTON, Princeton University

Thursday, August 6, 1987, 12:00 p.m.

ΠME Council Luncheon

Thursday, August 6, 1987, 1:15 p.m.

AMS Colloquium Lectures: Lecture II

1:15 - 2:15 (88) *Mathematical applications of quantum field theory, II.* EDWARD WITTEN, Princeton University

Thursday, August 6, 1987, 2:30 p.m.

MAA Prize Session and Business Meeting

Friday, August 7, 1987, 7:30 a.m.

MAA Session on Teaching Strategies Involving Computers

7:30– 7:45 (89) *Using computer graphing to enhance the teaching and learning of mathematics.* FRANKLIN DEMANA, Ohio State University, Columbus

7:50– 8:05 (90) *Transformations and the numerical integration of improper integrals.* CHRIS W. AVERY and FRANK P. SOLER*, De Anza College

8:10– 8:25 (91) *Understanding the central limit theorem.* DIANE H. KREBS, Valparaiso University

8:30– 8:45 (92) *The role of computer graphics in differential equations and numerical analysis courses.* ELTON GRAVES, Rose-Hulman Institute of Technology

8:50– 9:05 (93) *A computer aided "discovery" approach to the fundamental theorem of calculus and report on the classroom experience.* ROBERT DECKER, University of Hartford

9:10– 9:25 (94) *Use of microcomputer in teaching algebraic functions.* APARNA B. GANGULI, University of Minnesota, Minneapolis

9:30– 9:45 (95) *Effective use of the computer as a pedagogical tool.* KAILA KATZ, Montclair State College

Friday, August 7, 1987, 8:00 a.m.

AMS Invited Address

8:00– 8:50 (96) *The invariants and polynomial identities of $n \times n$ matrices.* EDWARD W. FORMANEK, Pennsylvania State University, University Park (836-16-05)

Friday, August 7, 1987, 8:00 a.m.

MAA Minicourse #4: Part B

8:00– 9:55 *A survey of educational software.* DAVID P. KRAINES, Duke University and VIVIAN KRAINES, Meredith College

Friday, August 7, 1987, 8:30 a.m.

MAA Committee on the Mathematical Education of Teachers (COMET) Panel Discussion

8:30– 9:55 *New directions in teacher education–pros and cons.*

Friday, August 7, 1987, 8:30 a.m.

MAA Committee on the Participation of Women Panel Discussion

8:30– 9:55 *What are the problems? What are the solutions?*

Friday, August 7, 1987, 9:00 a.m.

ΠME Contributed Paper Sessions

Friday, August 7, 1987, 9:05 a.m.

AMS Invited Address

9:05– 9:55 (97) *Comparing* $\mathrm{Aut}(\mathbf{Z} * \cdots * \mathbf{Z})$ *with* $\mathrm{Aut}(\mathbf{Z} \oplus \cdots \oplus \mathbf{Z})$. KAREN VOGTMANN, Cornell University (836-20-127)

Friday, August 7, 1987, 10:10 a.m.

AMS-MAA Invited Address

10:10–11:00 (98) *R H Bing's mathematical vitality.* MICHAEL STARBIRD, University of Texas, Austin

Friday, August 7, 1987, 11:15 a.m.

MAA Earle Raymond Hedrick Lectures: Lecture II

11:15–12:15 (99) *Two and three dimensional geometry, II.* WILLIAM P. THURSTON, Princeton University

Friday, August 7, 1987, 12:30 p.m.

AMS Special Session on Ring Theory and Invariant Theory, II

12:30 - 12:50 (100) *Chain rule for resultant.* JAMES H. MCKAY and STUART SUI-SHENG WANG*, Oakland University (836-13-122)

1:00 - 1:20 (101) *Young tableaux and generalized second fundamental theorem of invariant theory.* S. ABHYANKAR, Purdue University, West Lafayette (836-13-37)

1:30 - 1:50 (102) *Bijection between standard bitableaux and monomials.* SHREERAM S. ABHYANKAR, Purdue University, West Lafayette, and DEVADATTA M. KULKARNI*, Oakland University (836-13-63)

2:00 - 2:20 (103) *Cross product representations of generalised Clifford algebras.* Preliminary report. TIMOTHY HODGES* and STEVEN TESSER, University of Cincinnati (836-16-79)

2:30 - 2:50 (104) *Lattices over integral group rings for groups of square-free order.* Preliminary report. LEE KLINGLER, Florida Atlantic University (836-16-30)

3:00 - 3:20 (105) *Minimal differential identities of prime rings.* CHARLES LANSKI, University of Southern California (836-16-32)

3:30 - 3:50 (106) *Scalar-reflexive rings.* Preliminary report. DON HADWIN, University of New Hampshire, and JEANNE WALD KERR*, Michigan State University (836-13-43)

Friday, August 7, 1987, 1:00 p.m.

AMS Special Session on Geometry and Analysis on CR manifolds, I

1:00 - 1:20 (107) *Chains in CR geometry: Some examples.* Preliminary report. HOWARD JACOBOWITZ, Rutgers University, Camden (836-32-75)

1:30 - 1:50 (108) *Chains, pseudochains, and pseudoriemannian geometry.* Preliminary report. LISA K. KOCH, Rutgers University, New Brunswick (836-32-45)

2:00 - 2:20 (109) *Some global invariants of three-dimensional CR manifolds.* DANIEL M. BURNS, JR., University of Michigan, Ann Arbor (836-32-129)

2:30 - 2:50 (110) *The heat equation and CR geometry.* NANCY K. STANTON, University of Notre Dame (836-32-52)

3:00 - 3:20 (111) *Real hypersurfaces in quaternionic manifolds.* Preliminary report. CLAUDE LE BRUN, State University of New York, Stony Brook (836-53-85)

3:30 - 3:50 (112) *Geometric properties of CR mappings of finite multiplicity.* Preliminary report. LINDA ROTHSCHILD, University of California at San Diego, La Jolla (836-32-107)

Friday, August 7, 1987, 1:00 p.m.

AMS Special Session on Geometric Methods in Group Theory, I

1:00 - 1:20 (113) *Homology of Hilbert modular groups.* ALAN BROWNSTEIN, University of Michigan, Ann Arbor (836-55-100)

1:30 - 1:50 (114) *Continuation spaces.* Preliminary report. JAMES W. CANNON, Brigham Young University (836-55-98)

2:00 - 2:20 (115) *Fold paths in the space of free actions on trees.* Preliminary report. MARC CULLER, University of Illinois, Chicago (836-20-96)

2:30 - 2:50 (116) *A finiteness theorem for elliptics.* Preliminary report. MARK FEIGHN*, University of Texas, Austin, and GEOFF MESS, University of California, Los Angeles (836-20-74)

3:00 - 3:20 (117) *Higher end invariants of groups.* ROSS GEOGHEGAN, State University of New York, Binghamton (836-20-84)

3:30 - 3:50 (118) *Whitehead complexes.* S. M. GERSTEN, University of Utah (836-20-12)

Friday, August 7, 1987, 1:00 p.m.

AMS Session on Differential Equations

1:00 - 1:10 (119) *A Lagrangian approach to the calculus.* F. SCHREMMER*, West Chester State University, and A. SCHREMMER, Community College of Philadelphia (836-98-105)

1:15 - 1:25 (120) *Smoothness and degeneracy conditions for flux-difference schemes.* Preliminary report. CHARLES W. SCHELIN, University of Wisconsin, La Crosse (836-65-82)

1:30 - 1:40 (121) *Higher order continuous solution of $y'' = f(x, y, y')$ and $y'' = f(x, y)$ initial value problems.* CURTIS OUTLAW, LEROY DERR, and DIRAN SARAFYAN*, University of New Orleans (836-65-120)

1:45 - 1:55 (122) *Convergence to constant equilibrium for a coevolution model.* ROGER LUI, Worcester Polytechnic Institute (836-35-126)

2:00 - 2:10 (123) *Quasilinear ellipticity and the 2nd BVP.* Preliminary report. VICTOR L. SHAPIRO, University of California, Riverside (836-35-72)

2:15 - 2:25 (124) *Discrete observability of initial data for the heat equation.* D. S. GILLIAM* and C. F. MARTIN, Texas Tech University (836-93-125)

Friday, August 7, 1987, 1:15 p.m.

AMS Colloquium Lectures: Lecture III

1:15– 2:15 (125) *Mathematical applications of quantum field theory, III.* EDWARD WITTEN, Princeton University

Friday, August 7, 1987, 1:15 p.m.

MAA Invited Address

1:15– 2:05 (126) *Mathematical aspects of blood clotting.* AARON L. FOGELSON, University of Utah

Friday, August 7, 1987, 1:30 p.m.

MAA Minicourse #5: Part A

1:30– 3:30 *Introduction to computer graphics.* JOAN P. WYZKOSKI, Fairfield University

Friday, August 7, 1987, 1:30 p.m.

MAA Minicourse #7: Part A

1:30– 3:30 *For all practical purposes.* SOLOMON A. GARFUNKEL, COMAP, Inc.

Friday, August 7, 1987, 1:30 p.m.

MAA Undergraduate Student Paper Session

1:30– 1:45 (127) *Curves length minimizing modulo n in R^n.* JEFF ABRAHAMSON, Massachusetts Institute of Technology

1:50– 2:05 (128) *NP-completeness and the traveling salesman problem.* MELANIE K. BREAKER, Northeast Missouri State University

2:10– 2:25 (129) *The classical problems of antiquity in the hyperbolic plane.* ROBERT R. CURTIS, University of California, Santa Cruz

2:30– 2:45 (130) *A physical derivation of the well-tempered musical scale.* TIMOTHY KOPONEN, Aquinas College

Additional papers to be announced at the meeting.

Friday, August 7, 1987, 2:00 p.m.

ΠME Contributed Paper Sessions

Friday, August 7, 1987, 2:30 p.m.

MAA Invited Address

2:30– 3:20 (131) *Larger bodies with smaller cross-sectional areas.* ERWIN LUTWAK, Polytechnic University of New York

Friday, August 7, 1987, 4:05 p.m.

AMS Steele Prize Session and Business Meeting

Friday, August 7, 1987, 7:00 p.m.

MAA Film Program

Friday, August 7, 1987, 7:00 p.m.

MAA Minicourse #6: Part A

7:00– 9:00 *A calculus lab course using MicroCalc.* HARLEY FLANDERS, University of Michigan, Ann Arbor

Friday, August 7, 1987, 8:30 p.m.

ΠME J. Sutherland Frame Lecture

8:30– 9:30 *Reflections of a problems editor.* CLAYTON DODGE, University of Maine

Saturday, August 8, 1987, 8:00 a.m.

AMS Special Session on Ring Theory and Invariant Theory, III

8:00 - 8:20 (132) *The Nagata-Higman problem.* Preliminary report. DANIELE MONTANARI, Brandeis University (836-16-81)

8:30 - 8:50 (133) *Skew group rings of finite abelian groups acting on prime rings.* SUSAN MONTGOMERY*, University of Southern California, and D. S. PASSMAN, University of Wisconsin, Madison (836-16-64)

9:00 - 9:20 (134) *The structure of G_0 for certain polycyclic group algebras and related algebras.* DONALD S. PASSMAN, University of Wisconsin, Madison (836-16-66)

9:30 - 9:50 (135) *A Noether-Skolem theorem for group graded rings.* JAMES OSTERBURG*, University of Cincinnati, and DECLAN QUINN, University of Utah (836-16-10)

10:00 - 10:20 (136) *Polynomial identities of low degree algebras.* MICHEL RACINE, University of Ottawa (836-16-39)

10:30 - 10:50 (137) *Invariants of certain finite groups in characteristic p.* Preliminary report. DAVID R. RICHMAN, University of South Carolina, Columbia (836-13-56) (Sponsored by Charles A. Nicol)

11:00 - 11:20 (138) *Actions of linearly reductive groups on affine PI-algebras.* Preliminary report. NIKOLAUS VONESSEN, Massachusetts Institute of Technology (836-16-42)

11:30 - 11:50 (139) *Covering groups as Galois groups.* MURRAY M. SCHACHER, University of California, Los Angeles, and Université Catholique de Louvain, Belgium (836-16-95)

12:00 - 12:20 (140) *Some classical invariants which appear in the reversion of power series.* Preliminary report. DAVID WRIGHT, Washington University (836-13-70)

Saturday, August 8, 1987, 8:00 a.m.

AMS Special Session on Geometry and Analysis on CR Manifolds, II

8:00 - 8:20 (141) *Linearized boundary invariants and log term asymptotics on strictly pseudoconvex domains.* C. ROBIN GRAHAM, University of Washington (836-32-36)

8:30 - 8:50 (142) *Regularity of CR homeomorphisms.* STEVE BELL, Purdue University, West Lafayette (836-32-22)

9:00 - 9:20 (143) *Regularity of $\overline{\partial}, \overline{\partial}_b$, and of the Szego and Bergman projections in complex dimension two.* J. J. KOHN, Princeton University (836-35-101)

9:30 - 9:50 (144) *Regularity and uniqueness of isometric immersions of positively curved Riemannian manifolds and its analogy with CR geometry.* CHONG-KYU HAN, University of Alabama, Tuscaloosa (836-53-40)

10:00 - 10:20 (145) *Analyticity of proper holomorphic mappings.* Preliminary report. M. SALAH BAOUENDI, Purdue University, West Lafayette (836-32-108)

10:30 - 10:50 (146) *Homotopy formulas for the tangential Cauchy-Riemann equations.* Preliminary report. FRANÇOIS TREVES, Rutgers University, New Brunswick (836-32-123)

11:00 - 11:20 (147) *Locally spherical CR-structures on closed 3-manifolds.* Preliminary report. WILLIAM M. GOLDMAN, University of Maryland, College Park (836-53-91)

11:30 - 11:50 (148) *Non-degenerate CR structures of codimension 2.* ROBERT I. MIZNER, University of Washington (836-53-28)

12:00 - 12:20 (149) *Calculus on Heisenberg manifolds.* Preliminary report. PETER GREINER, University of Toronto (836-35-38)

Saturday, August 8, 1987, 8:00 a.m.

MAA Minicourse #5: Part B

8:00 - 9:55 *Introduction to computer graphics.* JOAN P. WYZKOSKI, Fairfield University

Saturday, August 8, 1987, 9:00 a.m.

AMS Special Session on Geometric Methods in Group Theory, II

9:00 - 9:20 (150) *Homomorphisms of groups.* RICHARD GOLDSTEIN, State University of New York, Albany (836-20-99)

9:30 - 9:50 (151) *Some remarks on a conjecture of Mumford.* Preliminary report. RONNIE LEE, Yale University (836-14-97)

10:00 - 10:20 (152) *Cohomological properties of 3-manifold mapping class groups.* DARRYL MCCULLOUGH, University of Oklahoma (836-57-17)

10:30 - 10:50 (153) *Ends and group cohomology of amalgamated products and HNN-extensions.* Preliminary report. MICHAEL L. MIHALIK* and STEVEN TSCHANTZ, Vanderbilt University (836-20-77)

11:00 - 11:20 (154) *Homology of classical Lie groups made discrete, II. H_2, H_3 and relations with scissors congruences.* JOHAN L. DUPONT, Aarhus Universitet, Denmark, WALTER PARRY*, Eastern Michigan University, and CHIH-HAN SAH, State University of New York, Stony Brook (836-20-83)

11:30 - 11:50 (155) *Ergodic behavior of free actions on R-trees.* FRANK RIMLINGER, Columbia University (836-20-15)

12:00 - 12:20 (156) *Using sub-normality to show the simple connectivity at infinity of a finitely presented group.* Preliminary report. JOSEPH S. PROFIO, Vanderbilt University (836-99-130)

Saturday, August 8, 1987, 9:05 a.m.

MAA Invited Address

9:05 - 9:55 (157) *Modern research trends in matrix analysis.* CHARLES R. JOHNSON, College of William and Mary

Saturday, August 8, 1987, 9:30 a.m.

AMS Session on Topology and Geometry

9:30 - 9:40 (158) *Products of convex structures.* JAY KANGEL, Minneapolis, Minnesota (836-52-24)

9:45 - 9:55 (159) *Density of arc components in unicoherent continua.* E. J. VOUGHT, Sacramento State University (836-54-78)

10:00 - 10:10 (160) *Functionally Hausdorff spaces.* HARRIET M. LORD, California State Polytechnic University (836-54-47)

10:15 - 10:25 (161) *On the graded ring $\tilde{\Omega}_*^U(Z_p)$.* CHING-MU WU, Tamkang University, Taiwan (836-57-01)

10:30 - 10:40 (162) *Rank two mixing transformation.* DANIEL ULLMAN, George Washington University (836-28-71)

10:45 - 10:55 (163) *Computing the dimension of a fractal related to the powers of a polynomial.* STEPHEN J. WILLSON, Iowa State University (836-52-48)

11:00 - 11:10 (164) *Mixed cusp forms and holomorphic forms on elliptic varieties.* MIN HO LEE, University of Northern Iowa (836-14-03)

11:15 - 11:25 (165) *Complete filtered Lie algebras and the Spencer cohomology.* Preliminary report. THOMAS W. JUDSON, University of Portland (836-17-67)

Saturday, August 8, 1987, 11:15 a.m.

MAA Earle Raymond Hedrick Lectures: Lecture III

11:15 - 12:15 (166) *Two and three dimensional geometry, III.* WILLIAM P. THURSTON, Princeton University

Saturday, August 8, 1987, 1:15 p.m.

AMS Colloquium Lectures: Lecture IV

1:15 - 2:15 (167) *Mathematical applications of quantum field theory, IV.* EDWARD WITTEN, Princeton University

Saturday, August 8, 1987, 1:15 p.m.

AMS Invited Address

1:15 - 2:05 (168) *Title to be announced.* BRIAN C. WHITE, Stanford University (836-99-128)

Saturday, August 8, 1987, 1:30 p.m.

MAA Minicourse #7: Part B

1:30 - 3:30 *For all practical purposes.* SOLOMON A. GARFUNKEL, COMAP, Inc.

Saturday, August 8, 1987, 1:30 p.m.

MAA Session on Using Computer Algebra in the Classroom

1:30 - 1:55 (169) *Symbolic algebra, geometry and physics: A teaching example with CAL.* JAMES E. WHITE, Bates College

2:00 - 2:15 (170) *Some student uses of hand-held computers in elementary mathematics courses.* WADE ELLIS, JR., West Valley College

2:20 - 2:40 (171) *Calculators and computers in math education: What is needed?* CHARLES M. PATTON, Hewlett-Packard Company

2:45 - 3:00 (172) *A calculus interface for computer algebra systems.* J. DOUGLAS CHILD, Rollins College

Saturday, August 8, 1987, 1:30 p.m.

MAA Session on New Models for the Mathematical Preparation of Teachers

1:30– 1:50 (173) *A content methematics master's degree for teachers.* JAMES R.C. LEITZEL, Ohio State University, Columbus

2:00– 2:10 (174) *Alternate routes, retraining, and reform: The New Jersey model.* DAVID E. BOLIVAR, Trenton State College

2:15– 2:30 (175) *New models for the mathematical preparation of teachers.* MARGUERITE GRAVEZ, Pennsylvania State University, University Park

2:35– 2:45 (176) *The mathematical preparation of teachers in Togo, West Africa: A comparative study.* DONALD M. HILL, Florida A&M University

2:50– 3:00 (177) *A program for preparing middle school mathematics teachers.* MARJORIE ENNEKING, Portland State University

3:05– 3:15 (178) *Classical approach for the preparation of mathematics teachers.* SATISH C. BHATNAGAR, University of Nevada, Las Vegas

Saturday, August 8, 1987, 2:30 p.m.

AMS Invited Address

2:30– 3:20 (179) *Classification of restricted simple Lie algebras.* ROBERT LEE WILSON, Rutgers University, New Brunswick (836-17-118)

Saturday, August 8, 1987, 2:30 p.m.

MAA Committee on Placement Examinations Panel Discussion

2:30– 4:00 *Using placement examinations to create order in freshman placement.*

Saturday, August 8, 1987, 2:30 p.m.

MAA Minicourse #6: Part B

2:30– 4:30 *A calculus lab course using MicroCalc.* HARLEY FLANDERS, University of Michigan, Ann Arbor

Saturday, August 8, 1987, 3:35 p.m.

AMS Invited Address

3:35– 4:25 (180) *The Yamabe problem for CR manifolds.* DAVID JERISON, Massachusetts Institute of Technology (836-58-110)

Salt Lake City, Utah

Hugo Rossi
AMS Associate Secretary

Eugene, Oregon

Kenneth A. Ross
MAA Secretary

Presenters of Papers

Numbers following the names indicate the speakers' positions on the program.
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Lincoln, October 30 – November 1, University of Nebraska

Second Announcement of the 837th Meeting

The eight hundred and thirty-seventh meeting of the American Mathematical Society will be held at the University of Nebraska in Lincoln, Nebraska, on Friday afternoon, Saturday and Sunday mornings, October 30 – November 1, 1987.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Central Sectional Meetings, there will be four invited addresses. The speakers, their affiliations, and titles, where available, are as follows:

CAROLYN S. GORDON, University of Pennsylvania and Washington University, St. Louis, *When you can't hear the shape of a manifold.*

DAVID GRIFFEATH, University of Wisconsin, Madison, title to be announced.

DAVID W. MASSER, University of Michigan, Ann Arbor, *Transcendence without transcendental numbers.*

DAN VOICULESCU, University of California, Berkeley, title to be announced.

Special Sessions

By invitation of the same committee, there will be seven special sessions of selected twenty-minute papers. The topics of the sessions, and the names and affiliations of the organizers, are as follows:

Operator algebras and operator theory, FRANK L. GILFEATHER, University of Nebraska, Lincoln. The tentative speakers include William Arveson, Larry Baggett, Harry Bercovici, Don Bunce, Rauúl Curto, Ronald G. Douglas, Ciprian Foias, Domingo Herrero, Palle Jergensen, Victor Kastal, David Larson, Quing Lin, Paul Muhly, Costel Peligrad, Justin Peters, Norberto Salinas, Albert Sheu, Roger Smith, Harald Upmeier, Belisario Ventura, Bruce Wagner, Martin Walter, Gary Weiss, and Derek Westwood.

Transformation groups in geometry, CAROLYN S. GORDON and QUO-SHIN CHI, Washington University.

Cellular automata and nonlinear dynamics, ERICA JEN, Los Alamos National Laboratory.

Finite geometries and combinatorial design, SPYROS D. MAGLIVERAS, EARL S. KRAMER, and DALE MESNER, University of Nebraska, Lincoln. Tentative speakers include Bruce A. Anderson, Dan Archdeacon, Michael D. Atkinson, Ronald D. Baker, Eiichi Bannai, Lynn M. Batten, A. Beutelspacher, Julia M. Brown, Aiden A. Bruen, A. Camina, W. E. Cherowitzo, Charles J. Colbourn, Huw Davies, John F. Dillon, Jeffrey H. Dinitz, Jean Doyen, Clifton E. Ealy, Jr., Katherine Heinrich, J.W.P. Hirschfeld, Daniel R. Hughes, Dieter Jungnickel, Donald L. Kreher, Rudi Mathon, Nathan S. Mendelsohn, E. T. Parker, Stanley E. Payne, Vera S. Pless, D. Ray-Chaudhuri, Alex Rosa, Paul J. Schellenberg, J. J. Siedel, E. Spence, Douglas R. Stinson, Jeff A. Thas, Luc Teirlinck, V. C. Tonchev, Tran Van Trung, Scott A. Vanstone, Walter D. Wallis, and M. A. Wertheimer.

Semi-groups and connections with automata and formal languages, JOHN C. MEAKIN and STUART W. MARGOLIS, University of Nebraska, Lincoln. Tentative speakers are J. Berstel, J.-C. Birget, K. Byleen, J. A. Gerhard, S. Goberstein, P. Jones, D. Klarner, M. Kunze, G. Lallement, K.S.S. Nambooripad, F. Pastijn, D. Perrin, J.-E. Pin, M. Putcha, L. Renner, J. Rhodes, C. Reutenauer, J. Sakarovitch, B. M. Schein, J. B. Stephen, H. Straubing, D. Therien, and P. Weil.

Diophantine problems, ROBERT E. TUBBS, University of Colorado, Boulder.

Commutative algebra and algebraic geometry, ROGER A. WIEGAND and BRIAN HARBOURNE, University of Nebraska, Lincoln. The tentative speakers include Susan Colley, Bruce Crauder, Frank DeMeyer, Lawrence Ein, E. Graham Evans, William Heinzer, Melvin Hochster, James Huckaba, Craig Huneke, Dan Katz, Sheldon Katz, William Lang, Pablo Lejarraga, Lawrence Levy, Steve McAdam, Rick Miranda, Ira Papick, Michael Pulte, Igor Reider, Christel Rothaus, Judith Sally, David Saltman, and Bernd Ulrich.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone submitting an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract form and submit it **by July 27, 1987**, three weeks before the deadline for contributed papers, in order that it may be considered for inclusion. Participants are reminded that a charge of $16 is imposed for retyping abstracts that are not in camera-ready form.

Contributed Papers

There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in the Departments of Mathematics. Abstracts should be sent to the Editorial Department, American Mathematical Society, P. O. Box 6248, Providence, RI 02940, so as to arrive before the **August 17, 1987**, abstract deadline. Participants are reminded that a charge of $16 is imposed for retyping abstracts that are not in camera-ready form. Late papers will not be accommodated.

Registration

The meeting registration desk will be located in Room 203, Oldfather Hall. The desk will be open from 2:30 p.m. to 5:00 p.m. on Friday and from 8:00 a.m. to 3:00 p.m. on Saturday. The registration fees are $30 for members, $45 for nonmembers, and $10 for students or unemployed mathematicians.

Petition Table

A petition table will be set up in the registration area. Additional information can be found in a box in the Salt Lake City meeting announcement on page 526 of the April issue of *Notices*.

Accommodations

Rooms have been blocked at the following three downtown hotels. Participants should make their own reservations directly with the hotel of their choice and be sure to identify themselves as attending the AMS meeting at the University of Nebraska. The rates are subject to possible change and do not include applicable taxes. The deadline for reservations is **September 29**, after which reservations will be accepted on a space-available basis.

Clayton House
10th and "O" Streets, Lincoln 68508
Telephone: 402-476-0333 or
800-233-7778
(outside Nebraska)

Single	$34 (1 queen bed)
Double	$39 (1 queen bed)
Double	$42 (2 queen beds)

Cornhusker Hotel
333 South 13th Street, Lincoln 68508
Telephone: 402-474-7474 or
800-742-2226
(within Nebraska)
800-228-2676
(outside Nebraska)

Single $58 Double $68

NOTE: Participants employed at a state-supported institution should so indicate and show an I.D. to obtain the following rates:

Single $39 Double $49

Lincoln Hilton
141 North 9th Street, Lincoln 68508
Telephone: 402-475-4011 or 800-HILTONS
Single $34 Double $44

Food Service

A list of restaurants, grocery stores, and bakeries will be available at the meeting registration desk.

Travel

The University of Nebraska campus is four miles from the Lincoln Airport, which is served by Air Midwest, America West, Continental, Eastern, Northwest, TWA, and United Airlines. Although several car rental agencies have counters at the airport terminal, the three hotels listed above provide complimentary limousine service for their guests and can be summoned by the courtesy telephones in the terminal. It is also possible to fly to Omaha, rent a car, and drive the 55-mile distance to Lincoln. In addition to the airlines mentioned above, Omaha Airport is served by Air Wisconsin, American, Braniff, Delta, and Midway Airlines.

Lincoln is also served by AMTRAK trains, as well as Greyhound and Trailways Bus Lines, each of which has terminals near the campus.

Participants traveling by car may reach Lincoln via Interstate Route 80 from the east and west, or via U.S. Route 77 from the north or south. Either I-180 or "O" Street lead to downtown Lincoln and the campus.

Parking

Free parking will be available on campus during the meeting; however, participants should avoid reserved spaces and the lot by the Sheldon Art Gallery (marked "SGL"). Anyone arriving before 2:30 p.m. on Friday should obtain a free parking permit from Rhonda Bordeaux in the Mathematics and Statistics Department. The telephone number to call is 402-472-3731.

Robert M. Fossum
Urbana, Illinois Associate Secretary

Los Angeles, November 14–15, University of California, Los Angeles

Second Announcement of the 838th Meeting

The eight hundred and thirty-eighth meeting of the American Mathematical Society will be held at the University of California on Saturday and Sunday, November 14–15, 1987. This meeting will be held in conjunction with the Southern California section of the Mathematical Association of America. All sessions will take place in the Mathematical Sciences Building.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Far Western Sectional Meetings, there will be five invited one-hour addresses including:

BJORN ENQUIST, University of California, Los Angeles, *Computation of oscillatory solutions to hyperbolic differential equations.*

HENRYK HECHT, University of Utah, title to be announced.

PAUL C. YANG, University of Southern California, title to be announced.

Special Sessions

By invitation of the same committee, there will be five special sessions of selected twenty-minute papers. The topics of the sessions, and the names and affiliations of the organizers, are as follows:

Differential geometry, ROBERT GREENE, University of California, Los Angeles, S.-Y. CHENG, University of California, Los Angeles, and H.-Y. CHOI, University of Utah.

Geometric methods in representation theory, HENRYK HECHT.

Game theory, WILLIAM LUCAS, Claremont Graduate School.

Stochastic processes, SIDNEY PORT, University of California, Los Angeles, and RUTH WILLIAMS, University of California, San Diego.

Geometric topology, JOHN WALSH, University of California, Riverside.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone submitting an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract form and submit it **by July 28, 1987**, three weeks before the deadline for contributed papers, in order that it may be considered for inclusion. Participants are reminded that a charge of $16 is imposed for retyping abstracts that are not in camera-ready form.

Contributed Papers

There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in the Departments of Mathematics. Abstracts should be sent to the Editorial Department, American Mathematical Society, P. O. Box 6248, Providence, RI 02940, so as to arrive **before the August 18, 1987**, abstract deadline. Participants are reminded that a charge of $16 is imposed for retyping abstracts that are not in camera-ready form. It appears unlikely that late papers can be accommodated.

MAA Program

The MAA program will take place on Saturday and will include a luncheon. Additional information will be included in the October issue of *Notices*.

Joint Invited Addresses

By invitation of the Committee to Select Hour Speakers for Far Western Sectional Meetings, and the Mathematical Association of America, there will be a joint invited address as follows:

THEODORE E. HARRIS, University of Southern California, title to be announced.

Registration

The meeting registration desk will be located in the Faculty Lounge in the Mathematical Sciences Building. The desk will be open from 8:00 a.m. until 4:00 p.m. on Saturday, and from 8:30 a.m. to noon on Sunday. The registration fees are $10 for members of the AMS or MAA, $16 for nonmembers, and $5 for students or unemployed mathematicians.

Petition Table

A petition table will be set up in the registration area. Additional information can be found in a box in the Salt Lake City meeting announcement on page 526 of the April issue of *Notices*.

Accommodations

Blocks of rooms are being held at the following locations. Participants should make their own arrangements directly with the hotel of their choice and be sure to mention the joint AMS-MAA meeting at UCLA. Note that the rates do not include applicable taxes. The Claremont and Royal Palace hotels are located in Westwood Village within walking distance, adjacent to the south side of campus. The UCLA Guest House is on the campus.

Claremont Hotel
1044 Tiverton Avenue, Westwood 90024
Telephone: 213-208-5957
Single $33.50 Double $39.50

Royal Palace Westwood
1052 Tiverton Avenue, Westwood 90024

Telephone: 213-208-6677 or
800-248-6955 (California)
800-631-0100 (Outside California)
Single $49, 56, 62, 65, 75
Double $55, 62, 68, 71, 81

UCLA Guest House
(on UCLA campus)
Telephone: 213-825-2923

Standard room	$57 single or double
Parlor room	$55 single or double
Suite	$78 2 queen-size beds (sleeps up to 4 people)

Tax is included in rates.

Food Service

Information will be provided at the meeting registration desk regarding availability of food service within walking distance.

Travel

The UCLA campus is located approximately 12 miles north of Los Angeles International Airport (LAX), which is served by all of the major airlines. The taxi fare from the airport to the UCLA campus is approximately $20 plus tip. There is no extra charge for additional passengers going to the same destination. The Super Shuttle, which provides door-to-door service, can be summoned by dialing number 35 from the courtesy phones in the baggage claim area. The bus should arrive within 15 minutes; the fare is $15 for one passenger and $6 for each additional person, plus tip. For information or advance reservations call 213-777-8000.

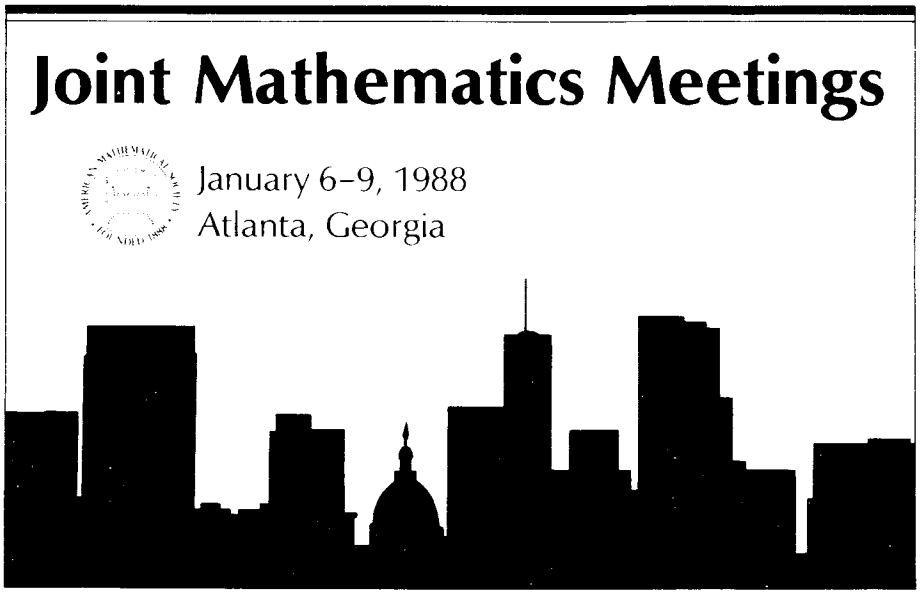
The most economical transportation is via public bus from the LAX Transit Center at 96th Street and Vicksburg Avenue (1/4 mile northeast of the main airport exit). To reach the Transit Center from the terminal, wait next to the lower level roadway under a SHUTTLE BUS sign, which lists buses as A, B, C, etc. Board the free C or Lot C bus and exit the airport, getting off at its first stop outside of the airport just after it enters Parking Lot C. Walk 100 yards east to the LAX Transit Center. The fastest and most frequent service to UCLA is by the RTD #560 bus, which takes approximately 30 minutes to reach the campus and costs $1.20. (NOTE: exact change in **coins** is required: no bills accepted!). Direct service to UCLA is also available Monday through Friday on the Culver City #6 bus, which takes approximately 50 minutes: the fare is 50 cents. All buses approach the campus from the south, up Westwood Boulevard, turning right (east) at LeConte Avenue. Exit the bus at that corner and walk north up Westwood to the Mathematical Sciences Building (Boelter Hall, approximately 3/4 mile on the right, beyond parking structure #9.) Participants planning to stay at the UCLA Guest House should stay on the bus to end of the line.

Parking

Permits costing $3 per day are required for any cars parking on campus between the hours of 7:00 a.m. and 9:00 p.m. daily, and may be obtained at any of the several parking kiosks around the campus. Visitors with permits from other University of California campuses may use these to park at UCLA, but must check in at a kiosk. The parking area closest to the Mathematical Sciences Building is Structure #9 on Westwood Boulevard; its kiosk is in the center of the Boulevard.

Hugo Rossi
Associate Secretary

Salt Lake City, Utah



Invited Speakers and Special Sessions

Invited Speakers at AMS Meetings

The individuals listed below have accepted invitations to address the Society at the times and places indicated. For some meetings, the list of speakers is incomplete.

Lincoln, October 1987

Carolyn S. Gordon
David Griffeath
David W. Masser
Dan Voiculescu

Los Angeles, November 1987

Bjorn Enquist
Theodore E. Harris (AMS-MAA)
Henryk Hecht
Paul Yang

Atlanta, January 1988

Constantine M. Dafermos
R. Mark Goresky
Philip J. Hanlon
H. W. Lenstra, Jr.
Dusa McDuff
Roger D. Nussbaum
David P. Ruelle (Gibbs Lecturer)
Peter Clive Sarnak
Stephen W. Semmes

AMS Centennial Celebration Providence, August 1988

Michael Aschbacher
Luis A. Caffarelli
Persi Diaconis
Charles L. Fefferman
Michael H. Freedman
Harvey M. Friedman
Benedict H. Gross
Joseph Harris
Roger E. Howe
Vaughan F. R. Jones
Andrew Majda
Charles S. Peskin
Dennis P. Sullivan
Robert E. Tarjan
William P. Thurston
Karen Uhlenbeck
Edward Witten

Organizers and Topics of Special Sessions

The list below contains all the information about Special Sessions at meetings of the Society available at the time this issue of *Notices* went to the printer. The section below entitled **Information for Organizers** describes the timetable for announcing the existence of Special Sessions.

October 1987 Meeting in Lincoln

Central Section
Deadline for organizers: Expired
Deadline for consideration: July 27, 1987

Frank Gilfeather, *Operator algebras and operator theory*

Carolyn Gordon and Quo-Shin Chi, *Transformation groups in geometry*

Erica Jen, *Cellular automata and nonlinear dynamics*

Spyros D. Magliveras, Earl Kramer, and Dale Mesner, *Finite geometries and combinatorial design*

John C. Meakin and Stuart W. Margolis, *Semigroups and connections with automata and formal language*

Robert Tubbs, *Diophantine problems*

Roger Wiegand and Brian Harbourne, *Commutative algebra and algebraic geometry*

November 1987 Meeting in Los Angeles

Far Western Section
Deadline for organizers: Expired
Deadline for consideration: July 28, 1987

S.-Y. Cheng, H.-Y. Choi, and Robert Greene, *Differential geometry*

Henryk Hecht, *Geometric methods in representation theory*

William Lucas, *Game theory*

Sidney Port and Ruth Williams, *Stochastic processes*

John Walsh, *Geometric topology*

Fall 1987 Meeting

Eastern Section
No meeting will be held

Fall 1987 Meeting

Southeastern Section
No meeting will be held

January 1988 Meeting in Atlanta

Associate Secretary: W. Wistar Comfort
Deadline for organizers: Expired
Deadline for consideration: September 17

Marlow Anderson and Todd Feil, *Ordered algebraic systems*

Alfred D. Andrew and John H. Elton, *Banach space theory*

Jean Bevis, George Davis, Frank Hall, Fred A. Massey, and Valerie Miller, *Modern trends in matrix analysis and applications*

Jack B. Brown and R. Daniel Mauldin, *Measure theory and descriptive set theory*

Shui-nee Chow and Roger D. Nussbaum, *Nonlinear differential delay equations*

Lewis A. Coburn, *Toeplitz operators and geometry*

Gary Cornell and H. W. Lenstra, Jr., *Algebraic number theory and algorithms*

Saber Elaydi, *Stability of differential and integro-differential equations*

Herbert Freedman and Paul Waltman, *Applications of differential equations to population ecology*

Robert B. Gardner and Clyde Martin, *Geometry of nonlinear control systems*

Ronald Gould and Michael S. Jacobson, *Graph theory*
Johnny Henderson and R. A. Zalik, *Total positivity and applications*
Paul Hill, *Abelian groups*
Theodore P. Hill and Robert Kertz, *Discrete-time optimal stopping theory*
Stephen R. Mahaney, *Structural complexity theory*
Lynn McLinden and Jay S. Treiman, *Optimization*
A. G. Ramm, *Multidimensional inverse problems, related problems in analysis and applications*
Dennis Stanton, *Combinatorics and group representations*

March 1988 Meeting in East Lansing

Central Section
Deadline for organizers: September 15, 1987
Deadline for consideration: To be announced

August 1988 AMS Centennial Celebration in Providence

There will be no Special Sessions.

Information for Organizers

Special Sessions at Annual and Summer Meetings are held under the general supervision of the Program Committee. They are administered by the Associate Secretary in charge of the meeting with staff assistance from the Society office in Providence.

Some Special Sessions arise from an invitation to a proposed organizer issued through the Associate Secretary. Others are spontaneously proposed by interested organizers or participants. Such proposals are welcomed by the Associate Secretaries.

The number of Special Sessions at a Summer or Annual Meeting is limited to twelve. Proposals, invited or offered, that are received at least nine months prior to the meeting are screened for suitability of the topic and of the proposed list of speakers, and for possible overlap or conflict with other proposals. (Specific deadlines for requesting approval for Special Sessions at national meetings are given above.) If necessary, the numerical limitation is enforced.

Proposals for Special Sessions should be submitted directly to the Associate Secretary in charge of the meeting (at the address given in the accompanying box). If such proposals are sent to the Providence office, addressed to *Notices*, or directed to anyone other than the Associate Secretary, they will have to be forwarded and may not be received before the quota is filled.

In accordance with an action of the Executive Committee of the Council, no Special Session may be arranged so late that it may not be announced in *Notices* early enough to allow any member of the Society who wishes to do so to submit an abstract for consideration for presentation in the Special Session before the deadline for such consideration.

Special Sessions are effective at Sectional Meetings and can usually be accommodated. They are arranged by the Associate Secretary under the supervision of the Committee to Select Hour Speakers for the section. The limitation on the number of sessions depends on the space and time available. The same restriction as for national meetings applies to the deadline for announcing Special Sessions at sectional meetings: no Special Session may be approved too late for its announcement to appear in time to allow a reasonable interval for members to prepare and submit their abstracts prior to the special early deadline set for consideration of papers for Special Sessions.

The Society reserves the right of first refusal for the publication of proceedings of any special session. These proceedings appear in the book series *Contemporary Mathematics*.

Information for Speakers

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 in Providence prior to the special early deadline announced above and in the announcements of the meeting at which the Special Session has been scheduled. Contributors should know that there is a limitation in size of a single special session, so that it is sometimes true that all places are filled by invitation. Papers not accepted for a Special Session are considered as ten-minute contributed papers.

Abstracts of papers submitted for consideration for presentation at a Special Session must be received by the Providence office (Editorial Department, American Mathematical Society, P. O. Box 6248, Providence, RI 02940) by the special deadline for Special Sessions, which is usually three weeks earlier than the deadline for contributed papers for the same meeting. 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.

Send Proposals for Special Sessions to the Associate Secretaries

The programs of sectional meetings are arranged by the Associate Secretary for the section in question:

Far Western Section (Pacific and Mountain)

Hugo Rossi, Associate Secretary
Department of Mathematics
University of Utah
Salt Lake City, UT 84112
(Telephone 801-581-8159)

Central Section

Robert M. Fossum, Associate Secretary
Department of Mathematics
University of Illinois
1409 West Green Street
Urbana, IL 61801
(Telephone 217-333-3975)

Eastern Section

W. Wistar Comfort, Associate Secretary
Department of Mathematics
Wesleyan University
Middletown, CT 06457
(Telephone 203-347-9411)

Southeastern Section

Frank T. Birtel, Associate Secretary
Department of Mathematics
Tulane University
New Orleans, LA 70118
(Telephone 504-865-5646)

As a general rule, members who anticipate organizing Special Sessions at AMS meetings are advised to seek approval at least nine months prior to the scheduled date of the meeting. No Special Sessions can be approved too late to provide adequate advance notice to members who wish to participate.

COMBINATORICS AND ORDERED SETS
Ivan Rival, Editor
(Contemporary Mathematics, Volume 57)

For the mathematician interested in discrete mathematics, from the senior undergraduate to the professional level, this volume provides first-rate surveys of the important combinatorics themes in ordered sets.

These expository lectures, given at a 1985 Joint Summer Research Conference, cover a wide range of topics, which include: the three-machine problem to illustrate the order-theoretic aspects of scheduling theory; the techniques used in settling the "matching conjecture"; the decomposition of ordered sets into few chains; the reorientation of graphs; the varied occurrences of the meet-distribution property; surveys techniques used in settling binary sorting problems; the formulation of a general view point for retraction; the survey of cutsets; and the role played by subdiagrams in ordered sets.

1980 *Mathematics Subject Classifications*: 06, 05
ISBN 0-8218-5051-2, LC 86-8006, ISSN 0271-4132
304 pages (softcover), 1986
List price $29, Institutional member $23, Individual member $17
Code CONM/57NA

Shipping/Handling: 1st book $2, each add'l $1, $25 max. By air, 1st book $5, each add'l $3, $100 max. Prepayment required. Order from AMS, P.O. Box 1571, Annex Station, Providence, RI 02901-9930, or call 800-556-7774 to use VISA or MasterCard.

NOETHERIAN RINGS AND THEIR APPLICATIONS

Lance W. Small, Editor
(Mathematical Surveys and Monographs, Volume 24)

Researchers in ring theory or allied topics, such as the representation theory of finite dimensional Lie algebras, will appreciate this collection of expository lectures on recent advances in ring theory and their applications to other areas. Five of the lectures were delivered at a conference on Noetherian rings at the Mathematisches Forschungsinstitut, Oberwolfach, in January 1983, and the sixth was delivered at a London Mathematical Society Durham conference in July 1983. The study of the prime and primitive ideal spectra of various classes of rings forms a common theme in the lectures, and they touch on such topics as the structure of group rings of polycyclic-by-finite groups, localization in noncommutative rings, and rings of differential operators. The lectures require the background of an advanced graduate student in ring theory and may be used in seminars in ring theory at this level.

Contents

J. T. Stafford, *The Goldie rank of a module*

Daniel R. Farkas, *Noetherian group rings: An exercise in creating folklore and intuition*

J. C. Jantzen, *Primitive ideals in the enveloping algebra of a semisimple Lie algebra*

Thomas J. Enright, *Representation theory of semisimple Lie algebras*

Jan-Erik Björk, *Filtered Noetherian rings*

R. Rentschler, *Primitive ideals in enveloping algebras*

1980 *Mathematics Subject Classifications*: 16A33, 16A03, 16A08, 17B35, 17B10, 20C07
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Call For Topics For 1989 Conferences

Suggestions are invited from mathematicians, either singly or in groups, for topics of the various conferences that will be organized by the Society in 1989. The deadlines for receipt of these suggestions, as well as some relevant information about each of the conferences, are outlined below. An application form to be used when submitting suggested topic(s) for any of these conferences (except the Short Course Series) may be obtained by writing to the Meetings Department, American Mathematical Society, P.O. Box 6248, Providence, RI 02940, or telephoning 401-272-9500.

Individuals willing to serve as organizers should be aware that the professional meeting staff in the Society's Providence office will provide full support and assistance before, during, and after each of these conferences. Organizers should also note that for all conferences, except Summer Research Conferences, it is required that the proceedings be published by the Society, and that proceedings of Summer Research Conferences are frequently published. A member of the Organizing Committee must be willing to serve as editor of the proceedings.

All suggestions must include (1) the names and affiliations of proposed members and chairman of the Organizing Committee; (2) a two- or three-page detailed outline of the subject(s) to be covered, including the importance, timeliness of the topic, and estimated attendance; (3) a list of the recent conferences in the same or closely related areas; (4) a tentative list of names and affiliations of the proposed principal speakers; (5) a list of likely candidates who would be invited to participate and their current affiliations; and (6) any other observations which may affect the size of the conference and the amount of support required. Any suggestions as to sites and dates should be made as early as possible in order to allow adequate time for planning. By action of the AMS Board of Trustees, the Meetings Department of the Society is responsible for the final selection of the site for each conference and for all negotiations with the host institution. Individuals submitting suggestions for the conferences listed below are requested to recommend sites or geographic areas which would assist the Meetings Department in their search for an appropriate site. In the case of Joint Summer Research Conferences in the Mathematical Sciences, a one-, two-, or three-week conference may be proposed.

Refer to the accompanying box titled **Topics of Current and Recent Conferences** for lists of topics.

Topics of Current and Recent Conferences

AMS Summer Institute

1985 – *Algebraic geometry*, organized by DAVID EISENBUD of Brandeis University.

1986 – *Representations of finite groups and related topics*, organized by JONATHAN L. ALPERIN of the University of Chicago.

1987 – *Theta functions*, organized by LEON EHRENPREIS of Yeshiva University and ROBERT GUNNING of Princeton University.

1988 – *Operator theory/Operator algebras and applications*, organized by WILLIAM B. ARVESON of University of California, Berkeley, and RONALD G. DOUGLAS of State University of New York at Stony Brook.

AMS-SIAM Symposium on Some Mathematical Questions in Biology

1985 – *Plant biology*, organized by ROBERT M. MIURA of the University of British Columbia.

1986 – *Modeling circadian rhythms*, organized by GAIL A. CARPENTER of Northeastern University.

1987 – *Models in population biology*, organized by ALAN HASTINGS of the University of California, Davis.

1988 – *Dynamics of excitable media*, organized by HANS G. OTHMER of the University of Utah.

AMS-SIAM Summer Seminar

1984 – *Nonlinear systems of PDE in applied mathematics*, organized by BASIL NICOLAENKO of Los Alamos National Laboratories.

1985 – *Reacting flows: Combustion and chemical reactors*, organized by G.S.S. LUDFORD of Cornell University.

1987 – *Computational Aspects of VLSI Design with an Emphasis on Semiconductor Device Simulation*, organized by RANDOLPH BANK of the University of California, San Diego.

1988 – *Computational solution of nonlinear systems of equations*, organized by EUGENE ALLGOWER of Colorado State University.

1989 AMS Summer Institute

Summer institutes are intended to provide an understandable presentation of the state of the art in an active field of research in pure mathematics and usually extend over a three-week period. Dates for a summer institute must not overlap those of the Society's summer meeting, which at the time of this printing have not yet been determined. There should be a period of at least one week between them. Proceedings are published by the Society as volumes in the series *Proceedings of Symposia in Pure Mathematics.*

Deadline For Suggestions: August 15, 1987

1989 AMS-SIAM Summer Seminar

The goal of the summer seminar is to provide an environment and program in applied mathematics in which experts can exchange the latest ideas and newcomers can learn about the field. Proceedings are published by the Society as volumes in the series *Lectures in Applied Mathematics.*

Deadline For Suggestions: August 15, 1987

1989 Joint AMS-IMS-SIAM Summer Research Conferences in the Mathematical Sciences

These conferences are similar in structure to those held at Oberwolfach and represent diverse areas of mathematical activity, with emphasis on areas currently especially active. Careful attention is paid to subjects in which there is important interdisciplinary activity at present. Topics for the sixth series of one-week conferences, being held in 1987, are *Categories in computer science and logic, Hamiltonian dynamical systems, Graphs and algorithms, Geometry of group representations, The connection between infinite dimensional and finite dimensional dynamical systems, Geometry of random motion, Crystal growth and pattern formation in phase transitions, Complex analytic dynamics,* and *Statistical inference from stochastic processes.* If proceedings are published by the Society, they will appear as volumes in the series *Contemporary Mathematics.*

Deadline For Suggestions: February 1, 1988

Call for Topics for 1989 AMS Short Course Series

The AMS Short Courses consist of a series of introductory survey lectures and discussions ordinarily extending over a period of one and one-half days starting immediately prior to the Joint Mathematics Meetings held in January and August each year. Each theme is a specific area of applied mathematics or mathematics used in the study of a specific subject or collection of problems in one of the physical, biological, or social sciences, technology, or business. Topics in recent years have been *Moments in Mathematics* (January 1987), *Approximation Theory* (January 1986), *Actuarial Mathematics* (August 1985), *Fair Allocation* (January 1985), *Environmental and Natural Resource Mathematics* (August 1984). Proceedings are published by the Society as volumes in the series *Proceedings of Symposia in Applied Mathematics,* with the approval of the Editorial Committee.

Deadline for Suggestions: Suggestions for the January 1989 course should have been submitted by July 1, 1987; suggestions for the August 1989 course should be submitted by December 1, 1987.

Submit suggestions to: Professor Stefan A. Burr, Chairman, AMS Short Course Subcommittee, Department of Computer Sciences, CUNY, City College, New York, NY 10031.

HANDLEBODY DECOMPOSITIONS OF COMPLEX SURFACES

John Harer, Arnold Kas, and Robion Kirby

This book gives handlebody descriptions of the elliptic surfaces over $\mathbf{P}^1$, including the Kümmer surface. The authors derive handlebody decompositions of the surfaces obtained by performing logarithmic transforms to these elliptic surfaces. They pay special attention to the Dolgachev surfaces $D(p, q)$.

1980 *Mathematics Subject Classifications*: 57, 14
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Special Meetings

THIS SECTION contains announcements of meetings of interest to some segment of the mathematical public, including *ad hoc*, local, or regional meetings, and meetings or symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. Information on meetings of the Society, and on meetings sponsored by the Society, will be found both in this section and on the inside front cover. All meetings listed here, to the best of our knowledge, are open meetings and the public is invited to attend.

AN ANNOUNCEMENT will be published in *Notices* if it contains the place, date, and the subject (when applicable); a second full announcement will be published only if there are changes or necessary additional information. Once an announcement has appeared, the event will be briefly noted in each issue until it has been held and a reference will be given in parentheses to the month, year, and page of the issue in which the complete information appeared.

IN GENERAL, announcements of meetings held in North America carry only date, title of meeting, place of meeting, names of speakers (or sometimes a general statement on the program), deadlines for abstracts or contributed papers, and source of further information. Meetings held outside the North American area may carry more detailed information. In any case, if there is any application deadline with respect to participation in the meeting, this fact should be noted. All communications on special meetings should be sent to the Editor of *Notices*, care of the American Mathematical Society in Providence.

DEADLINES for entries in this section are listed on the inside front cover of each issue. In order to allow participants to arrange their travel plans, organizers of meetings are urged to submit information for these listings early enough to allow them to appear in more than one issue of *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.

1986–1987. **Special Year in Combinatorics and Complexity**, University of Illinois at Chicago, Chicago, Illinois. (April 1987, p. 548)

1986–1987. **Special Year in Modern Analysis**, University of Illinois at Urbana-Champaign, Urbana, Illinois. (October 1986, p. 840)

1987–1988. **Academic Year Devoted to Several Complex Variables**, Mittag-Leffler Institute, Djursholm, Sweden. (January 1987, p. 131)

October 12, 1986–December 13, 1987. **Mathematisches Forschungsinstitut Oberwolfach** (Weekly Conferences), Federal Republic of Germany. (October 1986, p. 840)

September 14, 1987–June 25, 1988. **Program on Applied Combinatorics**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota. (April 1987, p. 548)

January–July 1988. **Symposium on Representation Theory and Group Theory**, Manchester, England. (April 1987, p. 548)

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JULY 1987

10–11. **Logic and Linguistics Conference**, Stanford University, Stanford, California. (January 1987, p. 134)

12–16. **Seventh Inter-American Conference on Mathematics Education**, Santo Domingo, Dominican Republic.
Information: VII CIAEM, Centro de Investigaciones, Universidad Católica Madre y Maestra, Apdo. Postal 822, Santiago de los Caballeros, Dominican Republic.

13–17. **Automata, Languages, and Programming**, Karlsruhe, Federal Republic of Germany. (August 1986, p. 654)

13–17. **Eleventh British Combinatorial Conference**, London, United Kingdom. (November 1986, p. 962)

13–17. **Inequalities: Fifty Years on From Hardy, Littlewood and Polya**, University of Birmingham, Birmingham, England. (October 1986, p. 844)

13–17. **National Science Foundation-Conference Board of the Mathematical Sciences Regional Conference on Group Actions on Manifolds**, Virginia Polytechnic Institute and State University, Blacksburg, Virginia. (April 1987, p. 551)

13–17. **Sixth National Conference on Artificial Intelligence**, Seattle, Washington. (February 1987, p. 362)

13–23. **Group Actions on Manifolds**, Virginia Polytechnic Institute and State University, Blacksburg, Virginia. (February 1987, p. 362)

14–24. **Durham Symposium on Representation Theory of Algebraic Groups and Related Finite Groups**, Durham, England. (June 1987, p. 682)

19–24. **Conference on Potential Theory**, Charles University, Prague, Czechoslovakia. (June 1986, p. 560)

19–August 15. **Joint Summer Research Conference in the Mathematical Sciences**, Cornell University, Ithaca, New York.
Information: Carole Kohanski, American Mathematical Society, Meetings Department, Post Office Box 6248, Providence, Rhode Island 02940.

20–24. **Workshop on Topological Markov Shifts and Related Systems**, Heidelberg, Federal Republic of Germany. (April 1987, p. 551)

20–25. **1987 European Summer Meeting of the ASL, Logic Colloquium 1987**, University of Granada, Spain. (April 1987, p. 551)

20–25. **Second International Congress of the International Fuzzy Systems Association**, Tokyo, Japan. (June 1987, p. 682)

20–25. **United States - United Kingdom Joint Seminar on Operator Algebras**, Coventry, England. (April 1987, p. 551)

27–29. **SLU-GTE Conference on Commutative Harmonic Analysis**, Saint Lawrence University, Canton, New York. (April 1987, p. 551)

27–31. **International Symposium on Information and Coding Theory**, State University of Campinas, Campinas, Brazil. (January 1987, p. 134)

27–August 1. **Second Siegen Topology Symposium**, Siegen, Federal Republic of Germany. (February 1987, p. 362)

27–August 8. **K-theory and its Applications**, Ibadan, Nigeria. (February 1987, p. 362)

31–August 3. **Boston Workshop for Mathematics Faculty**, Wellesley College, Wellesley, Massachusetts. (January 1987, p. 134)

1–5. **Symposium on Dependence in Statistics and Probability**, Laurel Highlands, Pennsylvania. (June 1987, p. 682)

1–6. **Fifth Conference on Graph Theory of China**, People's Republic of China. (August 1986, p. 654)

3–7. **Georgia Topology Conference**, University of Georgia, Athens, Georgia. (January 1987, p. 134)

3–7. **Second Howard University Symposium on Nonlinear Semigroups, Partial Differential Equations, and Attractors**, Howard University, Washington, District of Columbia. (February 1987, p. 362)

3–21. **Mathematical and Statistical Developments of Evolutionary Theory**, Université de Montréal, Montréal, Canada. (January 1987, p. 134)

3–28. **Four-week Program on Robotics**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota. (February 1987, p. 362)

4–7. **Sixth International Conference on Mathematical Modelling: An Interdisciplinary Integrative Forum for Researchers and Educators in Engineering, Economics, Biological, Medical, Environmental, Social and other Sciences**, Washington University, St. Louis, Missouri. (February 1987, p. 362)

4–8. **National Science Foundation-Conference Board of the Mathematical Sciences Regional Conference on Algorithms**, Colorado College, Colorado Springs, Colorado. (April 1987, p. 552)

5–7. **Workshop on Generic Families of Vector Fields**, Montreal, Canada. (February 1987, p. 362)

5–8. **Joint Mathematics Meetings**, Salt Lake City, Utah.
Information: For further details, see the Meetings section of this issue of *Notices*.

6–9. **Sixth Annual Summer Conference, Extending the Human Mind: Computers in Education**, University of Oregon, Eugene, Oregon. (June 1987, p. 683)

9–15. **International Conference on Abelian Groups**, Perth, Western Australia. (June 1986, p. 560)

9–15. **Statistical Inference from Stochastic Processes**, Ithaca, New York. (June 1987, p. 683)

9–22. **Harmonic Analysis on Real and p-adic Groups**, Bowdoin College, Brunswick, Maine. (This conference has been postponed. For further details, see the announcement for August 14–27, 1988, in this section of Special Meetings.)

10–13. **Sixth International Conference on Mathematical Modelling**, Washington University, Saint Louis, Missouri. (February 1987, p. 362)

10–14. **National Science Foundation-Conference Board of the Mathematical Sciences Regional Conference on Methods of Equivalence and Applications to Control Systems**, Texas Tech University, Lubbock, Texas. (April 1987, p. 552)

10–14. **National Science Foundation-Conference Board of the Mathematical Sciences Regional Conference on Theory and Applications of Multivariate Splines**, Howard University, Washington, District of Columbia. (April 1987, p. 551)

10–21. **Set Theory and its Applications–Conference at York**, York University, Toronto, Canada. (January 1987, p. 134)

16–21. **Sixteenth Conference on Stochastic Processes and their Applications**, Stanford University, Stanford, California. (August 1986, p. 654)

16–22. **Twenty-fifth International Symposium on Functional Equations**, Hamburg, Federal Republic of Germany. (February 1987, p. 362)

17–20. **International Conference on Computational Techniques and Applications**, Sydney, Australia. (February 1987, p. 362)

17–20. **International Conference on Rings, Modules, and Radicals**, Hobart, Tasmania. (June 1986, p. 560)

17–20. **1987 Joint Statistical Meetings**, San Francisco, California. (April 1987, p. 552)

17–21. **Second International Colloquium on Group Theory**, Debrecen, Hungary. (June 1987, p. 683)

17–22. **Eighth International Congress of Logic, Methodology and Philosophy of Science**, Moscow, Union of Soviet Socialist Republics. (January 1987, p. 134)

17–28. **TEX Users Group's Annual Conference**, University of Washington, Seattle, Washington.
Program: The meeting will focus on many topics of current concern to the TEX community, and there will be sessions on issues of implementation, hardware and software support, exhibits of the latest TEX products, software and output devices, and more.
Information: TEX Users Group, Post Office Box 9506, Providence, Rhode Island 02940, 401-272-9500, extension 323.

18–21. **Third Conference on Numerical Methods and Approximation Theory**, University of Niš, Niš, Yugoslavia. (January 1987, p. 135)

22–29. **Workshop on Lie Algebras of Prime Characteristic**, University of Wisconsin, Madison, Wisconsin. (June 1987, p. 683)

24–28. **Conference on Differential Equations "Equadiff '87"**, Democritus University of Thrace, Greece. (January 1986, p. 134)

24–28. **International Conference on Web Geometry and Related Fields**, Szeged University, Szeged, Hungary. (June 1986, p. 560)

24–28. **Second International Conference on Combinatorial Mathematics and Computing**, Canberra, Australia. (March 1986, p. 370)

24–28. **Seventeenth European Meeting of Statisticians**, Thessaloniki, Greece. (June 1987, p. 683)

24–28. **Sixth National Conference on Artificial Intelligence**, Seattle, Washington. (March 1986, p. 370)

24–29. **Meeting on Geometry of Banach Spaces**, Mons, Belgium. (August 1986, p. 655)

24–30. **Ottawa-Moosonee Workshop in Algebra**, Carleton University, Ottawa, and Polar Bear Lodge, Moosonee, Canada.
Invited Speakers: B. Parshall, L. Scott, J. Patera, C. Ringel, and W. Schelter.
Program: The program will include four series of lectures by the invited speakers, additional lectures, as well as seminars and discussions, which will be organized during the meeting.
Information: V. Dlab, Carleton University, Department of Mathematics and Statistics, Ottawa, Canada K1S 5B6, 613-564-7132 or 613-564-5500.

26–29. **Second Pan Pacific Computer Conference on Information Technology: Emerging Opportunities and Challenges**, Singapore, Republic of Singapore. (June 1987, p. 683)

27–29. **Conference on Recent Developments in Statistics and Their Applications**, Seoul, Korea. (April 1987, p. 552)

31–September 2. **Joint Sino-American Statistical Meeting**, Beijing, China. (June 1987, p. 683)

31–September 4. **First International Conference on Statistical Data Analysis Based on the L_1-Norm and Related Methods**, University of Neuchâtel, Neuchâtel, Switzerland. (January 1987, p. 135)

31–September 6. **Workshop on Artificial Intelligence for Natural Sciences**, Torino, Italy. (June 1987, p. 683)

1–5. **Conference on Mathematical Quantum Field Theory and Related Topics**, Université de Montréal, Québec, Canada. (June 1987, p. 683)

3–5. **Satellite Meeting to the 46th Session of the International Statistical Institute**, Kyoto, Japan. (April 1987, p. 552)

7–9. **Summer Conference on Category Theory and Computer Science**, University of Edinburgh, Edinburgh, Scotland. (January 1987, p. 135)

7–11. **International Symposium on Harmonic Analysis**, Centre Universitaire de Luxembourg, Luxembourg. (February 1987, p. 363)

8–11. **Third International Conference on the Teaching of Mathematical Modelling and Applications**, University of Kassel, Kassel, Federal Republic of Germany. (January 1987, p. 135)

8–16. **Forty-sixth Biennial Session of the International Statistical Institute**, Tokyo, Japan. (June 1987, p. 684)

9–11. **Seventh Gesellschaft für Angewandte Mathematik und Mechanik Conference on Numerical Methods in Fluid Mechanics**, Louvain-la-Neuve, Belgium. (February 1987, p. 363)

9–11. **Twelfth Symposium on Operations Research**, University of Passau, Passau, Federal Republic of Germany. (February 1987, p. 363)

9–12. **Internationale Konferenz über Anwendungen und Modellbildung im Mathematikunterricht**, Kassel, Federal Republic of Germany. (June 1986, p. 560)

9–12. **Sixth Aachen Symposium on Signal Theory: Multidimensional Signals and Image Processing**, Aachen, Federal Republic of Germany. (February 1987, p. 363)

10–12. **Advances in Computational Modelling and Numerical Analysis**, University of Chicago, Chicago, Illinois. (February 1987, p. 363)

13–19. **Journées Arithmétiques 1987**, Ulm, Federal Republic of Germany. (June 1986, p. 560)

14–18. **National Science Foundation-Conference Board of the Mathematical Sciences Regional Conference on Fractal Geometry**, University of Cincinnati, Cincinnati, Ohio. (April 1987, p. 552)

14–18. **Workshop on Polyhedral Combinatorics and Geometric Complexity**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota. (February 1987, p. 363)

17–19. **International Association of Statistical Computing, First Satellite Meeting**, Tokyo, Japan.
Information: C. Hayashi, 23-11, Inokasira, 2-Tyome, Mitaka-Sei, Tokyo, Japan.

17–20. **Conference on Mathematics, Mechanics, and Astronomy**, Cambridge, England.
Information: D. Fletcher, Department of Mathematics, University College of Wales, Aberystwyth, Dyfed SY23 3BZ.

20–26. **DMV-Jahrestagung 1987**, Berlin, Federal Republic of Germany. (June 1986, p. 560)

21–24. **1987 Conference on Software Maintenance**, Austin, Texas. (June 1987, p. 684)

21–25. **European Congress on Simulation**, Prague, Czechoslovakia.
Information: V. Hamata, Institute of Computer Science, Czechoslovak Academy of Sciences, 182 07 Prague, Post Office Box 5, Czechoslovakia.

28–30. **International Conference on Linear Algebra and Applications**, Valencia, Spain. (June 1987, p. 684)

29–October 2. **Fifth International Symposium on Data Analysis and Informatics**, Versailles, France. (February 1987, p. 363)

October. **87 ICAR-International Conference on Advanced Robotics**, Paris or Nice, France. (August 1986, p. 655)

October. **Journées Méthodes Numériques en Méchanique des Fluides**, Sophia-Antipolis, France. (August 1986, p. 655)

5–9. **Tenth Conference on Probability and Statistics in Atmospheric Science**, Edmonton, Alberta, Canada. (June 1987, p. 684)

9–10. **Fifteenth Annual Mathematics and Statistics Conference**, Miami University, Oxford, Ohio. (April 1987, p. 553)

9–10. **Sixth Annual Midwest Statistics Conference**, University of Illinois, Urbana-Champaign, Illinois. (June 1987, p. 684)

9–10. **Thirteenth Annual Student Conference**, Miami University, Oxford, Ohio. (April 1987, p. 553)

10. **Tenth Conference on Probability and Statistics in Atmospheric Science**, Alberta, Canada. (April 1987, p. 553)

10–11. **Second Fall Foliage Topology Seminar**, Moosilauke Ravine Lodge, North Woodstock, New Hampshire.
Program: The seminar will consist of a limited number of invited addresses with time between talks for discussion.
Information: P. Latiolais, Department of Mathematics and Computer Science, Dartmouth College, Hanover, New Hampshire 03755.

12–15. **Society for Industrial and Applied Mathematics (SIAM) 35th Anniversary Meeting**, Denver, Colorado.
Themes: Inverse Scattering, Large Scale Modeling/Scientific Computing, Vector and Parallel Processing, Linear Algebra, Optimization, Robotics, Discrete Math, Multigrid Methods, and much more.
Meeting Organizers: H. Weinberger, D. Sattinger, and P. Olver, University of Minneapolis.
Information: SIAM Conference Coordinator, 1400 Architects Building, 117 South 17th Street, Philadelphia, Pennsylvania 19103-5052, 215-564-2929.

16–17. **Third Eastern Small College Computing Conference**, Marist College, Poughkeepsie, New York. (February 1987, p. 363)

19–23. **20th International Conference on the Application of Computers and Mathematics in the Mineral Industries**, Johannesburg, South Africa. (June 1987, p. 684)

19–23. **Workshop on Orderly Dispositions in Space**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota.
Organizers: B. Grunbaum and M. Senechal.
Information: A. Friedman, Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street Southeast, Minneapolis, Minnesota 55455.

20–22. **Fourth International Conference on Text Processing Systems (PROTEXT IV)**, Boston, Massachusetts. (June 1987, p. 684)

22–23. **31st Annual Fall Technical Conference**, Atlantic City, New Jersey.
Information: T. Murphy, ASQC-CPID, 33 Junard Drive, Morristown, New Jersey 07960, 201-365-6410; R. Hoerl, ASQC-SD, Hercules Incorporated Research Center, Wilmington, Delaware 19894, 302-995-3736; and Bob Perry, ASA-SPES, McDonnell Douglas Electronics Company, Post Office Box 426, Saint Charles, Missouri 63302, 314-925-4428.

23–24. **Combined Midwest-Southeast Differential Equations Conference**, Vanderbilt University, Nashville, Tennessee. (June 1987, p. 684)

23–24. **Ninth Midwest Probability Colloquium**, Northwestern University, Evanston, Illinois.
Invited Speakers: P. Diaconis (Harvard University), A. de Acosta (Case Western Reserve University), and K. Burdzy (Purdue University).

Information: M. Pinsky or M. Rubin, Mathematics Department, Northwestern University, Evanston, Illinois 60201, 312-491-5519.

25–28. **Joint National Meeting of the Operations Research Society of America and the Institute of Management Sciences**, Saint Louis, Missouri. (June 1987, p. 684)

25–31. **International Conference on Population Mathematics**, Schwerin, German Democratic Republic. (June 1987, p. 684)

26–28. **The Operations Research Society of America and The Institute of Management Sciences Joint National Meeting**, Saint Louis, Missouri.
Information: V. Sauter, School of Business, University of Missouri, 8001 Natural Bridge Road, Saint Louis, Missouri 63121-4499, 314-553-6281.

26–30. **Third Asian Conference in Mathematical Logic**, Beijing, China. (June 1987, p. 684)

26–31. **Mathematical Methods in Operations Research**, Sofia, Bulgaria. (January 1987, p. 135)

27–30. **Computer Communication for Developing Countries '87**, New Delhi, India. (June 1987, p. 684)

28–30. **Mathematical Approaches to Environmental and Ecological Problems**, Cornell University, Ithaca, New York.
Topics: Topics will include dynamical systems theory, spatial statistics, stochastic optimization, numerical methods, and their application to epidemiology, pest management, fisheries management, and other ecological issues.
Information: D. Pendell, Center for Applied Mathematics, 305 Sage Hall, Cornell University, Ithaca, New York 14853-6201, 607-255-4335.

30–November 1. **837th Meeting of the AMS**, Lincoln, Nebraska. (April 1987, p. 553)
Information: For further details, see the Meetings section of this issue of *Notices*.

NOVEMBER 1987

1–6. **Conference on Combinatorics, Algorithms, and Coding Theory**, Taipei, Taiwan, Republic of China.
Invited Speakers: J. Bermond, G. Cohen, M. Deza, P. Frankl, M. Las Vergnas, and P. Rosenstiehl.
Call for papers: Send papers to the address below by September 1, 1987.
Information: K.-W. Lih, Institute of Mathematics, Academia Sinica, Taipei, Taiwan, Republic of China.

9–December 18. **College on Riemann Surfaces**, Trieste, Italy. (February 1987, p. 363)

14–15. **838th Meeting of the AMS**, Los Angeles, California. (April 1987, p. 553)
Information: For further details, see the Meetings section of this issue of *Notices*.

DECEMBER 1987

7–9. **42nd Annual Conference on Applied Statistics**, Newark, New Jersey.
Information: W. Young, Medical Research Division, American Cyanamid, Building 60, Room 203, Pearl River, New York 10965, 914-735-5000, extension 3224.

14–18. **Workshop on Applications of Combinatorics and Graph Theory to Computer Science**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota.
Organizers: G. Graham, L. Snyder, and R. Tarjan.
Information: A. Friedman, Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street Southeast, Minneapolis, Minnesota 55455.

22–24. **Eleventh National Systems Conference - 1987**, Kurukshetra, India. (April 1987, p. 553)

26–28. **Ramanujan Birth Centenary Year International Symposium on Analysis**, Pune, India. (June 1987, p. 685)

28–29. **1987-1988 Association for Symbolic Logic Annual Meeting**, New York City, New York.
Information: C. W. Henson, Association for Symbolic Logic Secretary-Treasurer, Department of Mathematics, University of Illinois, 1409 West Green Street, Urbana, Illinois 61801.

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JANUARY 1988

4–8. **Fifth Caribbean Conference in Combinatorics and Computing**, University of the West Indies, Cave Hill, Barbados. (June 1987, p. 685)

5–6. **1988 AMS Short Course: Computational Complexity Theory**, Atlanta, Georgia.
Information: Monica Foulkes, American Mathematical Society, Meetings Department, Post Office Box 6248, Providence, Rhode Island 02940.

6–8. **American Statistical Association Winter Conference: Statistics in Biotechnology**, San Antonio, Texas.
Information: American Statistical Association, 806 15th Street, Northwest, Washington, District of Columbia 20005, 202-393-3253.

6–9. **Joint Mathematics Meetings**, Atlanta, Georgia. (April 1987, p. 553)
Information: H. Daly, American Mathematical Society, Meetings Department, Post Office Box 6248, Providence, Rhode Island 02940.

11–15. **National Science Foundation-Conference Board of the Mathematical Sciences Regional Conference on Kaluza-Klein Theory**, University of New Mexico, Albuquerque, New Mexico. (April 1987, p. 553)

18–22. **Workshop on Application of Combinatorics and Graph Theory to the Biological and Social Sciences**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota.
Organizers: J. Cohen and F. Roberts
Information: A. Friedman, Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street Southeast, Minneapolis, Minnesota 55455.

20–February 5. **Twenty-eighth Summer Research Institute of the Australian Mathematical Society**, Shortland, Australia. (June 1987, p. 685)

FEBRUARY 1988

Symposium on Some Glimpses of Contemporary Mathematics (on the Occasion of the Centenary of the American Mathematical Society), Boston, Massachusetts.
Information: Betty Verducci, American Mathematical Society, Meetings Department, Post Office Box 6248, Providence, Rhode Island 02940. (Exact dates for this symposium are undetermined.)

7–11. **1988 Australian Applied Mathematics Conference**, Leura, Australia. (February 1987, p. 363)

8–12. **Workshop on Representations of p-adic Groups and Applications to Automorphic Forms**, Mathematical Sciences Research Institute, Berkeley, California.
Program: This workshop forms part of the Institute's yearlong 1987-1988 program on Representations of Lie Groups.
Organizing Committee: L. Clozel, P. Sally (chairman), and D. Shelstad.
Information: I. Kaplansky, Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720.

MARCH 1988

7–11. **Period of Concentration on q-Series and Partitions**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota.
Organizer: D. Stanton.
Information: A. Friedman, Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street Southeast, Minneapolis, Minnesota 55455.

14–18. **Second International Conference on Hyperbolic Problems**, Aachen, Federal Republic of Germany. (February 1987, p. 363)

16–18. **Twenty-first Annual Simulation Symposium**, Tampa, Florida.
Information: S. Witenhafer, Program Chairwoman, 848 Levitt Parkway, Rockledge, Florida 32955, 305-984-5711.

18–19. **AMS Central Sectional Meeting**, East Lansing, Michigan.
Information: John Balletto, American Mathematical Society, Meetings Department, Post Office Box 6248, Providence, Rhode Island 02940.

21–25. **International Conference on Theory and Applications of Differential Equations**, Ohio University, Athens, Ohio.
Objectives: To bring together experts from various branches in the field of differential equations for the purpose of exchanging information and viewpoints relevant to theory and applications. Topics stressed will be Ordinary differential equations in the real and complex domain, Functional differential equations, Partial differential equations, Numerical methods, and Applications.
Call for Papers: Further details on the abstract deadline for contributed papers will be available upon request in August.
Information: A. Aftabizadeh, Department of Mathematics, Ohio University, Athens, Ohio 45701, 614-593-1282.

21–25. **Workshop on Invariant Theory and Tableaux**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota.
Organizers: G.-C. Rota and D. Stanton.
Information: A. Friedman, Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street Southeast, Minneapolis, Minnesota 55455.

28–31. **Nineteenth Iranian Mathematical Conference**, Rasht, Iran.
Information: M. Toomanian, President of the Iranian Mathematical Society, Post Office Box 13145-418, Tehran, Iran.

APRIL 1988

17–30. **The First Canadian Number Theory Society Conference**, Banff, Alberta, Canada. (February 1987, p. 364)

MAY 1988

May or June. **International Symposium in Honor of John von Neumann**, Hofstra University, Hempstead, New York.
Information: John Balletto, American Mathematical Society, Meetings Department, Post Office Box 6248, Providence, Rhode Island 02940. (Exact dates for this symposium are undetermined.)

16–20. **Ninth Australian Statistical Conference**, Canberra, Australia.
Information: D. Daley, Statistics Department, GPO Box 4, Canberra, ACT 2601, Australia.

16–20. **1988 Mathematical Sciences Congress and 32nd Annual General Meeting of the Australian Mathematical Society**, Canberra, Australia. (June 1987, p. 685)

23–27. **Conference on Mathematical Methods and Applications**, Chiangmai, Thailand. (June 1987, p. 685)

30–June 3. **International Conference on Numerical Mathematics**, Kent Ridge, Republic of Singapore. (April 1987, p. 553)

30–June 3. **Sixth International Conference on the Theory and Applications of Graphs**, Western Michigan University, Kalamazoo, Michigan. (June 1987, p. 685)

JUNE 1988

12–18. **Workshop on Coding Theory and Applications**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota.
Organizer: D. Ray-Chaudhuri.
Information: A. Friedman, Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street Southeast, Minneapolis, Minnesota 55455.

19–25. **Workshop on Design Theory and Applications**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota.
Organizer: D. Ray-Chaudhuri.
Information: A. Friedman, Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street Southeast, Minneapolis, Minnesota 55455.

20–24. **International Algebra Conference**, Lisbon, Portugal.
Program: The topics will be Universal Algebra, Lattices, and Semigroups. There will be a number of invited speakers as well as contributed papers.
Call for Papers: Persons intending to contribute papers should write to the address below.
Information: Centro de Algebra, Universidade de Lisboa, Rua Ernesto Vasconcelos, Bloco C1, 30 Piso, 1700 Lisboa, Portugal.

20–24. **Fifth International Conference on Boundary and Interior Layers: Computational and Asymptotic Methods**, Shanghai, China. (June 1987, p. 685)

20–24. **International Algebra Conference**, Lisbon, Portugal. (February 1987, p. 364)

27–July 15. **Microprogram on the Structure of Banach Spaces**, Mathematical Sciences Research Institute, Berkeley, California. (June 1987, p. 685)

JULY 1988

10–16. **Representation Theory and Group Theory**, Manchester, England. (February 1987, p. 364)

13–20. **Edinburgh Mathematical Society's 1988 Saint Andrews Colloquium**, St. Andrews, Fife, Scotland. (February 1987, p. 364)

17–27. **Ninth Congress of the International Association of Mathematical Physics**, Swansea, Wales. (February 1987, p. 364)

18–22. **Twelfth IMACS World Congress on Scientific Computation**, Paris, France. (February 1987, p. 364)

23–August 3. **Sixth International Congress on Mathematical Education**, Budapest, Hungary. (February 1987, p. 364)

25–30. **Third International Congress on Computational and Applied Mathematics**, University of Leuven, Belgium.
Call for Papers: A limited number of short communications will be accepted for presentation. Participants who would like to present a paper should submit a title and a short abstract (at most 1 page) by January 1, 1988.
Information: F. Broeckx, R.U.C.A., Middelheimlaan 1, B-2020 Antwerpen, Belgium.

AUGUST 1988

8–12. **AMS Centennial Celebration**, Providence, Rhode Island. (April 1987, p. 553)
Information: H. Daly, American Mathematical Society, Meetings Department, Post OfficeBox 6248, Providence, Rhode Island 02940.

9–12. **International Symposium in Real Analysis**, University of Ulster, Coleraine, Northern Ireland. (February 1987, p. 364)

14–27. **Harmonic Analysis on Reductive Groups**, Bowdoin College, Brunswick, Maine. (June 1987, p. 686)

20–26. **Groups**, Pusan, Republic of Korea. (June 1987, p. 686)

21–27. **Seventeenth International Congress of Theoretical and Applied Mechanics**, Grenoble, France. (January 1987, p. 135)

22–25. **1988 Joint Statistical Meetings**, New Orleans, Louisiana. (June 1987, p. 686)

JANUARY 1989

8–11. **First Caribbean Conference on Fluid Dynamics**, Saint Augustine, Trinidad, West Indies. (June 1987, p. 686)

11–14. **Joint Mathematics Meetings**, Phoenix, Arizona. (April 1987, p. 553)
Information: H. Daly, American Mathematical Society, Meetings Department, Post Office Box 6248, Providence, Rhode Island 02940.

JULY 1989

5–19. **Microprogram on Noncommutative Rings**, Mathematical Sciences Research Institute, Berkeley, California. (June 1987, p. 686)

AUGUST 1989

28–September 1. **Third International Conference on the Theory of Groups and Related Topics**, Canberra, Australia. (June 1987, p. 686)

JANUARY 1990

17–20. **Joint Mathematics Meetings**, Louisville, Kentucky. (April 1987, p. 553)
Information: H. Daly, American Mathematical Society, Meetings Department, Post Office Box 6248, Providence, Rhode Island 02940.

CURRENT TRENDS IN ARITHMETICAL ALGEBRAIC GEOMETRY

Kenneth A. Ribet, Editor
(Contemporary Mathematics, Volume 67)

This volume contains papers presented at the AMS-IMS-SIAM Joint Summer Research Conference on Current Trends in Arithmetical Algebraic Geometry, held in August 1985 at Humboldt State University in Arcata, California. The conference focused on hyperbolic geometry, Arakélov theory, and connections between étale cohomology and crystalline cohomology. The book is accessible to both graduate students and mathematicians interested in current topics in arithmetical geometry, particularly those readers in neighboring fields who wish to acquire an overview of some topics in which research is now intensely active. Some of the introductory papers will be of interest to the nonspecialists, while others are directed at researchers and advanced graduate students familiar with the area. Portions of this book are likely to become fundamental references and will be of permanent value to researchers.

Contents

Introduction

A. Beilinson, *Height pairing between algebraic cycles*

Pierre Deligne, Dale Husemöller, *Survey of Drinfel'd modules*

Jean-Marc Fontaine, William Messing, *p-adic periods and p-adic étale cohomology*

Henri Gillet, *An introduction to higher dimensional Arakélov theory*

Serge Lang, *Diophantine problems in complex hyperbolic analysis*

Ron Livné, *Cubic exponential sums and Galois representations*

J.-P. Serre, *Lettre à J.-F. Mestre*

Joseph H. Silverman, *A survey of the theory of height functions*

Lucien Szpiro, *Présentation de la théorie d'Arakélov*

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NEW AMS PUBLICATIONS

TUKEY CITATION INDEX

This five volume set covering literature in statistics and probability is an authoritative reference source designed to provide a variety of access points to 25,000 works published between 1902 and 1968. The books are now available from the American Mathematical Society.

This five volume reference should be useful to statisticians, specialists in areas of statistics and probability, librarians and students who need references on particular topics, wish to trace a paper by an author, want a bibliographic collection on a particular topic, want help with an unfamiliar abbreviation, and more.

The electronic version of the *Index to Statistics and Probability* (Volume 5) has been added to Math\Sci, the online database of *MR*, *CMP*, and *Current Index to Statistics* (published by the American Statistical Association and the Institute of Mathematical Statistics). Information in Volumes 2–5 can be searched in Math\Sci through online vendors BRS, Dialog, and ESA-IRS.

THE STATISTICS CUMINDEX (VOLUME 1)

James L. Dolby and John W. Tukey

The indexes of 113 statistics books have been merged into a single alphabet, providing access to a large number of statistical concepts.

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John W. Tukey

This volume allows the user to find information by "advancing" from a key item: it lists works that were published after the key item and that cite the key item as a reference.

1980 *Mathematics Subject Classifications*: 60, 62
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INDEX TO STATISTICS AND PROBABILITY: PERMUTED TITLES (VOLUMES 3 AND 4)

Ian C. Ross and John W. Tukey

These volumes allow the user to search through the titles of the books for words or word combinations.

1980 *Mathematics Subject Classifications*: 60, 62
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INDEX TO STATISTICS AND PROBABILITY: LOCATIONS AND AUTHORS (VOLUME 5)

Ian C. Ross and John W. Tukey

This volume has two sections: a "location" section, which lists authors and titles of papers grouped by journal and arranged chronologically; and an "author" section, which lists the papers alphabetically by author and gives the names of the journals in which they appeared. The TUKEY subfile of Math\Sci is derived from Volume 5.

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John W. Tukey

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all the journals and composites (such as conference proceedings and volumes in honor of distinguished scholars) that appeared in Volumes 2 through 5.

ξ-RADIAL PROCESSES AND RANDOM FOURIER SERIES

Michael B. Marcus
(Memoirs of the AMS, Number 368)

Gaussian processes can be represented as random Fourier transforms of time changed Brownian motion. The more general class of ξ-radial processes is the focus of this memoir, which extends the work of R. Dudley and X. Fernique on stationary Gaussian processes and of G. Pisier and the author on p-stable processes. By providing a methodology for studying questions about the sample path properties of ξ-radial processes, this work would lead to further study of infinitely divisible processes on abstract structures. The author also provides recent results about infinitely divisible processes which are of interest even in the case of real valued random variables.

The book is directed at probabilists interested in sample path properties of stochastic processes, as well as at harmonic analysts having an interest in random structures. Readers will gain insight into the way the entropy approach to the study of continuity of strongly stationary processes extends to those processes which are naturally associated with Orlicz space metrics.

Contents

Representing ξ-radial processes

Necessary conditions for continuity

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Processes for which the Levy transforms or the logarithms of the characteristic functions are regularly varying with index $1 < p < 2$

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Suprema of ξ-radial processes and random Fourier series

1980 *Mathematics Subject Classifications*: 60G10, 60G17, 60G15, 60E07, 42A61, 42A20, 43A50
ISBN 0-8218-2432-5, LC 87-12569
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STEENROD CONNECTIONS AND CONNECTIVITY IN H-SPACES

James P. Lin
(Memoirs of the AMS, Number 369)

The connectivity of finite H-spaces has interested topologists for many years. This memoir will provide readers with an understanding of current methods of using higher order operations to study the cohomology of H-spaces.

The author shows that the first nonvanishing homotopy group of a finite H-space occurs in degrees 1, 3, 7, or 15. These results are derived from techniques he developed to determine the action of the Steenrod algebra on the mod 2 cohomology of a finite H-space. The structure of the mod 2 cohomology is described as a Hopf algebra over the Steenrod algebra.

Requiring background in algebraic topology, this book will find its audience among topologists, especially those interested in homotopy theory, and among Lie group specialists.

Contents

SubHopf algebras of $H^*(X; \mathbf{Z}_2)$

Some factorizations in the Steenrod algebra

Indeterminacy arising from doubletons

Some basic theorems

$Q^{2^r+2^{r+1}k-1} = Sq^{2^r k} Q^{2^r+2^r k-1}$

Applications

1980 *Mathematics Subject Classifications*: 55P45, 55S35, 55S45, 55U99; 55P15, 55P600, 55R05, 55T15
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INVOLUTIVE HYPERBOLIC DIFFERENTIAL SYSTEMS,

Deane Yang
(Memoirs of the AMS, Number 370)

The Cartan-Kähler theorem asserts that a real analytic exterior differential system has local solutions if it is "involutive," and moreover,

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it counts the number of solutions. The proof constructs solutions to an overdetermined system of partial differential equations by successive integrations, with involutivity as the necessary and sufficient formal condition that allows the construction to work.

Using only basic ideas of linear algebra, this memoir illuminates the notion of involutivity and shows how the solutions are constructed and counted in the Cartan-Kähler theorem. The author then shows that the theorem can be applied to obtain local solutions for C^∞ overdetermined systems which are hyperbolic in the appropriate sense. Three examples from Riemannian geometry are also presented: triply orthogonal systems on a Riemannian 3-manifold, isometric embedding of hyperbolic n-space into Euclidean $(2n-1)$-space, and isometric embedding of a Riemannian 3-manifold into Euclidean 6-space.

The book is aimed at differential geometers and analysts wishing to understand better the theory of overdetermined systems of partial differential equations and exterior differential systems. The book's elementary approach requires background in basic analysis, linear algebra, manifolds, vector bundles, and an understanding of the Cauchy-Kovalevski theorem.

Contents

Involutive hyperbolic symbols

Involutive hyperbolic linear differential operators

Involutive hyperbolic quasilinear differential operators

Involutive hyperbolic Pfaffian differential systems

Applications to differential geometry

1980 *Mathematics Subject Classifications*: 35N10, 35L60, 53B20
ISBN 0-8218-2433-3, LC 87-10104
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INTEGRAL GEOMETRY

Robert L. Bryant, Victor Guillemin, Sigurdur Helgason, and R. O. Wells, Jr., Editors

The topic of integral geometry is not as well known as its counterpart, differential geometry. However, research in integral geometry has indicated that this field may yield as equally deep insights as differential geometry has into the global and local nature of manifolds and the functions on them. In 1984, an AMS-IMS-SIAM joint summer research conference on integral geometry was held at Bowdoin College. This volume consists of papers presented there.

The papers range from purely expository to quite technical and represent a good survey of contemporary work in integral geometry. Three major areas are covered: the classical problems of computing geometric invariants by statistical averaging procedures; the circle of ideas concerning the Radon transform, going back to the seminal work of Funck and Radon around 1916–1917; and integral-geometric transforms which are now being used in the study of field equations in mathematical physics. Some of these areas also involve group-representation theoretic problems.

1980 *Mathematics Subject Classifications*: 53, 52, 60, 43
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Personal Items

Goong Chen of Pennsylvania State University has been appointed Full Professor of Mathematics at Texas A&M University.

Robert C. James, Professor Emeritus of the Claremont Graduate School, was awarded an Honorary Doctor of Science degree by Kent State University on May 17, 1987.

Paul Raymond Patten of North Georgia College, Dahlonega, Georgia, has been promoted to associate professor at that institution.

Justin R. Smith of Drexel University has been promoted to associate professor at that institution.

Jianxin Zhou of Pennsylvania State University has been appointed Assistant Professor of Mathematics at Texas A&M University.

Deaths

Lucian J. Braden of Flushing, New York, died on April 7, 1987, at the age of 77. He was a member of the Society for 9 years.

Charles R. Burton, Professor Emeritus of San Diego State University, died on July 21, 1985, at the age of 67. He was a member of the Society for 25 years.

Reginald H. Downing of Dayton, Ohio, died on April 15, 1987, at the age of 78. He was a member of the Society for 54 years.

Russell J. Dunholter, Professor Emeritus of the University of Cincinnati, died on August 22, 1986, at the age of 78. He was a member of the Society for 42 years.

J.J.L. Hinrichsen, Professor Emeritus of Iowa State University, died on February 5, 1987, at the age of 83. He was a member of the Society for 58 years.

Robert L. Long of the University of Florida, Gainesville, Florida, died on May 8, 1987, at the age of 46. He was a member of the Society for 16 years.

Torrence D. Parsons of California State University, Chico, died on April 2, 1987, at the age of 46. He was a member of the Society for 23 years.

Bernhard A. Roider of Linz, Austria, died on February 14, 1987, at the age of 40. He was a member of the Society for 7 years.

Eugene Usdin of Tulsa, Oklahoma, died on October 1, 1986, at the age of 60. He was a member of the Society for 37 years.

OPERATOR ALGEBRAS AND MATHEMATICAL PHYSICS

Palle E. T. Jorgensen and Paul S. Muhly, Editors

This volume contains papers presented at the University of Iowa 1985 Summer Conference in honor of H.-J. Borchers, N. M. Hugenholtz, R. V. Kadison, and D. Kastler and gives a systematic, up-to-date treatment of the fruitful interaction that the last two decades have brought between operator algebras and mathematical physics. Special attention is paid to an overview of the algebraic approach to quantum field theory, and, in particular, to quantum statistical mechanics. More than half the papers culminate with a presentation of new results which have not appeared previously in journals, and, with a few exceptions, these new results are presented with complete proofs.

This book is addressed to graduate students and researchers working in a broad spectrum of areas in mathematics and mathematical physics. Functional analysis, operator algebras, operator theory, differential geometry, cyclic cohomology, K-theory, and index theory are applied to questions in the quantum theory of fields and statistical mechanics. The individual papers are self-contained, but the reader should have some familiarity with the basic concepts of functional analysis and operator theory, although no physics background is assumed.

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Visiting Mathematicians (*Supplementary List*)

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

American Mathematicians Visiting Abroad

Name and Home Country	Host Institution	Field of Special Interest	Period of Visit
Fornaess, John E. (U.S.A.)	Institut Mittag-Leffler, Sweden	Nonlinear Differential Equations	9/87 - 7/88
Katz, Nicholas M. (U.S.A.)	Institut des Hautes Etudes Scientifique, France	Arithmetic Algebraic Geometry	5/87 - 8/88
Racine, Michel (Canada)	Collège de France	Algèbres de Jordan	7/87 - 6/88
Scott, Philip (Canada)	Riken University, Japan	Logic	9/87 - 11/87

Visiting Foreign Mathematicians

Jiang, Boju (People's Republic of China)	Princeton University	Topology	10/87 - 12/87
Kheyfets, Arkady (U.S.S.R.)	North Carolina State University	Mathematical Physics	8/87 - 5/88
Knabe, Stefan K. E. (Germany)	Princeton University	Mathematical Physics	9/87 - 8/88
Lai, Heng-Lung (People's Republic of China)	Princeton University	Algebraic Number Theory	8/87 - 7/88
Lánský, Petr (Czechoslovakia)	North Carolina State University	Stochastic Processes, Neural Models	1/88 - 5/88
Lenstra, Arjen (Netherlands)	University of Chicago	Computational Number Theory	10/87 - 6/88
Loffredo, Maria I. (Italy)	Princeton University	Mathematical Physics	9/87 - 6/88
Min, K. C. (South Korea)	University of Ottawa	Functional Analysis	1/88 - 4/88
Schnorr, Klaus (Germany)	University of Chicago	Theoretical Computer Science, Number Theory, Cryptography	9/87 - 12/87
Shamir, Adi (Israel)	University of Chicago	Theoretical Computer Science, Number Theory, Cryptography	9/87 - 6/88
Szpiro, Lucien (France)	Columbia University	Commutative Algebra, Algebraic Geometry	1/88 - 5/88
Viola, Carlo (Italy)	Columbia University	Number Theory	9/87 - 5/88

PROCEEDINGS OF THE 1985 MONTREAL CONFERENCE IN NUMBER THEORY

H. Kisilevsky and J. Labute, Editors

(Conference Proceedings of the Canadian Mathematical Society, Volume 7)

This volume contains the proceedings of the Canadian Mathematical Society's Summer Seminar in Number Theory, held in June 1985 at the Loyola Campus of Concordia University. Directed at advanced graduate students and research mathematicians, this book requires a background of graduate study in number theory and modular functions and will provide readers with a survey of current research topics in number theory. The papers range over a variety of areas, including local and global number fields, L-series, modular forms, Iwasawa theory, and arithmetic algebraic geometry. Included are papers by H. Stark and B. Gross based on lectures they gave at the conference. In his paper, Stark presents a new point of view regarding modular forms and Dirichlet series. Gross's paper presents a geometric approach to Eichler's arithmetic theory of definite quaternion algebras and to Waldspurge's results on the central critical values of L-series.

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Backlog of Mathematics Research Journals

Backlog. Information on the backlog of papers for research journals, primarily those published in North America, is reported to the Providence Office by those editorial boards which elect to participate. The figures are an estimate of the number of printed pages which have been accepted, but are in excess of the number required to maintain copy editing and printing schedules.

Observed Waiting Time. The quartiles give a measure of normal dispersion. They do not include extremes which may be misleading. Waiting times are measured in months from receipt of manuscript in final form to publication of the issue. When a paper is revised, the waiting time between an editor's receipt of the final revision and its publication may be much shorter than is the case otherwise, so these figures are low to that extent.

The observations are made from the latest issue published before the deadline for this issue of *Notices* from journals that have actually been received by a subscriber in the Providence, Rhode Island, area; in some cases this may be two months later than publication abroad. If the waiting time as defined above is not given in the journal, if no new issue has been received since the last survey, or if the latest issue is for some reason obviously not typical, no times are given in this report and such cases are marked NA (not available or not applicable).

Journal	Number Issues per Year	Approximate Number Pages per Year	Backlog of Printed Pages 5/31/87	Backlog of Printed Pages 12/15/86	Editor's Estimated Time for Paper Submitted Currently to be Published (In Months)	Observed Waiting Time in Latest Published Issue (In Months) Q_1	M	Q_3
Acta. Inform.	6	720	0	0	6	5	7	7
Aequationes Math.	6	640	0	0	6	7	8	11
Alg. Groups Geom.	4	550	0	0	7	8	9	13
Amer. J. Math.	6	1476	900	650	7	17	22	26
Ann. of Math.	6	1320	1200	800	20	13	22	22
Ann. Probab.	4	1600	600	650	18	15	19	24
Ann. Sci. Ecole Norm. Sup.	4	650	0	0	12	12	17	18
Ann. Statist.	4	1650	300	200	15	10	11	14
Appl. Math. Optim.	6	576	400	400	4	9	13*	18
Arch. Hist. Exact Scis.	8	800	0	0	10-11	9	10	13
Arch. Rational Mech. Anal.	16	1600	0	0	15-16	8	9	10
Bull. Austral. Math. Soc.	6	1000	200	0	9	14	14	15
Bull. Soc. Math. France	4	NR	NR	NR	NR	15	19	27
Canad. J. Math.	6	NR	NR	1400	NR	19	27	34
Canad. Math. Bull.	4	512	200	NR	13	17	19	21
Comm. Algebra	12	2400	1200	2575	10	13	18	20
Comm. Math. Phys.	20	3520	0	0	5	7	7	10
Comm. Partial Diff. Equations	12	1400	300	200	8	9	**	11
Computing	8	720	0	NR	6	9	11	11
Discrete Comput. Geom.	4	400	345	NA	15	10	14	17
Duke Math. J.	6	1300	400	250	11	9	12	15
Houston J. Math.	4	600	900	NR	15	19	30	31
Illinois J. Math.	4	704	624	NR	17	25	26	27
IMA J. Appl. Math.	6	620	620	0	9	7	7	7
IMA J. Math. Appl. Med. Biol.	4	350	80	80	9		NA	
IMA J. Math. Control Inform.	4	550	NR	NR	4-5		NA	
IMA J. Numer. Anal.	4	520	100	100	8	8	8	10
Indiana Univ. Math. J.	4	930	100	300	12	17	18	21
Inst. Hautes Etudes Sci. Publ. Math.	2	400	0	0	10	13	19	27
Internat. J. Math. Math. Sci.	4	832	100	4	6	10	12	13
Invent. Math.	12	2688	0	0	9	9	10	12
Israel J. Math.	12	1500	NR	NR	8	10	11	13
J. Algorithms	4	600	NR	NR	13	19	20***	29
J. Amer. Statist. Assoc.	4	NR	NR	NR	NR	10	11	13

Journal	Number Issues per Year	Approximate Number Pages per Year	Backlog of Printed Pages 5/31/87	Backlog of Printed Pages 12/15/86	Editor's Estimated Time for Paper Submitted Currently to be Published (In Months)	Observed Waiting Time in Latest Published Issue (In Months) Q_1	M	Q_3
J. Assoc. Comput. Mach.	4	900	350	285	6–12	13	14	18
J. Austral. Math. Soc. Ser. A	6	844	800	800	22	18	20	24
J. Austral. Math. Soc. Ser. B	4	NR	NR	57	NR	10	12	13
J. Comput. System Sci.	6	1000	0	0	12	8	8	15
J. Differential Geom.	6	NR	NR	800	NR	9	14	19
J. Math. Biol.	6	720	300	NR	6	5	6	7
J. Math. Phys.	12	3400	0	0	7	8	10***	14
J. Nigerian Math. Soc.	1	100	0	0	12		NA	
J. Operator Theory	4	800	200	300	12	12	13	14
J. Symbolic Logic	4	1144	150	0	16	11	12	13
Linear Algebra Appl.	13	3900	300	600	12	13	13	14
Manuscripta Math.	12	1536	0	0	5	5	7	12
Math. Ann.	12	2112	0	0	7	5	7	9
Math. Biosci.	10	NR	NR	NR	NR	5	6	6
Math. Comp.	4	1500	0	60	12–15	11	13	17
Math. Oper. Res.	4	NR	450	380	20	18	18	21
Math. Programming	9	1080	100	100	15	7	8	10
Math. Social Sci.	6	600	400	600	10	17	20	25
Math. Systems Theory	4	320	0	0	0	7	8	8
Math. Z.	12	1824	0	0	11-12	8	12	17
Mem. Amer. Math. Soc.	6	2800	0	0	3	9	**	25
Michigan Math. J.	3	480	50	0	12-15	9	11	15
Monatsh. Math.	8	704	0	NR	12	7	12	14
Numer. Funct. Anal. Optim.	12	1400	0	300	6	8	11	14
Numer. Math.	12	1488	0	0	5	7	9	18
Oper. Res.	6	1008	NR	700	24	12	16	20
Pacific J. Math.	10	2000	NR	NR	12	9	15	18
Probab. Theor. Relat. Theor.	12	1920	0	0	10-11	5	9	17
Proc. Amer. Math. Soc.	12	2400	600	600	14	15	15	15
Proc. London Math. Soc.	6	NR	NR	NR	NR	14	14	15
Quart. Appl. Math.	4	800	300	400	13	17	19***	26
Quart. J. Math. Oxford Ser. (2)	4	512	120	100	15	11	14	20
Results Math.	8	768	0	0	9	18	20	24
Rocky Mountain J. Math.	4	800	1600	1100	NR	22	24	27
Semigroup Forum	3	384	0	0	0	3	4	5
SIAM J. Algebraic Discrete Methods	4	650	0	0	0	8	8*	10
SIAM J. Appl. Math.	6	1380	345	320	11	16	19***	20
SIAM J. Comput.	6	1290	272	0	11	21	25***	33
SIAM J. Control Optim.	6	1686	70	457	10	17	22***	30
SIAM J. Math. Anal.	6	1878	211	593	10	18	23***	27
SIAM J. Numer. Anal.	6	1450	570	313	13	18	23***	28
SIAM J. Sci. Statist. Comput.	6	1500	111	250	10	21	25***	31
SIAM Rev.	4	620	324	155	13	16	20	21
Topology Appl.	9	NR	NR	12	NR	13	14	15
Trans. Amer. Math. Soc.	12	5000	0	0	10	14	15	17

NR means no response received.
NA means not available or not applicable.
* From date accepted.
** The latest issue contained only two articles.
*** Dates of revision not indicated in this journal.

Recent Appointments

Committee members' terms of office on standing committees expire on December 31 of the year given in parentheses following their names, unless otherwise specified.

James G. Glimm (1989) has been appointed by President G. D. Mostow to the *Committee on Science Policy.* Continuing members of the committee are Hyman Bass (1987), Felix E. Browder (1987), Carl-Wilhelm de Boor (1988), Ronald G. Douglas (1989), chairman, Frederick W. Gehring (1987), Ronald L. Lipsman (1989), James W. Maxwell (ex officio), G. D. Mostow (ex officio), Robert Osserman (1988), Judith D. Sally (1988), David A. Sanchez (1989), William P. Thurston (1989), and Guido L. Weiss (1988).

A joint AMS-MAA *Committee on Arrangements for the Annual Meeting in Atlanta* (January 6–9, 1988) has been appointed by Past-President Lynn A. Steen (MAA) and President G. D. Mostow (AMS). Committee members are Jean H. Bevis, Sylvia T. Bozeman, W. Wistar Comfort (ex officio), Frank J. Hall, Ray A. Kunze, Stephen L. Langston, Robert A. Leslie, William J. LeVeque (ex officio), Fred A. Massey, chairman, John D. Neff, Mary M. Neff, Kenneth A. Ross (ex officio), Charles R. Stone, and Thomas R. Thomson.

Presidents Leonard Gillman (MAA) and G. D. Mostow (AMS) have appointed H. W. Lenstra, Jr., Carl Pomerance, Paul H. Rabinowitz, and James W. Vick to the AMS-MAA *Program Committee for the Atlanta Meeting.* Professor Vick will serve as chairman.

Report from the Committee on Human Rights of Mathematicians

Mathematics Student Imprisoned in Chile

I'm writing to draw the attention of the members of the American Mathematical Society to the very unfortunate situation of a mathematics student from the Catholic University in Santiago, Chile.

The student, Cristian Meneses Torres, was arrested on April 10, 1985, by the Chilean police. He has been held without trial for the last two years. Our AMS Committee on Human Rights of Mathematicians has very trustworthy information that Mr. Meneses Torres has been periodically beaten in prison, causing him to suffer recurring back injuries. He is currently being held in the Carcel Publica in Santiago, Chile. He has never been tried on any charges.

Repeated requests for more information by our committee to the Chilean embassy have gone unacknowledged. There is considerable interaction between the Chilean mathematical community and our own, and there is a sizeable government program of scientific interchange of considerable benefit to the mathematicians involved. The success of these programs depends on a relative normal scientific ambience in both countries. This report tends to call into question the normalcy of Chilean academic ambience, and thereby discourages cooperation. Therefore, a clarification of the reasons for the detention of Mr. Meneses Torres and reassurance that his basic human rights are being respected seem to us to be called for.

We regret the seeming unwillingness of Chilean authorities to give any assurances or even any information, and we urge these authorities to reconsider.

C. Herbert Clemens, Chair

THEORY AND APPLICATIONS OF DIFFERENTIABLE FUNCTIONS OF SEVERAL VARIABLES

S. M. Nikol'skii, Editor

(Proceedings of the Steklov Institute, Volume 170)

This collection of papers deals with various problems on the theory of differentiable functions of several real variables and its application to partial differential equations. Topics considered are: imbedding theorems, applications for Sobolev spaces, separation theorems, denseness of smooth compactly supported functions, approximation numbers for imbedding operators, Calderón-Zygmund singular operators, as well as the solutions of a variety of boundary value problems and Cauchy problems.

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Officers and Committee Members

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Numbers to the left of headings are used as points of reference in a contents to AMS committees which follows this listing. Primary and secondary headings are:

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4.5 Status of the Profession
4.6 Prizes and Awards
4.7 Institutes and Symposia
4.8 Joint Committees
5 Representatives
6 Contents

1. Officers

President	G. D. Mostow	1988
Ex-President	Irving Kaplansky	1987
Vice-Presidents		
	Richard A. Askey	1987
	Olga Taussky-Todd	1987
	Karen Uhlenbeck	1988
Secretary	Everett Pitcher	1988
Associate Secretaries	Frank T. Birtel	1988
	W. Wistar Comfort	1988
	Robert M. Fossum	1987
	Hugo Rossi	1987
Treasurer	Franklin P. Peterson	1988
Associate Treasurer	Steve Armentrout	1988

1.1. Liaison Committee

All members of this committee serve *ex officio*.

Chairman	G. D. Mostow
	Franklin P. Peterson
	Everett Pitcher

2. Council

2.0.1. Officers of the AMS

President	G. D. Mostow	1988
Ex-President	Irving Kaplansky	1987
Vice-Presidents		
	Richard A. Askey	1987
	Olga Taussky-Todd	1987
	Karen Uhlenbeck	1988
Secretary	Everett Pitcher	1988
Associate Secretaries*	Frank T. Birtel	1988
	W. Wistar Comfort	1988
	Robert M. Fossum	1987
	Hugo Rossi	1987
Treasurer	Franklin P. Peterson	1988
Associate Treasurer	Steve Armentrout	1988

2.0.2. Representatives of Committees

American Journal of Mathematics	Spencer Bloch	1988
Bulletin	Wu-chung Hsiang	1987
	Edgar Lee Stout	1988
Colloquium	Raoul H. Bott	1987
	Charles L. Fefferman	1988
Committee to Monitor Problems in Communication	Marian B. Pour-El	1989
Mathematical Reviews	Melvin Hochster	1989
	Morton Lowengrub	1987
Mathematical Surveys and Monographs	M. Susan Montgomery	1987
	R. O. Wells, Jr.	1988
Mathematics of Computation	Walter Gautschi	1989
	Donald Goldfarb	1987
	Hugh C. Williams	1988
Proceedings	Doug Curtis	1989
	Richard R. Goldberg	1988
	Irwin Kra	1988
	Paul S. Muhly	1990
	Andrew M. Odlyzko	1989
	Donald S. Passman	1988
	Daniel W. Stroock	1987
Science Policy Committee	Ronald G. Douglas	1989
	Vaughan F. R. Jones	1989
	Lance W. Small	1987
	Joel A. Smoller	1987

2.0.3. Members-at-Large

James G. Arthur	1988	Marc A. Rieffel	1989
Hyman Bass	1987	Cora S. Sadosky	1987
Daniel M. Burns	1987	Jean E. Taylor	1988
Jane P. Gilman	1988	Chuu-Lain Terng	1988
Joseph B. Keller	1987	Audrey A. Terras	1987
H. Blaine Lawson, Jr.		William A. Veech	1988
	1989	David A. Vogan, Jr.	1987
Yiannis N. Moschovakis		Robert F. Williams	1988
	1989	Carol S. Wood	1989
Linda A. Ness	1989		

2.1. Executive Committee of the Council

	Hyman Bass	1987
	Irving Kaplansky	*ex officio*
	Irwin Kra	1990
Chairman	G. D. Mostow	*ex officio*
	Everett Pitcher	*ex officio*
	Jean E. Taylor	1988
	William A. Veech	1989

* Only one Associate Secretary is a Council member at a Council meeting, namely the cognizant Associate Secretary, except that in 1987 Fossum and Rossi are members.

3. Board of Trustees

	Steve Armentrout	*ex officio*
	Ramesh A. Gangolli	1989
	Frederick W. Gehring	1987
	Ronald L. Graham	1991
Secretary	M. Susan Montgomery	1990
	G. D. Mostow	*ex officio*
	Franklin P. Peterson	*ex officio*
Chairman	Paul J. Sally, Jr.	1988

4. Committees

4.1. Editorial and Communications Committees

4.1.1. Abstracts Editorial Committee

All members of this committee serve *ex officio*.

	Frank T. Birtel	
	W. Wistar Comfort	
	Robert M. Fossum	
Chairman	Everett Pitcher	
	Hugo Rossi	

4.1.2. American Journal of Mathematics, Society's Representatives

Chairman	Spencer Bloch	1988
	Richard B. Melrose	1989

4.1.3. Bulletin (New Series)

	Morris W. Hirsch	1989
	Wu-chung Hsiang	1987
Chairman	Edgar Lee Stout	1988

Associate Editors for Research Announcements

Spencer Bloch	1987	Roger Howe	1989
Gergory L. Cherlin	1989	H. Blaine Lawson, Jr.	
Ronald L. Graham	1987		1987
Victor W. Guillemin	1987	Harold M. Stark	1987

Associate Editors for Research - Expository Articles

Lenore Blum	1989	David A. Vogan, Jr.	1989
Victor Kac	1987	Alan Weinstein	1989
Barry Mazur	1989	Guido L. Weiss	1987

4.1.4. Colloquium

Chairman	Raoul H. Bott	1987
	Charles L. Fefferman	1988
	H. Jerome Keisler	1989

4.1.5. Committee to Monitor Problems in Communication

	Sheldon Axler	1989
	Jozef Dodziuk	1988
Consultant	Nancy Gubman	
	Arthur M. Jaffe	1988
	William J. LeVeque	*ex officio*
Chairman	Marian B. Pour-El	1989
	Judith D. Sally	1987
	Floyd L. Williams	1987

4.1.6. Journal of the AMS

Chairman	Michael Artin	1992
	H. Blaine Lawson, Jr.	1991
	Richard B. Melrose	1990
	Wilfried Schmid	1990
	Robert E. Tarjan	1992

Associate Editors

James G. Arthur	Joe Harris
Peter Bickel	Hendrik W. Lenstra, Jr.
Gerd Faltings	Andrew Majda
Charles L. Fefferman	Hugh L. Montgomery
Michael H. Freedman	Paul H. Rabinowitz
Daniel Friedan	Karen Uhlenbeck
Ronald L. Graham	

4.1.7. Mathematical Reviews

	Leonard Berkovitz	1988
Chairman	Melvin Hochster	1989
	Morton Lowengrub	1987

4.1.8. Mathematical Surveys and Monographs

	Victor W. Guillemin	1989
	Irwin Kra	1988
	M. Susan Montgomery	1987
Chairman	R. O. Wells, Jr.	1988

Associate Editor: Thomas F. Banchoff

Editorial Board for Contemporary Mathematics

	M. Salah Baouendi	1988
	Daniel M. Burns	1989
	David Eisenbud	1989
	W. H. Jaco	1988
	Gerald J. Janusz	1989
Chairman	Irwin Kra	1988
	Jan Mycielski	1987
	Alan D. Weinstein	1987

4.1.9. Mathematics of Computation

Chairman	Walter Gautschi	1989
	Donald Goldfarb	1987
	John E. Osborn	1989
	Hugh C. Williams	1988

Associate Editors

James Bramble	1989	Philip Rabinowitz	1987
Bille C. Carlson	1989	René Schoof	1989
Eugene Isaacson	1989	Larry L. Schumaker	1988
Heinz-Otto Kreiss	1987	Ridgway Scott	1989
James N. Lyness	1989	Daniel Shanks	1987
Syvert P. Nørsett	1988	Frank Stenger	1989
Andrew M. Odlyzko	1988	Hans J. Stetter	1988
Frank W. J. Olver	1989	G. W. Stewart	1989
Stanley J. Osher	1989	Vidar C. Thomée	1989
Beresford N. Parlett	1988	Lars B. Wahlbin	1989
Carl Pomerance	1989	John W. Wrench, Jr.	
			1987

4.1.10. Notices

	Robert J. Blattner	1990
	Ralph P. Boas	1988
	Lucy J. Garnett	1990
Chairman	Everett Pitcher	*ex officio*
	Mary Ellen Rudin	1988
	Nancy K. Stanton	1990
	James A. Voytuk	*ex officio*
	Steven H. Weintraub	1988

Associate Editors

Queries	Stuart S. Antman
	Hans Samelson
Special Articles	
	Ronald L. Graham

4.1.11. **Proceedings**

	Thomas H. Brylawski	1989
	Dennis Burke	1989
	John B. Conway	1988
	Doug Curtis	1989
	William J. Davis	1987
	David G. Ebin	1987
	Richard R. Goldberg	1988
	Larry J. Goldstein	1987
	Thomas J. Jech	1988
	Irwin Kra	1988
	Walter Littman	1987
	R. Daniel Mauldin	1989
	Kenneth R. Meyer	1987
	Haynes R. Miller	1987
Chairman	Paul S. Muhly	1990
	Andrew M. Odlyzko	1989
	Donald S. Passman	1988
	Louis J. Ratliff, Jr.	1987
	Bhama Srinivasan	1987
	Daniel W. Stroock	1987
	William D. Sudderth	1987

4.1.12. **Proceedings of Symposia in Applied Mathematics**

	Stuart S. Antman	1988
	J. F. G. Auchmuty	1989
Chairman	Jane Cronin Scanlon	1988
	Lawrence A. Shepp	1987

4.1.13. **Transactions and Memoirs**

	James W. Cannon	1989
	Ralph L. Cohen	1990
	Ronald Getoor	1990
	Ronald L. Graham	1987
	Peter W. Jones	1988
	Vaughan F. R. Jones	1989
	Jerry L. Kazdan	1990
	Kenneth Kunen	1987
	David J. Saltman	1990
Chairman	Lance W. Small	1987
	Joel A. Smoller	1987
	Robert J. Zimmer	1990

4.1.14. **Translation from Chinese**

	Sun-Yung Alice Chang
	S. Y. Cheng
Chairman	Tsit-Yuen Lam
	Tai-Ping Liu
	Chung-Chun Yang

4.1.15. **Translation from Japanese**

	Nagayoshi Iwahori
	Tosio Kato
	Shoshichi Kobayashi
	Masayoshi Nagata
Chairman	Katsumi Nomizu

Ad Hoc Committee

4.1.16. **Advisory Committee on a Russian-English Dictionary**

	Robert G. Bartle
	James R. Bunch
	Paul R. Halmos
	Edwin Hewitt
Chairman	Hans F. Weinberger

4.2. Committees of the Board of Trustees

4.2.1. **Agenda and Budget**

All members of this committee serve *ex officio*.

	Steve Armentrout
	Hyman Bass
	G. D. Mostow
	Franklin P. Peterson
	Everett Pitcher
	Paul J. Sally, Jr.

4.2.2. **Appeals Committee on Discounted Subscriptions**

Consultant	Carol-Ann Blackwood	
Consultant	Melvin Hochster	
	William J. LeVeque	*ex officio*
Chairman	Morton Lowengrub	
	Franklin P. Peterson	
	Paul J. Sally, Jr.	

4.2.3. **Audit**

	Steve Armentrout
	M. Susan Montgomery

4.2.4. **Computer Operations and Facilities, Visiting Committee on**

	Jill P. Mesirov	1988
Chairman	S. Tucker Taft	1989
	Peter J. Weinberger	1987

4.2.5. **Corporate Relations**

Chairman	Ramesh A. Gangolli
	Maria M. Klawe
	Oscar S. Rothaus

4.2.6. **Endowment**

	Andrew M. Gleason
Chairman	W. Ted Martin
	Cathleen S. Morawetz

4.2.7. **Investment**

	Steve Armentrout	*ex officio*
	Ramesh A. Gangolli	
Chairman	Franklin P. Peterson	*ex officio*

4.2.8. **Legal Aid**

	Steve Armentrout
Chairman	Morton L. Curtis
	Todd Dupont
	Murray Gerstenhaber

4.2.9. **Liaison Committee**

All members of this committee serve *ex officio*.

Chairman	G. D. Mostow
	Franklin P. Peterson
	Everett Pitcher

4.2.10. **Long Range Planning**

All members of this committee serve *ex officio*.

	Franklin P. Peterson
	Everett Pitcher
	Paul J. Sally, Jr.
Chairman	Jean E. Taylor
	William A. Veech

4.2.11. **Membership**

Chairman	Frederick W. Gehring	1987
	Melvin Henriksen	1987
	Irwin Kra	1987
	Jill P. Mesirov	1989
	Hugo Rossi	1988

4.2.12. **The Publication Program**

	Steve Armentrout	1988
	Peter L. Duren	1987
Chairman	Murray Gerstenhaber	1988
Consultant	Mary C. Lane	
	William J. LeVeque	*ex officio*
	Andrew M. Odlyzko	1987
	Everett Pitcher	*ex officio*
	Hugo Rossi	1987
	Paul J. Sally, Jr.	1987

4.2.13. **Salaries**

	Steve Armentrout	*ex officio*
Chairman	Ronald L. Graham	
	Franklin P. Peterson	*ex officio*
	Paul J. Sally, Jr.	*ex officio*

4.2.14. **Staff and Services**

Chairman	Steve Armentrout
	Franklin P. Peterson
	Paul J. Sally, Jr.

Ad Hoc Committee

4.2.15. **Institutional Membership**

Consultant	Carol-Ann Blackwood
	Ramesh Gangolli
Chairman	Frederick W. Gehring
	William A. Veech
	James A. Voytuk *ex officio*

4.3. Internal Organization of the American Mathematical Society

Standing Committees

4.3.1. **Committee on Committees**

	James G. Glimm	1988
Chairman	William H. Jaco	1988
	Irwin Kra	1988
	G. D. Mostow	*ex officio*
	Everett Pitcher	*ex officio*
	Paul H. Rabinowitz	1988
	Audrey A. Terras	1988
	William A. Veech	1988

4.3.2. **Nominating Committee**

Chairman	John T. Baldwin	1987
	M. Salah Baouendi	1988
	James W. Cannon	1987
	Paul C. Fife	1988
	Catherine L. Olsen	1987
	Carl Pomerance	1988
	Burton Rodin	1987
	William P. Ziemer	1988

4.3.3. **Centennial Committee**

	Felix E. Browder
	Harold M. Edwards
	Andrew M. Gleason
	G. D. Mostow
Chairman	Everett Pitcher

4.3.4. Centennial Program Committee

	Hyman Bass
Chairman	Felix E. Browder
	Philip A. Griffiths
	John W. Milnor
	Cathleen S. Morawetz

Ad Hoc Committees

4.3.5. **1986 Election Tellers**

	Edward W. Evans
	J. Calvin Gerhard
	Kyu Park
	Thomas L. Pirnot

4.3.6. **Search Committee for The Position of Executive Director**

Chairman	Frederick W. Gehring
	G. D. Mostow
	Franklin P. Peterson
	Everett Pitcher
	Paul J. Sally, Jr.

4.4. Program and Meetings

Standing Committees

4.4.1. **Program Committee for National Meetings**

	Joan S. Birman	1988
	F. Reese Harvey	1987
	Hugh L. Montgomery	1989
	Everett Pitcher	*ex officio*
Chairman	Paul H. Rabinowitz	1988
	Richard P. Stanley	1987
	Nolan R. Wallach	1988

4.4.2. **Central Sectional Meetings (Select Hour Speakers for)**

	Donald G. Aronson	1988
	Robert M. Fossum	*ex officio*
	Jerry Kaminker	1988
Chairman	Nancy K. Stanton	1987
	Jeffrey D. Vaaler	1987

4.4.3. **Eastern Sectional Meetings (Select Hour Speakers for)**

	Joel M. Cohen	1987
	W. Wistar Comfort	*ex officio*
Chairman	Roger Keith Dennis	1987
	Richard H. Herman	1988
	Lesley M. Sibner	1988
	Thomas Crawford Spencer	1988

4.4.4. **Far Western Sectional Meetings (Select Hour Speakers for)**

	Heinz-Otto Kreiss	1988
	Hugo Rossi	*ex officio*
	Murray M. Schacher	1988
	Gary M. Seitz	1987
Chairman	Ronald J. Stern	1987

4.4.5. **Southeastern Sectional Meetings (Select Hour Speakers for)**

	J. Thomas Beale	1987
	Frank T. Birtel	*ex officio*
	Jon F. Carlson	1988
	Frank S. Quinn III	1988
Chairman	John J. Walsh	1987

4.4.6. **Agenda for Business Meetings**

	M. Salah Baouendi	1988
Chairman	Everett Pitcher	
	Carol L. Walker	1988

4.4.7. **Gibbs Lecturers for 1987 and 1988, Committee to Select**

Chairman	Arthur M. Jaffe
	Martin D. Kruskal
	Joel L. Lebowitz

4.5. Status of the Profession

Standing Committees

4.5.1. Academic Freedom, Tenure, and Employment Security

	Jerome A. Goldstein	1989
	Shoshichi Kobayashi	1987
	Robert R. Phelps	1989
	Vera S. Pless	1987
Chairman	Halsey L. Royden	1988
	Gail S. Young	1989

4.5.2. Human Rights of Mathematicians

	Bettye Ann Case	1989
Chairman	Charles Herbert Clemens	1987
	Patrick X. Gallagher	1989
	Herman R. Gluck	1989
	Leon A. Henkin	1988
	Neil I. Koblitz	1988
	Seymour Schuster	1987

4.5.3. Professional Ethics

Chairman	C. Edmund Burgess	1987
	Judith V. Grabiner	1987
	Paul R. Halmos	1988
	Linda Keen	1989
	Anneli Lax	1988

4.5.4. Recruitment of Young Mathematicians

	Paul J. Sally, Jr.	
Chairman	James D. Stasheff	
	Lynn A. Steen	

4.5.5. Research Fellowships
(Terms expire on June 30)

	J. William Helton	1987
	Philip C. Kutzko	1988
	Stephen Lichtenbaum	1987
	George Lusztig	1988
Chairman	Kenneth C. Millett	1987
	M. Beth Ruskai	1988
	Nancy K. Stanton	1988

4.5.6. Science Policy

	Hyman Bass	1987
	Felix E. Browder	1987
	Carl-Wilhelm R. de Boor	1988
Chairman	Ronald G. Douglas	1989
	Frederick W. Gehring	1987
	James G. Glimm	1989
	Ronald L. Lipsman	1989
	James W. Maxwell	*ex officio*
	G. D. Mostow	*ex officio*
	Robert Osserman	1988
	Seymour V. Parter	1989
	Judith D. Sally	1988
	David A. Sanchez	1989
	William P. Thurston	1989
	Guido L. Weiss	1988

4.5.7. Service to Mathematicians in Developing Countries

Chairman	Raymond G. Ayoub
	James A. Donaldson
	James Eells
	Donald M. Hill
	Marshall H. Stone

Ad Hoc Committees

4.5.8. Applied Mathematics

	Constantine Dafermos
	David S. Kinderleher
	Eduardo Daniel Sontag
Chairman	Jean E. Taylor

4.5.9. Cooperation with the Chinese

	S.-Y. Cheng
	Ronald L. Graham
Chairman	Richard S. Palais

4.6. Prizes and Awards

Standing Committees

4.6.1. National Awards and Public Representation

Chairman	Irving Kaplansky	1987
	G. D. Mostow	*ex officio*
	Everett Pitcher	*ex officio*
	Stephen Smale	1987

4.6.2. Steele Prizes Terms expire on June 30

	Frederick J. Almgren	1989
Chairman	Richard W. Beals	1987
	Jerry L. Bona	1987
	Hermann Flaschka	1988
	John P. Hempel	1988
	William S. Massey	1989
	Lawrence E. Payne	1987
	Frank A. Raymond	1989
	Louis Solomon	1989
	Richard P. Stanley	1989

Ad Hoc Committee

4.6.3. Automatic Theorem Proving, Committee to Recommend Winners of Prizes for

Chairman	David Mumford
	Jacob T. Schwartz
	John L. Selfridge

4.7. Institutes and Symposia

Standing Committee

4.7.1. Summer Institutes and Special Symposia
Terms expire on February 28

Chairman	Albert Baernstein II	1987
	Eric M. Friedlander	1988
	H. Blaine Lawson, Jr.	1987
	Linda Preiss Rothschild	1989
	Robert B. Warfield, Jr.	1989
	John Wermer	1988

Ad Hoc Committee

4.7.2. 1987 Summer Institute on Representations of Finite Groups and Related Topics

Chairman	Jonathan L. Alperin
	Charles W. Curtis
	Walter Feit
	Paul Fong

4.8. Joint Committees

4.8.1. AMS-AAAS-MAA Committee on Opportunities in Mathematics for Disadvantaged Groups

	Manuel P. Berriozabal	1988
	Sylvia T. Boseman	1989
	William G. Chinn	1987
	James A. Donaldson	1988
	Amassa C. Fauntleroy	1987
	Tepper L. Gill	1987
Chairman	Gloria F. Gilmer	1988
	Shirley Malcom	*ex officio*
	Rogers J. Newman	1989
	Clarence E. Stephens	1989
	Harold J. Stolberg	1987
Consultant	Argelia Veléz-Rodriguez	

4.8.2. AMS-ASA-IMS-MAA-NCTM-SIAM Committee on Women in the Mathematical Sciences (NCTM members' terms expire April 1 of the year given.)

	Grace Burton (NCTM)	1990
	Susan J. Devlin (ASA)	
	Marjorie Enneking (NCTM)	1989
	Susan Geller (AMS)	1987
	Marjorie G. Hahn (IMS)	
	Jeanne W. Kerr (AMS)	1989
Chairman	Carole B. LaCampagne (AMS, MAA)	1987
	Jeanne LaDuke (MAA)	1989
	Suzanne Marie Lenhart (AMS)	1989
	Betty K. Lichtenberg (NCTM)	1988
	Joyce R. McLaughlin (SIAM)	1987
	Ingram Olkin (IMS)	
	Janet Peterson (SIAM)	1988
	Linda Petzold (SIAM)	1989
	Alice T. Schafer (MAA)	1988
	Elizabeth L. Scott (IMS)	
	Bhama Srinivasan (AMS)	1989

4.8.3. AMS-ASL-IMS Committee on Translations from Russian and Other Slavic Languages

Chairman	Boris M. Schein (AMS)	1987

AMS Subcommittee Members

	Michael I. Brin	1987
	Charles V. Coffman	1988
	Courtney S. Coleman	1989
	Allen Devinatz	1988
	Igor Dolgachev	1987
	Richard Ericson	1987
	Vladislav V. Goldberg	1988
	John R. Isbell	1988
	Dmitry Khavinson	1987
	L. G. Makar-Limanov	1989
	Paul G. Nevai	1989
Chairman	Boris M. Schein	1987

ASL Subcommittee Members

	Vladimir Lifschitz	1987
Chairman	Elliott Mendelson	
	Gregory Minc	1987
	B. F. Wells	

IMS Subcommittee Members

Chairman	Eugene Dynkin
	B. Pittel
	A. Rukhin
	W. J. Studden

4.8.4. AMS-IMS-SIAM Ad Hoc Executive Committee of The Evaluation Panel for NSF Postdoctoral Fellowships in the Mathematical Sciences

	Mark Ablowitz (SIAM)
	George C. Tiao (IMS)
Chairman	William T. Trotter (AMS)

4.8.5. AMS-IMS-SIAM Committee on Joint Summer Research Conferences in the Mathematical Sciences

Terms expire on June 30

Chairman	William B. Arveson (AMS)	1987
	James W. Daniel (SIAM)	1988
	Martin Golubitsky (SIAM)	1988
	Ronald L. Graham (AMS)	1987
	James I. Lepowsky (AMS)	1988
	John R. Martin (AMS)	1987
	Tilla Klotz Milnor (AMS)	1987
	Evelyn Nelson (AMS)	1987
	Ingram Olkin (IMS)	1988

4.8.6. AMS-MAA Arrangements Committee for the Atlanta Meeting, January 6-9, 1988

	Jean H. Bevis	
	Sylvia T. Bozeman	
	W. Wistar Comfort	*ex officio*
	Frank J. Hall	
	Ray A. Kunze	
	Stephen L. Langston	
	Robert A. Leslie	
	William J. LeVeque	*ex officio*
Chairman	Fred A. Massey	
	John D. Neff	
	Mary M. Neff	
	Kenneth A. Ross	*ex officio*
	Charles R. Stone	
	Thomas R. Thomson	

4.8.7. AMS-MAA Joint Program Committee for the Atlanta Meeting

	H. W. Lenstra, Jr.
	Carl Pomerance
	Paul H. Rabinowitz
Chairman	James W. Vick

4.8.8. AMS-MAA Arrangements Committee for the Salt Lake City Meeting, August 5–7, 1987

Chairman	C. Edmund Burgess	
	E. Allan Davis	
	William J. LeVeque	*ex officio*
	Kenneth A. Ross	*ex officio*
	Hugo Rossi	*ex officio*
	Peter C. Trombi	
	Carolyn Tucker	

4.8.9. AMS-MAA Joint Program Committee for the Salt Lake City Meeting

	Judith V. Grabiner
	Reuben Hersh
Chairman	Paul H. Rabinowitz
	John M. Smith

4.8.10. AMS-MAA Joint Meetings Committee

Chairman	William J. LeVeque	*ex officio*
	Everett Pitcher	
	Kenneth A. Ross	
	Alfred B. Willcox	

4.8.11. **AMS-MAA Committee on Employment and Educational Policy**

	Morton Brown (MAA)	1989
	Stefan A. Burr (AMS)	1989
Chairman	Edward A. Connors (AMS)	1988
	Philip C. Curtis, Jr. (MAA)	1987
	David J. Lutzer (MAA)	1989
	Donald C. Rung (AMS)	1987
	Audrey A. Terras (AMS)	1988

4.8.12. Data Subcommittee

	Lida K. Barrett	1988
Chairman	Edward A. Connors	1987
Consultant	Lincoln K. Durst	
	James Hurley	1988
	Charlotte Lin	1989
	James W. Maxwell	*ex officio*
	Donald E. McClure	1987
	Donald C. Rung	1989

4.8.13. Employment Concerns Subcommittee

	Morton Brown	1989
	Audrey A. Terras	1989
	Robert J. Thompson	1988
Chairman	Barnet M. Weinstock	1989

4.8.14. Short Course Subcommittee

Chairman	Stefan A. Burr	1989
	Lisl Novak Gaal	1989
	Robert P. Kurshan	1987
	Barbara L. Osofsky	1988
	Marjorie L. Stein	1987

4.8.15. **AMS-MAA-SIAM Committee on Employment Opportunities**

	Wilfred E. Barnes (MAA)	1987
	Calvin T. Long (MAA)	1988
	Brian J. McCartin (SIAM)	1989
Chairman	John W. Petro (AMS)	1988
	Donald C. Rung (AMS)	1987
	Robert S. Stepleman (SIAM)	1988

4.8.16. **AMS-MAA-SIAM Joint Administrative Committee**

	I. Edward Block (SIAM)
	James W. Daniel (SIAM)
	Paul W. Davis (SIAM)
	Leonard Gillman (MAA)
	William J. LeVeque (AMS)
	Franklin P. Peterson (AMS)
Chairman	Everett Pitcher (AMS)
	Kenneth A. Ross (MAA)
	Alfred B. Willcox (MAA)

4.8.17. **AMS-MAA-SIAM Joint Policy Board for Mathematics**

I. Edward Block (SIAM)	*ex officio*
Charles William Gear (SIAM)	*ex officio*
Leonard Gillman (MAA)	*ex officio*
Donald Kreider (MAA)	1987
William J. LeVeque (AMS)	*ex officio*
G. D. Mostow (AMS)	*ex officio*
Everett Pitcher (AMS)	1988
Werner C. Rheinboldt (SIAM)	1988
Alfred B. Willcox (MAA)	*ex officio*

4.8.18. Joint Policy Board for Mathematics

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Public Information Director: Kathleen Holmay
General Counsel: Jennifer Vance

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Cambridge, MA 02139
Telephone: 617-253-3214

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Mathematical Association of America
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Washington, DC 20036
Telephone: 202-387-5200

4.8.19. JPBM Joint Coordinating Committee on Public Understanding of Mathematics

	Ronald L. Graham (AMS)
	Joseph B. Keller (SIAM)
	Lynn A. Steen (MAA)

4.8.20. JPBM Committee for Mathematics Department Heads (Terms expire in January).

	Donald F. Reynolds	1990
	Donna Szott	1990
	Thomas W. Tucker	1990

4.8.21. **AMS-SIAM Committee on Applied Mathematics**

	Constantine M. Dafermos	1989
	James M. Hyman	1987
	Donald E. McClure	1988
Chairman	George C. Papanicolaou	1989
	Francis Sullivan	1988
	Robert F. Warming	1987

4.8.22. **AMS-SIAM Committee on Mathematics in the Life Sciences**

	Kenneth L. Lange	1987
	Michael C. Mackey	1989
	Hans G. Othmer	1988
	Alan S. Perelson	1987
Chairman	Richard E. Plant	1988
	John M. Rinzel	1989

4.8.23. **AMS-SIAM Committee to Screen Applicants for Graduate Study from the People's Republic of China**

	Chia-Chiao Lin
	Beresford N. Parlett
	Franklin P. Peterson
	Mei-Chang Shen
	Karen Uhlenbeck

4.8.24. **AMS-SIAM Committee to Select the Winner of the Birkhoff Prize for 1988**

	Wendell H. Fleming
	Gilbert Strang
Chairman	Hans F. Weinberger

5. Representatives

5.0.1. **Advisory Board of the National Translations Center of the John Crerar Library**

Ralph P. Boas

5.0.2. **Commission on Professionals in Science and Technology**

Edward A. Connors

5.0.3. **Conference Board of the Mathematical Sciences**

G. D. Mostow 1988

5.0.4. **Fulkerson Prize Committee**

Alan J. Hoffman

5.0.5. **Section A of the American Association for the Advancement of Science**
Term expires on May 27
Louise Hay 1989

5.0.6. **U.S. National Committee on Theoretical and Applied Mechanics**
Term expires on October 31
Stuart S. Antman 1988

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THE LEGACY OF SONYA KOVALEVSKAYA

Linda Keen, Editor

Sonya Kovalevskaya was a distinguished mathematician and considered by her contemporaries to be among the best of her generation. Her work, ideas and approach to mathematics are still relevant today, while her accomplishments continue to inspire women mathematicians.

The academic year 1985–86 marked the 15th anniversary of the Association for Women in Mathematics and the 25th anniversary of the Mary Ingraham Bunting Institute of Radcliffe College, Harvard University both organizations that have enhanced women's role in mathematics. These two occasions provided a framework for a Kovalevskaya celebration, which included a symposium at Radcliffe College, and special sessions at the the AMS meeting in Amherst, Massachusetts, both in October 1985. The papers in this collection were drawn from those two events.

The first group of papers contains background material about Kovalevskaya's life and work, including a discussion of how she has been perceived by the mathematical community over the last century. The rest of the papers contain new mathematics and cover a wide variety of subjects in geometry, analysis, dynamical systems and applied mathematics. They all involve in one form or another Kovalevskaya's main areas of interest, differential equations and mathematical questions arising from physical phenomena.

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Apply to: Guy Hirsch, Secretary, Société Mathématique de Belgique, 317, Avenue Charles Woeste, 1090 Brussels, Belgium.

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Latin America

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Apply to: Aron Simis, Departamento de Matemática-UFPE, Cidade Universitária, 50.730, Recife, PE, Brazil.

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Middle East

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Officers: M. Toomanian (President-Secretary), S. H. Javadpoor (Treasurer).

Israel Mathematical Union

Address for mail: Israel Mathematical Union, c/o Nira Dyn, Secretary, School of Mathematics, Tel-Aviv University, Tel-Aviv, Israel 69978.

Apply to: Nira Dyn, School of Mathematics, Tel-Aviv University, Tel-Aviv, Israel 69978.

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Australian Mathematical Society

Address for mail: Australian Mathematical Society, c/o Department of Mathematics, University of Queensland, St. Lucia, Queensland 4067, Australia.

Apply to: W. R. Bloom, Secretary, Australian Mathematical Society, c/o School of Mathematical & Physical Sciences, Murdoch University, Murdoch, W. A. 6150, Australia.

Dues: $A38.00; payable to D. G. Tacon, Associate Treasurer, Australian Mathematical Society, c/o School of Mathematics, The University of New South Wales, P.O. Box 1, Kensington, N.S.W. 2033, Australia.

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Apply to: Membership Committee, Mathematical Society of the Philippines, Department of Mathematics, Ateneo de Manila University, P.O. Box 154, Masophman, Philippines.

Dues: $5; payable to Mathematical Society of the Philippines.

Privileges: Publications and newsletter of the Mathematical Society of the Philippines.

Officers: Jose Marasigan (President), Rene P. Felix (Vice-President), Leticia Castillo (Treasurer), Norman Quimpo (Secretary).

•New Zealand Mathematical Society

Address for mail: Department of Mathematics, University of Canterbury, Christchurch, New Zealand.

Apply to: J. A. Shanks, Treasurer, Department of Mathematics, University of Otago, Dunedin, New Zealand.

Dues: $NZ 11.50; payable to J. A. Shanks, Treasurer, Department of Mathematics, University of Otago, Dunedin, New Zealand.

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Institute for Computer Applications in Science and Engineering (ICASE). A limited number of visiting appointments are available for both junior- and senior-level researchers at the Institute for Computer Applications in Science and Engineering (ICASE) which is operated by the Universities Space Research Association. ICASE serves as a center for interaction between Langley Research Center staff and the academic community in the areas of applied and numerical mathematics, applied computer science, and development of mathematical models in a variety of application areas. Applications for partial support while on sabbatical leave are encouraged as are applications from Ph.D.'s for two-year renewable appointments. Inquiries should be addressed to the Director, ICASE, Mailstop 132C, NASA Langley Research Center, Hampton, Virginia 23665. An Equal Opportunity Employer.

TENNESSEE STATE UNIVERSITY
Department of Physics, Mathematics, and Computer Science

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UNIVERSITY OF ARIZONA
DEPARTMENT OF MATHEMATICS
TUCSON, ARIZONA 85721

The Mathematics Department at the University of Arizona will have several visiting positions for next year. Applications received by February 1, 1988 will be considered first, if suitable candidates are not found then late applications will be reviewed. Send applications (please include Social Security number if possible) to Department Head, Department of Mathematics. The University of Arizona is an Equal Opportunity/Affirmative Action Employer.

Mathematics and Computer Science
Knox College
Galesburg, Illinois 61401

Two positions, one tenure track and one visiting, for computer scientist/mathematician to teach computer science and mathematics in a department of mathematics and computer science. Teaching load is two courses per term for each of three terms. Salary and rank dependent on qualifications and experience. Knox is a selective liberal arts college. Applications from women and minorities are strongly encouraged. Send vita, transcripts, and three letters of recommendation to Dennis M. Schneider, Chairman.

Boston University
Department of Mathematics

Position for Professor of Applied Mathematics for Fall 1988. Record of distinguished achievements in research and commitment to excellence in teaching required. Preference to candidates in partial differential equations and/or mathematical physics with distinguished contribution to pure mathematics. Women and minorities are encouraged to apply. Send nominations and applications by November 1, 1987 to Search Committee, Department of Mathematics, 111 Cummington St., Boston, MA 02215. The University is an EO/AA employer.

MILLS COLLEGE
Department of Mathematics and Computer Science
Oakland, California 94613

Mills College is seeking outstanding candidates for a tenure-track position as Assistant, Associate or Full Professor of Mathematics commencing Fall 1988. Candidates must submit evidence of superior teaching and research abilities, and demonstrate a commitment to become involved in a highly innovative and energetic department. Rank and salary will depend on experience and qualifications. The initial contract will be for three years, subject to final administrative approval. Mills College is an Affirmative Action/Equal Opportunity Employer.

Send vita and direct three letters of reference to:

Professor Richard Bassein
Chair of the Mathematics Search Committee
Mills College
Oakland, CA 94613

Deadline for application: January 15, 1988

POSITIONS AVAILABLE

The Department of Mathematics at the University of Alberta wishes to sponsor a strong candidate for the Natural Sciences and Engineering Research Council of Canada (NSERC) 1987–88 University Research Fellowship Competition. These Fellowships are five year research positions (with a review in the third year), in the nature of research assistant professorships, and carry a teaching load of at most one course throughout the academic year. Applicants should have shown some substantial research ability beyond their doctoral thesis. They should be Canadian citizens or permanent residents of Canada.

Interested candidates should send their curricula vitae to:

Professor H. I. Freedman, Acting Chairman
Department of Mathematics
University of Alberta
632 Central Academic Building
Edmonton, Alberta, T6G 2G1

They should arrange for at least two letters of reference to be sent directly to the same address. All documentation should reach the Department by September 15, 1987. The Department will make its recommendations to NSERC early in October 1987. NSERC will announce its decision in March 1988.

Please refer to File AMD-12 when responding to this advertisement.

The University of Alberta is an equal opportunity employer.

UNIVERSITY OF ARIZONA
DEPARTMENT OF MATHEMATICS
TUCSON, ARIZONA 85721

The Mathematics Department at the University of Arizona is happy to announce several postdoctoral fellowships (Research Associate) which will be available beginning August '88. Applicants with areas of strength in applied mathematics, computational science and nonlinear optics may qualify for special Center of Excellence Awards. Only candidates with outstanding research records or potential should apply. Applications received by February 1, 1988 will be considered first, if suitable candidates are not found then late applications will be reviewed. Send applications (please include Social Security number if possible) to Department Head, Department of Mathematics. The University of Arizona is an Equal Opportunity/Affirmative Action Employer.

UNIVERSITY OF ARIZONA
DEPARTMENT OF MATHEMATICS
TUCSON, ARIZONA 85721

Tenure track positions at all levels. Ph.D., excellent research record or potential, strong commitment to teaching required. Field is less important than ability but should complement existing strengths in algebra, computational science, differential equations, dynamical systems, geometry, mathematical physics, nonlinear analysis, number theory, probability and statistics. Applications received by February 1, 1988 will be considered first, if suitable candidates are not found then late applications will be reviewed. Send applications (please include Social Security number if possible) to Department Head, Department of Mathematics. The University of Arizona is an Equal Opportunity/Affirmative Action Employer.

Pohang Inst of Science & Tech
Department of Mathematics
Pohang, 680 Korea

Positions at all levels are available for mathematicians holding a Ph.D. in Mathematics. Preference is given to candidates who can speak the Korean language, and have shown strong evidence of ability for doing original research in mathematics. Salaries are higher and teaching loads are lower than comparable institutions in Korea. Interested persons should write to Professor Jin-Ho Kwak at the above address or Professor C. N. Lee, Department of Mathematics, University of Michigan, Ann Arbor, MI 48109. (Tel. 313-668-0330).

Department of Mathematics and Statistics
McGill University

The Department of Mathematics and Statistics at McGill University is seeking to fill two tenure-track Assistant Professorships in September 1988. A further two appointments may be available for September 1988 or September 1989, but the latter two are still subject to budgetary approval. Candidates should have a Ph.D. and a solid record of achievement in research.

There are three priority areas: algebraic or differential geometry; numerical analysis (preferably associated with partial differential equations); and mathematical statistics (where a more senior appointment can be considered). However, we will entertain applications from outstanding candidates in other areas.

The applications should be sent to:

Professor M. Herschorn, Chairman
Department of Mathematics and Statistics
McGill University
805 Sherbrooke Street West
Montreal, Quebec, Canada
H3A 2K6

Please include a statement of research accomplishments and plans along with your letter of application, and arrange for 3 letters of recommendation to be forwarded. McGill University is an equal opportunity employer, but in accordance with the Canadian Immigration requirements priority will be given to Canadian citizens and permanent residents.

The deadline for the receipt of completed applications is November 15, 1987.

University of Missouri-Rolla
Chair – Department of Mathematics
and Statistics

The Department invites applications for the position of Department Chair, to begin September 1, 1988. The Rolla campus is one of four within the University of Missouri system, has an enrollment of about 5500, and emphasizes engineering and science. The Department has 22 faculty and offers bachelor, master, and doctoral programs in mathematics and statistics. Candidates should have a strong research record and a commitment to excellent teaching. The review of applications will begin October 1, 1987, and will continue until the position is filled. A vita and at least three references should be sent to Professor Glen Haddock, Department of Mathematics and Statistics, University of Missouri-Rolla, Rolla, MO 65401. Applications by minorities are encouraged. AA/EOE.

POSITIONS AVAILABLE

UNIVERSITY OF WISCONSIN-MILWAUKEE
Department of Mathematical Sciences

The Department of Mathematical Sciences of the University of Wisconsin-Milwaukee anticipates two full or associate level professorships (with tenure) in ring theory beginning in August, 1988. Duties for the positions consist of research and teaching two courses per semester. Applicants must have a strong research and publication record. Salary is commensurate with experience and qualifications.

Applicants should submit a vita, a list of publications, and at least five letters of recommendation to Search Committee, Department of Mathematical Sciences, Univeristy of Wisconsin-Milwaukee, P. O. Box 413, Milwaukee, WI 53201 by November 1, 1987.

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OREGON STATE UNIVERSITY
Numerical Analysis with Applications

Assistant Professor position in numerical analysis with applications may become available September 1988. Salary depends on qualifications. Closing date January 4, 1988. Write to:

Professor Robert Higdon
Staff Selection Committee
Department of Mathematics
Oregon State University
Corvallis, OR 97331

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OREGON STATE UNIVERSITY

Assistant Professor position in Algebra, Analysis, Geometry, Probability, or Topology may become available September 1988. Salary depends on qualifications. Closing date January 4, 1988. Write to:

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Staff Selection Committee
Department of Mathematics
Oregon State University
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CENTRE COLLEGE
MATHEMATICS POSITION

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UNIVERSITY OF UTAH
DEPARTMENT OF MATHEMATICS

invites applications for the following positions:

1. Three full time tenure track appointments are available. Two of these are to be at the Assistant Professor or Associate Professor rank and one is to be at the Associate Professor or Professor rank. Selection will be based on research expertise and teaching ability. Applications will be accepted until January 31, 1988 or until all three positions are filled.

2. One tenure track position of one-third to full time at the rank of Associate Professor or Professor. Selection as above. Applications will be accepted until November 30, 1987 or until the position is filled.

3. Two or more nonrenewable three-year Instructorships. Persons of any age receiving Ph.D. degrees in 1987 or 1988 are eligible. Applicants will be selected on the basis of ability and potential in teaching and research. **Starting salary this academic year is $27,000** and cost of living increases are contingent on action by the State Legislature. Duties consist of teaching two courses through the academic year. Applications will be accepted until February 28, 1988 or until the positions are filled.

4. One or more visiting positions of one year or less. Selection criteria are teaching ability and potential contribution to our research environment. Applications will be accepted until February 28, 1988 or until the positions are filled.

Applications must include curriculum vita, bibliography and three letters of reference. (Instructorship applications must also include an abstract of thesis and a list of graduate courses completed or transcripts.)

Please send your application to:

COMMITTEE ON STAFFING
DEPARTMENT OF MATHEMATICS
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SALT LAKE CITY, UTAH 84112

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CLAREMONT McKENNA COLLEGE
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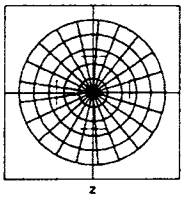

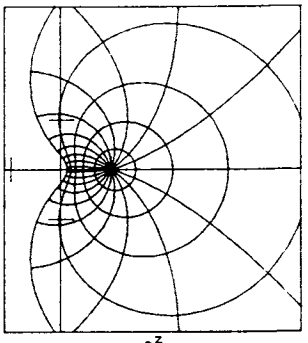

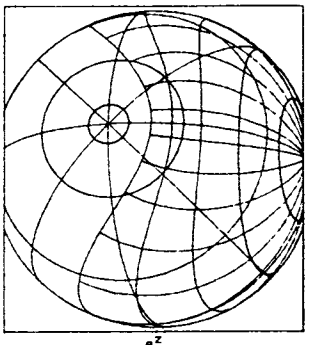

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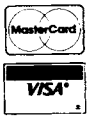

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