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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 the *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 headquarters 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
822	October 26–27, 1985	Amherst, Massachusetts	EXPIRED	October
823	November 1–2, 1985	Columbia, Missouri	EXPIRED	October
824	November 8–9, 1985	Claremont, California	EXPIRED	October
825	January 7–11, 1986 (92nd Annual Meeting)	New Orleans, Louisiana	October 16	January
826	April 11–12, 1986	Indianapolis, Indiana	February 5	March
827	May 3–4, 1986	Baltimore, Maryland	February 10	March
	August 3–11, 1986 (International Congress of Mathematicians)	Berkeley, California	April 8	
	October 10–11, 1986	Logan, Utah		
	October 31–November 1, 1986	Denton, Texas		
	January 21–25, 1987 (93rd Annual Meeting)	San Antonio, Texas		
	January 6–11, 1988 (94th Annual Meeting)	Atlanta, Georgia		
	August 8–12, 1988 (AMS Centennial Celebration)	Providence, Rhode Island		
	January 11–15, 1989 (95th Annual Meeting)	Phoenix, Arizona		

DEADLINES: Advertising (*November* 1985 *Issue*) *Oct.* 2, 1985 (*January* 1986 *Issue*) *Nov.* 14, 1985
News/Special Meetings (*November* 1985 *Issue*) *Sept.* 16, 1985 (*January* 1986 *Issue*) *Oct.* 28, 1985

Other Events Sponsored by the Society

January 5–6, 1986, AMS Short Course: Approximation Theory, New Orleans, Louisiana. Details: January issue.

June 22–August 2, 1986, Joint Summer Research Conferences in the Mathematical Sciences, University of California, Santa Cruz, California. Details: this issue.

July 7–25, 1986, AMS Summer Research Institute on Representations of Finite Groups and Related Topics, California location to be announced. Details: January issue.

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Notices
of the American Mathematical Society

Volume 32, Number 5, October 1985

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1986 International Congress Of Mathematicians

by Yousef Alavi, Andrew M. Gleason, Peter Hilton, Jill P. Mesirov, and Jean Pedersen

In the summer of 1986, the United States mathematical community will be host to the International Congress of Mathematicians (ICM-86) from August 3–11 in Berkeley, California. Because of the importance of this event, the American Mathematical Society will not hold its summer meeting that year.

The purpose of a Congress is twofold. Through its scientific program, it provides an opportunity for mathematicians to review the progress in their subject over the last four years, and to award the Fields medals to some of the outstanding contributors. Furthermore, it enables mathematicians from all over the world to meet in a congenial social setting to discuss their research interests and common problems. Perhaps ICM-86 will also be of some help in demonstrating to the public at large that mathematics is a vigorous research discipline with a strong influence on today's technological society.

The first ICM was held in Chicago in 1893 in conjunction with the Chicago World's Fair. The attendance was about fifty. E. H. Moore of the University of Chicago, a member of the Organizing Committee, suggested that the New York Mathematical Society publish the proceedings of the Congress. The Society agreed, and this proved to be "the final impulse leading, on 1 July 1894, to the changing of the Society's name to the American Mathematical Society."[1] During his inaugural address at the Congress, Felix Klein called for the formation of international mathematical unions and praised the Congress at Chicago as a step in that direction.

Since that time, Congresses have been held every four years except during periods of World War (a list of past Congresses is appended). It was at the Paris ICM of 1900 that David Hilbert presented his famous collection of twenty-three open problems. The second Congress to be held in the United States was to have taken place in 1940 at Harvard University; it was postponed for ten years because of World War II. About 1700 mathematicians attended the 1950 Congress in Cambridge and heard M. H. Stone report that the first steps towards the formation of the International Mathematical Union had been taken. The 1986 Congress in Berkeley will be the third ICM to be held in the United States; about 4000 mathematicians are expected to attend.

Traditionally, arrangements for the International Congress are made by an Organizing Committee of volunteer mathematicians at and around the site University. ICM-86 is a break with that tradition. Before inviting the International Mathematical Union to hold the 1986 Congress in the United States, the National Academy of Sciences asked the AMS to manage the organization of the Congress and to assume financial responsibility for it. The Society has chosen to do so through a newly-formed nonprofit subsidiary corporation, ICM-86. Thus, the office of the Congress Manager is at the Society's home office in Providence, instead of in Berkeley, and it is in Providence that all of the details of travel, housing, registration, entertainment, and meeting facilities are handled. A Steering Committee of fifteen mathematicians having a wide spectrum of interests advises the Providence staff. The Committee is chaired by Andrew M. Gleason of Harvard University. In addition, John W. Addison, Jr., of the University of California, Berkeley, is chairman of the Local Arrangements Committee.

The expenses of running ICM-86 will be covered primarily by the registration fees of the participants. However, in order to keep these fees at a reasonable level, funds have been sought from government agencies, foundations, and the private sector. Generous grants have already been secured from the National Science Foundation, Air Force, Army, Navy, Department of Energy, and the Sloan Foundation. So far, major corporate contributions have come from AMOCO, Exxon Research and Development, IBM, Grumman Corporation, Honeywell, and John Hancock Mutual Life Insurance Company. These gifts have been solicited by the Committee on Special Funds, chaired by Richard D. Anderson. Contributions are also being received from individual members of the AMS as a supplement to their annual dues.

The scientific program remains under the control of the International Mathematical Union (IMU) through its Program Committee, a group of internationally renowned mathematicians. The IMU tries to insure a broad global geographical representation on the Committee. This Committee has divided the work of the Congress into nineteen sections (see below), and has appointed a subcommittee to oversee each section.

[1] Amer. Math. Soc. Semicentennial Publ., Volume 1, Amer. Math. Soc., New York, 1938, page 74.

The main program will consist of three parts. First there are sixteen invited one-hour plenary addresses. These are of an expository nature and are meant to survey progress in various fields of mathematics. Next there will be approximately 130 speakers invited to give 45-minute lectures within the various sections. Finally, the program includes provision for about 1000 short communications (ten minutes in length). There will also be facilities for participants to hold informal seminars.

The *Proceedings* of the Congress, which are expected to appear in 1987, will include write-ups of the plenary addresses and the 45-minute section talks. *Proceedings* will be distributed to all mathematicians who register for the Congress.

One of the highlights of an ICM is the awarding of the Fields Medals at the Opening Ceremonies, and the talks given immediately after on the research of each of the recipients. At the last Congress, in Warsaw, a new prize was introduced to recognize outstanding mathematical contributions in the field of information sciences, the Nevanlinna Prize. This prize will also be awarded in Berkeley.

The social program of the Congress should provide many opportunities for mathematicians to meet their colleagues from all over the world, especially those who may only rarely be able to leave their home countries. Among the events scheduled are a reception given by the Chancellor of the University of California, Berkeley, and a rodeo/barbecue at the Cow Palace in San Francisco. It is hoped that some evening musical events can also be scheduled. In addition, plans are underway to arrange interesting activities for those family members who are not involved in the scientific program; the San Francisco Bay Area is one of the most popular tourist areas in the United States.

All of us will want to take advantage of this opportunity to welcome our colleagues from abroad, to exchange ideas, and to strengthen the bonds of the international mathematical community.

The 19 Sections for the 1986 Congress

1. Mathematical Logic and Foundations
2. Algebra
3. Number Theory
4. Geometry
5. Topology
6. Algebraic Geometry
7. Complex Analysis
8. Lie Groups and Representations
9. Real and Functional Analysis
10. Probability and Mathematical Statistics
11. Partial Differential Equations
12. Ordinary Differential Equations and Dynamical Systems
13. Mathematical Physics
14. Numerical Methods and Computing
15. Discrete Mathematics and Combinatorics
16. Mathematical Aspects of Computer Science
17. Applications of Mathematics to Nonphysical Sciences
18. History of Mathematics
19. Teaching of Mathematics

A List of Past Congresses

1893 - Chicago
1897 - Zurich
1900 - Paris
1904 - Heidelberg
1908 - Rome
1912 - Cambridge, U.K.
1920 - Strasbourg
1924 - Toronto
1928 - Bologna
1932 - Zurich
1936 - Oslo
1950 - Cambridge, U.S.A.
1954 - Amsterdam
1958 - Edinburgh
1962 - Stockholm
1966 - Moscow
1970 - Nice
1974 - Vancouver
1978 - Helsinki
1982 - Warsaw

Fields Medalists

1936
Lars Ahlfors
Jesse Douglas

1950
Atle Selberg
Laurent Schwartz

1954
Kunihiko Kodaira
Jean-Pierre Serre

1958
Klaus Roth
René Thom

1962
Lars Hörmander
John Milnor

1966
Michael Atiyah
Paul J. Cohen
Alexander Grothendieck
Stephen Smale

1970
Alan Baker
Heisuke Hironaka
Sergei Novikov
John G. Thompson

1974
Enrico Bombieri
David Mumford

1978
Pierre Deligne
Charles Fefferman
Gregori Aleksandrovitch Margulis
Daniel Quillen

1982
Alain Connes
William P. Thurston
Shing-Tung Yau

Nevanlinna Prize

1982
Robert E. Tarjan

INTERNATIONAL CONGRESS OF MATHEMATICIANS

Berkeley, California, U.S.A.

FIRST ANNOUNCEMENT

The U.S. National Committee for Mathematics of the U.S. National Academy of Sciences is pleased to announce that the next International Congress of Mathematicians will be held at the University of California, Berkeley, from Sunday, August 3 through Monday, August 11, 1986. The university is situated along gently sloping hills that overlook the city of Berkeley, and, across the bay, the city of San Francisco and the Golden Gate Bridge.

Mathematical Program

The work of the Congress will be divided into 19 sections. There will be about 16 invited one-hour expository addresses covering recent developments in the major areas of mathematics, and approximately 130 invited 45-minute lectures in the sections. All Ordinary Members of the Congress will have an opportunity to present ten-minute communications of contributed papers, and to hold informal mathematical seminars on their own initiative. All scientific sessions of ICM-86 will be held on the campus of the University of California, Berkeley. All invited lectures will be published in the Proceedings of ICM-86. A complimentary copy will be sent to each Ordinary Member of the Congress. Abstracts of the short communications will be distributed to Ordinary Members at the Congress at no charge. English, French, German and Russian are the official languages of the Congress.

Social Events

The Chancellor of the University of California, Berkeley, will host an opening reception for all registered participants on Sunday evening, August 3. On Thursday, August 7, all registered participants will have an opportunity to attend an authentic Western Barbecue and Rodeo at the Cow Palace in San Francisco. Both the reception and barbecue/rodeo will be free to all registered Ordinary and Accompanying Members. During ICM-86, short day trips to local sites of interest in the scenic Northern California area will be available. Preregistrants will have an opportunity to purchase these day trips in advance, as well as several pre- and post-Congress tours. More detailed descriptions of these activities will appear in the Second Announcement.

Accommodations

Participants will be housed in a variety of hotels and student residence halls in Berkeley, Oakland and San Francisco. Detailed information on locations and rates will be provided in the Second Announcement, which will include a preregistration/housing request form to complete and return to ICM-86.

Second Announcement

The Second Announcement of ICM-86 will describe all activities of the Congress in detail, and provide instructions on how to complete the preregistration process and obtain accommodations. It will provide more, although not complete, information on the scientific program, and give instructions regarding the submission of abstracts of short communications and the organization of informal seminars. Advice will be given on how to proceed upon arrival at either the San Francisco or Oakland International airports. Full descriptions and prices will be given of the available day trips and pre- and post-Congress tours; preregistrants will be given the opportunity to purchase these in advance.

If you wish to receive the Second Announcement, please **PRINT** your name and address on the form opposite and mail it so as to reach ICM-86 **no later than October 30, 1985**. The Second Announcement will be mailed to you before the end of 1985.

In order to receive the Second Announcement of ICM-86, please complete this form and return so as to arrive by October 30, 1985 to:

ICM-86,
Post Office Box 6887
Providence, Rhode Island 02940
U.S.A.

Please PRINT your name and address below as you would like them to appear on the official Congress records.

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(last/family/surname) (first/given name) (middle name/initial)

Mailing Address: _____
(institution)

_____
(street and number) (city or town) (zip or postal code)

_____
(state, province, etc.) (country)

My two major areas of mathematical interest, according to the 19 subject classifications listed below, are:

Primary _____ Secondary _____

1. *Mathematical logic and foundations*
2. *Algebra*
3. *Number theory*
4. *Geometry*
5. *Topology*
6. *Algebraic geometry*
7. *Complex analysis*
8. *Lie groups and representations*
9. *Real and functional analysis*
10. *Probability and mathematical statistics*
11. *Partial differential equations*
12. *Ordinary differential equations and dynamical systems*
13. *Mathematical physics*
14. *Numerical methods and computing*
15. *Discrete mathematics and combinatorics*
16. *Mathematical aspects of computer science*
17. *Applications of mathematics to nonphysical sciences*
18. *History of mathematics*
19. *Teaching of mathematics*

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1985 Steele Prizes Awarded at Summer Meeting in Laramie

Three Leroy P. Steele Prizes were awarded at the Society's Summer Meeting in Laramie, Wyoming.

The Steele Prizes are made possible by a bequest to the Society by Mr. Steele, a graduate of Harvard College, Class of 1923, in memory of George David Birkhoff, William Fogg Osgood and William Caspar Graustein.

Three Steele Prizes are awarded each year: one for expository mathematical writing, one for a research paper of fundamental and lasting importance, and one in recognition of cumulative influence extending over a career, including the education of doctoral students. The current award is $4000 for each of these categories.

The recipients of the Steele Prizes for 1985 are MICHAEL SPIVAK for the expository award; ROBERT STEINBERG for research work of fundamental importance; and HASSLER WHITNEY for the career award.

These prizes were awarded by the Council of the Society (acting through its Executive Committee) on the recommendation of the Committee on Steele Prizes whose members at the time of these selections were Richard W. Beals, Jerry L. Bona, Charles W. Curtis, Harold M. Edwards, Frederick W. Gehring, H. Jerome Keisler, Yiannis N. Moschovakis (Chairman), Lawrence E. Payne, George B. Seligman, Patricia Lilaine Sipe.

The text which follows contains the Committee's citations for each award, the recipients' responses at the prize session in Laramie, and a brief biographical sketch of each of the recipients.

Expository Writing

Michael Spivak

Citation

The 1985 Steele Prize for expository writing is awarded to MICHAEL SPIVAK for his books in differential geometry. His five-volume set, *A Comprehensive Introduction to Differential Geometry*, accomplishes with style the seemingly impossible tasks announced in the title, presenting a novice to the field with a comprehensive view of the subject, from the classic early works of Gauss and Riemann to the various contemporary approaches of Cartan, Chern, Koszul, and Ehresmann. In the ten years since its completion, this work has become a kind of classic of its own, providing the reader with important insights into the development of the subject, a well-selected set of central topics, and a unique and exhaustive annotative bibliography. Furthermore, it is written in a lucid and informal style that makes reading it a pleasure. An earlier "classic" by Spivak is his *Calculus on Manifolds*, one of the first books to make available to an undergraduate audience the basic concepts and techniques of differentiable manifolds and differential forms.

Michael Spivak

Response

It was as gratifying as it was surprising to learn that I was to receive the Steele Prize for my books on differential geometry. When I made my first intrepid, not to say foolhardy, attempts to fathom the multi-media world of differential geometry, I certainly hadn't anticipated completing a work of such outlandish proportions. I hope this award will encourage others on similar ventures, and show that they can be accomplished even from the periphery of the academic world.

Perhaps it is now appropriate to use $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX, the next of my imprudent projects, to typeset these books, so that, some time in the distant future, the books can appear in more permanent form—after all, I still do remember, vaguely, what a connection is (I mean are).

Biographical Sketch

MICHAEL DAVID SPIVAK was born May 25, 1940, in Queens, New York. He received an A.B. degree from Harvard University in 1960, and a Ph.D. from Princeton University in 1964. Between 1964 and 1970 he was a member of the department of mathematics at Brandeis University (lecturer, 1964–1967, and assistant professor, 1968–1970). In 1967-1968 he was a National Science Foundation Fellow at the Institute for Advanced Study in Princeton. From 1970 on, he visited and lectured at several universities, including Bonn and the University of California, Berkeley, pursued his career as a publisher of mathematical books, and developed an interest in computer composition of mathematical text.

His book *Calculus on Manifolds: A Modern Approach to Classical Theorems of Advanced Calculus* was published by Benjamin in 1965 [MR **35** #309], and subsequently translated into Polish, Spanish, Japanese and Russian. Another text, *Calculus*, was published originally by Benjamin and translated into Spanish; it is now in a second edition published by Publish or Perish, Inc.

The five volumes of *A Comprehensive Introduction to Differential Geometry* were published originally in 1970 (volumes 1 and 2) [MR **42** #2369, #6726] and in 1975 (volumes 3, 4, 5) [MR **51** #8962, **52** #15254a, #15254b]; a second edition, of all five volumes, was issued in 1979 by Publish or Perish, Inc. See also the *Bulletin of the American Mathematical Society*, volume **84** (1978), pages 27–32, for a more extensive review of the differential geometry series.

Dr. Spivak is the creator of the $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX macro package (see the *Notices*, February 1981, page 176), and the author of *The Joy of TEX*, a book describing $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX and its use, published by the American Mathematical Society. He is also the principal of Publish or Perish, Inc., a mathematical publishing house.

Fundamental Paper

Robert Steinberg

Citation

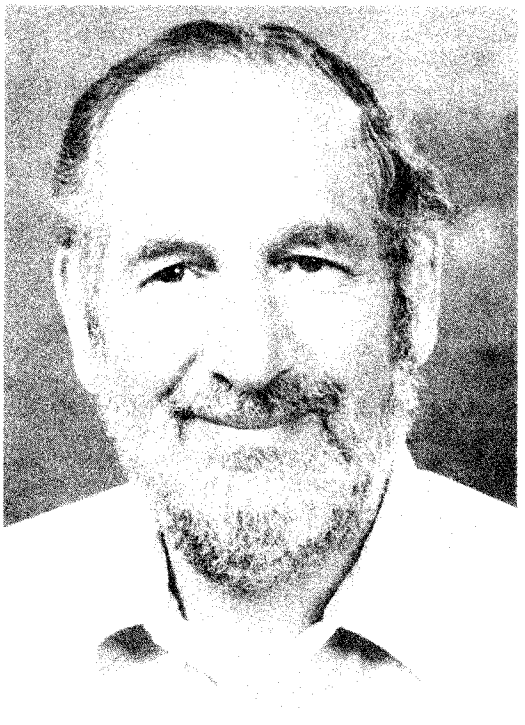
The 1985 award for a paper, whether recent or not, which has proved to be of fundamental or lasting importance in its field, or a model of important research, is made to ROBERT STEINBERG for the following series of papers on various aspects of the theory of algebraic groups:

Representations of algebraic groups, Nagoya Mathematical Journal, volume **22** (1963), pages 33-56. [MR **31** #4788]

Regular elements of semisimple algebraic groups, Institut des Hautes Études Scientifiques. Publications Mathématiques, volume **25** (1965), pages 49-80. [MR **31** #4788]

Endomorphisms of linear algebraic groups, Memoirs of the American Mathematical Society, volume **80** (1968), 108 pages. [MR **37** #6288]

The results and methods contained in these papers have contributed to progress on a wide range of deep and important problems in the theory of finite simple groups, representation theory, and cohomology, as well as in the theory of algebraic groups. This work has helped open the way to the establishment of the theory of algebraic groups as a strong and versatile method for the solution of problems, many of which had long appeared inaccessible.



Robert Steinberg

Response

I want to thank the Steele Prize committee for this award. The news, when I first learned about it, came as a total surprise. To have my name added to the list of distinguished mathematicians who have received this award is indeed an honor. I view the award as a tribute, not just to me, but to all of the people, before and after, who have worked in this field and continue to make it such

a vital area of mathematics. Those that preceded me made my own work possible and those that followed are responsible for any lasting value that it may have. It is not possible to name all of the people involved, but I would like to mention two of them, Professors Claude Chevalley and Richard Brauer, both unfortunately now dead. They were primarily responsible for the renewed interest and great surges in the theory of algebraic groups and the theory of finite groups just before the papers cited in the award were written. Brauer was also my main teacher and my indebtedness to him can not be measured. It pleases me a great deal that the first of the three papers chosen by the committee is dedicated to Brauer and has as its takeoff a theorem of his. The main result of that paper is a "tensor product theorem" that simplifies the representation theory of the finite and the algebraic simple groups. The second paper contains the construction of a cross section of the set of regular elements of a semisimple algebraic group similar to the Jordan normal form for matrices and, as a consequence, the theorem that the Galois cohomology of connected algebraic groups defined over fields of dimension at most 1 is trivial. The latter result has been used in the study of groups over local fields and vector bundles over Riemann surfaces. The third paper introduces the notion of affine root system, but one of its main purposes is the development of a connection between the simple algebraic groups and the simple finite groups. The point is that, with some exceptions, each of the latter is the set of fixed points of a suitable endomorphism of one of the former. The first paper and a companion paper on central extensions of algebraic groups were written while I was a visitor at the Institute for Advanced Study in 1961-1962, while the second paper and a preliminary version of the third were written in Paris in 1963-1964. Thus, leaves away from home and the resulting contacts with other mathematicians have been of great benefit to me. Since a number of talented younger mathematicians are now working in the area in which my papers were written, I expect it to remain an active one.

Biographical Sketch

ROBERT STEINBERG was born May 25, 1922, in Stykon, Rumania. His undergraduate and graduate studies were done at the University of Toronto, where he received a B.A. in 1944 and a Ph.D. in mathematics in 1948 and was a lecturer in mathematics in 1947-1948. Since 1948 he has been a member of the department of mathematics at the University of California, Los Angeles, as an instructor, assistant professor, associate professor, and (since 1962) a full professor. He has visited the Institute for Advanced Study (1955-1956, 1961-1962, 1969), Yale University (1967-1968), M.I.T. (1968-1969), Tata Institute (1972), and (informally) the University of Paris (1963-1964, 1973) and Queen Mary College (1979-1980). This year he was elected to the National Academy of Sciences.

He has given invited addresses at the AMS meeting in Las Cruces, New Mexico (April 1963), at the International Congress of Mathematicians in Moscow (August 1966), and at the Annual Meeting of the MAA in Las Vegas, Nevada, January 1972. The ICM lecture, *Classes of elements of semisimple algebraic groups* was published in the Proceedings of the International Congress of Mathematicians (Moscow, 1966), pages 277-284 [MR **39** #216].

He is a member of the American Mathematical Society and the Mathematical Association of America.

Career Award

Hassler Whitney

Citation

The 1985 Steele Prize for cumulative influence is awarded to HASSLER WHITNEY for his fundamental work on geometric problems. Whitney combined unusual but fruitful viewpoints with great technical prowess in his research. The ideas and methods he pioneered in the general theory of manifolds, in the study of differentiable functions on closed sets, in geometric integration theory, in the geometry of the tangents to a singular analytic space, and elsewhere, have become a part of the very fabric of these subjects and have had a profound influence on later work in these areas.

Hassler Whitney

Response

It appears to me a little strange, after eighteen years of concentrated work in mathematics education, to be given an award in mathematics. However, I appreciate this highly, and would like to say a few words about the present state of mathematics in relation to education.

I can start with my own experience. My schooling was rather informal, which suited me well. I built with erector sets and had mechanical projects which did not work well. There was just one clue to my future (about age nine). I figured out why the formula for divisibility by nine worked, then thought the basic reason was because nine was next to ten; but so was eleven, so I found the formula for eleven. I had little mathematics in school, and none in college. For advanced physics, I studied calculus by myself, and enjoyed it for a while. After graduating, on reviewing my notes for a physics course, I found that I had forgotten most of it. In physics it seems you have to remember facts, so I gave it up and moved into mathematics.

My mathematical career consisted basically of searching out interesting problems of a simple variety; then I would plunge in. I had lots of luck in finding things to work on; but with graduate students who wanted a thesis topic, I did not manage to help them much. In my work I would begin getting some results; other mathematicians would move in also and the field would expand; on its getting too big and complex, I would move out and look for new things.

I do feel that the essence of fine mathematics is its pure limpid simplicity, branching out into a myriad of patterns and interconnections that defy imagination. I can dive into these patterns for a while; then it is too much. The hardest nice theorem I accomplished was the duality (product) theorem in sphere (now vector) bundles. Later it became part of a definition. And one of my more trivial papers was on linear dependence; it became a basis of a large new branch of combinatorial theory, which I do not attempt to understand. I can't describe my feelings.

Like many others, I have had a lifelong teaching urge (in mathematics, mountain climbing, skating, string quartet playing ...). A course at Harvard to help incoming graduate students understand what mathematics was about developed into a book, completed in 1964, but unpublished because I did not see it actually *helping* high school teachers. They were trying to work under teacher-power, not their own power. This I now see as a basic problem throughout math (and other) teaching. I am still learning to *let others do their thing. Presenting* material puts the focus on the *teacher's* thoughts instead of the student's; and hence the students get *patterns* of thought without the reasoning from which they came. We know pretty well that this occurs in school, but hide from the fact that it is mostly true in college also. In Brazil I was asked: "They understand $y = ax + b$, but not $x = x_0 + vt$. What can we do?" The principal trouble is that "understand" means (for the students) simply knowing certain things you are asked to do, like "where does it cut the x-axis?"

My success came simply from continuing my preschool habit of exploring situations. We can all do this, if allowed. (For example, Beth, with a lifetime of mathematics anxiety and almost no math, essentially constructed the exponential function and found its derivative, in answer to a question about children getting a sense of a large range of numbers.)

Our teaching of calculus, in particular, is being recognized as missing most students badly. I now see the troubles as essentially identical on all levels. A principal cure is to give them things to explore; *after* this, through class discussions (you join in), underlying principles start coming out.

For an example, let s be the side length and A the area of a square. Make the square a little bigger, by Δs and ΔA; how do these relate? Putting the little square on the bigger one, one corner on a corner, we *see* the extra area ΔA, and easily find its value, $2s\Delta s$ plus a tiny bit, $(\Delta s)^2$. This is the essence of the relationship. With more study and play, we can introduce definitions of derivative, inverse functions, etc. Now our formula easily takes on the familiar forms for the derivatives of x^2 and of $\sqrt{y}$. But teaching the final results only leaves a lifeless jewel, not a part of the student's world, without connections with anything outside or with the student's experience. It removes all the pleasure of discovery and denigrates human powers.

Thus this underlying trouble, an essential part of the failure in school, continues into college; so engineering students and others drop out in droves. We claim to serve them, but do not. It is pleasure to work up exploration situations! Let's do it. Let us cooperate and transform mathematics teaching at *all* levels, bringing back the real beauties which we can all appreciate to everyone's benefit.

Biographical Sketch

HASSLER WHITNEY was born March 23, 1907, in New York City. He received his Ph.D. from Harvard University in 1932 and was awarded an honorary D.Sc. degree by Yale University in 1947. He was a member of the Harvard faculty from 1933 to 1952; in 1952 he moved to the Institute for Advanced Study as a professor, and in 1977 he retired as professor emeritus. He was elected to the National Academy of Sciences in 1945. He delivered the Colloquium Lectures at the AMS Summer Meeting in August 1946 and he served as vice president of the American Mathematical Society in 1948 and 1949. He was a member of the *Transactions* editorial committee from 1942 to 1949 and the *Mathematical Reviews* editorial committee from 1949 to 1954. He was awarded the

National Medal of Science in 1977 by President Carter.

The 1982 Wolf Foundation Prize in mathematics ($100,000) was awarded jointly to Hassler Whitney and Mark Grigor'evich Krein of the Ukrainian S.S.R. Academy of Sciences, Odessa. (See the February 1983 *Notices*, page 145.) The Wolf foundation citation for Whitney's work read as follows:

His innovative ideas have been the seed from which contemporary work in combinatorics, topology and differential geometry have grown to maturity. Matroids, differential manifolds, fiber bundles, characteristic classes, classifying spaces, stratifications, rational homotopy are only some of the concepts that trace their parentage to Whitney. His work inaugurated the style of geometric and combinatorial reasoning that has become the standard for the second half of the twentieth century.

The Academic Mathematicians—A Time of Challenge

The Background

Since mid-century, American colleges and universities have occupied a position of uncontested world leadership in mathematical research and higher education. This position of dominance, now taken for granted, has contributed in a fundamental way to the country's overall leadership in science and technology. In the mid 1980s, as we enter a new era of intense scientific activity, the mathematical sciences once again are being challenged. But events and circumstances of recent years have raised severe problems for the mathematical sciences profession, and weakened its ability to respond to new opportunities. This proposed study is part of a unified effort by the profession to understand the nature of the challenges before us, and to come to grips with the obstacles to success.

The role of the mathematical sciences has been transformed since World War II. Universal precollege education in mathematics has become more critical, and its nature has greatly changed. Mathematical training has been introduced into most college curricula. The traditional role of mathematics at the foundations of the physical sciences has expanded, and has extended to molecular biology and the biomedical fields. Mathematical statistics has matured. Operations research has been born. The mathematics of engineering and technology has become vastly more sophisticated. Mathematical analysis has become solidly established in economics and financial management. Scientific computation has come into its own, and has transformed classical applied mathematics.

The Joint Policy Board for Mathematics (JPBM) is a consulting committee among the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics. It enables the three organizations to plan joint policies or action that can then be taken to their separate governing boards for approval or suggested revision. The Committee on the Status of the Profession (CSP) is a subcommittee. The paper here presented is adapted from a position paper prepared by the subcommittee in September 1984, including a recommendation to the parent committee. Its publication was recommended to the Editors of the *Notices* by the Executive Committee and Board of Trustees of the American Mathematical Society.

These sweeping changes have not come about without strain, and indeed it is widely recognized that the period of the late 1960s and the 1970s was a time when the academic enterprise faltered badly, under the stress of resource limitations and a lessened sense of national purpose. This, of course, affected all of higher education, not just mathematics, but it is now becoming apparent that the position of mathematics may have eroded relatively more severely than that of other academic sciences.

Recently, extraordinary attention has been focused on the serious problems of school mathematics, through such reports as the Gardiner Commission's *A Nation at Risk* (*Notices*, Volume 30, Number 6, October 1983, pages 580–590), through the Conference Board of Mathematical Sciences' 1973 Airlie House Conference and its report *New Goals for Mathematical Sciences Education* (*Notices*, Volume 31, Number 3, April 1984, pages 260–270), and through Congressional consideration and final passage of HR1310, the school science and mathematics education bill. At the other end of the spectrum, problems in mathematical sciences research have been examined critically first in the Smith-Karlesky report and, quite recently, in the monumental David Committee report *Renewing U.S. Mathematics: Critical Resource for the Future* (*Notices*, Volume 31, Number 5, August 1984, pages 435–466; Volume 31, Number 6, October 1984, pages 570–616).

Lying between school mathematics and research, the broad issues of post-secondary mathematical sciences education require a similar intensive examination that is the motivation for the proposal.

The Challenge

In the coming decades the academic mathematics profession—in core mathematics, applied mathematics, statistics, operations research, and scientific computation—will face major challenges and a period of rapid change.

In its broad educational role, the profession will have to respond to the nation's need for a steadily expanding pool of scientific and technical workers (now growing at an 8% annual rate), and for increasing mathematical sophistication in all of society. More than any other academic scientists, mathematicians have always played a major part in the education of the entire scientific community, not just their own "majors." Now, mathematicians and mathematics departments have to assume a major burden of responsibility

for disseminating mathematical modes of thought even more broadly, as formal mathematical modeling and computer-related analyses penetrate more deeply into scientific, technological, and commercial life.

The mathematics profession itself is changing, as increasingly there is demand for trained mathematicians, many with bachelor's or master's degrees and some with Ph.D.'s, to undertake the analysis of applied problems in resource management, industry, commerce and government. Frequently, this work entails interdisciplinary modeling activities and numerical computation. The implication of this change is profound, in a profession where advance training once focused exclusively on the career objective of college teaching. Now, nearly a third of new Ph.D. mathematicians are finding careers outside of academe, and a terminal master's degree holder can easily find professional employment there. The impact on the mathematics major's course of study ultimately will be substantial; but as a profession we have just begun to respond to this new reality.

College and university mathematicians have a major responsiblity for the quality of science and mathematics in the schools, stemming both from their influence on curriculum and their role in teacher preparation. There is an important job to be done both in updating the professional training of the current high school teaching staff, and in recruiting and educating the next generation of young teachers who will gradually take over from them.

The mathematical sciences profession, in its scholarly role, in scientific research and the dissemination of advanced technical information, may, after a period of consolidation, be entering a time of renewed growth: a resurgence and refocusing of the post World War II thrust that put U.S. mathematics at the pinnacle of worldwide achievement. The challenge now is to move outward from that base of accomplishment, to integrate mathematical achievements into the broader scientific stream, and at the same time to maintain and revitalize mathematical research at the core. Much of this effort will be centered in our colleges and universities.

The roles of the academic mathematician as teacher and scholar are not separable. Nor is that dual role confined to professionals at the relatively few "research universities." Being engaged in teaching, and participating in intellectual dialogue with students, has always been a source of stimulation in creative study. Being engaged in research and scholarship has always been a source of inspiration in creative teaching. The academic mathematics community must, in the coming years, maintain the atmosphere and conditions in which this dual teacher-scholar role will be nurtured. It is the essential basis for the continuing dynamism and vitality of the profession.

Symptoms of Trouble

In meeting the new challenges, the academic mathematics profession faces some formidable difficulties. Knowledgeable observers are well aware that the decade of the 1970s was generally a period of resource limitation and even stagnation for colleges and universities. Less well understood is the relative erosion in the position of mathematics which occurred at that time.

Since 1970, mathematics enrollments have been growing, but faculties have not. During 1975–1980, at four-year institutions, enrollments in the mathematical sciences increased by 33% while the number of faculty increased by only 8% . This contributed to a 27% increase in faculty course loads in mathematical sciences from 1970 to 1980. To the extent that the institutions have responded, they have done so by hiring part-timers, or using teaching assistants.

The phenomenal expansion in computer science instruction has placed additional pressures on mathematical scientists and teachers at all educational levels. Some of the best college mathematics teachers are taking on new careers in computer science; many undergraduate mathematical science departments are being overburdened with rapidly expanding academic programs in computer science; and mathematically talented undergraduate and graduate students are being diverted from their studies by high paying employment in the computing industry.

The explosion of uses for mathematics has increased the demand for professional mathematicians in industry. In the 1980s nearly one-third of the new Ph.D.'s in the mathematical sciences are taking positions in industry. This increased demand for applicable mathematics has come at a time when the profession is least able to respond because of other pressures and reduced resources.

Renewal of our mathematical sciences faculty is very much in doubt. The number of undergraduate degrees in the mathematical sciences is now down to 40% of the number awarded in 1970. The demographics of the faculty in the mathematical sciences project a need for at least 3,000 retiree-replacements by year 2000 and show that 53% of the profession is in the 35-49 age group. This foreshadows a serious problem by 2000 if good young people are not attracted into the profession now. But with declining numbers of young people in the college-age cadre, mathematics will face severe competition in its attempts to recruit new members to its ranks.

The number of mathematical sciences Ph.D.'s awarded has dropped steadily since 1972 and the percent of non-U.S. citizens among the Ph.D. recipients has risen steadily to nearly 40% in 1983.

Research funding for the mathematical sciences has not kept pace with funding for similar disciplines. According to the NRC's David committee report, "Since the late 1960s, support for the mathematical sciences research in the United States has declined substantially in constant dollars, and has come to be markedly out of balance with support for related scientific and technological efforts." In contrast to chemistry, physics, and molecular and developmental biology, there has been virtually no funding of postdoctoral positions in mathematics.

The number of research publications by U.S. mathematical scientists decreased by 36% during the period 1973–1980, and the U.S. share of the world's mathematics literature production dropped from 48% in 1973 to 40% in 1980. This does not represent so much a decline at the major research centers as it does a narrowing of the base of research activities in the broader academic community.

Undergraduate mathematics has an aging and rigid curriculum that is restricted by historical service roles but pressured by new directions and new demands. Among these new pressures are those of integrating the computer into the undergraduate courses and responding to calls for changes from traditional courses to the discrete mathematics made more important by algorithmic computation.

The changing nature of instruction in the mathematical sciences, strongly influenced by opportunities afforded by applied modeling and computation, has created a serious need for retraining and continuing education for members of the nation's faculty in the mathematical sciences. At present, there are limited opportunities for such activities, and little time or incentive for undertaking them.

Many of the recent uses of mathematical technology require interdisciplinary work, but most academic mathematical scientists have little training for participating in such ventures. Interdisciplinary work requires the development of entirely new attitudes, outside of the experience of most present mathematics faculty.

The majority of academic mathematicians in the United States were trained at a time when the primary focus of mathematics departments was very different from what it is today. Most of them specialized in pure mathematics, and even those called applied mathematicians were trained for the most part in applicable analysis, with little emphasis on mathematical modeling or discrete mathematics. Today of course the new center-of-gravity of student interest is in applied modeling and computation. There is little hope that we can keep up with the changing demands on mathematics departments by just hiring new kinds of specialists, especially at smaller institutions where new positions are rare. Something has to be done to reward breadth of interests and to provide incentives for mathematicians to learn new areas and to develop new kinds of courses.

The straitened circumstances of colleges and universities not only have led to an overworked mathematical sciences faculty, but one with fewer resources for carrying out its obligation to keep up with change. Training students for careers in industry calls for the acquisition of sophisticated and expensive computer equipment along with the personnel to run and maintain it. Library support has not kept pace with costs, leading to deterioration of reference collections. Travel support has declined at a time when travel costs have escalated, so that fewer mathematicians are able to attend national professional meetings or conferences related to curricular development or research. There are fewer opportunities for periods of study and professional developments. Furthermore, these problems are projected to intensify as schools and colleges enter a period of further retrenchment.

In summary, for the academic mathematicians, educational responsibilities have grown and changed, while resources for carrying them out have diminished. Opportunities and time for faculty development and curricular experimentation have declined. Support for scholarly work and research has dropped. The vitality of the academic mathematics community has been impaired as opportunities and incentives have closed off for young people to enter the profession. The profession has lost some of its vital dynamism, at a time when new challenges demand its best.

Recommendation

The CSP urges JPBM to commission a major policy study of the conditions affecting the academic mathematical sciences profession: recent trends, present circumstances, and future outlook concerning the characteristics of college and university mathematics faculty; their changing responsibilities and capacity to meet these responsibilities; the adequacy of institutional support; opportunities for faculty development and renewal, for curricular innovation, and for scholarly activities and research; future manpower needs of the profession, and the prospects for meeting these needs. The objective would be to clarify the nature and dimension of problems that are perceived within the profession to be severe, and to suggest approaches to their solution. Policy recommendations should be developed which reflect the experience and judgment of the profession, as drawn out through extensive discussion and commentary. Findings and recommendations should be directed toward those groups within society with particular responsibilities for post-secondary mathematical science education: college and university administrators and trustees, federal and state government leaders, private foundation executives, and the mathematical sciences professional organizations. A vigorous follow-up effort

should then be made to communicate the results of the study to these responsible groups, and to the public.

The challenges to the academic mathematics community have never been greater. Our problems have seldom been more severe. The responsibility for addressing the problems and rising to the challenges rests primarily with us. We can expect help, but we ourselves must show the way, and we must take the lead.

Committee on the Status of the Profession

LIDA BARRETT, Associate Provost, Northern Illinois University

WENDELL FLEMING, Chairman, Division of Applied Mathematics, Brown University

LOUIS HAY, Head, Department of Mathematics, Statistics, and Computer Science, University of Illinois at Chicago

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Supplementary Report

Institutional Support for Mathematical Science Departments

by Bernard L. Madison

This is a report of the results of responses to a supplementary form which was included in the 28th Annual AMS Survey in the Spring, 1984. The questions on the form were prepared at the request of the AMS-MAA-SIAM Joint Committee on the Status of the Profession, which was concerned with measuring the adequacy of resources provided through academic institutions to their mathematical science departments. The focus of the questions was on institutional support other than salaries as salary information is gathered annually through the AMS Survey.

The areas of items for responses on the form, entitled *Institutional Support for Mathematical Science Departments*, were student semester hour production, numbers of teaching and support personnel, operating funds, library holdings, and computing services. The data was requested for the year 1983-1984—teaching data for the academic year, personnel data for the Fall semester, and operating funds for the twelve month fiscal year, July 1, 1983 to June 30, 1984.

This summary should be considered a first approximation of the actual support in the areas included. Additional data gathering based on this experience should produce better information. Also, this summary should not be considered as a model for standards of support. In fact, the levels of support indicated by much of the data are generally inadequate for sustaining quality programs.

The results are reported here in summary form with some interpretative comments. Responses to some of the items were judged less informative than others, and the less informative responses have less summary data included in this report. The author is pleased to acknowledge the advice of Wendell H. Fleming, Donald C. Rung, and Richard D. Anderson in the preparation of this report.

The general results of the survey can be summarized by two not-so-surprising observations:

- The teaching responsibilities of faculty members increase as one moves from Group I, to Group II, to Group III, to Group M, and to Group B institutions.
- Support for libraries, travel, support personnel, colloquia, travel, conferences, and telephones was best at Group I institutions, less for Group II, still less for Group III, and suffered a significant drop off at Groups M and B. One concludes that research and graduate teaching activities at Ph.D.-granting institutions are receiving some support in these categories, but activities at Group M and B institutions are receiving very little. It is also apparent from the responses that much of the support for these activities at Ph.D.-granting institutions, especially those in Groups I and II, is coming from external grant funds.

Most of the data was summarized by groups—for Group I, II, III, M, B, the union of I, II, and III, and all institutions combined.

The numbers of responses included in the summary data are: 16 for Group I, 24 for Group II, 30 for Group III, 100 for Group M, and 237 for Group B. Thus 70 responses are from Ph.D.-granting institutions, and the total number of institutional responses included is 407. Some of these 407 did not respond to some of the items on the survey form.

Three measures of faculty size were requested: the number of tenured or tenure-track faculty members, the number of full-time faculty members (including ones not eligible for tenure but

Groups I and II include the leading departments of mathematics in the U.S. according to the 1982 assessment of Research-Doctorate Programs conducted by the Conference Board of Associated Research Councils in which departments were rated according to the quality of their graduate faculty.[1]

Group I is composed of 39 departments with scores in the 3.0–5.0 range.

Group II is composed of 43 departments with scores in the 2.0–2.9 range.

Group III contains the remaining U.S. departments reporting a doctoral program.

Group IV contains U.S. departments (or programs) of statistics, biostatistics and biometrics reporting a doctoral program.

Group V contains U.S. departments (or programs) in applied mathematics/applied science, operations research and management science which report a doctoral program.

Group VI contains doctorate-granting departments (or programs) in the mathematical sciences in Canadian universities.

Group M contains U.S. departments granting a master's degree as the highest graduate degree.

Group B contains U.S. departments granting a baccalaureate degree only.

[1]These findings were published in *An Assessment of Research-Doctorate Programs in the United States: Mathematical and Physical Sciences*, edited by Lyle V. Jones, Gardner Lindzey and Porter E. Coggeshall, National Academy Press, Washington, D.C., 1982. The information on mathematics, statistics and computer science was presented in digest form in the April 1983 issue of the *Notices*, pages 257–267, and an analysis of the above classifications was given in the June 1983 *Notices*, pages 392–393.

excluding visitors), and the numbers of part-time faculty members and graduate teaching assistants. Combining the part-time faculty members (counted as 0.5 of a full-time equivalent, or FTE, of faculty member) and the graduate teaching assistants (again counted as 0.5 FTE) with the full-time faculty members, we have a measure of the total FTE of faculty members. As a measure of teaching responsibilities, we asked for the number of student semester hours taught in 1983-1984. Normally, one student semester hour is produced by teaching one student one contact hour per week for a semester.

Some of the summary data is reported by normalizing production or resources per faculty member or per student credit hour. For example, the number of student semester hours produced per tenured or tenure-track faculty member was computed for each institution and the means, standard deviations, lower quartiles, medians, and upper quartiles were computed for each of the groupings of institutions. The results are reported for each computation by groupings below. Most numbers reported are to the nearest integer.

In the data below, in most instances the mean is larger than the median, sometimes significantly so. This indicates influence of some large outliers in the data sets, reflecting unusual circumstances. For example, an institution may have a very small percentage of tenure-track faculty members.

Student Semester Hours per Tenure-track Faculty Member in 1983-1984

Group	Lower Quartile	Median	Upper Quartile		Mean	Standard Deviation
I	456	692	887	*	683	361
II	623	812	1113	*	868	429
III	842	1099	1278	*	1046	270
M	774	950	1121	*	979	366
B	539	752	1066	*	1024	2274
I, II, III	653	893	1163	*	898	376
All	607	840	1114	*	989	1714

Student Semester Hours per FTE of Faculty in 1983-1984

Group	Lower Quartile	Median	Upper Quartile		Mean	Standard Deviation
I	216	323	525	*	336	175
II	398	525	632	*	509	206
III	504	640	725	*	623	149
M	508	633	757	*	650	214
B	393	529	653	*	541	217
I, II, III	379	547	663	*	517	207
All	420	572	693	*	566	220

Full-time Faculty Members per FTE of Secretary/Clerical Personnel in 1983-1984

Group	Lower Quartile	Median	Upper Quartile		Mean	Standard Deviation
I	6.5	8.3	10.2	*	8.5	2.7
II	6.6	9.3	11.7	*	9.9	4.3
III	7.6	10.0	12.3	*	11.3	7.0
M	11.0	13.7	17.0	*	14.5	5.5
B	8.0	12.0	16.0	*	13.2	8.5
I, II, III	7.2	9.2	11.0	*	10.1	5.4
All	8.1	11.7	16.0	*	13.0	7.3

The next two tables give travel funds per tenure-track faculty member and funds for colloquia and conferences per tenure-track faculty members. The numbers outside the parentheses are computed using total funds—the sum of institutional funds and other funds (e.g. external grants). The numbers inside the parentheses are computed using only the funds provided by the institution. From these tables it is clear that although the Group I and II institutions have more funds per faculty member, much of these funds are from external sources. A similar pattern was present in most data reported where institutional funds and other funds were separated. All funds given in the tables are in dollars.

The other library items in the survey on library holdings asked for the annual cost of the serial subscriptions, the cost of books/monographs purchased during July 1, 1983 to June 30, 1984, and the net change in the number of current serial subscriptions during the previous year (1983-1984). The means of the responses by group are given below.

From these data, the average annual cost of a journal subscription can be computed for each of the groups. This will have error because costs vary from institution to institution. Some institutions exchange publications of their own for journals, and these exchanges are probably not in the annual cost numbers. Anyway, from the above means of numbers and costs of serial subscriptions the mean costs for one serial per year are $100, $119, $129, $146, and $101 for groups I, II, III, M, and B, respectively.

Travel Funds per Tenure-track Faculty Member in 1983-1984
Total Travel Funds (Institutional Plus External) are Used for Numbers Outside Parentheses
Institutional Travel Funds are Used for Numbers Inside Parentheses

Group	Lower Quartile	Median	Upper Quartile		Mean	Standard Deviation
I	467 (7)	774 (47)	1123 (107)	*	780 (87)	397 (121)
II	175 (65)	332 (122)	467 (280)	*	362 (163)	246 (131)
III	158 (141)	318 (227)	526 (390)	*	361 (244)	256 (133)
M	100 (80)	188 (156)	275 (257)	*	214 (188)	164 (148)
B	100 (99)	200 (186)	364 (333)	*	287 (250)	368 (291)
I, II, III	186 (64)	393 (144)	630 (307)	*	452 (185)	333 (142)
All	109 (84)	216 (167)	398 (300)	*	297 (223)	329 (241)

Funds for Colloquia and Conferences per Tenure-track Faculty Member in 1983-1984
Total Funds (Institutional Plus External) are Used for Numbers Outside Parentheses
Institutional Funds are Used for Numbers Inside Parentheses

Group	Lower Quartile	Median	Upper Quartile		Mean	Standard Deviation
I	182 (69)	321 (133)	526 (286)	*	398 (179)	253 (120)
II	91 (82)	173 (142)	269 (268)	*	218 (210)	223 (232)
III	65 (48)	105 (91)	271 (195)	*	249 (149)	387 (142)
M	7 (0)	19 (17)	72 (50)	*	46 (39)	63 (57)
B	0 (0)	13 (5)	50 (42)	*	58 (53)	177 (179)
I, II, III	91 (67)	183 (123)	303 (250)	*	272 (176)	311 (173)
All	0 (0)	31 (20)	104 (90)	*	100 (76)	213 (162)

Total Funds for Long Distance Telephone Tolls per Full-time Faculty Member in 1983-1984

Group	Lower Quartile	Median	Upper Quartile		Mean	Standard Deviation
I	117	184	284	*	230	179
II	81	121	148	*	125	71
III	78	90	169	*	136	110
M	11	24	51	*	40	42
B	7	25	56	*	47	92
I, II, III	82	123	213	*	159	130
All	13	38	85	*	69	103

Other Data on Personnel

The survey form asked for the number of part-time faculty members employed during Fall 1983, and the percent of student credit hours taught by the part-time faculty members. Although not too informative, the means of the percents reported were 5%, 7%, 7%, 16%, and 18% for groups I, II, III, M, and B, respectively. This shows a heavier use of part-time faculty in the M and B institutions, but graduate teaching assistants are not included. Using each graduate teaching assistant and each part-time faculty member as 0.5 FTE of a faculty member, the percents of the FTE of faculty members represented by these two part-time components are 40%, 37%, 34%, 25%, and 18% for groups I, II, III, M, and B, respectively. For groups I, II, and III combined, this percent was 37%; and for all groups combined, it was 29%.

The other two items on personnel asked for the numbers of full-time graduate fellows and graduate research assistants and for the number of FTE of support personnel other than secretary/clerical personnel. The mean numbers of fellows and research assistants reported were 13.4, 3.6, 4.5, 0.9, and 0 for groups I, II, III, M, and B, respectively, while the mean numbers for other support personnel were 1.4, 1.2, 0.5, 0.2, and 0.2 for groups I, II, III, M, and B, respectively.

Other Operating Funds for 1983-1984

The survey form requested the amount spent by the responding department during the period July 1, 1983, to June 30, 1984, in the following areas: local telephone service fees, supplies, equipment (purchase, repair, or maintenance), and student services other than graduate teaching assistants (e.g. undergraduate assistants or paper graders). The form asked for the amounts provided in each of these categories by the institution and by other sources, but those two amounts are added for the summary results below.

Computing Services and Equipment

The survey form asked the following three questions:

(1) What is the cost of computing equipment purchased in the past five years that is under the control of your department?

(2) To what extent do the computing facilities at your institution satisfy the needs of your department's instructional program?

(3) To what extent do the computing facilities at your institution satisfy the needs of your department's research program?

The choices for responses to (2) and (3) were completely, adequately, poorly, and not at all. The responses are summarized in the tables that follow.

Number of Books/Monographs in Library Holdings in 1983-1984
(Those in Library of Congress Classification QA, Excluding Bound Serials)

Group	Lower Quartile	Median	Upper Quartile		Mean	Standard Deviation
I	11803	20000	27684	*	20355	9407
II	8750	12748	14525	*	17018	16671
III	9200	11063	14625	*	13641	9295
M	4300	6661	8922	*	6982	3485
B	1100	2025	3163	*	2792	3091
I, II, III	10019	12808	17225	*	16304	11994
All	1700	3495	8700	*	6435	7998

Number of Current Serial Subscriptions in 1983-1984
(Those in the Library of Congress QA Classification)

Group	Lower Quartile	Median	Upper Quartile		Mean	Standard Deviation
I	254	359	518	*	431	230
II	184	262	388	*	319	199
III	173	211	310	*	246	120
M	34	74	125	*	86	62
B	8	15	27	*	25	45
I, II, III	189	256	382	*	312	187
All	12	30	119	*	94	142

Means of the Responses

Group	Cost of Serial Subscriptions in 1983-1984	Cost of Books Purchased in 1983-1984	Net Change in Serial Subscriptions in 1983-1984
I	$43,148	$12,724	+ 8.7
II	$37,988	$12,163	+ 9.9
III	$31,736	$ 9,078	+13.9
M	$12,513	$ 7,203	+ 1.9
B	$ 2,534	$ 2,212	+ 1.4

Summary of Operating Funds

Group	Local Telephone per Full-Time Faculty Member	Supplies Per Student Credit Hour	Student Services per Student Credit Hour	Purchase or Maintenance of Equipment
I	$313	$0.64	$1.55	$14,837
II	$316	$1.00	$1.51	$16,359
III	$239	$0.34	$0.53	$17,076
M	$162	$0.34	$0.68	$15,136
B	$117	$0.68	$1.27	$ 7,211

Cost of Computing Equipment Purchased in Past Five Years (1979-1984)

	Group I	Group II	Group III	Group M	Group B
Mean	$51,482	$ 81,618	$ 77,002	$ 99,932	$43,712
Standard Deviation	$54,490	$121,988	$117,192	$303,328	$88,951

Institutional Computing Facilities Satisfy Needs of Instructional Programs

Number of Responses of:

Group	Completely	Adequately	Poorly	Not at All
I	1	6	6	0
II	2	16	4	0
III	4	20	4	1
M	16	55	23	1
B	36	140	32	4

Institutional Computing Facilities Satisfy Needs of Research Programs

Number of Responses of:

Group	Completely	Adequately	Poorly	Not at All
I	1	6	7	0
II	2	16	5	0
III	4	19	5	1
M	17	60	15	3
B	46	117	28	9

Call for Information
Mathematical Word Processing/Typesetting

The *Notices* is planning an article on mathematical word processing and mathematical typesetting systems. As an adjunct to this article we would like to provide a survey of the systems currently available and practical for use by individual mathematicians on personal computers or by mathematics departments on small office automation systems. To gather information for such a survey we are inviting letters both from experienced individual users of such systems and from those who have created, or who offer and maintain such systems. The form in which you submit information is up to you, but please include as much as you can about the following:

1) personal computers and output devices on which the system will run (including if possible minimal configuration requirements, e.g. IBM-PC with at least 256K RAM and a 5MB hard disk, with output to an Epson FX80 or an Okidata 2410);

2) comments on the ease of use of the system, and the ease of *learning* to use the system;

3) what fonts are available (e.g. italic, boldface, gothic (Fraktur), script) and at what point sizes;

4) any limitations or deficiencies you have noticed, as well as any particularly nice features;

5) the best source for further information about the system, who maintains it, whether it is proprietary or public domain, where it is available, and at approximately what cost.

In addition it would be very helpful if you could include a one or two page sample of mathematical text produced by the system with a description of the hardware (including output device) that was used, and a copy of any "input" file. Please send your information as soon as possible, but by October 25, 1985, at the latest, to the following address:

Professor Richard S. Palais
Department of Mathematics
Brandeis University
Waltham, Massachusetts 02154

Julia Bowman Robinson
1919–1985

Julia Robinson, at the middle of her one-year term as ex-president of the American Mathematical Society, died on July 30, 1985, at the Kaiser Hospital in Oakland, California, following a year-long struggle with leukemia. At the time of her death, she was also a member of the Executive Committee of the Council of the Society.

Among the many honors she received during her distinguished career were election to the National Academy of Sciences, the first woman mathematician ever so honored; she was the first woman elected to the presidency of the American Mathematical Society, the second woman invited to give the AMS Colloquium Lectures (the first was Ann Pell Wheeler, 1927), and in 1983, while serving as president of the AMS, she was selected as a MacArthur Fellow by the John D. and Catherine T. MacArthur Foundation, which provided a five-year grant to use as she wished (see the February 1983 *Notices*, page 145).

Professor Robinson was born in St. Louis, Missouri, December 8, 1919. She grew up in San Diego, California, and earned a B.A. in 1940, an M.A. in 1941, and a Ph.D. in 1948, all from the University of California, Berkeley. Between 1948 and 1976, she carried out research at Berkeley, serving occasionally as lecturer in the department of mathematics, and in 1976 she was appointed professor of mathematics. She retired from her professorship on July 1, 1985.

In her research she is probably best known for bringing the methods of number theory to the solution of problems of mathematical logic. Her most famous accomplishment is her contribution to the solution of Hilbert's tenth problem, the result being that there can be no automatic method to decide which equations have integer solutions. This work was described in her lecture at the DeKalb Symposium on Hilbert's problems in 1974, and published in Volume 28 of the AMS *Proceedings of Symposia in Pure Mathematics.*

Julia Robinson is survived by her husband, Raphael M. Robinson (who is also a well-known mathematician) and two sisters, one of whom, Constance Reid, is well known among mathematicians as the biographer of Hilbert, Courant, and Neyman.

A tribute to ex-president Robinson is being prepared for publication in the *Notices* by a number of her colleagues and friends. The editors hope it will be ready in time to appear in the November issue.

In accordance with her wishes, there was no funeral service, and those wishing to make gifts in her memory are encouraged to contribute to the Alfred Taski Fund, which she helped establish to honor of her late teacher, friend and colleague. Contributions may be sent to the Department of Mathematics, 970 Evans Hall, University of California, Berkeley, California 94720, and should be clearly marked as contributions to the Tarski Fund in memory of Julia Robinson.

Gabor Szegö
1895–1985

Gabor Szegö, professor emeritus of mathematics at Stanford University, died at the age of ninety on August 7, 1985, after a long illness. He was chairman of the Stanford department of mathematics from 1938 to 1958 and has been credited with playing an essential role in establishing the mathematical center at Stanford. In 1960 he retired as professor emeritus.

Szegö was elected to membership in the AMS in 1935. He was a member of the editorial committee for the *Transactions* (1937–1943) and a Member-at-Large of the Council (1942–1944) He was the author of *Orthogonal Polynomials*, the twenty-third volume of the AMS book series *Colloquium Publications.* This book, which appeared first in 1939, has gone through four editions and numerous reprintings, the most recent in 1981 [MR 51 #8724]. He presented two invited hour addresses to the Society: at the Annual Meeting in St. Louis (December 1935–January 1936) and at the November meeting in Los Angeles (1944). He served on a number of AMS committees, including the Committee on Aid to Libraries Devastated by the War (1945) and the Committee to Select Gibbs Lecturers for 1948 and 1949.

Szegö was born in Kunhegyes, Hungary, January 20, 1895. He received his doctoral degree from the University of Vienna in 1918. In Europe he taught at the Technical School of Budapest, the University of Berlin and the University of Königsberg, before coming to the United States in 1934. He spent four years at Washington University in St. Louis, Missouri, before going to Stanford in 1938.

Szegö is possibly best known for his long-term collaboration with George Pólya. In 1924 their classic *Aufgaben und Lehrsätze aus der Analysis* was published by Springer in Berlin; it has gone through numerous editions, including an English translation (published also by Springer). (Pólya, who celebrated his ninetieth birthday in December 1977, joined Szegö at Stanford in 1942 and currently is professor emeritus of mathematics there.) *(See page 599 for notice of G. Pólya's death.)*

Szegö was a member of the AMS, the Mathematical Association of America, the American

Academy of Arts and Sciences, the Academy of Sciences in Vienna, and the Hungarian Academy of Sciences. Szegö's collected works have been published by Springer.

Loo-Keng Hua
1910–1985

Loo-Keng Hua, one of China's earliest director's of research, died on June 12 in Tokyo, Japan. Hua was born in Jiangsu, China, on November 12, 1910 and had only nine years of early education. At the age of fifteen he left school to help run his family's grocery store and studied mathematics in his spare time. Hua did not receive a university degree until 1979 when the University of Nancy in France made him Docteur Honoris Causa.

In 1931, he began work as a clerk at the Tsing Hua University, rising in rank to assistant, and then to lecturer. At the invitation of G. H. Hardy, he moved to Cambridge University in 1936 as a research fellow of the China Foundation. He returned to China as a professor at the South-West United University in 1938 and remained there until 1946. During that time, he also taught at Yunnan University. In the Spring of 1946, he visited the Soviet Union for three months at the invitation of the Institute of Mathematics of the Academy of Sciences of the U.S.S.R. From 1946 to 1947, he was a member of the Institute for Advanced Study at Princeton and taught number theory at Princeton University. He worked as a professor at the University of Illinois at Urbana-Champaign during 1948–1950.

Hua returned to China as Professor at Tsing Hua University in 1950, when the People's Republic of China was founded. He also served as Director of the Institute of Mathematics of Academia Sinica (since 1950), Director of the Chinese Mathematical Society (since 1950), Editor-in-chief of *Acta Mathematica Sinica* (since 1950), Vice President of the Chinese University of Science and Technology (since 1958), Vice President of the Chinese National Association of Sciences and Technology (since 1978), the Director of the Institute of Applied Mathematics of Academia Sinica (since 1980) and as the Vice President of Academia Sinica (1979-1981).

Throughout his career, Hua organized seminars in a wide variety of areas and was deeply concerned with mathematics education. Besides his research in pure mathematics, he also contributed to the application of mathematics to the national economy of China. In 1956, he was awarded the Chinese National Scientific Prize, first rank. He was a principal speaker at the fourth International Congress on Mathematical Education in Berkeley, California, in 1980. He was elected a foreign associate of the U.S. National Academy of Sciences in 1982 and was a Sherman Fairchild Distinguished Scholar at the California Institute of Technology in 1983. That same year, he was awarded an Honorary Degree of Doctor of Science from the Chinese University of Hong Kong. At the time of his death, he was presenting an invited address at the University of Tokyo.

Mary P. Dolciani Halloran
1923–1985

Mary Patricia Dolciani Halloran, professor of mathematics at Hunter College, City University of New York, died on August 5, 1985, at the age of sixty-two.

She was born on March 3, 1923, in New York City, educated at Hunter College, and did her graduate work at Cornell University where she received her Ph.D. in 1947. She spent the following year at the Institute for Advanced Study in Princeton and taught as an instructor at Vassar for several years before returning to Hunter College as a member of the faculty. While there, she served as chairman of the department of mathematics, and as associate provost. From 1974 to 1976, she was dean of academic development for City University of New York. In 1980, she returned to teaching at Hunter. Last year ill health forced her to go on leave.

She was very generous in her support of professional mathematical organizations, in particular the Mathematical Association of America which has named the book series *Dolciani Mathematical Expositions* and its headquarters in Washington in her honor.

Her name is familiar to many young people as the lead author of the Dolciani series of mathematics text books published by Houghton Mifflin & Company of Boston, which enjoyed a remarkable success and wide adoption. Over 50 million copies are reported to have been sold.

1985 MacArthur Prize Fellows

The John D. and Catherine T. MacArthur Foundation has announced the selection of twenty-five new MacArthur Fellows. George F. Oster, University of California, Berkeley, and Shing-Tung Yau, University of California at San Diego, La Jolla, are the two mathematical scientists in the present group.

MacArthur Prize Fellows receive annual tax-free awards ranging from $24,000 to $60,000 for five years. The amount of the award varies with the age of the recipient. The MacArthur Fellows Program "frees outstandingly talented and creative people from the constraints of having to earn a living, conform to traditional career paths, or be accountable to forces other than their own productive instincts and energies. Fellows can pursue whatever they believe is important and relevant." The MacArthur Foundation imposes no requirements, restrictions or performance standards on MacArthur Fellows. There are no applications for MacArthur grants. Instead

nominees are chosen by more than 100 anonymous nominators, who refer their choices to a fifteen member selection committee. Since the Fellows Program was established in May 1981, the MacArthur Foundation has committed more than $50 million to 166 Fellows.

George F. Oster's research "applies mathematical modeling to developmental and evolutionary biology and ecology. His recent work applies methods of physics and chemistry to cell, developmental and evolutionary biology." Oster was born in New York City in 1940. In 1961, he received a B.S. in marine engineering from the U. S. Merchant Marine Academy. He received his Ph.D. in engineering from Columbia University in 1967. From 1968–1970, he did postdoctoral work at the University of California, Berkeley, where he holds the position of professor.

Shing-Tung Yau was born in Kwantung, China in 1949. He received his Ph.D. from the University of California, Berkeley in 1971 and his D.Sc. from the Chinese University of Hong Kong in 1980. During the years 1971-1972 and 1979-1980, Yau was a member of the Institute for Advanced Study and was a professor there from 1980–1984. He is currently a professor of mathematics at the University of California at San Diego, La Jolla. Among the honors earned by Yau are a Guggenheim Foundation Fellowship for 1980, the Society's Veblen Prize in Geometry in 1981 and a Fields Medal at the International Congress of Mathematicians in Warsaw in 1983. Yau will present the Colloquium Lectures at the 92nd Annual Meeting of the AMS in New Orleans (January 1986).

Lobačevskiĭ Prize

Herbert Busemann, Professor Emeritus at the University of Southern California, is the first American to receive the Lobačevskiĭ Prize. The Prize is awarded by the U.S.S.R. Academy of Sciences in Moscow every four years for work in geometry. The prize was established in the late nineteenth century in honor of N. I. Lobačevskiĭ, a professor of mathematics at the University of Kazan and one of the founders of non-Euclidean geometry. Previous recipients include M. S. Lie, D. Hilbert, H. Poincaré, F. Klein, H. Weyl, E. Cartan and H. Hopf, among others. Busemann received the Prize for his book *The Geometry of Geodesics* which was published in 1955 by Academic Press and translated into Russian. As a recipient of the Prize, he was invited to the U.S.S.R. as a guest of the Academy this past September.

James R. Murphy Awarded Congressional Science Fellowship

James R. Murphy of the University of Colorado Medical School has been awarded the 1985-1986 Congressional Science Fellowship by the American Mathematical Society (AMS), the Mathematical Association of America (MAA), and the Society for Industrial and Applied Mathematics (SIAM).

James R. Murphy

Murphy holds a B.A. in Chemistry from the University of Chicago, an M.A. in Mathematics from the University of Denver, and a Ph.D. in Biostatistics from Johns Hopkins University.

He has been a member of the Department of Biometrics and Preventive Medicine at the University of Colorado Medical School since 1973.

As a biostatistician, Murphy's interests are in the formation of health policy, the effectiveness of health care strategies, assessing the safety, efficacy, and economic impact of health care technology, and in medical inference and decision-making. During his Fellowship year, Murphy hopes to act in an advisory capacity to a Congressman or a Congressional Committee, interpreting data necessary in forming national policies on health care issues.

Murphy is the seventh Fellow to serve in the AMS-MAA-SIAM program since it was established in 1978. –CBMS Press Release

Addendum to the Members of the American Academy of Arts and Sciences

In the article, *Newly Elected Members of the American Academy of Arts and Sciences, Notices,* August 1985, page 469, the following

mathematicians were omitted from the list of members: IRVING J. GOOD, Virginia Polytechnic Institute and State University; MARTIN SHUBIK, Yale University; and ROBERT E. TARJAN, AT&T Bell Laboratories, Murray Hill, NJ. The following mathematicians should have been included in the list of foreign honorary members: MICHAEL A. E. DUMMETT, Oxford University and ARYEH DVORTZKY, Hebrew University of Jerusalem.

Salem Prize

The Salem Prize for 1985 has been awarded to Thomas H. Wolff of the California Institute of Technology at Pasadena, for his contributions to the corona problem, interpolation theory, nonlinear potential theory and the Helson-Szegö theorem. The prize, established in 1968, is given every year to a young mathematician who is judged to have produced an outstanding work in the field of interest of Salem, primarily on Fourier series and related topics. The previous recipients were Nicholas Varopoulos (1968), Richard Hunt (1969), Yves Meyer (1970), Charles Fefferman (1971), Thomas Körner (1972), E. M. Nikišin (1973), Hugh Montgomery (1974), William Beckner (1975), M. R. Herman (1976), S. B. Bočkarëv (1977), Björn E. Dahlberg (1978), Gilles Pisier (1979), Stylianos Pichorides (1980), Peter Jones (1981), Alexei B. Aleksandrov (1982), Jean Bourgain (1983) and Carlos Kenig (1984). The jury consisted of L. Carleson, Y. Katznelson, Y. Meyer and E. M. Stein.

The John L. Synge Award

The Mathematics Division of the Royal Society of Canada has decided to raise funds to establish an award for outstanding contributions to the Mathematical Sciences, to be awarded at regular intervals, not necessarily to a Fellow of the Society.

There is such an award in Physics and in Chemistry; both of these awards are named after Rutherford, they are awarded every year if suitable candidates are available, and each of them consists of a Medal and a cash award of $1,500.

It is hoped that the Mathematics award will be of the same nature but all depends on the success of the fund raising. In any case the award will be named in honour of John L. Synge, who was elected to the Royal Society of Canada more than fifty years ago and who was the first recipient of the Henry M. Tory Gold Medal of the Royal Society of Canada. Synge, now resident in Dublin, Ireland, was for many years Professor of Applied Mathematics at the University of Toronto.

Persons and organizations are invited to contribute to the proposed John L. Synge Award. Checks should be made payable to The Royal Society of Canada, John L. Synge Award and sent to Israel Halperin, Chairman of the John L. Synge Awards Committee, Department of Mathematics, University of Toronto, Toronto, Ontario M5S 1A1, Canada.

The d'Alembert Prize

The Société Mathématique de France (SMF) has created a prize to encourage and honor works, in the French language, that present mathematics to the general public in an understandable and interesting form. The d'Alembert Prize will be awarded biennially for an article, a book, a radio or television broadcast, a film script, or any other project designed to make mathematics and its recent developments better known and understood. Any work nominated must have been produced within the past two years. A prize of 15,000 francs will be awarded at the annual meeting of the SMF.

Nominations for the 1985 d'Alembert Prize must be submitted by the candidates themselves or any other person by **November 1, 1985**. In view of the rapidly approaching deadline, SMF suggests that nominations (including documentation of the works) be sent immediately to Société Mathématique de France, B.P. 126-05, 75226 Paris Cédex 05, France; Telephone: 633-39-42.

ONR and ASEE Fellowships Awarded

A total of forty-eight fellowships to support engineering and science students have been awarded by the Office of Naval Research (ONR). The ONR fellows, selected by a panel of Navy and university experts, will receive funds for three years of study toward a doctorate.

The program, which the American Society for Engineering Education (ASEE) administers, is designed to increase the pool of Ph.D. candidates available for careers in government, industry and education. The Navy pays full tuition and a $2,000 supplement to each fellow's university department, as well as generous annual stipends: $13,000 the first years, $14,000 the second and $15,000 the third. To encourage recipients to conduct research at Navy labs during the summer, ONR offers higher monthly stipends plus travel funds for the fellow's academic adviser to visit the lab.

The program, now in its fourth year, has awarded a total of 162 fellowships. The 1985 fellows in mathematics and their home institutions are: JULIAN L. ANTHONY, Southern Methodist University; GERALD FEIGIN, Dartmouth College; LANCE FORTNOW, Cornell University; WILLIAM H. NUGENT, Hampshire College; BONNIE K. RAY, Baylor University; and ERIC WEINSTEIN, University of Pennsylvania. For more information contact John Lisack, Jr., Director of Membership, Projects and Federal Relations, ASEE, 11 Dupont Circle, Suite 200, Washington, D.C.; 202-745-3616 or 202-293-7080. –ASEE News Release

Board on Mathematical Sciences

Representing the mathematical sciences at the National Academy of Sciences/National Research Council is the recently formed Board on Mathematical Sciences. The Board, chaired by NAS member Michael Artin of the Massachusetts Institute of Technology, is charged with providing a unified voice for advising the government on mathematics, applied mathematics, and statistics. Three standing committees represent research areas within the Board. These include: the Committee on Mathematics (COM), chaired by Joseph J. Kohn of Princeton University; the Committee of Applications of Mathematics (CAM, chaired by E. F. Infante of the University of Minnesota; and the Committee on Applied and Theoretical Statistics (CATS), chaired by Ronald Pyke of the University of Washington.

The Board will sponsor the Annual Mathematical Sciences Chairmen's Day Colloquium in Washington, D.C. on Saturday, October 12 at the Washington Marriot Hotel. The focus of last year's meeting was the David report and its implications. This year there will be follow-up on this thrust, reports on several Board studies of mathematics research, and reports from the federal funding agencies. This activity provides an excellent opportunity to improve the public visibility for research in the mathematical sciences and make an impact on the funding agencies. In addition, chairmen are able to make specific contacts with the agency personnel and learn about possible funding opportunities for their faculty.

Currently the Board and its committees are involved in a variety of activities, including a worldwide survey of the state-of-the-art of mathematics, a survey of U.S. mathematics, various seminars and workshops, projects on specific topics, as well as advisory activities with government agencies. In addition, the Board acts in an advisory capacity to other Academy groups whose interests overlap those of the mathematical sciences.

This summer, Frank Gilfeather began work as the Board's first Staff Director. Gilfeather came to the Board from the National Science Foundation where he was the Program Director for Modern Analysis in the Mathematical Sciences Division. Prior to his work at NSF, he held faculty positions at Indiana, Hawaii and is currently on leave from the University of Nebraska. Seymour Selig is working part time as a Staff Officer of the Board. Previously, he worked with the Mathematical Sciences Division of the Office of Naval Research. Meg Knemeyer recently became the Staff Assistant to the Board. Knemeyer has previously worked within the NRC structure, and in a number of research settings.

Recent appointments of the Board and its committees and panels include:

E. F. INFANTE (University of Minnesota) as chair of the Committee on Applications of Mathematics (CAM) and member of the Board;

WILLIAM COOPER (University of Texas, Austin) and GARY MCDONALD (General Motors) as members of the Panel on Applied Mathematics Research Alternatives for the Navy (PAMRAN);

NOLAN WALLACH as a member of the U.S. National Committee for Mathematics;

RONALD PYKE (University of Washington) as chair and RALPH BRADLEY (University of Georgia), G. C. TIAO (University of Chicago) and JOAN ROSENBLATT (National Bureau of Standards) as members of the Committee on Applied and Theoretical Statistics (CATS).

Retiring members and chairs include:

WERNER C. RHEINBOLDT as chair and JAMES M. HYMAN as member of the Committee on Applications of Mathematics (CAM);

WILLIAM A. WOODS as member of the Panel on Applied Mathematics Research Alternatives for the Navy (PAMRAN);

LIPMAN BERS, RONALD GRAHAM and HUGH MONTGOMERY as members of the U.S. National Committee for Mathematics;

JANET ELASHOFF, WALTER T. FEDERER and DAVID S. MOORE as members of the Committee on Applied and Theoretical Statistics (CATS).

In addition, the Committee on Resources for the Mathematical Sciences, which issued the seminal David report, has completed its work and is being disbanded. This outstanding committee, headed by Edward E. David and staffed by Ken Hoffman, includes Gerard Debreau, Gerald P. Dinneen, Bradley Efron, Michael E. Fisher, Marvin L. Goldberger, Robert Herman, Arthur M. Jaffe, Peter D. Lax, Brockway McMillan, George D. Mostow, William A. Nierenberg, James B. Serrin, I. M. Singer, Guido Weiss, Jerome Wiesner, William Browder, Phillip Griffiths, and Ralph Gomory. The mathematics community will reap the benefits of the committee's tremendous effort for some time to come.

The location of the Board staff is Board on Mathematical Sciences, National Academy of Sciences, Room NAS 311, 2101 Constitution Avenue, N.W., Washington, DC 20418; 202-334-2421.

New Research Center at Cornell

Cornell University is the site for the new mathematical sciences research program funded by the U.S. Department of Defense through the Army Research Office. The selection followed an extensive review process that took place during the past year. More than thirty preliminary proposals were submitted, followed by formal proposals from thirteen of these institutions. The university will operate the center as the Mathematical Sciences Institute (MSI) under a $12.5 million contract for five years starting

January 1, 1986, after which the contract will be reviewed. Geoffrey S. S. Ludford will serve as director of MSI and participants will perform basic mathematical research with potential applications for problem solving in the sciences. Research work will be shared with the army, but the participants will not perform classified research.

MSI will be guided by a nine-member advisory committee consisting of four outside academicians: Julian Cole, Bjorn Engquist, James Glimm, and Jerrold Marsden; three faculty from Cornell: Michael Fisher, Anil Nerode, and Thomas Santner; and two scientists from the army laboratories: Gerald Andersen and Timothy Wright. The advisory committee will meet on a regular basis and the mathematical community is invited to provide input into the activities of the institute. MSI will be a unit of Cornell's Center for Applied Mathematics, which is directed by Philip J. Holmes, and will be housed in Caldwell Hall.

The primary areas of research are applied analysis, physical mathematics, statistics and applied probability, and numerical analysis and computing. The four areas will be coordinated, respectively, by Philip Holmes, professor of theoretical and applied mechanics and of mathematics; James Jenkins, professor of theoretical and applied mechanics; Narahari Prabhu, professor of operations research and industrial engineering; and Lars Wahlbin, professor of mathematics.

News from the Institute for Mathematics and its Applications

Minneapolis

Final planning is under way for the 1986-1987 program on *Scientific Computation.* The program will begin with a workshop on *Basic Methods of Numerical Analysis* and *Introduction to State-of-the-Art Research* from August 18 to 29, 1986. This workshop is intended as a "crash course" for non specialists who wish to learn what is involved in scientific computation. A series of lectures will be presented by a number of the leaders in the field of scientific computation.

The period from September to December will be devoted to the general area of *Computational Fluid Dynamics* and *Related Topics.* A number of specialists will be in residence and work in this area will be encouraged by means of formal and informal seminars. The period will be punctuated by several short periods of more intense activity. There will be a workshop on *Computational Fluid Dynamics* and *Reacting Gas Flows* from September 15 to 26 and a workshop on *Numerical Algorithms for Modern Computer Architectures* from November 3 to 7. Mary Wheeler of Rice University will lead a mini-symposium on *Numerical Simulation in Oil Recovery* from December 1 to 5.

January 1987 will be devoted to the study of *Inverse Problems* and *Applications to Bioengineering and Geophysics.* Inverse problems, in which the configuration is to be inferred from measuring the solution of a problem, arise in a number of rather diverse applications. These include x-ray tomography, CAT and NMR, ultra sound technology, seismology, and oil exploration. Experts in these various areas will be in residence and it is hoped to obtain interactions among them and between them and nonspecialist mathematicians.

From February through April the emphasis will be on *Solid Mechanics, Properties of Materials, Optimal Design,* and *Computer Aided Design.* Highlights of this period will be a workshop on *Materials with Nonlinear Constitutive Laws* from February 16 to 20 and a workshop on *Scientific Software* from March 23 to 27. The latter is being organized by John Rice of Purdue University.

From May through July the activity will focus on some problems in *Computational Physics and Chemistry.* Randy Bank of the University of California at San Diego, La Jolla, will organize a workshop on *Semiconductor Simulation* from May 4 to 8. From June 15 to the end of July the focus will be on *Atomic and Molecular Structure and Dynamics.* This part of the program will be led by Don Truhlar of the School of Chemistry at the University of Minnesota.

The overall program is being organized by a committee which consists of Björn Engquist (Chairman), Roland Glowinski, Mitchell Luskin and Andrew Majda. They are being assisted by an advisory committee whose members are Rutherford Aris, Joseph Keller, Peter Lax, Jacques-Louis Lions, John Rice, L. E. Scriven, Gilbert Strang and Kenneth Wilson.

Primary support for the IMA comes from the National Science Foundation. Additional support is received from the AFOSR, the ARO, and the ONR, as well as from the IMA Participating Institutions (Indiana University, Iowa State University, Michigan State University, Northern Illinois University, Northwestern University, Ohio State University, Purdue University, University of Chicago, University of Illinois, Urbana-Champaign, University of Iowa, University of Michigan, University of Minnesota, Wayne State University).

Visitors are welcome to all activities of the IMA. Interested persons should write to the Director, Hans Weinberger. Support is available for postdoctoral members and, to a more limited extent, for senior members.

Replacement Ballots

This year the deadline for receipt of ballots in Providence is **November 11, 1985.**

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, 1985, 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 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 mail, the deadline for receipt of ballots will not be extended to accommodate these special cases.

Faculty Exchange Clearinghouse

The Faculty Exchange Center, a nonprofit, faculty-administered program, helps arrange teaching exchanges on the college-university level, and house exchanges for study and travel for teachers and administrators at all levels of the education profession. The current roster of members will be made available to new members upon registration. For more information send a stamped and self-addressed envelope to Faculty Exchange Center, 952 Virginia Avenue, Lancaster, Pennsylvania 17603.

New Computer Network Needed

Members of the House Committee on Science and Technology have been informed that researchers need a new computer network to gain access to supercomputers.

"Supercomputers in isolation are not useful," said Larry L. Smarr, director of the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign.

Although "enormous computational power is becoming available," he said, it will not reach the researchers who need it unless a network is built.

Smarr urged the committee to double this year's support in the following fiscal year.

– *The Chronicle of Higher Education*

The Center for Supercomputing Research and Development at the University of Illinois has been selected to receive $2 million in equipment and research grants from International Business Machines Corporation. The research grant, totaling $950,000 over three years, is "no-strings-attached" money to be used in the center's research and development work.

–University of Illinois News Release

DOD-University Research Instrumentation Program FY 1986-FY 1987

The Department of Defense has recently announced that its "University Research Instrumentation Program" guidelines for FY 1986 and FY 1987 are available through the Air Force Office of Scientific Research, Army Research Office, and the Office of Naval Research. The announcement covers the third and final phase of this program as there are currently no plans to extend the program beyond FY 1987.

Some highlights of the announcement are:

Deadline for receipt of a proposal is **November 15, 1985.**

A single proposal is required to compete in this third and final phase of the program. A separate proposal for each funding year WILL NOT BE ACCEPTED.

The Army Research Office is serving as the point of contact for the third phase of this

Notice to Authors

There has been a recent change in the AMS policy regarding Copyright Transfer Agreements for papers published by the Society. In the past a signed transfer agreement was required from only one author for each paper being published. It is the policy now that these transfer agreements must be received from **each** author before a paper can be published by the Society. These forms are sent to all authors upon receipt of the accepted manuscript in the Providence office. It is necessary for an author to sign this form and return it to the Providence office as quickly as possible so as to avoid delay in publication. The Society **will not publish** a paper unless a Copyright Transfer Agreement has been received from **each** author that collaborated on the manuscript.

program; hence, proposals directed to any one of the three service branches should be mailed to the Army Research Office. Note, however, that a single proposal may be directed simultaneously to all three service branches, and proposals so directed will receive consideration from all three branches.

Proposals from the mathematical sciences should focus on computing equipment which can be shown to be an essential part of an identified research project of interest to the DOD.

IBM to Award Grants

International Business Machines Corporation (IBM) has invited thirty-six universities to apply for twelve $2-million grants to improve research and graduate instruction in materials and processing science.

IBM gave the universities up to $12,000 each to help them prepare proposals. The company will announce next spring the institutions chosen in the final selection.

Materials and processing science encompasses the properties, composition, structure, processing, and applications of materials used to develop and manufacture circuits, packages, and storage media for the information-systems industry.

Institutions that have not received planning grants may still be considered for the final award. For more information, contact University Relations Department, IBM, Armonk, New York 10504. –*The Chronicle of Higher Education*

U.S. Team Second in International Mathematical Olympiad

In the twenty-sixth International Mathematical Olympiad held in July in Helsinki, the U.S. team placed second. The team from Romania took first place. The third, fourth, fifth, sixth, and seventh teams were from: Hungary, Bulgaria, Vietnam, USSR, and West Germany.

The members of the 1985 U.S. team were: David Grabiner (Claremont, California), Waldemar Horwat (Hoffman Estates, Illinois), Joseph Keane (Pittsburgh, Pennsylvania), David Moews (Willimantic, Connecticut), and Bjorn Poonen (Winchester, Massachusetts). Horwat and Hoffman won first prizes as individuals and the other members of the U.S. team all won second prizes. One student from Hungary and one from Romania achieved perfect scores. According to a report by Stephen Maurer in the MAA's *Focus*, the top scorer from the USSR was female (she achieved a first prize), and two other young women won second prizes.

Maurer's article in *Focus* also reported that coaches for the U.S. team this year were Cecil Rousseau of Memphis State University and Gregg Patruno, a 1985 graduate of Princeton University, a former USA Mathematical Olympiad winner, and currently a Putnam Fellow.

The Mathematical Olympiad activities are sponsored by seven national associations in the mathematical sciences with arrangements made by the Mathematical Association of America. Financial support is provided by IBM, the Army Research Office, the Office of Naval Research, and Hewlett-Packard.

ONR Graduate Fellowships

The 1986 ONR Graduate Fellowships will be awarded for study and research in nine major disciplines including computer science and mathematics. Participants must be U.S. citizens or nationals and receive a baccalaureate degree in 1986. Fellows selected in 1986 will receive stipends as follows: $13,000 for the first year of tenure; $14,000 for the second year; $15,000 for the third year. In addition to stipends, ONR will pay the Fellow's institution full tuition and fees (not to include room and board) and provide $2,000 per year to the Fellow's department. The application deadline is January 31, 1986. For application information contact the American Society for Engineering Education, 202-745-3616 or 202-293-7080.

New Fellowship Program Will Aid Minorities

Blacks, Puerto Ricans, Mexican Americans, and Native Americans continue to be underrepresented on the faculties of many U.S. colleges and universities. Moreover, minority enrollment in graduate schools, from which institutions of higher education draw their faculties, has declined recently.

To address the situation, the Ford Foundation is funding a new $9 million doctoral fellowship program for minority graduate students, to be administered by the National Research Council (NRC).

The program will award 120 three-year fellowships over a five-year period. Each fellowship will provide an annual stipend of $10,000 and $6,000 per year for tuition and fees. The program also will award ten $18,000 grants each year to minority Ph.D. candidates who have completed all degree requirements and need approximately one year to complete their dissertations.

Recipients will be chosen in March 1986 by panels of humanists, scientists, and engineers. Further information and application forms are available from the Fellowship Programs Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, DC 20418.

–NRC *News Report*

American-Scandinavian Foundation Offers Grants

Through its grants and fellowships, the American-Scandinavian Foundation (ASF) encourages advanced study and research in the Scandinavian countries. Awards are open to U.S. citizens and permanent residents who will have completed their undergraduate education at the time the overseas program begins. Outstanding proposals from all sources are invited; other factors equal, priority for fellowships is given to candidates at the dissertation level.

For information on awards or listings of study programs for 1986-1987, please contact the American Scandinavian Foundation, Exchange Division, Department AY/S, 127 East 73rd Street, New York, New York 10021; 212-879-9779.

Michigan Society of Fellows

The Michigan Society of Fellows was founded in 1970 through grants from the Ford Foundation and Horace H. Rackham Graduate School for the purpose of promoting the highest degree of excellence in the arts, sciences and professions. The objective of the program is to support individuals selected for scholarly accomplishment and professional promise. Applications are invited from qualified candidates for 4 three-year postdoctoral fellowships at The University of Michigan.

Application materials are available from the Michigan Society of Fellows, 3030 Rackham Building, University of Michigan, Ann Arbor, MI 48109-1070; 313-763-1259. Completed applications are due by **November 14, 1985.**

Pitcher Lectures

The next series of Everett Pitcher lectures will be held on Lehigh University's Bethlehem, Pennsylvania campus, October 16–18, 1985. They will be delivered by Sir Michael Atiyah. The lectures are open to the public and are in honor of Everett Pitcher, Secretary of the AMS, who served in the Mathematics Department at Lehigh from 1983 until 1978, retiring as Distinguished Professor of Mathematics. Further information can be obtained from Edward F. Assmus, Jr., Department of Mathematics, Building 14, Lehigh University, Bethlehem, Pennsylvania 18015; 215-861-3745.

New NATO Program on Sensory Systems for Robotic Control

A large variety of robots have been developed and introduced in recent years, particularly for the automation of industries. The challenge now is the development of robots with sophisticated sensory systems and controls which will enable them to adapt their behavior to variations in their surroundings.

A new North Atlantic Treaty Organization (NATO) Special Program has been launched to foster international cooperation, in particular between universities and industry. This program will provide support for individual research visits, cooperative research grants, Advanced Study Institutes, and Advanced Study Research Workshops, from 1984 to 1988 and will focus on transduction including peripheral preprocessing, pattern analysis and machine intelligence, and theoretical aspects of control.

–NATO Science & Society Newsletter

First World Congress of the Bernoulli Society

The Bernoulli Society for Mathematical Statistics and Probability was founded in 1975. The First World Congress of the Society will be held in Tashkent, U.S.S.R., September 8–14, 1985. All those interested are cordially invited to attend and, if they wish, to join the Bernoulli Society. Further information on the Congress can be obtained by writing K. Krickeberg, U.E.R. de Mathématiques, Logique Formelle et Informatique, Université de Paris V, 12 rue Cujas, F-75005 Paris, France.

University of Central Florida Invites Seminar Speakers

The Department of Mathematics at the University of Central Florida invites correspondence from mathematics, physics and engineering faculty members. Seminars are organized every year from September 1 through April 30. Those who will be visiting the Orlando area in the near future and might be interested in becoming a possible seminar speaker in any of the areas listed on the cover of *Mathematical Reviews*, please contact Lokenath Debnath, Department of Mathematics, University of Central Florida, Orlando, Florida 32816-6990; 305-275-2587.

NECC '86

The Seventh National Educational Computing Conference (NECC '86), hosted by the University of San Diego, will be held at the Town and Country Hotel in San Diego, California, June 4–6, 1986.

NECC '86, which is chaired by Susan M. Zgliczynski of the University of San Diego, is a cooperative effort of twelve educational, scientific and professional associations. Building on the success of six previous conferences, technical sessions and related activities are planned to benefit both experienced and new computer users in education, stressing the practical nature of such computer use.

A brochure, giving detailed information on the NECC '86, is available from James Adams, Association for Computing Machinery, 11 West 42nd Street, New York, New York 10036; 212-869-7440. —NECC News Release

Second Symposium on Computational Geometry

The first symposium on Computational Geometry was held in Baltimore June 5–7, 1985, and it drew a very enthusiastic response from about 200 researchers who attended it. Over the past decade, Computational Geometry has grown quite rapidly and today it encompasses many different sub-areas such as solid modeling, computer graphics, robotics, shape decomposition, geometric algorithms, and associated data structures.

The second symposium on Computational Geometry will be held at the IBM T. J. Watson Research Center, Yorktown Heights, New York, June 2–4, 1986. Papers describing either theoretical results or practical applications are solicited in all areas of Computational Geometry; these include geometric algorithms, mathematical bases for computational geometry, robotics, graphics, pattern recognition and solid modeling. Further information is available from David P. Doblin, Department of Computer Science, Princeton University, Princeton, New Jersey 08544; 609-452-4620.

IUTAM Symposia 1988-1989

The United States National Committee for Theoretical and Applied Mechanics (USNC/TAM) is seeking invitations to host IUTAM Symposia any time during the calendar years 1988-1989.

Invitations to host a symposium should be made on a prepared form which may be obtained from the Secretary of the USNC/TAM. The completed application should be sent to the Secretary not later than **December 1, 1985.** Applications will be competitively screened by the USNC/TAM. A maximum of five for the two year period will be forwarded to IUTAM where they will compete with those from other countries. Final decisions will be made at the meeting of the General Assembly of IUTAM in August 1986. Approximately twelve to twenty symposia will be scheduled for 1988-1989.

For each proposal accepted IUTAM will appoint a Scientific Committee. The chairman will normally be the submitter of the invitation, but the other members will be chosen from the international scientific community. The proposal may indicate a preference for 1988 or 1989, but actual scheduling within the year will be worked out jointly by the Scientific Committee and IUTAM.

Upon request the Secretary of USNC/TAM will send a symposium-invitation kit consisting of an application form, some examples of previously approved applications, and a list of recent symposia. Please address all inquiries to Philip G. Hodge, Jr., Secretary, USNC/TAM, 107 Akerman Hall, University of Minnesota, Minneapolis, MN 55455.

George Pólya (1887–1985)

George Pólya, Professor Emeritus of Mathematics, Stanford University, September 7, 1985 at the age of 97, after a long illness.

Pólya was born December 13, 1887, in Budapest, Hungary. He was educated at the Eötvös Loránd University in Budapest, where he received his Ph.D. in 1912. From 1914 to 1940 he was at the Eidgenössische Technische Hochschule Zürich, as assistant professor, associate professor, professor of mathematics and, after 1928, dean and chairman of the department. Between 1940 and 1942 he held visiting appointments at Brown University and Smith College, before moving to Stanford in 1942. He retired as professor emeritus in 1953.

Pólya was awarded the Mathematical Association of America's Distinguished Service Award for Mathematics in 1963 and was elected to the National Academy of Sciences in 1976. He was also a member of the Hungarian Academy of Sciences, the Académie des Sciences in Paris, the Académie Internationale de Philosophie des Sciences in Brussels, and the American Academy of Arts and Sciences.

The Society for Industrial and Applied Mathematics awards a prize named for George Pólya every four years. This prize, for "a notable application of combinatorial theory made five to ten years prior to the award," is supported by a fund created by Frank Harary and other individuals who assigned royalties on publications and books for this purpose. The next award of the Pólya Prize is scheduled for 1987. The Mathematical Association of America has a series of awards known as Pólya Awards for Expository Writing for authors of papers published in the MAA's *College Mathematics Journal.* Up to two of these awards are given at the summer meetings of the Association.

Pólya's mathematical activity covered many areas, including functions of complex variables, location of roots, probability, theory of numbers, applied mathematics, mathematical methods, problem solving, and combinatorics. His *Collected Papers,* edited by R. P. Boas, were published by the MIT Press in two volumes (1972, 1975).

Among his less technical publications, the books *How to Solve It,* Princeton University Press, 1945, and Doubleday Anchor Books, second edition, 1957, *Mathematics and Plausible Reasoning,* two volumes, Princeton University Press, 1954, and *Mathematical Discovery,* two volumes, John Wiley and Sons, 1962, 1965, have generated wide interest and have been translated into many foreign languages. These books were results of his intense interest during the past forty years in problems of education and the training of teachers of mathematics.

The report of Pólya's death was received in Providence after this issue of the *Notices* had been assembled for shipping to the printer. An advertisement was scheduled for this space.

Visiting Professorships For Women Awarded

The National Science Foundation (NSF) has announced twenty-six awards totalling $2.27 million under its 1985 Visiting Professorships for Women program. Six mathematicians were among those receiving awards.

The program encourages participation of women in the nation's science and engineering enterprise by giving women scientists and engineers from industry, government and academic institutions opportunities to serve as visiting professors. In addition to research, visiting professors undertake lecturing and counseling activities to increase the visibility of women scientists and engineers and to encourage other women to pursue careers in science and engineering. Awards ranged in size from $32,623 to $146,498, and in duration from six to twenty-four months.

The recipients in the mathematical sciences follow (the institutions in parentheses are their home institutions, those outside the parentheses are those at which the Visiting Professorship is to be held): DONNA BROGAN (Emory University), University of Michigan; VERA PLESS (University of Illinois, Chicago), California Institute of Technology; LESLIE M. SIBNER (Polytechnic Institute of New York), University of Pennsylvania; MARIE FRANCE VIGNERAS (University of Paris); University of California, Berkeley; ALICE WHITTEMORE (Stanford University), Harvard University; CAROL WOOD (Wesleyan University), Rutgers University.

Postdoctoral Research Fellowships

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, 1986; (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, 1986; and (4) will not previously have held any other NSF postdoctoral fellowship.

Deadline for applications is **November 15, 1985**. All applications should be sent to the American Mathematical Society, P.O. Box 6248, Providence, RI 02940. Request brochure NSF 85-45 on the Publications Order Form. For further information, contact the Special Projects Program, Division of Mathematical Sciences, National Science Foundation; 202-357-9764, or the American Mathematical Society; 401-272-9500.

New Deadlines and Procedures for Proposals

The Division of Mathematical Sciences has instituted two major changes in the procedures for submission of future proposals:

- They have reinstated a *target deadline* for the submission of proposals: proposals for work beginning in the spring or summer of 1986 should be received by **October 25, 1985**; proposals for work beginning prior to January, 1987, should be received by **May 1, 1986**. This applies to research proposals and not to Special Projects, which already have specific due dates.
- Renewal proposals must contain an explicit description of work accomplished under the current award. Reviewers will be asked to comment on and rate that work as part of their evaluation of the renewal proposal. *If a proposal is received without this information, the processing procedure will be significantly delayed, since the proposal will not be sent for review until the information is received.* For more information, refer to NSF Important Notice No. 96, which should be available through the applicant's grants office. **This requirement applies to all proposals submitted to the NSF after September 30, 1985.**

While the target deadlines listed above provide useful benchmarks, faculty should be reminded that it takes six to nine months to process a proposal. In particular, allowing at least seven months between the time the proposal is received by the Division and the time by which a decision on the proposal is desired is recommended. Faculty holding grants should check expiration dates to determine early whether or not they need to submit renewals at this time.

NSF Seeks Nominations for Eleventh Alan T. Waterman Award

The National Science Foundation (NSF) Alan T. Waterman Award Committee has issued a call for nominations of candidates for the eleventh annual award. Intended to give recognition to an outstanding young researcher in any field of science, mathematics or engineering and to encourage further high quality research, the award was established by the Congress in 1975 to mark the twenty-fifth anniversary of the NSF and to honor Waterman, who was the first Director of the Foundation.

In addition to a medal, the recipient receives up to $100,000 per year for up to three years of

research or advanced study in the mathematical, physical, medical, biological, engineering, social or other sciences at the institution of the recipient's choice.

Deadline for nominations for the 1986 award to be received by the award committee at the NSF is **December 31, 1985.** Announcement of the award will be made in May 1986. Nominations for the award may be submitted by the scientific and educational communities, individuals, professional societies, industry and other appropriate organizations. Six copies of each nomination should be submitted to the Alan T. Waterman Award Committee, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550. —*NSF Bulletin*

President to Nominate Two for Posts on NSB

President Reagan has announced his intention to nominate Thomas B. Day, president of San Diego State University, and James J. Duderstadt, dean of the University of Michigan's College of Engineering, as members of the National Science Board (NSB). The 24-member NSB is the policymaking body of the National Science Foundation (NSF).

Day, a physicist, and Duderstadt, an engineer, will serve for terms ending May 10, 1990.

Day has had wide experience both as an educator and with industry. He has published widely as a theoretical physicist, as an experimental high energy physicist and as co-author of computer programs currently used in high energy physics research.

Duderstadt has been a member of many University of Michigan committees and active with several other research institutions. His research activities include nuclear reactor theory and design, radiation transport theory, interaction of intense laser and particle beams with plasmas, computer simulation and many other areas.

In commenting on the appointments, Erich Bloch, NSF Director, said: "Rapidly changing science and technology are making more complex our task of providing for the health and welfare of our Nation in these areas. The addition of these two skilled and experienced persons will make the Board and the Foundation more effective."

—NSF News Release

President Reagan Nominates Richard S. Nicholson to NSF

President Reagan has announced his intention to nominate Richard S. Nicholson to be Assistant Director of the National Science Foundation (NSF) for Mathematical and Physical Sciences. Nicholson has been Acting Deputy Director and Staff Director of NSF since 1983. His nomination is subject to Senate confirmation.

Nicholson, a chemist, has been with NSF since 1970. He joined NSF from Michigan State University where he was associate professor of chemistry. Most recently he was Executive Director of the National Science Board Commission on Precollege Education in Mathematics, Science and Technology, 1982-1983. Prior to that he was Director of NSF's Chemistry Division, 1977-1982, and Deputy Assistant Director for the Mathematical and Physical Sciences, 1980-1982.

Nicholson's work in science administration has been widely recognized. He was awarded the William A. Jump Meritorious Award for Exemplary Achievement in Public Administration in 1975; NSF's Meritorious Service Award in 1978; NSF's Superior Accomplishment Award, 1979; NSF's Distinguished Service Award, 1980; Senior Executive Service Bonus, 1981; Senior Executive Service Award, 1982; and Presidential Distinguished Rank (the Government's highest civil service honor, conferred by the President at the White House), 1982.

Remarking on the nomination, Erich Bloch, Director of NSF, said, "Dr. Nicholson is an outstanding administrator who has brought to his work at NSF great interest, dedication and thoughtfulness. We at NSF are delighted with this recognition of his value to the agency and President Reagan's confidence in him."

—NSF News Release

NSF Selects Pennsylvania Consortium to Receive Supercomputer

The National Science Foundation (NSF) has selected the Pittsburgh Center for Advanced Computing, a consortium including Carnegie-Mellon University, the University of Pittsburgh and Westinghouse Electric Corporation, to receive a supercomputer from the National Aeronautics and Space Administration (NASA). Late this year, NASA will make available to the NSF a Cray 1S supercomputer now at NASA's Lewis Research Center in Cleveland. NSF will transfer the supercomputer and associated machinery to the Pittsburgh Center for operation by Westinghouse under the direction of the two universities.

The Pittsburgh Center, selected after a nationwide competition, will be included in a national academic computer network for use by scientists and engineers throughout the country and will serve to educate students and researchers in the application and advantages of advanced computing resources. —NSF News Release

NSF Seeks Proposals

The National Science Foundation (NSF) is seeking proposals from prospective host institutions in the U.S. for five-day regional conferences, each to feature ten lectures by a distinguished lecturer on a subject of current research interest in the

mathematical sciences. Topics for conferences may be concerned with any of the subdisciplines of the mathematical sciences. An applying institution should have at least a minimal research competence in the area of its proposal. The conferences should be planned for a summer week in 1986 (not earlier than May 1) or held during a recess in the succeeding academic year. The objective of the project is to stimulate and broaden mathematical research activity. The organization of the conferences, evaluation of proposals, and arrangements for publication of expository papers based on the guest speaker's lectures will be carried out by the Conference Board of the Mathematical Sciences (CBMS) under contract with the Foundation. The conference awards themselves, however, are made by NSF.

Each conference must plan for a single principal guest lecturer from outside the host institution and about twenty-five other participants. It is expected that the lecturer will give two lectures per day during the five days of the conference, with the remainder of the time available for study, informal discussion, and exchange of ideas.

Participants in a conference receive allowances for travel and subsistence under the host institution's grant from the Foundation for the conference. In addition, the principal lecturer receives from CBMS a fee for delivering his/her lectures and a second fee for organizing these into a substantial expository paper. CBMS arranges for the publication of these papers.

Proposals by prospective host institutions (twenty copies) should be sent directly to Data Support Service Section, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550, and must be received by **November 1, 1985.** Proposals will be evaluated by a panel of the Conference Board and awards of the conference grants will be made by the National Science Foundation with advice of the panel.

Inquiries regarding details of proposals for these regional conferences should be addressed to the Conference Board of the Mathematical Sciences, 1529 Eighteenth Street, N.W., Washington, D.C. 20036; 202-293-1170. –CBMS Press Release

Advisory Panel Meeting

The Advisory Committee for the Mathematical Sciences will meet at the Foundation on October 3–5, 1985. A significant portion of the meeting will be taken up with a formal review of all of the Mathematical Sciences Division's programs. The Committee's advice is very important to the Division in setting priorities and developing long-range plans. The mathematical community is welcome to attend public portions of the meeting or to suggest topics for discussion by contacting the Division administration; 202-357-9669.

Staff for the Division of Mathematical Sciences

The program directors for the coming year are:

Classical Analysis	John Ryff
Modern Analysis	Ken Ross
Geometric Analysis	Richard Millman
Topology & Foundations	Ralph Krause
Algebra and Number Theory	Richard Draper Bernard McDonald
Applied Mathematics	Melvyn Ciment Andrzej Manitius
Statistics & Probability	Peter Purdue Bruce Trumbo
Special Projects	Alvin Thaler (on leave)

The administrative staff includes:

Division Director	John Polking
Deputy Division Director	Judith Sunley
Administrative Officer	Fay Childress

The telephone number for the program directors is 202-357-9764 and for the administrative staff it is 202-357-9669. The permanent staff consists of Ciment, Krause, McDonald, Ryff, Sunley, and Thaler. The incoming rotators are Gross, University of Wyoming; Manitius, Rensselaer Polytechnic Institute; and Trumbo, California State University, Hayward. Polking, Draper, Millman and Purdue are continuing rotators. Thaler will be on leave from the NSF for the coming year, and questions on the Special Projects program should be referred to Sunley.

Note that the program staff consists of six permanent staff and seven rotators. This mix of permanent staff and rotators allows both internal consistency and an intimate contact with the universities, both of which are important to the Division's operation. However, with seven rotators on the staff, each of whom is at the Foundation for only one or two years, several new staff members must be hired each year. Applications are welcome from interested and qualified individuals in all fields of the mathematical sciences; additional information can be obtained from Division Director John Polking.

Positions Open in NSF

Applicants for the following positions should submit résumés including current salary to NSF, Personnel Administration Branch, Room 212, 1800 G Street, N.W., Washington, DC 20550; Attn: Catherine Handle, 202-357-7840. Hearing impaired individuals should use TDD 202-357-7492.

Specific years of successful scientific research experience beyond the Ph.D. are required for the following positions in all fields: Program Director, six to eight years; Associate Program Director, four to six years; Assistant Program Director, three to four years.

NSF's Division of Computer Research is seeking qualified applicants for the positions of assistant program director, associate program director and program director for Theoretical Computer

Science and for Intelligent Systems. The positions will be filled on a permanent, temporary or rotational basis. Salaries range from $35,000 to $50,000 for assistant program director; $40,000 to $60,000 for associate program director; and $45,000 to $68,700 for program director.

The incumbent will be responsible for/or assisting in the planning, coordination, and management of basic research facilities and other scientific activities primarily through Federal grants and contracts to academic institutions and nonprofit, nonacademic research institutions. A broad, general knowledge of computer research and some administrative experience are also required. For technical information about the positions contact Kent Curtis, Director, Division of Computer Research, 202-357-9747.

NSF's Division of Mathematical Sciences is seeking qualified applicants for positions which periodically become available. These positions will be filled on a one- or two-year rotational or temporary basis. Incumbents will be responsible for the planning, coordination, and management of basic research activities primarily through Federal grants and contracts to academic institutions and nonprofit, nonacademic research institutions. A broad, general knowledge of the field and some administrative experience are required. For technical information about the position contact John Polking, Director, Division of Mathematical Sciences, 202-357-9669. *–NSF Bulletin*

A Dirichlet Problem for Distributions and Specifications for Random Fields

Michael Röckner

(Memoirs of the AMS, Number 324)

Consistent conditional distributions for a large class of Gaussian measures defined on the space of (tempered) distributions on a domain D in $\mathbf{R}^d$ are constructed explicitly. The conditional distributions are with respect to an (uncountable) family of σ-fields associated with the complements of the (relatively compact) open subsets of D. The construction involves solving a Dirichlet problem whose "boundary data" is given by a distribution. Furthermore, the associated set of Gibbs states is studied. The extreme Gibbs states are characterized and it is proved that they have the global Markov property. Based on the Dirichlet solution for distributions it is shown that any Gibbs state can be represented in terms of extreme Gibbs states.

1980 *Mathematics Subject Classification*: 60G60
ISBN 0-8218-2325-6, LC 84-29009
ISSN 0065-9266
vi + 76 pages (softcover), March 1985
List price $11, Institutional member $9, Individual member $7
Shipping and handling charges must be added
To order, please specify MEMO/324N

Dirichlet Integrals of Type 2 and Their Applications

Milton Sobel, V. R. R. Uppuluri and K. Frankowski

(Selected Tables in Mathematical Statistics, Volume 9)

Abstract

This volume deals with incomplete Dirichlet integrals of type 2 and is a companion book to Volume 4 of this series (by the same authors) which deals with incomplete Dirichlet integrals of type 1. As in the previous volume

1) there are several new contributions present, some of which concern the development of new algorithms that made these tables possible,

2) there are many examples given to illustrate the use of the tables,

3) applications of these integrals are given to two types of problems: some that would be classified as being in the area of probability and also to some that are primarily statistical in nature,

4) there is already evidence that these tables and the associated write-up will serve as a catalytic agent for further research,

5) the probabilistic interpretation of the Dirichlet integral plays a major role in the direction we take and in the development of tables.

An important area of application of these integrals is to ranking and selection problems dealing with the multinomial distribution, especially when the statistic of major interest is related to the minimum or maximum frequency among the cells and the stopping rule is of the type used in inverse sampling. In the tables most attention is to the homogeneous multinomial; however much of the analysis attempts to get away from homogeneity.

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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 02901-1571. Call 800-556-7774 to use VISA or MasterCard.

It is planned that this column, "For Your Information," will be appearing in the *Notices* on a regular basis. It will include items which the Editor feels would be of general interest to the readership but which do not fall under the categories currently highlighted.

A Growing Partnership

by Erich Bloch, Director, NSF

As we look back on the Foundation's activities in fiscal year 1984, a key theme is the interdependence and overlapping interests of many NSF programs. This reflects a basic change in the nature of science and engineering as our understanding of fundamental phenomena grows. Increasingly the lines are blurred between science and engineering, between the various disciplines, and between established and emerging fields. Effective research requires cooperation between universities, industry, and government; between nations; and between individual researchers or small teams Mutual effort is also needed in large, capital-intensive projects involving many investigators from a variety of fields working over several years. Examples here are NSF's Ocean Drilling Program and the large research projects we support in the arctic and antarctic regions.

Our annual report highlights research supported by NSF last year, and much of it is indeed interactive and interdependent. But there are other recent activities to note as well:

- First, we have reinforced the role of the individual researcher with the program known as Presidential Young Investigators. This program addresses the brightest young faculty, chosen solely for their research promise. The objective here is to attract and retain these people on university faculties. The emphasis is on engineering and the physical sciences, where shortages are greatest.
- We are launching several Engineering Research Centers, with more to be added in the future. Each will be focused on a major interdisciplinary area of interest to both industrial and academic researchers. Each center will attract—and require the cooperation of—researchers from many scientific and engineering disciplines, including members of the behavioral sciences. The centers will be located on university campuses, to promote strong links between research and education. Engineers and scientists from industry are expected to participate, to help focus activities on their needs.
- We have started a major push to stimulate and coordinate research in topics related to biotechnology, an area in which the United States is strong—yet vulnerable to foreign competition.
- To remedy a problem of long standing, we have increased spending on research equipment and instrumentation sharply. We also have launched a large-scale effort to make access to advanced computing resources (supercomputers) available to university researchers as never before. To do the latter, we have set up an Office of Advanced Scientific Computing.
- Internally, we put more emphasis on certain program areas last year by creating new divisions, or separating earlier organizations. Thus we have split Mathematics and Computer Science into two divisions, and we created Cellular Biosciences and Molecular Biosciences from what was formerly Physiology, Cellular and Molecular Biology. We also have begun to rebuild our science and engineering education efforts.

Challenges, Responsibilities—and Partnerships. We are pleased with the progress of American research and technology and the role NSF has played in promoting that progress. However, we continue to see major challenges.

Today the United States faces international economic competition of unprecedented intensity. We can meet this challenge only if we understand the proper role of science and technology and make it work for us.

We face competition in research and development from other industrialized nations, and increasingly we will also have to expect significant competition from emerging regions as well.

Another challenge is that the complexity of technology is increasing at a more rapid rate than before—for products, for manufacturing processes, and for research itself. As the whole endeavor gets more complicated, the necessary skill levels become higher and many times more specialized, thus placing additional strain on our educational system.

So how do we meet the challenges? I say together, for today there is a much clearer view that a true partnership in support of science and engineering is necessary. Each partner has a stake in the outcome, and each should have a fairly well-defined role in providing certain kinds of support.

The partners are federal, state, and local governments, industry, and universities. The *federal government* shares with industry the principal responsibility for supporting basic research. But as we move along the continuum from basic research to development, the proper role of the national government declines.

The second major player in science and engineering is *state and local government.* Together

they bear principal responsibility for primary and secondary education, although federal programs may provide stimulation, some leadership, and specialized assistance.

Industry is the third major player. There is a clear recognition of industry's dominant role in development funding, but industry also has a major role in supporting basic research. Among the new approaches here is the rise in cooperative research arrangements. They increase the number of players dramatically and reduce costs without unduly affecting market competition.

Cooperative research efforts are also an example of closer ties between industry and *universities*, the fourth major partner. More and more, industry is joining with federal and often with state government to support university research in problems of interest to both industrial and academic researchers. Joint centers have emerged in such areas as welding, polymers, robotics, and computer graphics, to name just a few.

Twenty cooperative research centers launched by NSF now get most of their support from more than 200 private companies. They also involve 250 university faculty members, 30 postdoctoral scientists and engineers, 300 graduate students, and 40 undergraduates, along with 200-plus advisers and about 400 project monitors from industry.

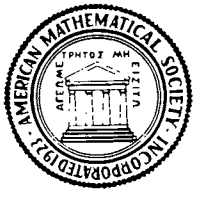
Moving Ahead. The challenges we face are tough ones, to be sure. But this vast and varied nation has often faced great problems with a spirit of great energy and creativity. I like to think that the National Science Foundation is a part of that spirit.

We will continue to promote scientific inquiry, and we remain committed to the goals set forth in the 1950 legislation that created this agency: "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..." In the coming years we will work to do even better what the Foundation has always done well: support science, engineering, and education so that the nation may benefit. –Excerpted from NSF Annual Report

Honorary Degrees Awarded

At the University of Pennsylvania's 229th commencement exercises on May 20, 1985, honorary degrees were awarded to two mathematicians. Perhaps this is a sign of increasing public recognition of the importance of mathematics.

Samuel Eilenberg, professor emeritus of mathematics at Columbia University, was awarded an honorary doctor of science degree. His citation read "A master theoretician of geometry, algebra, automata, and formal languages—our greatest mathematical stylist—you defined the very categories of modern mathematics." Hilary W. Putnam, professor of philosophy and mathematics at Harvard University, was awarded an honorary doctor of humane letters degree.



Some Basic Hypergeometric Orthogonal Polynomials that Generalize Jacobi Polynomials

Richard Askey and James Wilson

(Memoirs of the AMS, Number 319)

The classical orthogonal polynomials include those of Hermite, Laguerre, Jacobi and discrete analogues found by Chebychev, Charlier, Meixner and Hahn. In an earlier paper the authors found the most general set of classical orthogonal polynomials whose weight function is discrete. The same polynomials with different choices of parameters have an absolutely continuous weight function. The explicit orthogonality relation is obtained, many special cases are considered, and a few facts about these polynomials are discovered. These include quadratic transformations for some basic hypergeometric series, a solution of the connection coefficient problem which gives Watson's extension of the Rogers-Ramanujan identities, inequalities for the polynomials on the spectral interval, a divided difference equation and a Rodrigues type formula. All of the paper rests on a new extension of the beta integral which has four rather than two free parameters in addition to the q associated with basic hypergeometric series.

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Letters to the Editor

Mathematics and the Defense Department

In the June 1985 issue (page 378) Sheldon Axler and Donald Sarason castigate a "Report by the Subpanel on the Department of Defense," republished in the *Notices* in October 1984 (pages 609-616). In turn, this report was Attachment 2 to an Appendix to the David report "Renewing U.S. Mathematics." That David report, republished earlier in the *Notices*, was an illuminating and important description of the damages done to Mathematics by constraints on funding—plus helpful positive recommendations.

This Attachment 2 was criticized because of its use of the euphemism "defense" for the activities of the Pentagon and because it boasted about uses of statistics in testing the MX missiles but did not mention that the MX is potentially a first strike weapon. These two issues, whatever their merits, are strictly political ones, on which the mathematical community has no special expertise. Raising them in the *Notices* is counterproductive. We have enough problems to settle without taking on major government issues.

But that Attachment 2 is open to other, specifically mathematical, criticism. After the great common experience of WWII, the ONR and other defense agencies liberally supported science, including the whole range of mathematics, pure and applied. This support made a major difference in the size and quality of the mathematics community—and, as we can now see, it was healthy to have alternative sources of funding. This broad support ground to an end with the Mansfeld Amendment (1968), which tends to confine DOD support to research closely related to specific goals of the agencies—a restriction unfortunate both for the DOD and for mathematics.

That Attachment 2 does mention the Mansfeld Amendment, but fails to provide any real analysis of its effects in depriving the DOD of unexpected gains from mathematical research undertaken for its own sake. Instead, the attachment just tries to solicit DOD interest and funding by providing a long list of specific uses of pieces of mathematics. The list is heavily concentrated in mathematical engineering and includes topics remote from mathematics (e.g., computer-aided manufacturing). The list does mention favorably the subject of symbolic dynamics, but misses the excellent opportunity of observing that this subject was started (by G. D. Birkhoff and G. A. Hedlund) with no thought for its possible military use. What a dandy example to counter Mansfeld!

That Attachment 2 strikes me as a narrow-minded and "defense" dominated document, full of special pleading and hardly worthy of sponsorship by COSEPUP (the high level Committee on Science, Engineering and Public Policy under the NAS, NAL and IOM) (NAS = National Academy of Sciences). All NAS reports are subject to review before they are issued; in particular, the main body of the David report was carefully so reviewed. This review did not extend to the attachments—which had been issued earlier.

One last point: that noted slogan "the greatest good for the greatest number" hides mathematical nonsense. One cannot simultaneously maximize two different dependent variables. As chairman (1973–1981) of the Report Review Committee of the NAS, I repeatedly reminded non-mathematical authors that similar propaganda statements are meaningless. I never thought that I would have to point this out to a group of six accomplished mathematicians. But there it is (page 614, lower right):

> For the building of the strongest, most advanced and technologically sophisticated defense, at the lowest cost, the DOD needs..."

Three maxima and one minimum, and a euphemism to boot!

Saunders MacLane
The University of Chicago
(Received June 10, 1985)

This letter was prompted by a letter of Saunders MacLane (*Notices*, October 1985). I wish to raise three questions and in part to answer them.

1. Is there a relationship between modern mathematics and the worlds of science and technology? If this question was ever in doubt, it has been put to rest by the David committee report. From medicine to agriculture to commerce to engineering, there are few areas of modern life in which the force of mathematical thinking has no role.

2. Is this role of mathematical thinking appreciated by its potential or actual users? I believe that there is a general acceptance for the applicability of mathematics (although this idea is also occasionally disputed) but the specific instances are very often not recognized, not only by potential users, but also by the mathematical community at large and even by the experts in a specific field, who are occasionally surprised by the applicability of their own subjects. For example, when I began my work on the mathematical foundations of quantum field theory, the fact that this subject shared a common mathematical structure with statistical mechanics and with stochastic partial differential equations was not appreciated.

It follows that there is a value in an ongoing effort to establish effective communication between the mathematical community and various

groups of actual or potential users of mathematics. Again speaking from personal experience, a recent book on the mathematics of modeling petroleum reservoirs and a conference on petroleum reservoir modeling and exploration, to which I contributed, both seemed to be effective in aiding this communication process. There is a language barrier which must be overcome for communication to take place, and it is not obsequious but essential to learn and use the language of the other discipline. It is also the case that any particular such effort will make some selection of mathematical topics according to the needs of the situation, and that a broad balance will not be achieved. Rather the balance is achieved if there are a number of efforts to communicate mathematics in the context of a range of different applications.

3. Will involvement with the problems of science and technology benefit mathematics intellectually? The heritage of mathematics includes the work of Newton, Fourier and Poincaré, suggesting that the answer is positive. Historically, the pursuit of mathematical truth in the context of interdisciplinary problems has been very fruitful. I have never experienced a shortage of problems which were stimulating simultaneously in their mathematical aspects and in their relation to the subjects from which they arose. I would leave to others the task of deciding which fraction of any given piece of work of this type is mathematics and which is not. When the work succeeds, the intellectual boundaries of mathematics are enlarged, and so the fraction is larger at the conclusion of the work than it is at the outset.

I am presently interested in problems in the interactions of nonlinear waves defined by the solution of nonlinear partial differential equations. The problems begin as engineering and arise, for example, in the study of oil reservoirs, elasticity, chemically reacting fluids and fluid mechanics. Their solution requires topology, functional analysis, ordinary as well as partial nonlinear differential equations and perhaps geometry. There is no doubt that the solutions, as they are being obtained by a small group of people working on this problem, are an original and important contribution to mathematics itself.

The mathematization of science and technology is a force of history. This process will be carried forward by applied mathematicians and probably by a significant number of core mathematicians as well. They will be joined in doing this by mathematically oriented engineers, computer scientists and physicists. Mathematics will be intellectually richer as a result.

James Glimm
Courant Institute of
Mathematical Sciences,
New York University
(Received July 17, 1985)

Policy on Letters to the Editor

Letters submitted for publication in the *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 the *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.

The committee reserves the right to edit letters.

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

Letters should be mailed to the Editor of the *Notices*, American Mathematical Society, Post Office Box 6248, Providence, Rhode Island 02940, and will be acknowledged on receipt.

List of Retired Mathematicians Available for Employment

The annual *List of Retired Mathematicians* will be included in the December and January issues of the publication *Employment Information in the Mathematical Sciences*. Retired mathematicians who are interested in being included in the list may send the following information to the Mathematical Sciences Employment Register, American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940.

1. Full Name
2. Mailing Address
3. Highest degree, year, university
4. Most recent employment: institution
5. Type of position desired
6. Academic or industrial employment preferred
7. Date available for employment (month/year)
8. Geographic location preferred

The deadline for receipt of this information is **November 15**. Offprints of the list will be available for $5 from the Mathematical Sciences Employment Register, American Mathematical Society, P.O. Box 6887, Providence, Rhode Island 02940.

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

335. Sherwood Washburn (Seton Hall University, South Orange, NJ 07079). When is the sum of the squares of the first N positive integers a perfect square? This is the same as asking for solutions to the equation

$$6Y^2 = X(X+1)(2X+1)$$

in positive integers (X,Y). Clearly $(X,Y)=(1,1)$ and $(X,Y)=(24,70)$ are solutions. I believe that there are no other solutions, and I would like to ask whether a proof of this is known. The equation above defines an elliptic curve, and it is not difficult to outline a proof using the arithmetic of elliptic curves, but some of the steps in the argument seem non-trivial. Is there an elementary proof?

336. Sherwood Washburn (Seton Hall University, South Orange, NJ 07079). I would like to ask for a reference for the relation

$$S_{m,n} = \sum_{k=0}^{n-m} (-1)^k \binom{n-m}{k}\binom{n+1}{m+k+1} = 1/\binom{n}{m},$$

for positive integers m, n, with $0 \le m \le n$. I think that the relation deserves to be better known, since it gives an interesting expansion of the inverse of a binomial coefficient.

337. Roger Hester and Rajeev Vaidya (Department of Polymer Science), **James Caveny** (Department of Mathematics, University of Southern Mississippi, Hattiesburg, MS 39406–5045). Are there closed-form evaluations of the integral

$$\int_0^\infty v^c \exp\{-((b-1)/a)v^a\} \cdot \exp\{-K[v_0 + (v_m - v_0)v]^p\}\, dv?$$

Here a, b, c, K, v_0, v_m and p are constants with $a>0$, $b>1$, $c\ge 0$, $K>0$, $v_m > v_0 \ge 0$ and p is any real number. (Integrals of this type appear in applications; numerical integration can be quite time consuming.)

338. Frédéric Brulois (Department of Mathematical Sciences, San Diego State University, San Diego, CA 92182). It is possible to characterize those Fuchsian equations (i.e.: homogeneous linear differential equations on the Riemann sphere with all singular points regular) which have a solution with prescribed behavior at two singular points? For example: for what values of the parameter c does the equation

$$\begin{aligned} z(z-1)(z-a)w'' + [\gamma(z-1)(z-a) + \delta z(z-a) \\ + (\alpha+\beta-\gamma-\delta+1)z(z-1)]w' \\ + [c + \alpha\beta(z-a)]w = 0 \end{aligned}$$

possess a solution which is analytic at both $z=0$ and $z=1$?

339. G. Delaney (President, Association for the Study of Dreams, 337 Spruce Street, San Francisco, CA 94118). For a study of the use of dreams and early morning ideas for problem-solving and scientific and technological inventions I would like to get examples, with or without source references.

340. Andrew Lenard (Department of Mathematics, Indiana University, Bloomington, IN 47405). Suppose that a real function f defined on the 2-dimensional sphere S has the property that its restriction to any circle lying on S is Riemann integrable (with respect to arc length measure). Does it follow that f is Lebesgue measurable on S, or perhaps has even some stronger regularity property?

341. Albert A. Mullin (506 Seaborn Drive, Huntsville, AL 35806). About seventy years ago, S. Ramanujan introduced the novel idea of a *highly* composite number, i.e., a number N with more divisors than any number $M < N$; e.g., $N = 2, 4, 6, 720, 45360$. (a) Is there a *simple* rule (algorithm) for determining the gaps between two consecutive highly composite numbers? (b) Define $\nu(n)$ as follows: $\nu(1)=0$, $\nu(\text{prime})=1$; for $n = p_1^{r_1}\cdot p_2^{r_2}\cdot\cdots\cdot p_k^{r_k}$ put $\nu(n) = \max\ \nu(r_i)+1$. What is known about the rate of growth of $\nu(N)$, where N is highly composite? E.g., $\nu(45360)=3$.

Responses

The editor would like to thank all those who sent in replies.

170. (vol. 26, p. 102, February 1979, Mariano Gasca González) Does condition GC on a set X

of $N = \binom{k+2}{k}$ points in the plane imply that $k+1$ of the points are collinear? GC: to each $x \in X$ one can find k distinct lines L_i with $(\bigcup L_i) \cap X = X \backslash \{x\}$. (This is known for $k = 1, 2, 3$.) **Reply:** The answer is yes for $k = 4$, via a long and cumbersome argument. Details available through the AMS office. (Contributed by Jorge R. Busch)

327. part B. (vol. 32, p. 379, June 1985, Robert Vinograd) Location of the minimum angle between vectors on two cones. **Reply:** The conjecture stated in the query is correct; uniqueness of a_0 and b_0 is not needed. (Contributed by R. Vinograd)

333. (vol. 32, p. 472, August 1985, Charles Small) Are formal power series whose coefficients eventually satisfy a linear recurrence relation rational functions? **Reply:** There is a proof in G. H. Hardy: *A course in pure mathematics*, 9th Edition, Cambridge University Press (1948), Cambridge, England. A proof is also contained in the proof of Proposition 2.1 of a paper by Okoh and Zorzitto: Pacific Journal of Math., Vol. **109**, No. 2, Dec. 1983, pp. 437–455. Another proof can be found in Stephen J. Andrea: *Algebraic addition theorems*, Advances in Math. **13**, (1974), pp. 20–30. There the result is attributed to Hadamard. (Contributed by F. Okoh)

Correction

334, part A (vol. 32, p. 472, August 1985, E. Eisner): The query was not stated correctly. In the text "Does there exist an N such that for" should be replaced by "For", and "there exists a polynomial" by "does there exist a polynomial".

Memoirs

of the American Mathematical Society

Embedding and Multiplier Theorems for $H^p(\mathbf{R}^n)$

Albert Baernstein II and Eric T. Sawyer

(Memoirs of the AMS, Number 318)

This paper is about the real variable Hardy spaces $H^p(\mathbf{R}^n), 0 < p \leq 1$. We prove two main theorems. The first is a sufficient condition involving the "size" of $f \in S'$ which implies that $f \in H^p$, and the second a sufficient condition on $m \in L^\infty(\mathbf{R}^n)$ for m to be a Fourier multiplier of H^p. These conditions are phrased in terms of certain function spaces introduced by Herz, and within these spaces the conditions are sharp. The embedding theorem sharpens results of Taibleson and Weiss involving "molecules" and implies a sharp Fourier embedding theorem of the Bernstein-Taibleson-Herz type, while the multiplier theorem sharpens results of Calderón and Torchinsky. The paper also contains three other theorems about Fourier transforms of H^p distributions.

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Conditional Stability and Real Analytic Pseudo-Anosov Maps

Marlies Gerber

(Memoirs of the AMS, Number 321)

The author shows that the smooth pseudo-Anosov diffeomorphisms constructed by Gerber and Katok satisfy a "conditional structural stability" property, i.e. structural stability with respect to C^1 perturbations which preserve some finite number of jets at a given finite collection of points. As a corollary, she obtains real analytic diffeomorphisms which are Bernoulli with respect to a smooth invariant measure and which are conjugate to Thurston's pseudo-Anosov homeomorphisms. These results also hold for generalized pseudo-Anosov diffeomorphisms. In particular, this proves the existence of real-analytic Bernoulli diffeomorphisms on the two-dimensional disk which preserve Lebesgue measure.

1980 *Mathematics Subject Classifications*: 58F15, 58F30, 58F11
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The Theory of Gauge Fields in Four Dimensions

H. Blaine Lawson

(CBMS Regional Conference Series, Number 58
Supported by the National Science Foundation)

Lawson's expository lectures, presented at a CBMS Regional Conference held in Santa Barbara in August 1983, provide an in-depth examination of the recent work of Simon Donaldson, of especial interest to both geometric topologists and differential geometers. This work has excited particular interest in light of Mike Freedman's recent profound results: the complete classification, in the simply connected case, of compact topological 4-manifolds. Arguing from deep results in gauge field theory, Donaldson has proved the nonexistence of differentiable structures on certain compact 4-manifolds. Together with Freedman's results, Donaldson's work implies the existence of exotic differentiable structures in R^4–a wonderful example of the results of one mathematical discipline yielding startling consequences in another.

The lectures are aimed at mature mathematicians with some training in both geometry and topology, but they do not assume any expert knowledge; in addition to a close examination of Donaldson's arguments, Lawson also presents as background material the foundation work in gauge theory (Uhlenbeck, Taubes, Atiyah, Hitchin, Singer, et al.) which underlies Donaldson's work.

Contents

1. Introduction
2. The Geometry of Connections
3. The Self-dual Yang-Mills Equations
4. The Moduli Space
5. Fundamental Results of K. Uhlenbeck
6. The Taubes Existence Theorem
7. Final Arguments

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Amherst, October 26–27, University of Massachusetts

Program for the 822nd Meeting

The eight hundred and twenty-second meeting of the American Mathematical Society will be held at the University of Massachusetts, Amherst, on Saturday and Sunday, October 26–27, 1985. All scientific sessions will be held in the Lederle Graduate Research Tower and several nearby buildings.

Please note that Eastern Daylight Saving Time ends at 2:00 a.m. on October 27. Speakers and participants are advised to set watches and clocks back one hour before retiring on Saturday night, in order to not miss any of the program on Sunday morning.

On Friday, the Valley Geometry Seminar will sponsor a series of three expository lectures on recent progress in different areas of geometry.

In honor of the Hermann Weyl centenary, a special program will be presented on Saturday evening.

Following the AMS meeting on Sunday evening and all day Monday, a symposium at Harvard University will commemorate the accomplishments of Sonia Kovalevskaia.

Additional details concerning these activities are found elsewhere in this text.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Eastern Sectional Meetings, there will be four invited one-hour addresses. The speakers, their affiliations, the titles of their talks, and the times of presentation, are as follows:

VAUGHAN F. R. JONES, University of Pennsylvania and Mathematical Sciences Research Institute, Berkeley, *Some relations between operator algebras, braids, and links*, 1:30 p.m. Sunday.

ANDRÉ JOYAL, Université du Québec, Montréal, *Witt vectors from a categorical standpoint*, 11:00 a.m. Saturday.

NGAIMING MOK, Columbia University, *Metric rigidity theorems on Hermitian locally symmetric spaces*, 11:00 a.m. Sunday.

ROBERT T. SEELEY, University of Massachusetts, Boston, *Asymptotics of the heat equation at conic singularities*, 1:30 p.m. Saturday.

Special Sessions

By invitation of the same committee, there will be twelve special sessions of selected papers. The topics of these special sessions, names of the organizers, and lists of speakers, are as follows:

An introduction to quasi-crystals, JEAN TAYLOR, Rutgers University. The speakers are Enrico Bombieri, John W. Cahn, Paul J. Steinhardt, Jean Taylor, and William P. Thurston.

Nonlinear problems arising in physics and geometry, LESLEY M. SIBNER, Polytechnic Institute of New York. The speakers will be Ilya J. Bakelman, Josef Dodziuk, Hans Engler, Carolyn S. Gordon, Nancy Hingston, David A. Hoffman, Kathryn Kuiken, Tilla Milnor, Richard S. Palais, Thea Pignataro, Emma Previato, Walter Seaman, Lesley M. Sibner, Jean E. Taylor, and Chuu-Lian Terng.

Sonia Kovalevskaia: Major currents in 19th century mathematics, JANE CRONIN SCANLON, Rutgers University. The speakers will be Roger Cooke, Karen D. Rappaport, Jane Cronin Scanlon, and François Treves.

The above three special sessions are coordinated with the AWM Symposium on the legacy of Sonia Kovalevskaia.

Lattice theory, geometry and combinatorics, M. K. BENNETT, University of Massachusetts, Amherst, and GARRETT BIRKHOFF, Harvard University. The speakers are M. E. Adams, Margaret Bayer, M. K. Bennett, Garrett Birkhoff, Anders Björner, Kenneth P. Bogart, Isidore Fleischer, Gary Gordon, Curtis Greene, Mark D. Halsey, Melvin F. Janowitz, Robert Piziak, Richard P. Stanley, and Thomas Zaslavsky.

The mathematical science of Hermann Weyl: A centenary tribute, MELVYN S. BERGER, University of Massachusetts, Amherst, and DONAL O'SHEA, Mount Holyoke College. The speakers will be Richard Ackermann, Melvyn S. Berger, W. N. Everitt, Victor Guillemin, Arthur Jaffe, Henry P. McKean, Irving Segal, Marjorie Senechal, S. Sternberg, Daniel W. Stroock, and P. Werner..

Transcendental algebraic geometry, DAVID COX, Amherst College, and ALAN DURFEE, Mount Holyoke College. The speakers are Susan J. Addington, James Carlson, Richard M. Hain, William L. Hoyt, Ronnie Lee, Marc Levine, Ben Lichtin, David R. Morrison, V. Pati, Michael Pulte, Marvin Tretkoff, Loring Tu, and Steven Zucker.

Braids, links and operator algebras, RICHARD H. HERMAN, Pennsylvania State University, and VAUGHAN F. R. JONES. The speakers are Joel Anderson, Paul Baum, Joan S. Birman, Fred Goodman, David Handelman, Richard H. Herman, Hideki Kosaki, Kenneth C. Millett, Adrian Ocneanu, Geoffrey L. Price, Lee Rudolph, Craig C. Squier, Hans Wenzl, R. F. Williams, and David Yetter.

**-fields, Hermitian forms, and *-valuations*, SAMUEL S. HOLLAND, JR., University of Massachusetts, Amherst, and MAURICE CHACRON, Carleton University. The speakers will be Maurice Chacron, Thomas C. Craven, John Dauns, David Handelman, Samuel S. Holland, Jr., Mohammed Idris, Hans A. Keller, David Leep, Robert Piziak, A. Rosenberg, George B. Seligman, and Jean-Pierre Tignol.

Representations of reductive Lie groups, JAMES E. HUMPHREYS, University of Massachusetts, Amherst. The speakers will be Dan M. Barbasch, David

Approaches to the University of Massachusetts Campus

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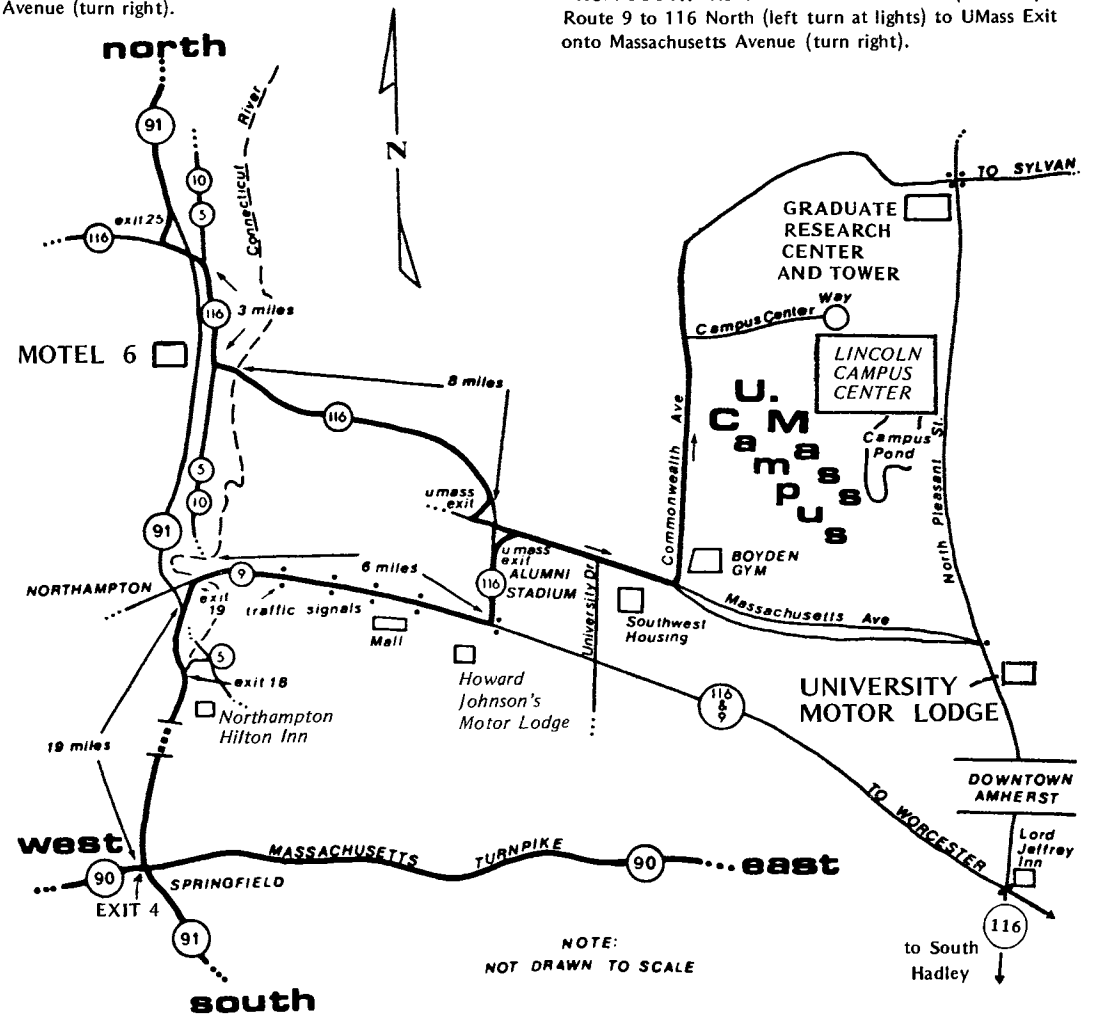

H. Collingwood, Thomas J. Enright, Rebecca A. Herb, A. W. Knapp, David A. Vogan, Jr., Nolan R. Wallach, Floyd L. Williams, and Gregg J. Zuckerman.

Topics in differential geometry, NGAIMING MOK. The speakers are J. E. D'Atri, Howard Jacobowitz, Masatake Kuranishi, John M. Lee, Yum-Tong Siu, McKenzie Y. Wang, and Scott A. Wolpert.

Functional equations and iteration, BERTHOLD SCHWEIZER, University of Massachusetts, Amherst. The speakers are J. Aczél, John Baillieul, Paul Blanchard, Robert L. Devaney, Bruce R. Ebanks, T. Erber, Pal Fischer, M. J. Frank, Jr., R. Korwar, M. A. McKiernan, C. T. Ng, Juerg Raetz, Lester J. Senechal, Howard Sherwood, Abe Sklar, and Robert Tardiff.

Categorical methods in homotopy theory, MYLES TIERNEY, Rutgers University. The speakers will be John W. Duskin, A. D. Elmendorf, Peter J. Freyd, Alex Heller, J. F. Jardine, André Joyal, Mark Kleiner, F. William Lawvere, Robert W. Thomason, Myles Tierney, Donovan H. van Osdol, and Charles Weibel.

Contributed Papers

There will also be sessions for contributed ten-minute papers.

Lectures in Geometry

A series of three lectures on recent progress in different areas of geometry will be sponsored by the Valley Geometry Seminar on Friday, October 25, immediately preceding the AMS meeting. The lectures will be held in Room 206 of the Seeley G. Mudd Building on the campus of Amherst College, which is approxiamtely one mile south of the University of Massachusetts. The program will consist of the following talks:

JOSEPH HARRIS, Brown University, *Parameter spaces and moduli spaces in geometry*, 1:30 p.m.; H. BLAINE LAWSON, SUNY Center at Stony Brook, *Minimal varieties and differential forms*, 3:00 p.m.; and JOHN MORGAN, Columbia University, title not available, 4:30 p.m.

An informal buffet supper will be served at 6:00 p.m. in the Merrill Dining Commons on the Amherst College campus; the cost will be approximately $10 per person. Please contact David A. Cox, Department of Mathematics, Amherst College, for additional information about the program.

Weyl Symposium

To commemorate the centenary of the birth of the distinguished mathematician Hermann Weyl (1885–1955), the Center for Applied Mathematics and Mathematical Sciences of the University of Massachusetts, Amherst and the Five Colleges Applied Mathematics Program, are planning to host a series of talks entitled, *Hermann Weyl–The Man and His Work*, on Saturday evening, October 26, beginning at 6:00 p.m. The talks will take place in the Colloquium Room, 1634 Lederle Graduate Research Tower. The speakers include Raoul Bott, Robert Cohen, and Alte Selberg, in addition to others.

Association for Women in Mathematics

A symposium in honor of Sonia Kovalevskaia will be held at Harvard University, Cambridge, Massachusetts, on Sunday evening, October 27, and all day Monday, October 28, following the AMS meeting in Amherst. The symposium has been organized by the Association for Women in Mathematics (AWM) in cooperation with the Mary Ingraham Bunting Institute of Radcliffe College.

The symposium will begin with registration on Sunday evening from 5:00 to 6:00 p.m. in the Cronkite Graduate Center of Radcliffe College, 6 Ash Street corner of Brattle, and the dinner at 6:00 p.m. will be followed by the opening lectures. (Note that the dinner hour is earlier than previously announced.) Registration fees are $3 for AWM members, $5 for nonmembers, and $1 for students or unemployed mathematicians. Some funds will be available to defray travel expenses of recent Ph.D.'s who are without institutional support. Itemized requests should be sent to Margaret Munroe at the AWM office address indicated on the preregistration and dinner reservation form in the back of this issue of the *Notices*. The program of the symposium appears on the same page. Please note that the location for the sessions on Monday has not been determined at this writing and, therefore, participants are asked to call the Mary Ingraham Bunting Institute at 617-495-8212 to obtain the location.

Registration

The AMS meeting registration desk will be located in the 16th floor lobby of the Lederle Graduate Research Tower. The desk will be open from 7:00 p.m. to 9:00 p.m. on Friday, from 8:00 a.m. to 2:00 p.m. on Saturday, and from 8:00 a.m. to noon on Sunday. The registration fees for the AMS meeting only are $10 for Society members, $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 New Orleans meeting announcement in this issue of the *Notices*.

Accommodations

Rooms have been blocked for participants at the following hotels or motels in the area. Individuals should make their own reservations directly and identify themselves as participants in the AMS meeting at Amherst. The rates listed are subject to change and, with the exception of Motel 6, do not include applicable tax.

Howard Johnson's Motor Lodge (2 miles from campus)
401 Russell Street, Hadley, MA 01035
Deadline for reservations: October 7
Telephone: 413-586-0114
Single or Double $65

Lincoln Campus Center Hotel (on campus)
University of Massachusetts, Amherst 01003
Deadline for reservations: October 11
Telephone: 413-549-6000
Single $38 Double $48
Triple $54

Lord Jeffery Inn (1 mile from campus)
30 Boltwood Avenue, Amherst, MA 01002
Deadline for reservations: September 15
Telephone: 413-253-2576
Single $74 Double $79

Motel 6 (10 miles from campus)
Routes 5 & 10, South Deerfield 01373
Deadline for reservations: October 4
Telephone: 413-665-2681
Single $18.97 Double $23.20
Quadruple $27.43

University Motor Lodge (1/4 mile from campus)
345 North Pleasant Street, Amherst 01002
Deadline for reservations: September 25
Telephone: 413-256-8111
Single $39 Double $48
Third person $5

Food Service

Meals will be available at the following campus locations: Top of the Campus Restaurant (located in Lincoln Campus Center) will serve dinner from 5:00 p.m. to 9:00 p.m. Friday and Saturday; Hatch Cafeteria in the Student Union is open from 8:00 a.m. to 4:00 p.m. Saturday and Sunday; and the Newman Center Cafeteria will be open from 8:30 a.m. to 4:00 p.m. on Saturday, and from 8:30 a.m. to 10:00 p.m. on Sunday. The Campus Center Coffee Shop is close to the Lederle Graduate Research Tower; wrapped sandwiches are available for take-out during the morning for people who want to attend sessions during the lunch hour.

Social Event

A wine and cheese party is scheduled to take place at 5:00 p.m. Saturday in the Mathematics Lounge on the 16th floor of the Lederle Graduate Research Tower, preceding the Weyl Symposium.

Parking

Parking will be permitted in any of the parking lots on campus from 6:00 p.m. on Friday until 7:00 a.m. Monday. There is no charge for parking in these campus lots. The only restrictions apply to spaces reserved for the handicapped or areas that are marked towing zone. Additional parking is available for a fee in the parking garage adjacent to the Lincoln Campus Center.

Travel

The University of Massachusetts, Amherst, is accessible by air, bus, and automobile. In the town of Amherst there is no taxi service, but it is expected that Pioneer Valley Transit Authority (PVTA) will provide free bus service between the campus and several points within the Amherst city limits.

Amherst is at least a one-hour drive from Bradley International Airport in Windsor Locks, Connecticut, which is served by such major airlines as American, Delta, Eastern, People Express, TWA, United, and USAir. Participants are advised to fly in and out of Bradley, since it is closer and more convenient than Logan International Airport in Boston. Peter Pan Bus Line provides frequent service between the terminal at Bradley International Airport and the Springfield bus terminal, where passengers then transfer to another Peter Pan bus which will take them to the Lincoln Campus Center. The present hours of operation from Bradley International Airport are from 8:40 a.m. to 9:15 p.m., and from the Lincoln Campus Center back to Bradley between 4:45 a.m. and 7:50 p.m. The bus trip takes approximately 90 minutes and the fare is $8.50 each way.

Several major car rental agencies, including Avis, Budget, Hertz, National, and Thrifty, are located at Bradley International Airport.

Spectral Sequence Constructors in Algebra and Topology

Donald W. Barnes

(Memoirs of the AMS, Number 317)

Spectral sequence constructors are a special type of functor to filtered chain complexes. They provide a means of comparing the various constructions which have been given for certain spectral sequences, for example, the spectral sequence of a group extension. In this book, the theory of spectral sequence constructors is developed, the four main constructions of the spectral sequence of a Hopf algebra extension are discussed and compared, and a uniqueness theorem for the spectral sequence is proved. A similar study is made of the spectral sequence of a fibration, and its uniqueness is also established.

1980 *Mathematics Subject Classifications*:
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Program of the Sessions

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

Abstracts of papers presented in AMS sessions at this meeting will be found in the October 1985 issue of *Abstracts of papers presented to the American Mathematical Society*, ordered according to the numbers in parentheses following the listings below.

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

Saturday, October 26, 1985, 9:00 a.m.

Special Session on Lattice Theory, Geometry and Combinatorics, I — Hasbrouck Laboratory 124

9:00– 9:20 (1) *Line-closed combinatorial geometries.* MARK D. HALSEY, Worcester Polytechnic Institute (822-05-21)

9:30– 9:50 (2) *When does "closed" imply "splitting"?* ROBERT PIZIAK, Baylor University (822-06-81)

10:00–10:20 (3) *Binary atomic lattices, S. L. spaces, and Hilbert's fourth problem.* GARRETT BIRKHOFF, Harvard University (822-06-103)

10:30–10:50 (4) *Relative Cohen-Macaulay complexes and spaces.* Preliminary report. RICHARD P. STANLEY, Massachusetts Institute of Technology (822-05-95)

Saturday, October 26, 1985, 9:00 a.m.

Special Session on The Mathematical Science of Hermann Weyl: A Centenary Tribute, I — Lederle Graduate Research Tower 203

9:00– 9:20 (5) *Nonlinear aspects of the Weyl gauge principle.* Preliminary report. MELVYN S. BERGER, University of Massachusetts, Amherst (822-51-42)

9:30– 9:50 (6) *Comments on the* 1910 *Mathematische Annalen paper of Hermann Weyl.* W. N. EVERITT, University of Birmingham, England (822-34-96)

10:00–10:20 (7) *H. Weyl's work on wave propagation in unbounded domains and some of its consequences.* P. WERNER, Universität Stuttgart, West Germany (822-51-120)

10:30–10:50 (8) *Symmetry.* MARJORIE SENECHAL, Smith College (822-51-04)

Saturday, October 26, 1985, 9:00 a.m.

Special Session on *-Fields, Hermitian Forms, and *-Valuations, I — Lederle Graduate Research Tower 319

9:00– 9:20 (9) *Power series rings.* Preliminary report. JOHN DAUNS, Tulane University (822-16-54)

9:30– 9:50 (10) *Order valuation of a c-ordered division ring.* MAURICE CHACRON, Carleton University (822-06-107)

10:00–10:20 (11) *Ordered rings and integral polytopes.* DAVID HANDELMAN, University of Ottawa (822-13-72) (Sponsored by Richard Herman)

10:30–10:50 (12) *Even Clifford algebras.* Preliminary report. GEORGE B. SELIGMAN, Yale University (822-17-83)

Saturday, October 26, 1985, 9:00 a.m.

Special Session on Sonia Kovalevskaia: Major Currents in 19th Century Mathematics, I — Hasbrouck Laboratory 134

9:00– 9:40 (13) *The mathematics of Sonia Kovalevskaia.* ROGER COOKE, University of Vermont (822-01-108)

9:50–10:30 (14) *The Cauchy-Kovalevsky theorem.* FRANÇOIS TREVES, Rutgers University, New Brunswick (822-01-158)

Saturday, October 26, 1985, 9:00 a.m.

Special Session on Braids, Links and Operator Algebras, I — Lederle Graduate Research Tower 323

9:00– 9:20 (15) *K theory for actions of discrete groups.* PAUL BAUM*, Brown University, and ALAIN CONNES, Collège de France, Paris (822-55-116)

9:30– 9:50 (16) *Jones' plat-braid formulas.* JOAN S. BIRMAN, Columbia University (822-57-85)

10:00–10:20 (17) *K-theory for certain group C^*-algebras.* Preliminary report. JOEL ANDERSON*, Pennsylvania State University, University Park, and WILLIAM L. PASCHKE, University of Kansas (822-46-159)

10:30–10:50 Discussion

Saturday, October 26, 1985, 9:00 a.m.

Special Session on Transcendental Algebraic Geometry, I — Hasbrouck Laboratory 126

9:00– 9:20 (18) *Variations of Hodge structure of maximal dimension.* Preliminary report. JAMES CARLSON*, University of Utah, and CARLOS SIMPSON, Harvard University (822-14-123)

9:30– 9:50 (19) *Estimates and relations for exponents of hypersurface singularities.* BEN LICHTIN, University of Rochester (822-32-66)

10:00–10:20 (20) *L^2-cohomology of algebraic varieties.* W.-C. HSIANG, Princeton University, and V. PATI*, Harvard University (822-51-92)

10:30–10:50 (21) *Relative weight filtrations for local monodromy.* STEVEN ZUCKER, Johns Hopkins University, Baltimore (822-14-124)

Saturday, October 26, 1985, 9:00 a.m.

Special Session on Functional Equations and Iteration, I — Lederle Graduate Research Tower 103

9:00– 9:20 (22) *The equation $F(x) + M(x)F(x^{-1}) = 0$ on the positive cone of $\mathbf{R}^n$.* BRUCE R. EBANKS, University of Louisville (822-39-32)

9:30– 9:50 (23) *Functions with complementing Cauchy kernels.* Preliminary report. C. T. NG, University of Waterloo (822-39-31)

10:00–10:20 (24) *On orthogonally additive mappings.* Preliminary report. JUERG RAETZ, University of Bern, Switzerland (822-39-29)

10:30–10:50 (25) *Determination of all generalized Hicks-neutral production functions.* J. ACZÉL, University of Waterloo (822-39-08)

Saturday, October 26, 1985, 9:00 a.m.

Special Session on Topics in Differential Geometry, I — Lederle Graduate Research Center A301

9:00– 9:30 (26) *Value distribution theory of holomorphic maps between manifolds of unequal dimensions.* YUM-TONG SIU, Harvard University (822-32-160)

9:40–10:10 (27) *A new solution of the Beltrami equation.* Preliminary report. SCOTT A. WOLPERT, University of Maryland, College Park (822-30-131)

10:20–10:50 Discussion

Saturday, October 26, 1985, 9:00 a.m.

Special Session on Nonlinear Problems Arising in Physics and Geometry, I — Lederle Graduate Research Tower 201

9:00– 9:20 (28) *Lower bounds for λ_1 on a finite volume hyperbolic manifold.* JOZEF DODZIUK* and BURTON RANDOL, Graduate School and University Center, City University of New York (822-58-141)

9:30– 9:50 (29) *A generalization of Kostant's convexity theorem.* Preliminary report. CHUU-LIAN TERNG, Northeastern University (822-52-144)

10:00–10:20 (30) *Isospectral families of potentials on Riemannian manifolds.* Preliminary report. DENNIS M. DETURCK, University of Pennsylvania, and CAROLYN S. GORDON*, Washington University (822-53-128)

10:30–10:50 (31) *Orbits in the symplectic group.* Preliminary report. NANCY HINGSTON, University of Pennsylvania (822-51-137)

Saturday, October 26, 1985, 9:10 a.m.

Session on Differential Equations — Lederle Graduate Research Tower 221

9:10– 9:20 (32) *Oscillation theorems for higher order delay equations.* WITOLD KOSMALA, Appalachian State University (822-34-07)

9:25– 9:35 (33) *A phase field approach to solidification—free boundary problems as systems of nonlinear equations.* GUNDUZ CAGINALP, University of Pittsburgh, Pittsburgh (822-35-132)

9:40– 9:50 (34) *Doubly stochastic measures on I^2 with hairpin support.* Preliminary report. MICHAEL D. TAYLOR, University of Central Florida (822-39-12)

9:55–10:05 (35) *On almost-periodicity and regularization for abstract differential equations.* S. ZAIDMAN, Université de Montréal (822-34-02)

10:10–10:20 (36) *Piecewise non-linear methods in the employ of oscillation theory of linear differential equations.* Preliminary report. BARRY ZASLOVE, Northeastern University (822-34-50)

10:25–10:35 (37) *On the solutions of a certain neutral functional diffferential equation.* Preliminary report. EMILIO O. ROXIN, University of Rhode Island and N.U.S.C., Newport, RI (822-34-70)

10:40–10:50 (38) *Removable singularities in coupled gauge fields: The higher-dimensional fermion equations.* THOMAS OTWAY, Polytechnic Institute of New York (822-35-104)

Saturday, October 26, 1985, 9:25 a.m.

Session on Geometry Lederle Graduate Research Tower 219

9:25– 9:35 (39) *Akinetor calculi.* MICHAEL CAVAGNERO, TOM ROBERTS, RANDY SEMAGIN and DOMINA EBERLE SPENCER*, University of Connecticut, Storrs (822-53-64)

9:40– 9:50 (40) *The three del-operators required in orthogonal coordinates.* PHILIP J. MANN, University of Connecticut, Storrs (822-47-63) (Sponsored by D. E. Spencer)

9:55–10:05 (41) *On isomorphic classical diffeomorphism groups.* AUGUSTIN BANYAGA, Pennsylvania State University, University Park (822-53-10)

10:10–10:20 (42) *Akinetors, the Riemann-Christoffel tensors, and the Ricci tensors.* MICHAEL CAVAGNERO, TOM ROBERTS, RANDY SEMAGIN, DOMINA EBERLE SPENCER and SHAMA Y. UMA*, University of Connecticut, Storrs (822-53-62)

10:25–10:35 (43) *The Bianchi identities.* MARTIN KURT ALBERT*, MICHAEL CAVAGNERO, TOM ROBERTS and DOMINA EBERLE SPENCER, University of Connecticut, Storrs (822-53-65)

10:40–10:50 (44) *A nonassociative algebra and its chain-geometry.* M. KHALIFAF, Teacher Training College, Ruwi, Sultanate of Oman (822-16-121)

Saturday, October 26, 1985, 9:30 a.m.

Special Session on Categorical Methods in Homotopy Theory, I Lederle Graduate Research Tower 101

9:30– 9:50 (45) *Some categorical aspects of homotopy theory.* ALEX HELLER, Graduate School and University Center, City University of New York University (822-99-162)

10:00–10:20 (46) *Combinatorial topology as the logic of "gros" toposes.* Preliminary report. F. WILLIAM LAWVERE, State University of New York, Buffalo (822-18-130)

10:30–10:50 Discussion

Saturday, October 26, 1985, 11:00 a.m.

Invited Address Engineering East 131

11:00–12:00 (47) *Witt vectors from a categorical standpoint.* ANDRÉ JOYAL, Université du Québec, Montréal (822-99-155)

Saturday, October 26, 1985, 12:15 p.m.

Special Session on An Introduction to Quasi-Crystals, I Goessmann Laboratory 20

12:15–12:20 (48) *Introduction to an introduction to quasi-crystals.* JEAN E. TAYLOR, Rutgers University, New Brunswick (822-82-77)

12:20–12:40 (49) *Quasiperiodic crystals.* JOHN W. CAHN, National Bureau of Standards, Gaithersburg (822-82-79) (Sponsored by Jean E. Taylor)

12:50– 1:10 (50) *Quasicrystals.* PAUL J. STEINHARDT, University of Pennsylvania (822-82-78) (Sponsored by Jean E. Taylor)

Saturday, October 26, 1985, 1:30 p.m.

Invited Address Engineering East 131

1:30– 2:30 (51) *Asymptotics of the heat equation at conic singularities.* ROBERT T. SEELEY, University of Massachusetts, Boston (822-99-156)

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Lattice Theory, Geometry and Combinatorics, II Hasbrouck Laboratory 124

2:45– 3:05 (52) *Consensus methods on median semilattices.* Preliminary report. MELVIN F. JANOWITZ, University of Massachusetts, Amherst (822-06-111)

3:15– 3:35 (53) *Rectangular products of lattices.* M. K. BENNETT, University of Massachusetts, Amherst (822-06-53)

3:45– 4:05 (54) *A continuous partition lattice.* Preliminary report. ANDERS BJÖRNER, Massachusetts Institute of Technology (822-06-82)

4:15– 4:35 (55) *The extended f-vectors of 4-polytopes.* Preliminary report. MARGARET BAYER, Northeastern University (822-52-52)

4:45– 5:05 (56) *Lattices generated by families of multisets, and partition identities.* CURTIS GREENE, Haverford College (822-05-139)

Saturday, October 26, 1985, 2:45 p.m.

Special Session on The Mathematical Science of Hermann Weyl: A Centenary Tribute, II
Lederle Graduate Research Tower 203

2:45– 3:15 (57) *The Higgs effect in gauge theories.* ARTHUR JAFFE, Harvard University (822-51-43)

3:20– 3:50 (58) *Geometry of Darboux's transformation.* Preliminary report. HENRY P. MCKEAN, Courant Institute of Mathematical Sciences, New York University (822-51-05)

3:55– 4:25 (59) *Outgrowths of Weyl's lemma.* Preliminary report. DANIEL W. STROOCK, Massachusetts Institute of Technology (822-51-59)

4:30– 5:00 (60) *Weyl asymptotics.* VICTOR GUILLEMIN, Massachusetts Institute of Technology (822-51-41)

Saturday, October 26, 1985, 2:45 p.m.

Special Session on *-Fields, Hermitian Forms, and *-Valuations, II Lederle Graduate Research Tower 319

2:45– 3:05 (61) *Quasi-fans and the representation theorem.* E. BECKER, University of Dortmund, Federal Republic of Germany, and A. ROSENBERG*, Cornell University (822-12-19)

3:15– 3:35 (62) *Orderings of *-rings: A perspective from real algebraic geometry.* THOMAS C. CRAVEN, University of Hawaii, Honolulu (822-16-127)

3:45– 4:05 (63) *Strong Baer orderings of division rings with involution.* MOHAMMED IDRIS, Carleton University (822-12-151)

4:15– 4:35 (64) *Systems of quadratic forms over formally real commutative fields.* DAVID B. LEEP, University of Kentucky (822-12-150)

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Sonia Kovalevskaia: Major Currents in 19th Century Mathematics, II
Hasbrouck Laboratory 134

2:45– 3:25 (65) *S. Kovalevskaya and the motion of a rigid body about a fixed point.* KAREN D. RAPPAPORT, Celanese Research Company, New Jersey (822-01-109) (Sponsored by Jane Cronin Scanlon)

3:35– 4:15 (66) *Figures of equilibrium of a rotating fluid mass: A problem with a long and colorful life.* JANE CRONIN SCANLON, Rutgers University, New Brunswick (822-01-129)

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Braids, Links and Operator Algebras, II Lederle Graduate Research Tower 323

2:45– 3:05 (67) *Index for von Neumann algebras.* FRED GOODMAN, University of Iowa (822-46-142)

3:15– 3:35 (68) *Xerox actions, polytopes, and random walks.* DAVID HANDELMAN, University of Ottawa (822-46-73) (Sponsored by Richard Herman)

3:45– 4:05 (69) *Central sequences in crossed products.* RICHARD HERMAN, Pennsylvania State University, University Park (822-46-110)

4:15– 4:35 (70) *Subgroups and representations of braid groups.* CRAIG C. SQUIER, State University of New York, Binghamton (822-20-147)

4:45– 5:05 (71) *Index of a subfactor in an arbitrary factor.* HIDEKI KOSAKI, Tulane University (822-46-13)

5:10– 5:30 Discussion

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Transcendental Algebraic Geometry, II Hasbrouck Laboratory 126

2:45– 3:05 (72) *Hodge structures on certain parabolic cohomology groups.* WILLIAM L. HOYT, Rutgers University, New Brunswick (822-14-39)

3:15– 3:35 (73) *Algebraic cycles, K-theory, and intermediate Jacobians.* MARC LEVINE, Northeastern University (822-14-113) (Sponsored by Alan Durfee)

3:45– 4:05 (74) *Cremona transformations and degrees of period maps for $K3$ surfaces with ordinary double points.* DAVID R. MORRISON*, Princeton University, and MASA-HIKO SAITO, Kyoto University, Japan (822-14-57)

4:15– 4:35 (75) *Generic Torelli for weighted hypersurfaces.* Preliminary report. LORING TU, Johns Hopkins University, Baltimore (822-14-125)

4:45– 5:05 Discussion

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Representations of Reductive Lie Groups, I Lederle Graduate Research Tower 321

2:45– 3:35 (76) *Unitary representations of semisimple Lie groups.* DAVID A. VOGAN, JR., Massachusetts Institute of Technology (822-22-37)

3:45– 4:05 (77) *Unitary representations induced from maximal parabolic subgroups.* M. W. BALDONI-SILVA, Università degli Studi di Trento, Italy, and A. W. KNAPP*, Cornell University (822-22-18)

4:15– 4:35 (78) *Spectral multiplicity of derived functor modules.* FLOYD WILLIAMS, University of Massachusetts, Amherst (822-22-88)

4:45– 5:05 Discussion

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Functional Equations and Iteration, II Lederle Graduate Research Tower 103

2:45– 3:05 (79) *Functional iteration, flows, and models in statistical physics.* T. ERBER, Illinois Institute of Technology (822-39-09)

3:15– 3:35 (80) *On the general unimodal solution of the Feigenbaum functional equation and related classes of solutions.* PAL FISCHER, University of Guelph (822-39-24)

3:45– 4:05 (81) *The dynamics of cubic polynomials.* PAUL BLANCHARD, Boston University (822-58-55)

4:15– 4:35 (82) *Exceptional functions and functional equations.* W. F. DARSOW and M. J. FRANK*, Illinois Institute of Technology (822-39-27)

4:45– 5:05 (83) *Functional equations which contain difference quotients.* LESTER J. SENECHAL, Mount Holyoke College (822-99-167)

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Categorical Methods in Homotopy Theory, II Lederle Graduate Research Tower 101

2:45– 3:05 (84) *Homology of some topoi.* R. W. THOMASON, Johns Hopkins University, Baltimore (822-99-161)

3:15– 3:35 (85) *K-theory homology of spaces.* CHARLES WEIBEL*, Rutgers University, New Brunswick, and ERIK PEDERSEN, Odense University, Denmark (822-18-48)

3:45– 4:05 (86) *Closed model structures on toposes.* Preliminary report. ANDRÉ JOYAL, Université du Québec, Montréal (822-18-87)

4:15– 4:35 (87) *Simplicial presheaves.* J. F. JARDINE, University of Western Ontario (822-18-45)

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Topics in Differential Geometry, II Lederle Graduate Research Center A301

2:45– 3:15 (88) *C-R manifolds and Cartan connections.* MASATAKE KURANISHI, Columbia University (822-53-115)

3:25– 3:55 (89) *Chains in* CR *geometry.* HOWARD JACOBOWITZ, Rutgers University, Camden (822-53-58)

4:05– 4:35 (90) *Conformal geometry and the Yamabe problem.* JOHN M. LEE*, Harvard University, and THOMAS H. PARKER, Brandeis University (822-53-106)

Saturday, October 26, 1985, 2:45 p.m.

Session on Logic, Combinatorics and Topology Lederle Graduate Research Tower 219

2:45– 2:55 (91) *Bivalence and reference in 3-valued, first-order modal logics.* BILLY JOE LUCAS, Manhattanville College (822-03-68)

3:00– 3:10 (92) *Prime divisibility of binomial and multinomial coefficients.* LEONARD J. NISSIM, Fordham University, College at Lincoln Center (822-05-01)

3:15– 3:25 (93) *Ubiquitous equivalence relations.* PAUL BANKSTON, Marquette University (822-05-135)

3:30– 3:40 (94) *Four examples demonstrating the unusual behavior of remote points.* T. J. PETERS*, Computervision Corporation, Bedford, Massachusetts, and ALAN DOW, University of Toronto (822-54-138)

3:45– 3:55 (95) *Dense G_δ's contain orthonormal bases.* RICHARD MERCER, Wright State University, Dayton (822-46-112)

4:00– 4:10 (96) *Rubik's tesseract.* Preliminary report. DAN VELLEMAN, Amherst College (822-20-49)

4:15– 4:25 (97) *The S^3-equivariant J-homomorphism and the homology of the universal S^3 gauge group.* Preliminary report. BENJAMIN MANN, Clarkson University (822-55-90)

4:30– 4:40 (98) *Examples of 3-manifolds with finite fundamental groups,* I. FRANCIS D. LONERGAN*, Webster, Massachusetts, and JOHN HOSACK, Colby College (822-55-105)

Saturday, October 26, 1985, 2:45 p.m.

Special Session on Nonlinear Problems Arising in Physics and Geometry, II Lederle Graduate Research Tower 201

2:45– 3:05 (99) *A general canonical form theorem.* Preliminary report. RICHARD S. PALAIS, Brandeis University (822-57-145)

3:15– 3:35 (100) *Two forms on four manifolds.* WALTER SEAMAN, University of Iowa (822-53-143) (Sponsored by Lesley M. Sibner)

3:45– 4:05 (101) *Stationary KP flows and affine coordinates for Jacobians.* EMMA PREVIATO, Boston University (822-14-03)

4:15– 4:35 (102) *A conformal Bernstein's theorem for timelike surfaces in Minkowski 3-space.* TILLA MILNOR, Rutgers University, New Brunswick (822-53-126)

Sunday, October 27, 1985, 8:30 a.m.

Special Session on Lattice Theory, Geometry and Combinatorics, III — Hasbrouck Laboratory 124

8:30– 8:50 (103) *Algebraic characteristic sets for matroids.* GARY GORDON, The BDM Corporation, McLean, Virginia (822-05-117)

9:00– 9:20 (104) *Posets, prefabs and generating functions.* Preliminary report. KENNETH P. BOGART, Dartmouth College (822-05-97)

9:30– 9:50 (105) *Geometric lattices of composed partitions.* Preliminary report. THOMAS ZASLAVSKY, State University of New York, Binghamton (822-06-22)

10:00–10:20 (106) *Pseudocomplemented semilattices are strongly amalgamable.* SYDNEY BULMAN-FLEMING, Wilfrid Laurier University, and ISIDORE FLEISCHER*, University of Windsor (822-06-34)

10:30–10:50 (107) *Congruence uniform distributive lattices.* M. E. ADAMS*, State University of New York, College at New Paltz, and R. BEAZER, University of Glasgow, Scotland (822-06-33)

Sunday, October 27, 1985, 8:30 a.m.

Special Session on *-Fields, Hermitian Forms, and *-Valuations, III — Lederle Graduate Research Tower 319

8:30– 8:50 (108) *A cyclicity criterion for central simple algebras of degree four with involution.* Preliminary report. TSIT-YUEN LAM, University of California, Berkeley, DAVID LEEP, University of Kentucky, and JEAN-PIERRE TIGNOL*, Université Catholique de Louvain, Belgium (822-16-149) (Sponsored by Samuel S. Holland, Jr.)

9:00– 9:20 (109) *Orthomodular lattices and quadratic spaces: A survey.* ROBERT PIZIAK, Baylor University (822-06-89)

9:30– 9:50 (110) *Measures on non-classical orthomodular spaces.* Preliminary report. HANS A. KELLER, Universidad Católica, Chile (822-46-93) (Sponsored by Samuel S. Holland, Jr.)

10:00–10:20 (111) *Baer ordered *-fields of the first kind.* S. S. HOLLAND, JR., University of Massachusetts, Amherst (822-12-84)

Sunday, October 27, 1985, 8:30 a.m.

Special Session on Braids, Links and Operator Algebras, III — Lederle Graduate Research Tower 323

8:30– 8:50 (112) *Polynomial invariants of unoriented knots and links.* ROBERT BRANDT, University of California, Santa Barbara, W. B. RAYMOND LICKORISH, University of Cambridge, England, and KENNETH C. MILLETT*, University of California, Santa Barbara (822-55-15)

9:00– 9:20 (113) *Braids and the Jones-Conway polynomial.* JOHN FRANKS and R. F. WILLIAMS*, Northwestern University (822-57-38)

9:30– 9:50 (114) *A natural splitting of the Milnor number of a fibred link, and the generalized Jones polynomial of some closed homogeneous braids.* Preliminary report. LEE RUDOLPH, Adamsville, Rhode Island (822-57-14)

10:00–10:20 (115) *Subalgebras are canonically fixed point algebras.* Preliminary report. ADRIAN OCNEANU, University of California, Berkeley (822-99-165)

Sunday, October 27, 1985, 8:30 a.m.

Special Session on Transcendental Algebraic Geometry, III — Hasbrouck Laboratory 126

8:30– 8:50 (116) *Equivariant holomorphic maps associated to spin groups.* Preliminary report. SUSAN L. ADDINGTON*, University of California, Santa Cruz, and TROELS N. PETERSEN, Massachusetts Institute of Technology (822-14-74)

9:00– 9:20 (117) *On a generalization of Hilbert's 21st problem.* Preliminary report. RICHARD M. HAIN, Institute for Advanced Study (822-14-164)

9:30– 9:50 (118) *Quotients of complex ball by discrete groups.* RONNIE LEE, Yale University (822-14-71)

10:00–10:20 (119) *The fundamental group of a Riemann surface: Mixed Hodge structures and algebraic cycles.* Preliminary report. MICHAEL PULTE, University of Arkansas, Little Rock (822-14-122)

10:30–10:50 (120) *The periods of the Fermat hypersurface: A higher dimensional analogue of Rohrlich's formula.* MARVIN TRETKOFF, Stevens Institute of Technology (822-14-86)

Sunday, October 27, 1985, 9:00 a.m.

Special Session on Functional Equations and Iteration, III — Lederle Graduate Research Tower 103

9:00– 9:20 (121) *Convexity and the dominates relation.* Preliminary report. ROBERT M. TARDIFF* and HOMER W. AUSTIN, Salisbury State College (822-39-30)

9:30– 9:50 (122) *Generating doubly stochastic measures with hairpin support.* Preliminary report. HOWARD SHERWOOD, University of Central Florida (822-60-23)

10:00–10:20 (123) *Chaotic dynamics in feedback systems.* JOHN BAILLIEUL, College of Engineering, Boston University (822-93-35)

10:30–10:50 (124) *Exploding Julia sets.* ROBERT L. DEVANEY, Boston University (822-58-26)

Sunday, October 27, 1985, 9:00 a.m.

Special Session on Nonlinear Problems Arising in Physics and Geometry, III — Lederle Graduate Research Tower 201

9:00– 9:20 (125) *Families of embedded minimal surfaces.* DAVID A. HOFFMAN*, University of Massachusetts, Amherst, and WILLIAM H. MEEKS, Rice University (822-53-60)

9:30– 9:50 (126) *Strong solutions for strongly damped quasilinear wave equations.* HANS ENGLER, Georgetown University (822-35-114)

10:00–10:20 (127) *The Dirichlet problem for non-linear elliptic Euler-Lagrange equations with applications to elasticity, plasticity and differential geometry.* ILYA J. BAKELMAN, Texas A&M University, College Station (822-35-133)

10:30–10:50 (128) *Crystalline minimal surfaces.* Preliminary report. JEAN E. TAYLOR, Rutgers University, New Brunswick (822-49-76)

Sunday, October 27, 1985, 9:00 a.m.

Special Session on Representations of Reductive Lie Groups, II — Lederle Graduate Research Tower 321

9:00– 9:20 (129) *Categories of highest weight modules.* Preliminary report. BRIAN D. BOE, University of California, Berkeley, THOMAS J. ENRIGHT*, University of California at San Diego, La Jolla, and BRAD SHELTON, University of Oregon (822-22-75) (Sponsored by James E. Humphreys)

9:30– 9:50 (130) *The fine structure of Jacquet modules.* DAVID H. COLLINGWOOD*, University of Utah, and LUIS G. CASIAN, Institute for Advanced Study (822-22-36)

10:00–10:20 (131) *The unitary dual for complex classical groups.* Preliminary report. DAN BARBASCH, Rutgers University, New Brunswick (822-22-134) (Sponsored by James E. Humphreys)

10:30–10:50 (132) *Automorphic forms constructed from Whittaker vectors.* Preliminary report. NOLAN R. WALLACH*, Rutgers University, New Brunswick, and ROBERTO MIATELLO, Ciudad Universitaria, Argentina (822-22-94) (Sponsored by James E. Humphreys)

Sunday, October 27, 1985, 9:00 a.m.

Special Session on The Mathematical Science of Hermann Weyl: A Centenary Tribute, III — Lederle Graduate Research Tower 203

9:00– 9:30 (133) *The nonlinear Weyl relations and quantum field theory.* IRVING SEGAL, Massachusetts Institute of Technology (822-51-44)

9:40–10:10 (134) *Differential geometry and gauge theory.* Preliminary report. S. STERNBERG, Harvard University (822-51-102) (Sponsored by Melvyn S. Berger)

10:20–10:50 (135) *The impact of Hermann Weyl on philosophy.* ROBERT ACKERMANN, University of Massachusetts, Amherst (822-51-101) (Sponsored by Melvyn S. Berger)

Sunday, October 27, 1985, 9:10 a.m.

Special Session on Topics in Differential Geometry, III — Lederle Graduate Research Center A301

9:10– 9:40 (136) *Some manifolds with infinitely many non-isometric Einstein metrics of positive scalar curvature.* Preliminary report. MCKENZIE Y. WANG, McMaster University (822-53-99)

9:50–10:20 (137) *Geometry of homogeneous bounded domains.* J. E. D'ATRI, Rutgers University, New Brunswick (822-32-146)

10:30–11:00 Discussion

Sunday, October 27, 1985, 9:30 a.m.

Special Session on Categorical Methods in Homotopy Theory, III — Lederle Graduate Research Tower 101

9:30– 9:50 (138) *Some categorical aspects of homotopy theory.* PETER J. FREYD, University of Pennsylvania (822-99-163)

10:00–10:20 (139) *Homotopy spaces of a space.* Preliminary report. DONOVAN H. VAN OSDOL, University of New Hampshire (822-18-140)

10:30–10:50 (140) *Categorical models for homotopy n-types.* Preliminary report. MYLES TIERNEY, Rutgers University, New Brunswick (822-18-152)

Sunday, October 27, 1985, 11:00 a.m.

Invited Address Engineering East 131

11:00–12:00 (141) *Metric rigidity theorems on Hermitian locally symmetric spaces.* NGAIMING MOK, Columbia University (822-53-61)

Sunday, October 27, 1985, 12:15 p.m.

Special Session on An Introduction to Quasi-Crystals, II Goessmann Laboratory 20

12:15–12:35 (142) *One-dimensional quasi-crystals.* ENRICO BOMBIERI, Institute for Advanced Study (822-82-153)

12:45– 1:05 (143) *Quasi-periodicity and triangulations.* WILLIAM P. THURSTON, Princeton University (822-82-154)

Sunday, October 27, 1985, 1:30 p.m.

Invited Address Engineering East 131

1:30– 2:30 (144) *Some relations between operator algebras, braids, and links.* VAUGHAN F. R. JONES, Mathematical Sciences Research Institute, Berkeley (822-57-119)

Sunday, October 27, 1985, 2:45 p.m.

Special Session on Representations of Reductive Lie Groups, III Lederle Graduate Research Tower 321

2:45– 3:05 (145) *Harmonic analysis on general semisimple Lie groups.* Preliminary report. REBECCA A. HERB, University of Maryland, College Park (822-22-17)

3:15– 3:35 (146) *Invariant differential operators.* Preliminary report. GREGG J. ZUCKERMAN, Yale University (822-22-56)

3:45– 4:05 Discussion

Sunday, October 27, 1985, 2:45 p.m.

Special Session on Functional Equations and Iteration, IV Lederle Graduate Research Tower 103

2:45– 3:05 (147) *On a joint characterization of the Pareto and the power function distributions.* R. KORWAR, University of Massachusetts, Amherst (822-62-28) (Sponsored by Haskell Cohen)

3:15– 3:35 (148) *A general Pexider equation and Cartan equivalence problems.* M. A. MCKIERNAN, University of Waterloo (822-39-118)

3:45– 4:05 (149) *The suspension construction for arbitrary functions.* Preliminary report. ABE SKLAR, Illinois Institute of Technology (822-39-25)

Sunday, October 27, 1985, 2:45 p.m.

Special Session on Categorical Methods in Homotopy Theory, IV Lederle Graduate Research Tower 101

2:45– 3:05 (150) *Integrations and cohomology in the Eilenberg-Moore category of a monad.* Preliminary report. MARK KLEINER, Syracuse University (822-18-46)

3:15– 3:35 (151) *Actions of categories on spectra.* A. D. ELMENDORF, Cornell University (822-55-47)

3:45– 4:05 (152) *The functor W, its adjoints and applications.* JOHN W. DUSKIN, State University of New York, Buffalo (822-18-51)

Sunday, October 27, 1985, 2:45 p.m.

Special Session on Nonlinear Problems Arising in Physics and Geometry, IV Lederle Graduate Research Tower 201

2:45– 3:05 (153) *Ground state and lowest eigenvalue of the Laplacian for non-compact hyperbolic surfaces.* THEA PIGNATARO*, Courant Institute of Mathematical Sciences, New York University, and DENNIS SULLIVAN, Institut des Hautes Etudes Scientifiques, France, and Graduate School and University Center, City University of New York (822-58-100)

3:15– 3:35 (154) *Monodromy groups of differential equations on Riemann surfaces of genus* 1. Preliminary report. KATHRYN KUIKEN*, Polytechnic Institute of New York, and JOHN T. MASTERSON, Seton Hall University (822-30-80)

3:45– 4:05 (155) *The removable point singularity problem for Yang-Mills fields.* LESLEY M. SIBNER, Polytechnic Institute of New York (822-35-20)

Sunday, October 27, 1985, 2:45 p.m.

Session on General Mathematics Lederle Graduate Research Tower 219

2:45– 2:55 (156) *A paradigm for search algorithms.* Preliminary report. AARON R. TODD, St. John's University, Notre Dame College (822-68-91)

3:00– 3:10 (157) *Natural superlogic formulation.* Preliminary report. S. L. WEINBERG, Berkeley Academy of Artscience, Berkeley, California (822-81-67)

3:15– 3:25 (158) *Mathematical analysis for basic human needs.* KRISHNANAND VERMA, University of Nevada, Las Vegas (822-90-06) (Sponsored by Lewis J. Simonoff)

3:30– 3:40 (159) *A systems model for Solomon's opponent process theory of addictions.* Preliminary report. RON WRIGHT, University of Pennsylvania (822-93-136)

Sunday, October 27, 1985, 2:45 p.m.

Special Session on Braids, Links and Operator Algebras, IV Lederle Graduate Research Tower 323

2:45– 3:05 (160) *More ring-valued invariants of knots and links.* Preliminary report. DAVID YETTER, Clark University (822-57-98)

3:15– 3:35 (161) *Subfactors via representations of the braid group.* Preliminary report. HANS WENZL, University of Pennsylvania (822-47-16)

3:45– 4:05 (162) *Shifts on C^* algebras.* GEOFFREY L. PRICE, United States Naval Academy (822-99-166)

4:15– 4:35 Discussion

W. Wistar Comfort
Associate Secretary

Middletown, Connecticut

Introduction to Intersection Theory in Algebraic Geometry

William Fulton

This book introduces some of the main ideas of modern intersection theory, traces their origins in classical geometry, and sketches a few typical applications. Intersection products are constructed and computed by means of the geometry of normal cones. In the case of properly intersecting varieties, this yields Samuel's intersection multiplicity; at the other extreme it gives the self-intersection formula in terms of a Chern class of the normal bundle; in general it produces an excess intersection formula of the author and R. MacPherson.

Among the applications are: formulas for degeneracy loci, for residual intersections, for multiple point loci; dynamic interpretations of intersection products; Schubert calculus and solutions to enumerative geometry problems; Riemann-Roch theorems.

Much of the material is accessible to graduate students in mathematics. Skilled algebraic geometers can fill in the proofs omitted.

The book was written from the expository lectures at the CBMS Conference at George Mason University, June 27—July 1, 1983.

"The books under review [this review included "Intersection Theory" by Fulton, published by Springer-Verlag, 1984] are destined to go through many editions. Therefore, each generation of readers will serve the next by providing the author with a list of errata and comments. The books are well written and may be recommended to anyone interested in algebraic geometry. The mathematical community owes the author a great debt of gratitude for these wonderful books."

– Steven L. Kleiman
Bulletin of the AMS, V. 12(1) 1985

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Columbia, November 1–2, 1985, University of Missouri

Program for the 823rd meeting

The eight hundred and twenty-third meeting of the American Mathematical Society will be held at the University of Missouri, Columbia, on Friday and Saturday, November 1 and 2, 1985. All scientific sessions will be held in the Memorial Union Complex, 518 Hitt Street, at the center of the campus.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Central Sectional Meetings, there will be four invited one-hour addresses. The speakers, the titles of their talks, and the scheduled times of presentation are as follows:

ERIC M. FRIEDLANDER, Northwestern University, *Cohomology of groups and algebras*, 1:30 p.m. Friday.

CARLOS E. KENIG, University of Chicago, *Compactness methods in nonlinear diffusions*, 11:00 a.m. Saturday.

ANDREW SOMMESE, University of Notre Dame, *A survey on hyperplane sections of projective varieties*, 11:00 a.m. Friday.

MICHAEL TALAGRAND, Ohio State University, *Regularity of Gaussian processes*, 1:30 p.m. Saturday.

These lectures will be held in the Auditorium of the Memorial Union.

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 organizers, and final lists of speakers, are as follows:

Ordinary differential equations, CALVIN D. AHLBRANDT, University of Missouri, Columbia. The speakers will be Whei-Ching Chan, Steven R. Dunbar, Herbert I. Freedman, L. J. Grimm, O. Hájek, Evans M. Harrell, John Hooker, Gary Jones, Hans G. Kaper, Marvin S. Keener, B. A. Luxon, Gary Meisters, Kenneth Meyer, Angelo B. Mingarelli, Lawrence M. Perko, Walter Pranger, George Seifert, and Ewa Weinmüller.

Differential geometry, JOHN KELLEY BEEM and PAUL EHRLICH, University of Missouri, Columbia. The speakers are Stephanie Alexander, Dean Allison, Richard L. Bishop, Robert A. Blumenthal, Lawrence Conlon, Gregory J. Galloway, Samuel I. Goldberg, Steven G. Harris, James Hebda, Gary R. Jensen, Franz W. Kamber, Marek Kossowski, Kishore B. Marathe, Bahram Mashhoon, Nadine Menninga, Phillip E. Parker, Thomas G. Powell, Brian Smyth, A. H. Taub, Philippe Tondeur, and S. Walter Wei.

Inverse scattering theory, BRIAN DE FACIO, University of Missouri, Columbia. The speakers are Mark S. Ashbaugh, Margaret Cheney, James Corones, Alexander B. Kostinski, Gerhard Kristensson, Robert Krueger, D. A. Lee, Roger G. Newton, Yoshima Saito, and Vaughn H. Weston.

Commutative algebra, RICHARD FEDDER, JAMES A. HUCKABA, and IRA J. PAPICK, University of Missouri, Columbia. The speakers will be D. D. Anderson, David F. Anderson, J. Brewer, E. H. Connell, Albert Dixon, David E. Dobbs, Robert Gilmer, Eloise A. Hamann, William Heinzer, Melvin Hochster, Sam Huckaba, Craig Huneke, Jon L. Johnson, Bernard Johnston, Daniel Katz, David Lantz, Andy Magid, Bruce Magurn, Mary B. Martin, Steve McAdam, Bernd Ulrich, Roger Wiegand, and Sylvia Wiegand.

Maximal functions in harmonic analysis, BJORN JAWERTH, Washington University, and ALBERTO TORCHINSKY, Indiana University. The speakers will be David R. Adams, J. Alvarez, Earl Berkson, Sagun Chanillo, Mike Christ, William C. Connett, Hans P. Heinig, Raymond Johnson, Douglas S. Kurtz, Christopher Meaney, Richard Rochberg, E. Sawyer, Xian-liang Shi, Christopher D. Sogge, and Jan-Olov Strömberg.

Banach spaces and related topics, ELIAS SAAB, University of Missouri, Columbia. The speakers are Dale E. Alspach, Alfred D. Andrew, Kevin T. Andrews, W. J. Davis, Joe Diestel, Steve Dilworth, Gilles Godefroy, W. B. Johnson, Victor Klee, E. Odell, N. T. Peck, Lawrence Riddle, James W. Roberts, Richard Rochberg, Haskell P. Rosenthal, Joel H. Shapiro, Nicole Tomczak-Jaegermann, Lutz Weis, Guido Weiss, and V. Zizler.

Contributed Papers

There will also be two sessions for contributed ten-minute papers on Saturday afternoon.

Midwest Differential Equations Conference

The fourteenth annual Midwest Differential Equations Conference will be held in Columbia, Missouri, on Thursday, October 31, 1985. Principal speakers will be TOM HALLAM of the University of Tennessee, Knoxville; MORRIS HIRSCH of the University of California, Berkeley; and PAUL WALTMAN of Emory University. This conference is being held in honor of W. R. UTZ on the occasion of his retirement from the University of Missouri, Columbia. A retirement dinner for Professor Utz will be held on the evening of October 31. Contact Calvin D. Ahlbrandt at the University of Missouri, Columbia, for further details.

Registration

The meeting registration desk will be located in the second floor foyer (south) in the Memorial Union. The desk will be open from 7:00 p.m. to 9:00 p.m. on Thursday, from 8:00 a.m. to 2:00 p.m. on Friday, and from 8:00 a.m. to noon on Saturday. The registration

fees are $10 for members, $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 New Orleans meeting announcement in this issue of the *Notices*.

Accommodations

Rooms have been blocked at three local hotels. Participants should make their own reservations and ask for the special meeting rate. The rates listed below are subject to change, but do include applicable taxes. Note that the deadline for reservations at each location is October 1. Numerous other motel chains and other accommodations are available in Columbia, but are not within walking distance of the meeting.

Broadway Inn (7 blocks north of Memorial Union)
1111 E. Broadway, Columbia 65201
Telephone: 314-449-2401
Single $38.93 Double $43.25

Red Roof Inn (2 miles north of campus)
201 E. Texas Street, Columbia 65201
(Take north exit from I-70 onto Providence Road)
Telephone: 314-442-0145 or 1-800-848-7878
Single $26.25 Double $33.82

Tiger Hotel (8 blocks north and west of Memorial Union)
23 S. 8th Street, Columbia 65201
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The Memorial Union complex includes a cafeteria serving three meals each day, the Hawthorne Room (lunch, weekdays only), and the Bengal Lair for all day fast food service. Within one-half to two blocks are several other simple eating places, including a McDonald's. Within one to four blocks of the Broadway Inn and Tiger Hotel there is a variety of restaurants serving Mexican, Asian, European or American foods.

Parking

A metered parking lot (15 cents per hour up to 5 hours) is located one block south of the Memorial Union on Hitt Street. Another lot is located at the south side of the Hearnes Multipurpose Arena, from which a shuttle bus is taken to the campus. An unlimited time lot is across the street from the Tiger Hotel. Parking is permitted virtually anywhere on campus on weekends.

Travel

Columbia is located near the center of Missouri on Interstate 70, approximately a two to two and one-half hour drive from St. Louis or Kansas City where two major airports (and all major car rental agencies) are located. ALIS Limousine Service of Columbia serves both airports twice a day. Reservations are necessary and may be arranged by calling 314-443-2547. The one-way fare from St. Louis is approximately $24.50, or from Kansas City it is approximately $29.50. Sac's Limousine offers less frequent service, but at lower rates; information can be obtained by calling 314-474-9943. Greyhound provides bus service to and from Lambert Field in St. Louis that is convenient for many (but not all) flights; the one-way fare to Columbia is $16.77. Participants may also fly into Columbia Regional Airport via Ozark Airline or TWA (which recently began service from St. Louis), or smaller regional carriers such as Air Midwest, Britt, or Resort, and take the limousine for the ten-minute ride to Columbia. Taxi service is also available in the area.

Those persons driving to Columbia from the east on I-70 should take the Highway 63 South exit to the westbound Stadium Boulevard exit and continue on Stadium Boulevard to a turn north onto College Avenue, which leads to the southeast corner of the campus. A left turn onto Rollins Road will lead to a right turn onto Hitt Street; the Memorial Union is one block north. Driving from the west, exit from I-70 directly onto Stadium Boulevard at the first (west) Columbia exit, continuing south and then east to College Avenue, and following the above directions.

Weather can suddenly be quite variable, with daytime highs between 35 and 70 degrees F and nighttime lows between 20 and 40 degrees F. At this time of the year rain or snow is unlikely, but possible.

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An Extension of the Galois Theory of Grothendieck

André Joyal and Myles Tierney

The development of the theory of topos was guided by the analogy between the category of sheaves on a site and sheaves on an ordinary topological space. In this work the authors intend to deepen this analogy by establishing a theorem which compares, in a precise way, this new concept of space to the classical notion of topological space. This comparison takes the form of a two-fold extension of the idea of space.

First, in classical topology, a space is a set X equipped with a topology of open sets $\mathcal{O}(X) \subseteq \mathcal{P}(X)$. Here, the authors replace $\mathcal{O}(X)$ by an arbitrary complete lattice satisfying the distributive law $u \wedge (\bigvee_{i\in I} u_i) = \bigvee_{i\in I}(u \wedge u_i)$. Such a lattice is called a *locale*. The concept of sheaf on a locale is clear and gives rise to a corresponding topos. The category of (extended) *spaces and continuous maps* is the dual of the category of locales. Joyal and Tierney study this category systematically, developing particularly the concept of *open mapping*.

Secondly, they show that the difference between an arbitrary Grothendieck topos and their new notion of space lies in the possibility of action by a *spatial groupoid*. That is, if $G_1 \rightrightarrows G_0$ is a groupoid in the category of (extended) spaces, then the general notion of Grothendieck topos is captured by considering sheaves on G_0 with a *continuous action* by G_1. This is an extension of Grothendieck's interpretation of classical *Galois theory*.

The basic technique used by the authors is *descent theory* for morphisms of locales, developed in the general set theory of an arbitrary elementary topos.

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Program of the Sessions

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

Abstracts of papers presented in AMS sessions at this meeting will be found in the October 1985 issue of *Abstracts of papers presented to the American Mathematical Society*, ordered according to the numbers in parentheses following the listings below.

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

Friday, November 1, 1985, 8:00 a.m.

Special Session on Ordinary Differential Equations, I — Memorial Union S203

8:00– 8:20 (1) *Parameter estimation in hepatic transport kinetics: Linearization of an infinite dimensional nonlinear differential system.* B. A. LUXON* and E. L. FORKER, University of Missouri, Columbia (823-92-30) (Sponsored by Roy Utz)

8:30– 8:50 (2) *Stability of equilibria for simple food chain models.* HERBERT I. FREEDMAN, University of Alberta (823-92-39)

9:00– 9:20 (3) *Virus transport in groundwater.* Preliminary report. MARVIN S. KEENER, Oklahoma State University, Stillwater (823-92-27)

9:30– 9:50 (4) *On a single-specie population equation with time delay.* Preliminary report. GEORGE SEIFERT, Iowa State University (823-34-41)

10:00–10:20 (5) *On the conditioning of singular boundary value problems.* EWA WEINMÜLLER, Technical University, Vienna (823-34-73) (Sponsored by Calvin D. Ahlbrandt)

10:30–10:50 (6) *Duality in the inverse Sturm-Liouville problem.* Preliminary report. WALTER PRANGER, DePaul University (823-34-50)

Friday, November 1, 1985, 8:00 a.m.

Special Session on Differential Geometry, I — Memorial Union S8

8:00– 8:20 (7) *Super-strongly unstable manifolds.* S. WALTER WEI, University of Oklahoma (823-53-26)

8:25– 8:45 (8) *The geometry of bounded solutions of the Sinh-Gordon equation.* Preliminary report. BRIAN SMYTH, University of Notre Dame (823-58-44) (Sponsored by John M. Burns)

8:50– 9:10 (9) *Quantization on V-manifolds.* Preliminary report. KISHORE B. MARATHE, Brooklyn College, City University of New York (823-54-10)

9:15– 9:35 (10) *Complete spacelike immersions.* Preliminary report. STEVEN G. HARRIS, Oregon State University (823-53-32)

9:40–10:00 (11) *Generic tangent subbundles.* Preliminary report. RICHARD L. BISHOP, University of Illinois, Urbana-Champaign (823-53-61) (Sponsored by Paul Ehrlich)

10:05–10:25 (12) *Characterizing S^m by the spectrum of the Laplacian.* SAMUEL I. GOLDBERG, University of Illinois, Urbana-Champaign (823-53-42)

10:30–10:50 (13) *A quantization theorem for harmonic S^2 in CP^n.* Preliminary report. GARY R. JENSEN*, Washington University, and MARCO RIGOLI, University of Durham, England (823-53-62)

Friday, November 1, 1985, 8:00 a.m.

Special Session on Maximal Functions in Harmonic Analysis, I — Memorial Union S7

8:00– 8:20 (14) *Poisson kernels for harmonic functions on a graph.* Preliminary report. MITCHELL H. TAIBLESON, Washington University (823-43-117)

8:30– 8:50 (15) *Maximal functions and L^p-potential theory.* DAVID R. ADAMS, University of Kentucky (823-31-95)

9:00– 9:20 (16) *The generalized M. Riesz theorem and transference.* EARL BERKSON*, University of Illinois, Urbana-Champaign, and T. A. GILLESPIE, University of Edinburgh, Scotland (823-43-78)

9:30– 9:50 (17) *Weak type $(1,1)$ estimates for oscillatory integrals.* SAGUN CHANILLO*, Ohio State University, Columbus, and M. CHRIST and E. M. STEIN, Princeton University (823-47-105)

10:00–10:20 (18) *Differentiation along curves.* Preliminary report. MIKE CHRIST, Princeton University (823-42-96)

Friday, November 1, 1985, 8:00 a.m.

Special Session on Banach Spaces and Related Topics, I — Memorial Union S207

8:00– 8:20 (19) *On $L_{p,\lambda}$ spaces for small λ.* DALE E. ALSPACH, Oklahoma State University, Stillwater (823-46-09)

8:30– 8:50 (20) *LU-factorization of order bounded operators on Banach sequence spaces.* KEVIN T. ANDREWS*, Oakland University, and JOSEPH D. WARD, Texas A&M University, College Station (823-47-15)

9:00– 9:20 (21) *Weak convergence of B-space valued martingales.* W. J. DAVIS*, Ohio State University, Columbus, N. GHOUSSOUB, University of British Columbia, W. B. JOHNSON, Texas A &M University, College Station, S. KWAPIEN, Case Western Reserve University, and B. MAUREY, University Paris VII, France (823-46-100)

9:30– 9:50 (22) *The coincidence of certain operator ideals: A brief survey.* JOE DIESTEL, Kent State University, Kent (823-46-101) (Sponsored by Olaf P. Stackleberg)

10:00–10:20 (23) *Convergence of certain martingales.* STEVE DILWORTH, University of Texas, Austin (823-46-86) (Sponsored by John D. Dollard)

10:30–10:50 (24) *On the structure of C*-algebras.* TOM BARTON, Memphis State University, and GILLES GODEFROY*, University of Paris VI, France, and University of Missouri, Columbia (823-46-106) (Sponsored by Elias Saab)

Friday, November 1, 1985, 8:30 a.m.

Special Session on Commutative Algebra, I — Memorial Union S206

8:30– 8:50 (25) *Commutative rings in which every ideal is a product of primary ideals.* D. D. ANDERSON*, University of Iowa, and L .A. MAHANEY, Dallas Baptist University (823-13-07)

9:00– 9:20 (26) *Locally almost factorial integral domains.* D. D. ANDERSON, University of Iowa, and DAVID F. ANDERSON*, University of Tennessee, Knoxville (823-13-37)

9:30– 9:50 (27) *Transcendence degree over an arbitrary commutative ring.* ELOISE A. HAMANN, Elmhurst College (823-13-01)

10:00–10:20 (28) *Almost principal ideals.* Preliminary report. ELOISE HAMANN, San Jose State University, and JON L. JOHNSON*, Elmhurst College (823-13-64)

10:30–10:50 (29) *Pole assignability in commutative rings.* J. BREWER*, D. KATZ and W. ULLERY, University of Kansas (823-13-33)

Friday, November 1, 1985, 11:00 a.m.

Invited Address — Memorial Union Auditorium

11:00–12:00 (30) *A survey on hyperplane sections of projective varieties.* ANDREW SOMMESE, University of Notre Dame (823-99-111)

Friday, November 1, 1985, 1:30 p.m.

Invited Address — Memorial Union Auditorium

1:30– 2:30 (31) *Cohomology of groups and algebras.* ERIC M. FRIEDLANDER, Northwestern University (823-99-110)

Friday, November 1, 1985, 3:00 p.m.

Special Session on Ordinary Differential Equations, II — Memorial Union S203

3:00– 3:20 (32) *A view of the development of ODE theory.* O. HÁJEK, Case Western Reserve University (823-34-03)

3:30– 3:50 (33) *Global invariant manifolds and periodic solutions in traveling wave equations.* STEVEN R. DUNBAR, University of Nebraska, Lincoln (823-34-17)

4:00– 4:20 (34) *Stability of subharmonic solutions.* Preliminary report. WHEI-CHING CHAN, Michigan State University (823-34-25)

4:30– 4:50 (35) *Global analysis of limit cycles.* LAWRENCE M. PERKO, Northern Arizona University (823-34-18)

5:00– 5:20 (36) *Dynamical questions about polynomial flows and vector fields on* $\mathbf{R}^n$. Preliminary report. GARY MEISTERS, University of Nebraska, Lincoln (823-34-83)

5:30– 5:50 (37) *Bifurcations of central configurations.* Preliminary report. KENNETH MEYER* and DIETER SCHMIDT, University of Cincinnati (823-34-54)

Friday, November 1, 1985, 3:00 p.m.

Special Session on Differential Geometry, II — Memorial Union S8

3:00– 3:20 (38) *Energy conditions in standard static space-times.* Preliminary report. DEAN ALLISON, Southern Illinois University, Carbondale (823-53-34)

3:25– 3:45 (39) *Sectional curvature and automorphy.* Preliminary report. PHILLIP E. PARKER, Wichita State University (823-53-31)

3:50– 4:10 (40) *Some connections between causality and completeness in Lorentzian geometry.* GREGORY J. GALLOWAY, University of Miami (823-53-35)

4:15– 4:35 (41) *Every surface is a leaf.* JOHN CANTWELL, St. Louis University, and LAWRENCE CONLON*, Washington University (823-57-08)

4:40– 5:00 (42) *DeRham-Hodge theory for Riemannian foliations.* FRANZ W. KAMBER* and PHILIPPE M. TONDEUR, University of Illinois, Urbana-Champaign (823-58-06)

5:05– 5:25 (43) *Comparing foliations with transversally symmetric foliations.* Preliminary report. FRANZ W. KAMBER, University of Illinois, Urbana-Champaign, ERNST A. RUH, University of Bonn, Federal Republic of Germany, and PHILIPPE TONDEUR*, University of Illinois, Urbana-Champaign (823-58-02)

5:30– 5:50 (44) *Cartan submersions and Cartan foliations.* ROBERT A. BLUMENTHAL, St. Louis University (823-53-12)

Friday, November 1, 1985, 3:00 p.m.

Special Session on Commutative Algebra, II Memorial Union S206

3:00– 3:20 (45) *The Picard group of certain polynomial rings.* MARY B. MARTIN*, Colgate University, and WILLIAM W. SMITH, University of North Carolina, Chapel Hill (823-13-55)

3:30– 3:50 (46) *Computing Picard groups of monoid rings.* Preliminary report. DAVID LANTZ, Colgate (823-13-65)

4:00– 4:20 (47) *Absolute stable range.* Preliminary report. BRUCE MAGURN, University of Oklahoma (823-18-74)

4:30– 4:50 (48) *A finiteness condition on regular local overrings.* BERNARD JOHNSTON, Purdue University (823-13-69) (Sponsored by Joseph Lipman)

5:00– 5:20 (49) *Jónsson ω_0-generated algebraic field extensions.* ROBERT GILMER, Florida State University, and WILLIAM HEINZER*, Purdue University (823-12-67)

5:30– 5:50 (50) *Each abelian extension of Q admits a Galois J-extension.* Preliminary report. ROBERT GILMER*, Florida State University, and WILLIAM HEINZER, Purdue University (823-13-82)

Friday, November 1, 1985, 3:00 p.m.

Special Session on Banach Spaces and Related Topics, II Memorial Union S207

3:00– 3:20 (51) *Natural embeddings of ℓ_p^n into L_T.* Preliminary report. T. FIGIEL, Polish Academy of Sciences, Poland, W. B. JOHNSON*, Texas A&M University, College Station, and G. SCHECHTMAN, The Weizmann Institute of Science, Israel (823-46-114)

3:30– 3:50 (52) *Some problems on tilings of Banach spaces.* VICTOR KLEE, University of Washington and Mathematical Sciences Research Institute (823-46-49)

4:00– 4:20 (53) *A nonseparable Banach space not containing a subsymmetric basic sequence.* E. ODELL, University of Texas, Austin (823-46-56)

4:30– 4:50 (54) *On the dual of weak L_1.* IGOR KLUVANEK, Flinders University, South Australia, and N. T. PECK*, University of Illinois, Urbana-Champaign (823-46-104)

5:00– 5:20 (55) *An application of Edgar's ordering of Banach spaces to the universal Pettis integral property.* Preliminary report. LAWRENCE RIDDLE, Emory University (823-46-102)

5:30– 5:50 (56) *A complex interpolation distance between Banach spaces.* RICHARD ROCHBERG* and MARCO VIGNATI, Washington University (823-46-53)

Friday, November 1, 1985, 3:00 p.m.

Special Session on Maximal Functions in Harmonic Analysis, II Memorial Union S7

3:00– 3:20 (57) *Weighted inequalities via tent spaces.* RAYMOND JOHNSON, University of Maryland, College Park (823-42-109)

3:30– 3:50 (58) *Operators acting on weighted H^p-spaces.* HANS P. HEINIG, McMaster University (823-47-80)

4:00– 4:20 (59) *Regularity of mean values.* Preliminary report. CHRISTOPHER MEANEY, University of Texas, Austin (823-42-79)

4:30– 4:50 (60) *Vector valued and maximal inequalities for strongly singular Calderon-Zygmund operators.* Preliminary report. J. ALVAREZ*, Princeton University, and M. MILMAN, Southern Illinois University, Carbondale (823-42-94)

5:00– 5:20 (61) *Hankel and Toeplitz operators on the Paley-Weiner space.* Preliminary report. RICHARD ROCHBERG, Washington University (823-46-52)

5:30– 6:00 (62) *Averages over hypersurfaces in $\mathbf{R}^n$.* Preliminary report. CHRISTOPHER D. SOGGE, University of Chicago (823-42-93)

Saturday, November 2, 1985, 8:00 a.m.

Special Session on Ordinary Differential Equations, III — Memorial Union S203

8:00– 8:20 (63) *Oscillation for linear second-order differential systems.* HANS G. KAPER*, Argonne National Laboratory, and MAN KAM KWONG, Northern Illinois University (823-34-28)

8:30– 8:50 (64) *Factorial series solutions of linear difference systems.* L. J. GRIMM* and W. D. NOBLE, University of Missouri, Rolla (823-39-46)

9:00– 9:20 (65) *Growth properties of solutions of a linear differential equation.* Preliminary report. GARY JONES, Murray State University (823-34-16)

9:30– 9:50 (66) *Disconjugacy of second-order linear difference equations.* CALVIN AHLBRANDT, University of Missouri, Columbia, and JOHN HOOKER*, Southern Illinois University, Carbondale (823-39-58)

10:00–10:20 (67) *On the existence of the Richardson index for non-definite Sturm-Liouville problems.* Preliminary report. ANGELO B. MINGARELLI, University of Ottawa (823-34-29)

10:30–10:50 (68) *Green functions and semiclassical approximation.* Preliminary report. E. BRIAN DAVIES, King's College, England, and EVANS M. HARRELL II*, Georgia Institute of Technology (823-34-19)

Saturday, November 2, 1985, 8:00 a.m.

Special Session on Differential Geometry, III — Memorial Union S8

8:00– 8:20 (69) *Immersions of positively curved manifolds into manifolds with curvature bounded above.* NADINE MENNINGA, Pease Air Force Base, New Hampshire (823-53-11)

8:25– 8:45 (70) *Parallel translation of curvature along geodesics.* JAMES HEBDA, St. Louis University (823-53-13)

8:50– 9:10 (71) *Cauchy uniqueness in the Riemannian obstacle problem.* Preliminary report. STEPHANIE ALEXANDER*, I. DAVID BERG and RICHARD L. BISHOP, University of Illinois, Urbana-Champaign (823-53-60)

9:15– 9:35 (72) *Positive energy in field theories.* A. H. TAUB, University of California, Berkeley (823-83-14)

9:40–10:00 (73) *Spacetime curvature generated by electromagnetic waves.* Preliminary report. BAHRAM MASHHOON, University of Cologne, Federal Republic of Germany (823-83-23) (Sponsored by Paul E. Ehrlich)

10:05–10:25 (74) *Properties of the Lorentzian conjugate locus.* THOMAS G. POWELL, University of Missouri, Rolla (823-53-45)

10:30–10:50 (75) *Intrinsic curvature of a light-like hypersurface in Minkowski space.* Preliminary report. MAREK KOSSOWSKI, Rice University (823-53-118)

Saturday, November 2, 1985, 8:00 a.m.

Special Session on Commutative Algebra, III — Memorial Union S206

8:00– 8:20 (76) *Primes associated to an ideal.* Preliminary report. STEVE MCADAM, University of Texas, Austin (823-13-24)

8:30– 8:50 (77) *Vanishing of cotangent functors.* Preliminary report. BERND ULRICH, Michigan State University (823-13-51)

9:00– 9:20 (78) *When is the intersection of two ideals equal to their product?* Preliminary report. MELVIN HOCHSTER, University of Michigan, Ann Arbor (823-13-68)

9:30– 9:50 (79) *Height two primes in three dimensional regular local rings.* Preliminary report. CRAIG HUNEKE, Purdue University (823-13-21)

10:00–10:20 (80) *The reduction number of an ideal.* Preliminary report. SAM HUCKABA, Purdue University (823-13-63)

10:30–10:50 (81) *The symbolic Rees ring of a prime ideal.* DANIEL KATZ*, University of Kansas, and L. J. RATLIFF, JR., University of California, Riverside (823-13-38)

Saturday, November 2, 1985, 8:00 a.m.

Special Session on Maximal Functions in Harmonic Analysis, III — Memorial Union S7

8:00– 8:20 (82) *The translated Hardy maximal function and some estimate obtained from it.* JAN-OLOV STRÖMBERG, University of Tromsö, Norway (823-42-120)

8:30– 8:50 (83) *Rearrangement inequalities for weak type operators.* Preliminary report. RICHARD J. BAGBY and DOUGLAS S. KURTZ*, New Mexico State University, Las Cruces (823-42-113)

9:00– 9:20 (84) *A weighted inequality and eigenvalue estimates for Schrödinger operators.* E. SAWYER, McMaster University (823-35-112)

9:30– 9:50 (85) *Poincaré and Sobolev inequalities in product spaces.* XIAN-LIANG SHI, Indiana University, Bloomington, and Hangzhou University, People's Republic of China (823-42-115) (Sponsored by Alberto Torchinsky)

10:00–10:20 (86) *Necessary conditions for convolutions arising from a Sturm Liouville problem.* Preliminary report. WILLIAM C. CONNETT* and ALAN L. SCHWARTZ, University of Missouri, St. Louis (823-42-116)

Saturday, November 2, 1985, 8:00 a.m.

Special Session on Banach Spaces and Related Topics, III Memorial Union S207

8:00– 8:20 (87) *On the structure of weak*-compact convex subsets of a dual Banach space.* Preliminary report. HASKELL P. ROSENTHAL, University of Texas, Austin (823-46-85)

8:30– 8:50 (88) *Composition operators on Dirichlet spaces of analytic functions.* JOEL H. SHAPIRO, Michigan State University (823-46-107)

9:00– 9:20 (89) *s-numbers of operators between spaces of weak cotype 2.* Preliminary report. ALAIN PAJOR, Université des Sciences et Techniques, France, and NICOLE TOMCZAK-JAEGERMANN*, University of Alberta (823-99-122)

9:30– 9:50 (90) *Banach space techniques in the theory of Fredholm operators.* LUTZ WEIS, Louisiana State University, Baton Rouge (823-46-36)

10:00–10:20 (91) *Spaces generated by blocks associated with compact Lie groups and certain homogeneous spaces.* Preliminary report. GUIDO WEISS* and ALES ZALOZNIK, Washington University (823-42-20)

10:30–10:50 (92) *Uniform asymptotic smoothness of norms.* T. LEWIS, University of Alberta, J. WHITFIELD, Lakehead University, and V. ZIZLER*, University of Alberta (823-46-57)

Saturday, November 2, 1985, 8:30 a.m.

Special Session on Inverse Scattering Theory, I Memorial Union S204

8:30– 8:50 (93) *Direct and inverse scattering in the time domain for a dissipative wave equation.* I. GERHARD KRISTENSSON*, Royal Institute of Technology, Sweden, and ROBERT KRUEGER, Ames Laboratory, U. S. Department of Energy, Iowa (823-35-98) (Sponsored by Brian De Facio)

9:00– 9:20 (94) *Direct and inverse scattering in the time domain for a dissipative wave equation.* II. ROBERT KRUEGER*, Ames Laboratory, U. S. Department of Energy, Iowa, and GERHARD KRISTENSSON, Royal Institute of Technology, Sweden (823-35-99) (Sponsored by B. C. Carlson)

9:30– 9:50 (95) *Some "good questions" for applications of inverse scattering.* D. A. LEE, United States Air Force, Wright-Patterson Air Force Base, Ohio (823-78-88) (Sponsored by Alan V. Lair)

10:00–10:20 (96) *Direct and inverse scattering for viscoelastic media.* Preliminary report. JAMES CORONES, Ames Laboratory, U. S. Department of Energy, Iowa (823-35-97) (Sponsored by B. C. Carlson)

10:30–10:50 (97) *Three-dimensional inverse scattering.* Preliminary report. MARGARET CHENEY*, Duke University, and JAMES H. ROSE, Iowa State University (823-81-77)

Saturday, November 2, 1985, 11:00 a.m.

Invited Address Memorial Union Auditorium

11:00–12:00 (98) *Compactness methods in nonlinear diffusions.* CARLOS E. KENIG, University of Chicago (823-35-72)

Saturday, November 2, 1985, 1:30 p.m.

Invited Address Memorial Union Auditorium

1:30– 2:30 (99) *Regularity of Gaussian processes.* MICHAEL TALAGRAND, Université Paris VI and Ohio State University, Columbus (823-60-71)

Saturday, November 2, 1985, 3:00 p.m.

Special Session on Inverse Scattering Theory, II Memorial Union S204

3:00– 3:20 (100) *Variational principles for inverse scattering.* ROGER G. NEWTON, Indiana University, Bloomington (823-81-76) (Sponsored by Brian DeFacio)

3:30– 3:50 (101) *Asymptotic and approximation formulas in the inverse scattering problem.* YOSHIMI SAITŌ, University of Alabama, Birmingham (823-81-22)

4:00– 4:20 (102) *Inverse problems for the reduced wave equation.* Preliminary report. VAUGHAN H. WESTON, Purdue University (823-35-59) (Sponsored by Brian De Facio)

4:30– 4:50 (103) *Optimization of the characteristic values of Hill's equation subject to a p-norm constraint on the potential.* Preliminary report. MARK S. ASHBAUGH, University of Missouri, Columbia (823-34-92)

5:00– 5:20 (104) *The electromagnetic inverse problem in radar polarimetry—A critical review.* ALEXANDER B. KOSTINSKI* and WOLFGANG-M. BOERNER, University of Illinois, Chicago (823-47-70) (Sponsored by Brian De Facio)

Saturday, November 2, 1985, 3:00 p.m.

Special Session on Banach Spaces and Related Topics, IV — Memorial Union S7

3:00– 3:20 (105) *On the Azimi-Hagler Banach spaces.* ALFRED D. ANDREW, University of California, Davis and Georgia Institute of Technology (823-46-04)

3:30– 3:50 (106) *p-Banach spaces with trivial dual.* Preliminary report. JAMES W. ROBERTS*, University of South Carolina, Columbia, and DAVID ROWE, Wingate College (823-99-123) (Sponsored by Anton Schep)

4:00– 4:20 Discussion

Saturday, November 2, 1985, 3:00 p.m.

Special Session on Commutative Algebras, IV — Memorial Union S206

3:00– 3:20 (107) *Local duality for rings with algebraic group action.* Preliminary report. ANDY MAGID, University of Oklahoma (823-13-66)

3:30– 3:50 (108) *Algebraic vector fields and integrable distributions.* E. H. CONNELL, University of Miami (823-13-40)

4:00– 4:20 (109) *Torsionfree modules over coordinate rings of singular affine curves.* Preliminary report. ROGER WIEGAND, University of Wisconsin, Madison and University of Nebraska, Lincoln (823-13-47)

4:30– 4:50 (110) *Direct-sum decompositions of torsionfree modules over one-dimensional rings.* Preliminary report. SYLVIA WIEGAND, University of Wisconsin, Madison (823-13-48)

5:00– 5:20 (111) *Universally catenarian integral domains.* ALAIN BOUVIER, Université de Lyon, France, DAVID E. DOBBS*, University of Tennessee, Knoxville, and MARCO FONTANA, Università di Roma, Italy (823-13-43)

5:30– 5:50 (112) *A polynomial ring localization.* Preliminary report. ALBERT DIXON, University of Missouri, Columbia (823-13-75)

Saturday, November 2, 1985, 3:00 p.m.

Session on Geometry — Memorial Union S8

3:00– 3:10 (113) *Group actions whose orbits represent real homology classes.* Preliminary report. DAVID J. WELSH, JR., University of Missouri, St. Louis (823-53-87)

3:15– 3:25 (114) *Lindelöf locales and realcompactness.* JAMES MADDEN and J. VERMEER*, University of Kansas (823-54-103)

3:30– 3:40 (115) *On Carnot-Carathéodory metrics.* JOHN MITCHELL, University of California, Los Angeles (823-53-05)

3:45– 3:55 (116) *On the polarity in E-space.* M. KHALIFAH, Teacher Training College, Ruwi, Sultanate of Oman (823-51-81)

4:00– 4:10 (117) *Projective superlogic: Natural projection principle.* STEPHEN L. WEINBERG, Berkeley, California (823-81-84)

Saturday, November 2, 1985, 3:00 p.m.

Session on Analysis — Memorial Union S207

3:00– 3:10 (118) *Harmonic analysis on the euclidean group in three-space.* II. JUNG SIK RNO, University of Cincinnati (823-43-91)

3:15– 3:25 (119) *Uniform differentiability, compactness, and* ℓ^1. RUSSELL G. BILYEU* and PAUL W. LEWIS, North Texas State University (823-46-89)

3:30– 3:40 (120) *Stationary attractive measures for Markov chains arising from function iteration.* MICHAEL BARNSLEY and JOHN ELTON*, Georgia Institute of Technology (823-60-108)

3:45– 3:55 (121) *A property of the embedding of* c_0 *in* ℓ_∞. A. K. SNYDER, Lehigh University (823-46-90)

4:00– 4:10 (122) *A covering lemma and the method of rotations.* Preliminary report. STEVE HUDSON, University of California, Los Angeles (823-99-121)

Robert M. Fossum
Associate Secretary

Urbana, Illinois

Claremont, November 8–9, 1985, The Claremont Colleges

Program for the 824th meeting

The eight hundred and twenty-fourth meeting of the American Mathematical Society will be held at the Claremont Colleges, Claremont, California, on Friday and Saturday, November 8–9, 1985. This meeting will be held in conjunction with a meeting of the Southern California section of the Mathematical Association of America. All sessions will be held in Galileo Hall on the Harvey Mudd campus.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Far Western Sectional Meetings, there will be two invited one-hour addresses. The speakers and the titles of their talks are as follows:

BRUCE BLACKADAR, University of Nevada, Reno, *Recent developments in noncommutative geometry and topology.*

JAMES CARRELL, University of British Columbia, *Zeroes of vector fields and intersection rings of flag varieties.*

Special Sessions

By invitation of the same committee, there will be five special sessions of selected twenty-minute papers. The topics of these special sessions, the names of the organizers and speakers, are as follows:

Algebraic geometry and control theory, CHRISTOPHER I. BYRNES, Arizona State University, and CLYDE F. MARTIN, Texas Tech University. The speakers are G. Ammar, A. Bloch, C. I. Byrnes, L. Drager, Bijoy K. Ghosh, and Mark A. Shayman.

Differential equations, STAVROS BUSENBERG, Harvey Mudd College, and KENNETH COOKE, Pomona College. The speakers are Donald S. Cohen, K. L. Cooke, H. O. Fattorini, F. A. Howes, Victor Klee, Kurt Kreith, Joseph M. Mahaffy, Victor L. Shapiro, Yasutaka Sibuya, and Donald R. Smith.

Industrial mathematics, ELLIS CUMBERBATCH, Claremont Graduate School. The speakers will be Kathryn Brenan, G. R. Chapman, Ellis Cumberbatch, R. Peter DeLong, Roland diFranco, N. D. Malmuth, Mario Martelli, Wulf D. Rehder, Peter Salamon, and Lawrence R. Weill.

Multifunctions, hyperspaces, and their application, GERALD BEER, California State University, Los Angeles, and RICHARD A. VITALE, Claremont Graduate School. The speakers will be Zvi Artstein, Gerald Beer, Joe Bellenger, Carlos R. Borges, Arrigo Cellina, Charles Dorsett, Barbara Flajnik, Gilles Fournier, Evarist Gine, Roger Hansell, Nicholas P. Jewell, Erwin Lutwak, Mario Martelli, R. Daniel Mauldin, Ernest Michael, Pedro Morales, K. Prikry, G. T. Sallee, Helga Schirmer, Stephen Simons, F. S. Van Vleck, and Richard A. Vitale..

Operator algebra theory, BERNARD RUSSO, University of California, Irvine. The speakers are Lawrence Baggett, Thomas Barton, Edward G. Effros, Yaakov Friedman, Gunther Horn, William Paschke, N. Christopher Phillips, A. Ramsay, Marc A. Rieffel, Bernard Russo, Norberto Salinas, Albert Jeu-Liang Sheu, Roger R. Smith, Harald Upmeier, and Walter E. Martin.

Contributed Papers

There will also be one session for contributed ten-minute papers.

MAA Program

The MAA program on Saturday will include the following invited speakers. J. ELWIN of San Diego State University will deliver a lecture titled, *Recent applications of graph theory.* S. GRABINER of Pomona College will deliver an address titled, *What and why are radical algebras?* At a noon luncheon in McConnell Center of Pitzer College, the speaker will be V. C. HARRIS, professor emeritus of San Diego State University, whose lecture is titled, *Incidents from the classroom.*

Registration

The meeting registration desk will be located in the lobby of Galileo Hall. The desk will be open from noon to 5:00 p.m. on Friday and from 8:00 a.m. to 12:30 p.m. on Saturday. 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 New Orleans meeting announcement in this issue of the *Notices.*

Accommodations

Participants should make their own arrangements directly with the hotel or motel of their choice and identify themselves as attending the AMS-MAA meeting at Claremont Colleges when making reservations. The rates listed below are subject to change and do not include applicable tax. Each of the hotels or motels listed below provides shuttle service to and from the Ontario Airport.

Griswold's Hotel (.5 mile from campus)
555 West Foothill Boulevard
Claremont, CA 91711
Telephone: 714-626-2411
Single $58 Double $62

Howard Johnson's Motor Lodge
(2.3 miles from campus)
721 South Indian Hill Boulevard
Claremont, CA 91711
Telephone: 714-626-2431 or 800-654-2000
Single $45 Double $50

Ramada Inn (2.5 miles from campus)
840 South Indian Hill Boulevard
Claremont, CA 91711
Telephone: 714-621-4831 or 800-228-2828
Single or Double $42

Uplander Motor Hotel (3.5 miles from campus)
81 West Foothill Boulevard
Upland, CA 91786
Telephone: 714-982-8821
Single $32 Double $38

Food Service

Several sandwich shops on the Claremont Colleges campuses are within a five-minute walk of Galileo Hall, and participants may purchase lunch on Friday at the Faculty House of the Claremont Colleges. Several restaurants of varying cuisines are within a 15- or 20-minute walk of Galileo Hall. A map indicating their locations will be available at the meeting registration desk.

Social

A banquet will be held at 7:00 p.m. on Friday at the Faculty House. The cost for the prime rib dinner will be $14.50 per person. Preceding the banquet there will be a no-host cash bar beginning at 6:00 p.m. Reservations and payment for the banquet should be sent by November 1 to Harry C. Mullikin, Mathematics Department, Pomona College, Claremont, CA 91711.

Travel

Claremont is served by Amtrak (Pomona station) and by Greyhound and Trailways bus lines. The Ontario International Airport is served by most major airlines. Participants are advised to fly in and out of Ontario airport, since it is closer and more convenient than the Los Angeles International Airport. The cost for a taxi from Ontario Airport to the Claremont Colleges is approximately $12 for up to 5 passengers. Also, as noted above under the section on Accommodations, shuttle service is available from the airport to local hotels. Information about the shuttle service should be obtained when making hotel reservations.

The Claremont Colleges' campuses are located north of Interstate Route 10 (the San Bernardino Freeway). Drivers should take the Indian Hill exit and travel approximately two miles north to 12th Street. Make a right turn onto 12th and continue four blocks to Dartmouth Avenue. Free parking is available at the corner of 12th Street and Dartmouth.

Presenters of Papers

Numbers following the names indicate the speakers' positions on the program.
•Invited one-hour lecturer *Special session speaker

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*Brenan, K., 66
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•Carrell, J. B., 55
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*Chapman, G. R., 49
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*di Franco, R., 64
*Friedman, Y., 10
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*Shayman, M. A., 20
*Sheu, A. J.-L., 23
Shiue, P. J.-s., 28
*Sibuya, Y., 39
*Simons, S., 4
*Smith, D. R., 43
*Smith, R. R., 45
*Upmeier, H., 7
*Van Vleck, F. S., 71
*Vitale, R. A., 38
*Walter, M. E., 9
*Weill, L. R., 65
White, D. B., 31

Program of the Sessions

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

Abstracts of papers presented in AMS sessions at this meeting will be found in the October 1985 issue of *Abstracts of papers presented to the American Mathematical Society*, ordered according to the numbers in parentheses following the listings below.

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

Friday, November 8, 1985, 9:00 a.m.

Special Session on Multifunctions, Hyperspaces, and their Application, I — Thomas-Garrett Hall, Room 101

9:00– 9:20 (1) *Approximate selections and fixed points for upper semicontinuous maps with decomposable values.* ARRIGO CELLINA*, GIOVANNI COLOMBO and ALESSANDRO FONDA, International School for Advanced Studies, Italy (824-54-60) (Sponsored by Gerald Beer)

9:30– 9:50 (2) *Fixed point index for multivalued noncompact maps.* GILLES FOURNIER*, Université de Sherbrooke, and DONALD VIOLETTE, Université de Moncton (824-55-13)

10:00–10:20 (3) *Positive eigenvectors of acyclic maps.* Preliminary report. MARIO MARTELLI, Bryn Mawr College (824-47-02)

10:30–10:50 (4) *On fixed-point, coincidence and best-approximation theorems.* STEPHEN SIMONS, University of California, Santa Barbara (824-47-07)

11:00–11:20 (5) *Existence of maximizable quasiconcave functions on paracompact convex spaces.* JOE BELLENGER, University of California, Santa Barbara (824-46-55)

11:30–11:50 (6) *Continuous selections.* ERNEST MICHAEL, University of Washington (824-99-64)

Friday, November 8, 1985, 9:30 a.m.

Special Session on Operator Algebra Theory, I — Galileo Hall, McAlister Room

9:30– 9:50 (7) *An index theorem for multivariable Toeplitz operators.* HARALD UPMEIER, University of Kansas (824-46-59)

10:00–10:20 (8) *Weak*-continuity of Jordan triple products.* THOMAS BARTON*, Memphis State University, and RICHARD TIMOREY, Trinity College, Ireland (824-46-05)

10:30–10:50 (9) *Dual algebras.* MARTIN E. WALTER, University of Colorado, Boulder (824-46-52)

11:00–11:20 (10) *A geometric model for quantum mechanics.* YAAKOV FRIEDMAN*, University of California, Riverside, and BERNARD RUSSO, University of California, Irvine (824-46-50)

11:30–11:50 (11) *Structure theory of Jordan C^*-algebras and their generalizations.* YAAKOV FRIEDMAN, University of California, Riverside, and BERNARD RUSSO*, University of California, Irvine (824-46-51)

Friday, November 8, 1985, 1:30 p.m.

Special Session on Multifunctions, Hyperspaces, and their Application, II — Thomas-Garrett Hall, Room 101

1:30– 1:50 (12) *Nielsen fixed point theory of multifunctions.* HELGA SCHIRMER, Carleton University (824-55-03)

2:00– 2:20 (13) *Convergence in hyperspaces.* BARBARA FLAJNIK, Wittenberg University (824-54-39) (Sponsored by Alan Stickney)

2:30– 2:50 (14) *Continuous selections for one-to-finite continuous multifunctions.* CARLOS R. BORGES, University of California, Davis (824-99-71)

3:00– 3:20 (15) *A multivalued version of the Lebesgue product integral.* Preliminary report. PEDRO MORALES, Université de Sherbrooke (824-28-37)

3:30– 3:50 (16) *Connectivity properties in hyperspaces.* CHARLES DORSETT, Louisiana Tech University (824-54-11)

4:00– 4:20 (17) *On UC spaces and the Hausdorff metric.* GERALD BEER, California State University, Los Angeles (824-54-42)

Friday, November 8, 1985, 2:00 p.m.

Special Session on Algebraic Geometry and Control Theory, I — Galileo Hall, Pryne Room

2:00– 2:30 (18) *The numerical solution of Riccati equations and actions on flag manifolds.* G. AMMAR, Northern Illinois University (824-93-69) (Sponsored by Thomas J. Taylor)

2:40– 3:10 (19) *Control theory, differential geometry of curves in Grassmannians and Riccati equations.* L. DRAGER, R. FOOT and C. F. MARTIN*, Texas Technical University (824-93-67)

3:20– 3:50 (20) *The biflag manifold and the fixed points of a unipotent transformation on the flag manifold.* UWE HELMKE, Regensburg University, Federal Republic of Germany, and MARK A. SHAYMAN*, Washington University (824-57-14)

Friday, November 8, 1985, 2:00 p.m.

Special Session on Operator Algebra Theory, II Galileo Hall, McAlister Room

2:00– 2:20 (21) *The fundamental group of a non-commutative torus.* Preliminary report. MARC A. RIEFFEL, University of California, Berkeley (824-46-17)

2:30– 2:50 (22) *Conjugacy classes in G and the K-theory of $C_r^*(G)$.* Preliminary report. JOEL ANDERSON, Pennsylvania State University, University Park, and WILLIAM PASCHKE*, University of Kansas (824-46-16)

3:00– 3:20 (23) *Stable ranks of certain group C^*-algebras.* ALBERT JEU-LIANG SHEU, University of Kansas (824-46-56)

3:30– 3:50 (24) *Equivariant K-theory for proper actions.* Preliminary report. N. CHRISTOPHER PHILLIPS, University of California, Los Angeles (824-55-45)

4:00– 4:20 (25) *Some structural properties of the models associated with generalized Bergmann kernels.* Preliminary report. NORBERTO SALINAS, University of Kansas (824-47-15)

Friday, November 8, 1985, 2:00 p.m.

Session for Contributed Papers Thomas-Garrett Hall, Room 103

2:00– 2:10 (26) *Three graceful labellings of a class of planar graphs and their chain-sum.* SIN-MIN LEE* and GRACE WANG, San Jose State University (824-05-26)

2:15– 2:25 (27) *On the number of disjoint copies of designs.* M. KHALIFAH* and M. A. BABIKIR, Teacher Training College, Ruwi, Sultanate of Oman (824-05-43)

2:30– 2:40 (28) *On the distribution of first digits of linear recurrence sequences.* PETER JAU-SHYONG SHIUE, University of Nevada, Las Vegas (824-11-46)

2:45– 2:55 (29) *Refinements and dense subgroup of pseudocompact groups.* W. W. COMFORT and LEWIS C. ROBERTSON*, Wesleyan University (824-22-57)

3:00– 3:10 (30) *Weak compactness in abstract H^1 spaces.* JAMES K. BROOKS* and NICOLAE DINCULEANU, University of Florida (824-60-01)

3:15– 3:25 (31) *Normal limit laws for sums arising from sampling without replacement from finite multivariate populations.* Preliminary report. DONALD B. WHITE, University of California, Irvine (824-60-54)

Friday, November 8, 1985, 4:30 p.m.

Invited Address Galileo Hall, McAlister Room

4:30– 5:30 (32) *Recent developments in noncommutative geometry and topology.* BRUCE BLACKADAR, University of Nevada, Reno (824-46-58)

Saturday, November 9, 1985, 8:25 a.m.

Special Session on Multifunctions, Hyperspaces, and their Application, III Thomas-Garrett Hall, Room 101

8:25– 8:45 (33) *Inequalities for mixed projection bodies.* ERWIN LUTWAK, Polytechnic Institute of New York (824-52-61)

8:50– 9:10 (34) *A special class of Minkowski spaces.* G. T. SALLEE, University of California, Davis (824-52-31)

9:15– 9:35 (35) *Piecewise linear and other approximations of set-valued maps.* ZVI ARTSTEIN, The Weizmann Institute of Science, Israel (824-55-12) (Sponsored by Gerald Beer)

9:40–10:00 (36) *Limit distributions and limit theorems for sums of independent random sets.* EVARIST GINE*, Texas A&M University, College Station, and MARJORIE G. HAHN, Tufts University (824-60-48)

10:05–10:25 (37) *Statistical properties of random convex hulls in the plane.* Preliminary report. NICHOLAS P. JEWELL* and JOSEPH P. ROMANO, University of California, Berkeley (824-60-44)

10:30–10:50 (38) *The Steiner point does not extend continuously to infinite dimensional convex bodies—an application of spherical probabilities.* RICHARD A. VITALE, Claremont Graduate School (824-52-41)

Saturday, November 9, 1985, 8:50 a.m.

Special Session on Differential Equations, I Jacobs Hall, Room 132

8:50– 9:10 (39) *Existence and uniqueness of asymptotic solutions of Gevrey type.* YASUTAKA SIBUYA*, University of Minnesota, Minneapolis, and JEAN-PIERRE RAMIS, University of Strasbourg, France (824-34-06)

9:15– 9:35 (40) *Some stability results for advection-reaction-diffusion equations.* F. A. HOWES, University of California, Davis (824-35-04)

9:40–10:00 (41) *Singular perturbation problems in linear spaces.* H. O. FATTORINI, University of California, Los Angeles (824-34-36)

10:05–10:25 (42) *Uniform zeros for beaded strings.* Preliminary report. KURT KREITH, University of California, Davis (824-34-40)

10:30–10:50 (43) *Decoupling and order-reduction via the Riccati transformation.* DONALD R. SMITH, University of California at San Diego, La Jolla (824-34-08)

Saturday, November 9, 1985, 8:50 a.m.

Special Session on Operator Algebra Theory, III Galileo Hall, McAlister Room

8:50– 9:10 (44) *Virtual amenability.* Preliminary report. LAWRENCE BAGGETT, University of Colorado, Boulder (824-43-33)

9:15– 9:35 (45) *The decomposition property for C^*-algebras.* ROGER R. SMITH* and DANA P. WILLIAMS, Texas A&M University, College Station (824-46-38)

9:40–10:00 (46) *Index of a subfactor having a common Cartan subalgebra.* Preliminary report. T. GIORDANO, Université de Genève, Switzerland, H. KOSAKI, Tulane University, and A. RAMSAY*, University of Colorado, Boulder (824-46-34)

10:05–10:25 (47) *Classification of JBW*-triples of type I.* Preliminary report. GÜNTHER HORN, Mathematisches Institut der Universität, West Germany (824-46-53) (Sponsored by Bernard Russo)

10:30–10:50 (48) *Completely bounded bimodule maps.* EDWARD G. EFFROS*, University of California, Los Angeles, and AKITAKA KISHIMOTO, Tohoku University, Japan (824-99-65)

Saturday, November 9, 1985, 9:00 a.m.

Special Session on Industrial Mathematics, I Thomas-Garrett Hall, Room 103

9:00– 9:20 (49) *Optimal data in a linear model.* G. R. CHAPMAN, University of Guelph (824-62-20) (Sponsored by Melvin Henriksen)

9:30– 9:50 (50) *Stiff problems in industrial aerodynamics.* N. D. MALMUTH, Rockwell International Science Center, Thousand Oaks, California (824-76-23) (Sponsored by Melvin Henriksen)

10:00–10:20 (51) *A charge-sheet model of a surface field-effect transistor.* RONALD J. GRIBBEN, University of Strathclyde, Scotland, and MARIO MARTELLI*, Bryn Mawr College (824-99-18) (Sponsored by Melvin Henriksen)

10:30–10:50 (52) *Simulated annealing.* PETER SALAMON, San Diego State University (824-99-19) (Sponsored by Melvin Henriksen)

11:00–11:20 (53) *A generalized circuit theory for multisource data fusion.* Preliminary report. R. PETER DELONG, Hughes Aircraft Company, Fullerton, California (824-94-25)

11:30–11:50 (54) *Modeling electromigration in integrated circuits.* WULF D. REHDER, San Jose State University (824-99-70)

Saturday, November 9, 1985, 11:00 a.m.

MAA Invited Address Galileo Hall, McAlister Room

11:00–12:00 *What and why are radical algebras?* S. GRABINER, Pomona College

Saturday, November 9, 1985, Noon

Luncheon and MAA Special Address McConnell Center of Pitzer College

Noon– *Incidents from the classroom.* V. C. HARRIS, San Diego State University

Saturday, November 9, 1985, 2:00 p.m.

Invited Address Galileo Hall, McAlister Room

2:00– 3:00 (55) *Zeroes of vector fields and intersection rings of flag varieties.* JAMES B. CARRELL, University of British Columbia (824-14-49)

Saturday, November 9, 1985, 3:15 p.m.

MAA Invited Address Galileo Hall, McAlister Room

3:15– 4:15 *Recent applications of graph theory.* J. ELWIN, San Diego State University

Saturday, November 9, 1985, 3:15 p.m.

Special Session on Differential Geometry, II — Jacobs Hall, Room 132

3:15– 3:35 (56) *Some free boundary problems occurring in polymer science.* DONALD S. COHEN*, California Institute of Technology, and CHARLES E. GOODHART, Jet Propulsion Laboratory, Pasadena (824-35-30)

3:40– 4:00 (57) *One-sided conditions for higher order quasilinear ellipticity.* Preliminary report. VICTOR L. SHAPIRO, University of California, Riverside (824-35-35)

4:05– 4:25 (58) *The effects of spatial diffusion on stability in models of genetic control by repression.* JOSEPH M. MAHAFFY, San Diego State University (824-39-28) (Sponsored by K. L. Cooke)

4:30– 4:50 (59) *A qualitative analysis of* $\dot{x} = Ax + b$. TERRENCE BONE, CLARK JEFFRIES and VICTOR KLEE*, University of Washington (824-34-09)

5:00– 5:20 (60) *Some stability results for delay differential equations.* K. L. COOKE*, Pomona College, and P. VAN DEN DRIESSCHE, University of Victoria (824-34-32)

Saturday, November 9, 1985, 3:15 p.m.

Special Session on Algebraic Geometry and Control Theory, II — Galileo Hall, Pryne Room

3:15– 3:45 (61) *Least squares estimation and completely integrable Hamiltonian systems.* A. BLOCH, University of Michigan, Ann Arbor (824-93-68)

3:55– 4:25 (62) *Invariant theory for the output feedback group.* C. I. BYRNES* and P. E. CROUCH, Arizona State University (824-93-66) (Sponsored by Thomas J. Taylor)

4:35– 5:05 (63) *The space of linear dynamical systems as a compact subspace of a real Grassmannian: Simultaneous pole assignment via enumerative geometry.* BIJOY K. GHOSH, Washington University (824-93-47)

Saturday, November 9, 1985, 3:15 p.m.

Special Session on Industrial Mathematics, II — Thomas-Garrett Hall, Room 103

3:15– 3:35 (64) *Ambiguity functions for multipulse signals using SMP.* ROLAND DI FRANCO*, University of the Pacific, and GUILFORD SPENCER, Williams College (824-99-22)

3:45– 4:05 (65) *Extraction of multipath propagation delays in passive sonar surveillance systems.* LAWRENCE R. WEILL, California State University, Fullerton (824-99-24)

4:15– 4:35 (66) *Numerical methods in trajectory simulation.* Preliminary report. KATHRYN BRENAN, The Aerospace Corporation and University of California, Los Angeles (824-65-27)

4:45– 5:05 (67) *Muck-pile formation.* ELLIS CUMBERBATCH, Claremont Graduate School (824-99-21) (Sponsored by Melvin Henriksen)

Saturday, November 9, 1985, 3:15 p.m.

Special Session on Multifunctions, Hyperspaces, and their Application, IV — Thomas-Garrett Hall, Room 101

3:15– 3:35 (68) *First class selectors for upper semi-continuous multifunctions.* ROGER HANSELL*, J. E. JAYNE and M. TALAGRAND, University of Connecticut, Storrs (824-54-29)

3:40– 4:00 (69) *The Cantor-Bendixson derived set operator.* R. DANIEL MAULDIN, North Texas State University (824-54-63)

4:10– 4:30 (70) *Caratheodory-type selections.* Preliminary report. T. KIM, K. PRIKRY* and N. YANNELIS, University of Minnesota, Minneapolis (824-28-10)

4:40– 5:00 (71) *The locally finite topology on* 2^X. C. J. HIMMELBERG, University of Kansas, K. PRIKRY, University of Minnesota, Minneapolis, and F. S. VAN VLECK*, University of Kansas (824-54-62)

Salt Lake City, Utah

Hugo Rossi
Associate Secretary

Abstract Processing Fee to Be Discontinued

The $15 abstract processing fee will be discontinued beginning with "by title" abstracts to appear in the January 1986 issue of *Abstracts of papers presented to the American Mathematical Society* **and papers to be presented at the January 1986 Annual Meeting of the Society.** This decision has been made by the Board of Trustees of the Society on the recommendation of the Council.

New abstract forms have been prepared for use by mathematicians who present papers at AMS meetings or who submit abstracts for presentation "by title" in *Abstracts.* The new forms are being distributed to departments of mathematics in universities and colleges in the United States and Canada and are available on request from the Editorial Department at the Society's office in Providence. Since there are no changes to the layout or typing instructions for abstracts, the current abstract forms may be used if the new form is not available. If the old form is used, the instructions for payment of the processing fee should be disregarded. Anyone who mistakenly includes the $15 payment with an abstract will be reimbursed.

The AMS will continue the service of preparing abstracts for authors not able to have them typed locally and will retype papers not reproducible as submitted by the author. The fee for having an abstract typed by the AMS will be $16.

New Orleans Meetings, January 5–11, 1986

Preliminary Announcement

The January 1986 Joint Mathematics Meetings, including the 92nd Annual Meeting of the AMS, the 69th Annual Meeting of the Mathematical Association of America, and the 1986 annual meetings of the Association for Women in Mathematics and the National Association for Mathematicians, will be held January 7–11 (Tuesday–Saturday), 1986, in New Orleans, Louisiana. The meetings will be preceded by the AMS Short Course on January 5–6 (Sunday–Monday), 1986. Sessions will take place in the Hyatt Regency New Orleans, Poydras at Loyola Avenue, and the Louisiana Superdome, Girod Street.

The members of the Local Arrangements Committee are Frank T. Birtel (ex-officio), L. W. Jones, William J. LeVeque (ex-officio), John Liukkonen, Michael Mislove (chairman), Charles Rees, Kenneth A. Ross (ex-officio), Steve Scariano (publicity director), and Peggy Soileau.

IMPORTANT DEADLINES

AMS Abstracts,	
For consideration for special sessions	**September 25**
Of contributed papers	**October 16**
MAA Abstracts,	
Of contributed papers	**September 30**
Employment Register (Applicants & Employers)	**November 15**
EARLY Preregistration and Housing	**October 31**
Preregistration and Housing	**November 15**
MAA Minicourse Preregistration	**November 15**
Motions for AMS Business Meeting	**December 9**
Preregistration cancellations (50% refund)	**January 2**

92nd Annual Meeting of the AMS January 7–11, 1986

Fifty-ninth Josiah Willard Gibbs Lecture

The 1986 Gibbs lecture will be presented at 8:30 p.m. on Tuesday, January 7, by L. E. SCRIVEN of the Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis. The title of this lecture will be announced later.

Colloquium Lectures

There will be a series of four Colloquium Lectures presented by SHING-TUNG YAU of the University of California, San Diego. The title of this lecture series will be announced later. The lectures will be given at 1:00 p.m. daily, Tuesday through Friday, January 7–10.

The Oswald Veblen Prize in Geometry

The 1986 Oswald Veblen Prize in Geometry will be awarded at 4:20 p.m. on Wednesday, January 8.

Invited Addresses

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

L. E. Scriven, Gibbs Lecturer

Preregistration

Preregistration for these meetings **must be completed by November 15, 1985.** Those wishing to preregister must complete the form which appears at the back of this issue and submit it together with the appropriate preregistration fee(s) to the Mathematics Meetings Housing Bureau in Providence by **November 15.** Please note that a space has been reserved on the Preregistration/Housing Form if one wishes to have his/her nickname printed on the meeting badge.

Preregistration fees do not represent an advance deposit for lodgings. One must, however, preregister for the meetings in order to obtain hotel accommodations through the Mathematics Meetings Housing Bureau, as outlined on the facing page.

As stated, all requests for hotel accommodations **must be accompanied by one night's deposit for each room requested.** Preregistration fees and hotel deposits may be made by check payable to the American Mathematical Society (Canadian checks must be marked for payment in U.S. funds), or by providing a VISA or MASTERCARD credit card number on the Preregistration/Housing Form. Please be sure to give the name and number **exactly** as they appear on the credit card, and to include the expiration date.

Those who preregister for the Joint Mathematics Meetings pay fees which are 30 percent lower than those who register at the meetings. The preregistration fees are as follows:

AMS Short Course	
Student/Unemployed	$ 5
All Others	$25
Joint Mathematics Meetings	
Member of AMS, MAA	$57
Emeritus Member of AMS, MAA	$15
Nonmember	$87
Student/Unemployed	$15
Employment Register	
Employer	$75
Applicant	$15
Employer posting fee	$10

U.S. Treasury regulation §1.162-5 allows an income tax deduction for education expenses (registration fees, cost of travel, meals, and lodging) incurred to (i) maintain or improve skills in one's employment or other trade or business or (ii) meet express requirements of an employer or a law imposed as a condition to retention of employment, job status, or rate of compensation. This is true even for education that leads to a degree.

There will be 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.

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.

A $5 charge will be imposed for all invoices prepared when Preregistration/Housing Forms are submitted without accompanying payment for the preregistration fee(s) and room deposits, or are accompanied by an amount insufficient to cover the total due. Preregistration/Housing Forms received well before the deadline of **November 15** which are not accompanied by correct payment will be returned to the participant with a request for resubmission and full payment. **This will, of course, delay the processing of any housing request so that it will be unlikely that the participant's first choices will still be available.**

A 50 percent refund of the preregistration fee(s) will be made for all cancellations received in Providence no later than January 2. **No refunds will be granted for cancellations received after that date,** or to persons who do not attend the meetings.

The only exception to this rule is someone who preregisters for the Joint Mathematics Meetings only in order to attend an MAA Minicourse, and is too late to obtain a slot in the Minicourse. In this case, full refunds will be made of the Joint Mathematics Meetings preregistration fee, **provided the preregistrant has checked the box** on the MAA Minicourse Preregistration Form that this was his or her intent. Individuals who preregister for both the Joint Meetings and a Minicourse and who intend to participate in the Joint Meetings, even if the Minicourse is not available, should, of course, **not** check the box on the MAA Minicourse Preregistration Form. In this case the Joint Meetings preregistration will be processed.

Those who wish to preregister for the Employment Register should read carefully the special article titled "Mathematical Sciences Employment Register" which follows this announcement of the New Orleans meetings. The attention of applicants is particularly directed to the section regarding the December issue of *Employment Information in the Mathematical Sciences.*

Please read the facing page titled **Housing** carefully before completing the Preregistration/Housing Form.

Housing

Special Bonus for Early Preregistrants!

Participants who preregister before the *early* preregistration deadline of **October 31** will be eligible for a complimentary room in New Orleans. (Multiple occupancy of these rooms is permissible.) Winners will be randomly selected from the names of all who preregister by October 31 and these lucky individuals will be notified by mail by December 31. **So, preregister early!**

Acknowledgment Form

Participants will receive an acknowledgement of their preregistration, room deposit, and hotel assignment from the Mathematics Meetings Housing Bureau, which will be followed by a confirmation of the room reservation from the hotel to which they have been assigned.

The Preregistration/Housing Form for requesting hotel accommodations will be found at the back of this issue. Use of the services offered by the Mathematics Meetings Housing Bureau requires preregistration for the meetings. Persons desiring confirmed hotel accommodations should complete the form, or a reasonable facsimile, and send it to the Mathematics Meetings Housing Bureau, Post Office Box 6887, Providence, Rhode Island 02940, **so that it will arrive no later than November 15, 1985. Housing requests received after the deadline of November 15 most surely cannot be honored.**

All reservation requests must be received in writing and will be processed through the Housing Bureau in Providence. Telephone requests will not be accepted. **Please do not contact the hotels directly.** Blocks of rooms and special rates have been set aside for the Housing Bureau, and the hotel will either refer you back to the Housing Bureau, or give you a room outside of the block, which may be at a higher rate.

Please read carefully the section on **Hotels** before completing the form. Forms sent to the wrong address and thus incurring delay in delivery to the Housing Bureau until after the deadline cannot be accepted and will, therefore, be returned.

Participants requesting hotel accommodations in New Orleans are required to submit housing deposits when preregistering. Deposits may be paid by check payable to the AMS (Canadian checks must be marked for payment in U.S. funds), or by providing a VISA or MASTERCARD credit card number on the Preregistration/Housing Form. Please be sure to give the name and number **exactly** as they appear on the credit card, and to include the expiration date. **Please read the section on Hotels carefully regarding deposits.**

The number of rooms being held by some of the New Orleans hotels at each rate is limited. Housing assignments are made on a first-come, first-served basis, so participants desiring low-cost accommodations are urged to get their housing requests in as early as possible. Participants should also be aware that the special rates being offered in the section titled **Hotels** may not be available **after December 31**.

Participants are strongly urged to rank each hotel on the housing form in the order of preference, and circle the type of room and the rate desired. Reservations will be made in accordance with preferences indicated on the reservation form insofar as this is possible. If not all hotels are ranked, and all rooms have been filled at the ranked hotels, the assignment will be made at an unranked hotel with the next lowest rate.

Participants who are able to do so are urged to share a room whenever possible as this procedure can be economically beneficial. The housing form should be fully completed to ensure proper assignment of rooms. Participants planning to share accommodations should provide the name(s) of the person(s) with whom they plan to occupy a room. Each participant should, however, complete a separate Preregistration/Housing Form. **In order to avoid confusion, parties planning to share rooms should send their forms together in the same envelope. The participant requesting the room should submit the deposit.**

Please make all changes to or cancellations of hotel reservations with the Housing Bureau in Providence **before January 1, 1986, by calling 401-272-9500, extension 239.** After that date, changes or cancellations should be made directly with the hotel assigned.

Please read the facing page titled **Preregistration** carefully before completing the Preregistration/Housing Form.

Please be sure to send housing deposits with Preregistration/Housing Form.

Shing-Tung Yau, Colloquium Lecturer

JOSEPH N. BERNSTEIN, Harvard University, *Representations of p-adic groups and algebras of abelian categories*, 10:05 a.m. Tuesday;

LENNART A. E. CARLESON, Royal Institute of Technology, Stockholm, *On the support of harmonic measure*, 3:30 p.m. Thursday;

ALEXANDER S. KECHRIS, California Institute of Technology, *The role of the axiom of determinacy in set theory*, 3:20 p.m. Tuesday;

SERGIU KLAINERMAN, Courant Institute of Mathematical Sciences, New York University, title to be announced, 10:05 a.m. Friday;

HAYNES R. MILLER, University of Washington, Seattle, *The rigidity of classifying spaces*, 9:00 a.m. Wednesday; and

JANE CRONIN SCANLON, Rutgers University, *Some problems in singular perturbed ordinary differential equations*, 3:20 p.m. Wednesday.

Special Sessions

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

Graph labelings, GARY S. BLOOM, CUNY, City College and D. F. HSU, Fordham University, 1:00 p.m. Friday and 8:00 a.m. Saturday. Stefan Burr, Fan Chung, Thomas Grace, Solomon Golomb, Anton Kotzig, Zevi Miller, Christos Papadimitriou, Fred Roberts, Alex Rosa, Peter Slater, and Herbert Wilf.

Mathematical modeling and computer simulation to problems in other disciplines, RICHARD BRONSON, Fairleigh Dickerson University, 8:00 a.m. and 2:15 p.m. Tuesday. Stanley Cohen, Pulse Analytics, Inc.; Frank Giordano, United States Military Academy; Chanoch Jacobsen, Israeli Institute of Technology; Thomas Johson, Virginia Polytech Institute and State University; Robert Kinnison, Battelle Pacific Northwest Laboratory; John Oddson, University of California, Riverside; Ronald Painter, United Technologies Norden Systems; Lawrence Ratcliffe, CONRAIL; and Joel Reiss, Singer-Kearfott Corporation.

Complex analysis, PETER L. DUREN, University of Michigan, 1:00 p.m. Friday and 8:00 a.m. Saturday. J. Milne Anderson, Albert Baernstein, Johnny Brown, Peter L. Duren, David Hamilton, Walter Hengartner, Dmitri Khavinson, Y. J. Leung, C. David Minda, Glenn Schober, and Carl Sundberg.

Equivalence problems and applications, ROBERT B. GARDNER, University of North Carolina and WILLIAM F. SHADWICK, University of Waterloo, 8:00 a.m. Wednesday and 1:00 p.m. Thursday. R. Bryant, S. S. Chern, James Faran, P. A. Griffiths, R. Hermann, N. Kamran, M. Kuranishi, and William Shadwick.

Radon transforms and tomography, ERIC L. GRINBERG, University of Michigan and ERIC TODD QUINTO, Tufts University, 1:00 p.m. Friday and 8:00 a.m. Saturday. Jan Boman, Carlos Baernstein, Allan Cormack, Leon Ehrenpreis, Eric L. Grinberg, Alberto Grünbaum, Victor Guillemin, Sigurdur Helgason, Alfred Louis, Frank Natterer, Eric Todd Quinto, Lawrence Shepp, Kennan Smith, Don Solmon, and Robert Stricharz.

Harmonic analysis on reductive groups, REBECCA A. HERB, University of Maryland and PAUL J. SALLY, JR., University of Chicago, 8:00 a.m. Wednesday and 1:00 p.m. Thursday. Jeff Adams, James Arthur, Laurent Clozel, Larry Corwin, Tom Enright, Rebecca A. Herb, Phil Kutzko, Allen Moy, Scott Osborne, and David Vogan.

Determinacy and large cardinals, ALEXANDER S. KECHRIS, California Institute of Technology and W. HUGH WOODIN, University of California, Berkeley, 8:00 a.m. Wednesday and 1:00 p.m. Thursday. S. Baldwin, J. Baumgartner, H. Becker, T. Carlson, M. Foreman, H. Friedman, S. Jackson, T. Jech, R. Laver, A. Louveau, M. Magidor, D. A. Martin, W. Mitchell, R. Solovay, and J. Steel.

Operator method of optimal control problems, SUNG J. LEE, University of South Florida, 8:00 a.m. Tuesday and Wednesday. N. U. Ahmed, S. L. Campbell, G. Chen, N. Chukwu, R. Datko, Hector O. Fattorini, A. G. Kartsatos, J. Lagnese, I. Lasiecka, E. B. Lee, J. W. Macki, A. Manitius, C. Martin, M. Z. Nashed, and A. N. V. Rao.

Convexity, ERWIN LUTWAK, Polytechnic Institute of New York, 8:00 a.m. and 2:15 p.m. Tuesday. J. R. Alexander, G. Beer, L. Billera, M. Breen, M. Gage, E. Gine, P. Goodey, H. Groemer, Victor Klee, C. M. Petty, J. Sangwine-Yager, and R. Vitale.

American Mathematical Society Short Course Series

Introductory Survey Lectures on

Approximation Theory

New Orleans, Louisiana, January 5–6, 1986

The American Mathematical Society, in conjunction with its ninety-second Annual Meeting, will present a one and one-half day Short Course entitled *Approximation Theory* on Sunday and Monday, January 5 and 6, at the Hyatt Regency New Orleans. The program is under the direction of Carl de Boor of the University of Wisconsin - Madison. Six lectures are planned, and it is anticipated that proceedings will be published in the series *Proceedings of Symposia in Applied Mathematics.*

Approximation theory is properly a subfield of analysis but derives much of its impetus from applications such as data fitting, the representation of curves and surfaces for design and display, the reconstruction of functions from partial information, and the numerical solution of functional equations. For this reason, approximation theory offers ready-made applications of the basic ideas of analysis.

The course is intended to provide a quick introduction to the fundamentals of approximation theory, followed by a discussion of five areas, theoretical as well as applied, of current research interest. The introductory lecture entitled "Approximation of Functions" will be delivered during the afternoon of the first day of the course by Ron DeVore (University of South Carolina, Columbia). Edward B. Saff (University of South Florida, Tampa) will follow with a lecture on "Approximation and Interpolation by Rational Functions." The second day of the course will begin in the morning with a lecture by Allan Pinkus (Technion, Israel) entitled "n-Widths and Optimal Recovery," followed by E.W. Cheney (University of Texas, Austin) speaking on "Algorithms for Approximation." Charles A. Micchelli (IBM, Thomas J. Watson Research Center) will open the afternoon session with a lecture on "Algebraic Aspects of Interpolation," and Klaus Höllig (University of Wisconsin, Madison) will present the final lecture entitled "Multivariate Splines." A period of general discussion will conclude the program.

The Short Course is best understood by those with a firm background in real and complex analysis as provided by a standard first-year graduate course on those topics. Synopses of the lectures and accompanying reading lists appear in this issue of the *Notices.*

All who wish to participate in the Short Course may do so upon payment of a $30 registration fee. There are reduced fees for students and unemployed individuals. Please refer to the sections entitled **Preregistration, Housing and Registration at the Meetings** for details.

The short course was recommended by the Society's Committee on Employment and Educational Policy, whose members are Lida K. Barrett, Stefan A. Burr, Philip C. Curtis, Jr., Lisl Novak Gaal, Gerald J. Janusz, and Donald C. Rung (chairman). The short course series is under the direction of the CEEP Short Course Subcommittee, whose members are Stefan A. Burr (chairman), Lisl Novak Gaal, Gerald J. Janusz, Robert P. Kurshan, Barbara L. Osofsky, and Philip D. Straffin, Jr.

Ordered algebras, JORGE MARTINEZ, University of Florida, Gainesville, 1:00 p.m. Thursday and Friday. Marlow Anderson, Paul Conrad, Michael Darnel, Andrew Glass, Anthony Hager, Melvin Henriksen, Charles Holland, Jams Madden, Steve McCleary, Wayne Powell, Robert Redfield, Stuart Steinberg, and Constantine Tsinakis.

Analytic methods in differential equations, PETER A. MCCOY, United States Naval Academy, Annapolis, 8:00 a.m. and 2:15 p.m. Tuesday. Robert W. Carroll, James A. Donaldson, Robert P. Gilbert, Jerome T. Goldstein, Deborah Tepper Haimo, Robert M. Kauffman, Ralph E. Kleinman, Mark A. Kon, Peter A. McCoy, John W. Neuberger, Thomas H. Pate, Louise A. Raphael, and Gilbert G. Walter.

Homotopy theory, STEPHEN A. MITCHELL, University of Washington, Seattle, 8:00 a.m. and 2:15 p.m. Tuesday. Gunnar Carlsson, Fred Cohen, Ralph Cohen, Ethan Devinatz, Mike Hopkins, Nick Kuhn, Mark Mahowald, Steve Mitchell, Joe Neisendorfer, David Pengelley, Stewart Priddy, Doug Ravenel, Jeff Smith, and Clarence Wilkerson.

Operator theory and several complex variables, PAUL S. MUHLY, University of Iowa, 2:15 p.m. Tuesday and 8:00 a.m. Wednesday. Richard Carey, Douglas Clark, Lewis Coburn, Raul Curto, Ron Douglas, Palle Jorgensen, Barbara MacCluer, Joel Pincus, Richard Rochberg, Norberto Salinas, Harald Upmeier, and Jingo Xia.

Mathematical biology, JANE CRONIN SCANLON, Rutgers University, 1:00 p.m. Thursday and Friday. Gail Carpenter, Warren Hirsch, James Keener, Michael Lacker, Stephen Merrill, Charles Peskin, Paul Rapp, John Rinzel, John Stephenson, and Charles Stevens.

Operator algebras and foliations, CLAUDE L. SCHOCHET, MSRI and Wayne State University and KENNETH C. MILLETT, University of California, Santa Barbara, 8:00 a.m. and 2:45 p.m. Tuesday. L. Conlon, T. Fack, J. Heitsch, S. Hurder, F. Camber, J. Kaminker, A. Katok, C. Lazarov, M. Ratner, M. Rieffel, J. Rosenberg, H. Wang, and R. Zimmer.

Recent advances in nonlinear hyperbolic equations, JALAL SHATAH, Brown University and SERGIU KLAINERMAN, Courant Institute of Mathematical Sciences, New York University, 1:00 p.m. Friday and 8:00 a.m. Saturday. Michael Beals, Demetrious Christodoulou, Constantine Dafermos, Ron DiPerna, Robert Glassey, Jonathan Goodman, Edward Harabedian, John Hunter, Fritz John, Peter Lax, Tai Ping Liu, Richard Melrose, Jalal Shatah, Thomas Sideris, Marshall Slemrod, Panagiotis Souganidis, Walter Strauss, Enrique Thomann, and Dean Yang.

Positive operators and their applications, LUTZ WEIS, Louisiana State University, 1:00 p.m. Thursday and Friday. C. D. Aliprantis, Simon Bernau, Owen Burkinshaw, Nassif Ghoussoub, Jerome Goldstein, William B. Johnson, Michel Lapidus, H. Lotz, W. J. Luxemburg, Haskell Rosenthal, Paulette Saab, Anton Schep, Jerry Uhl, and Manfred Wolff.

Most of the papers to be presented at these special sessions will be by invitation; however, anyone contributing an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these sessions should indicate this clearly on the abstract, **and should have been submitted by September 25, 1985, three weeks earlier than the normal deadline for contributed papers,** in order that it may be considered for inclusion. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in departments of mathematics, and should be sent to Abstracts, Editorial Department, American Mathematical Society, Post Office Box 6248, Providence, Rhode Island 02940. A charge of $16 is imposed for retyping abstracts that are not in camera-ready form.

Contributed Papers

There will be sessions for contributed papers Tuesday morning and afternoon, Wednesday morning, Thursday afternoon, Friday afternoon, and Saturday morning. Abstracts should be

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 Everett Pitcher (chairman), Marian B. Pour-El, David A. Sanchez, and Guido L. Weiss.

In order that a motion for the Business Meeting of January 8, 1986 receive the service offered by the committee in the most effective manner, it should be in the hands of the secretary by December 9.

Everett Pitcher, Secretary

prepared on the standard AMS form available from the AMS office in Providence or in departments of mathematics, and should be sent to Abstracts, Editorial Department, American Mathematical Society, Post Office Box 6248, Providence, Rhode Island 02940, **so as to arrive by the abstract deadline of October 16, 1985.** These abstracts are also subject to the charge of $16 for retyping.

Late papers will not be accepted.

Other AMS Sessions

Mathematics and Government Speaker

At the invitation of the AMS Committee on Science Policy, ERICH BLOCH, Director of the National Science Foundation, will give an address at 2:15 p.m. on Wednesday, January 8.

Special Invited Address

At the invitation of the AMS Program Committee, GEORGE F. CARRIER, Harvard University, will give a talk on the Nuclear Winter at 11:10 a.m. on Tuesday, January 7.

Committee on Opportunities in Mathematics for Disadvantaged Groups

The Committee on Opportunities in Mathematics for Disadvantaged Groups will sponsor a panel discussion titled *Unplugging the pipeline* at 3:30 p.m. on Friday, January 10. The panel will be moderated by GLORIA F. GILMER. Speakers include MANUEL P. BERRIOZABAL, WILLIAM G. CHINN, J. ARTHUR JONES, and ROGERS J. NEWMAN.

Council Meeting

The Council of the Society will meet at 2:00 p.m. on Monday, January 6.

Business Meeting

The Business Meeting of the Society will take place immediately following the award of the Veblen Prize at 4:20 p.m. on Wednesday, January 8. 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.

69th Annual Meeting of the MAA January 7–11, 1986

Retiring Presidential Address

IVAN NIVEN, University of Oregon, will deliver the MAA Retiring Presidential Address at 3:30 p.m. on Friday, January 10. The title of his address is *Surprising results in elementary mathematics II.*

Invited Addresses

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

R. H. BING, University of Texas at Austin, *Using examples in topology,* 9:00 a.m. Saturday.

RONALD L. GRAHAM, AT&T Bell Labs, title to be announced, 1:10 p.m. Friday.

PETER J. HILTON, SUNY at Binghamton, *Elementary algorithms in number theory,* 8:00 a.m. Friday.

JOSEPH B. KELLER, Stanford University, title to be announced, 9:00 a.m. Friday.

VICTOR L. KLEE, University of Washington, *Linear programming: The d-step conjecture and its relatives,* 2:15 p.m. Friday.

CATHLEEN S. MORAWETZ, Courant Institute of Mathematical Sciences, New York University, title to be announced, 1:00 p.m. Saturday.

HENRY O. POLLAK, AT&T Bell Labs, *School buses, baseball, and public cryptography,* 10:00 a.m. Saturday.

GAIL S. YOUNG, University of Wyoming, *The problems of mathematics to 2000; an attempt at prediction,* 11:00 p.m. Saturday.

Minicourses

Twelve Minicourses are being offered by the 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: *Introduction to actuarial mathematics* is being organized by ELLEN M. TORRANCE, M & R Services, Inc. Part A is scheduled from 10:30 a.m. to 12:30 p.m. on Friday, January 10 and Part B from 3:30 p.m. to 5:30 p.m. on Saturday, January 11. Total enrollment for this Minicourse is limited to 80 persons.

This Minicourse is designed to (1) give the participant a basic understanding of the nature, pricing and reserving of various insurance products (including annuities); and (2) provide simple "real world" applications that can be included in undergraduate probability courses. The use of spreadsheet software or simple computer programs for calculations will be discussed briefly. Most of the material will be based on mathematical expectation and conditional probability; a few applications will involve definite integrals. The Minicourse will consist of lectures with question-and-answer periods.

Minicourse #2: *muMATH workshop* is being organized by WADE ELLIS, JR., West Valley College. Part A is scheduled from 1:00 p.m. to 3:00 p.m. on Thursday, January 9 and Part B from 8:00 a.m. to 10:00 a.m. on Friday, January 10. Total enrollment for this Minicourse is limited to 30 persons.

muMATH, a computer symbolic algebra system developed by David Stoutemyer and Albert

Rich, is based on a LISP-like programming language. The system contains many specialized mathematically-oriented functions and operators. In the Minicourse, each participant will use muMATH on an IBM Personal Computer. No prior knowledge of computer programming will be assumed. The first session will begin with a demonstration of the muMATH formula entry conventions and computing environment. Participants will then work through hands-on guided exercises to become familiar with muMATH's built-in operations and the muSIMP computer language. The second session will be devoted to muMATH modules on calculus, linear algebra, and differential equations. A discussion period including a brief comparison of muMATH with other mathematical computer environments will conclude the workshop.

Minicourse #3: *Discrete mathematics using difference equations* is being organized by JAMES T. SANDEFUR, JR., Georgetown University. Part A is scheduled from 7:00 p.m. to 9:00 p.m. on Wednesday, January 8 and Part B from 3:30 p.m. to 5:30 p.m. on Thursday, January 9. Total enrollment for this Minicourse is limited to 30 persons.

This course is a nonstandard approach to discrete mathematics in which standard topics, such as linear algebra and probability theory, are interspersed with the study of finite difference equations so that many complex and interesting mathematical models, such as Markov processes and predator-prey relationships, can be studied. This provides a structure to the course, as well as giving students an appreciation of the power and versatility of mathematics. The Minicourse begins with the study of difference equations, both linear and nonlinear. The linear equations will be used to study linear mathematical models, such as amortization of loans, while nonlinear difference equations, consisting of the study of linearization and bifurcation theory, will be used to study nonlinear mathematical models, such as the growth of populations and how this growth varies when a species is hunted. Microcomputers will be used to enhance our understanding of the mathematical models studied, through both the numerical calculation of solutions, and the generation of graphical solutions.

Minicourse #4: *Data analysis and regression* is being organized by SUSAN J. DEVLIN, MARTIN A. KOSCHAT, and PAUL A. TUKEY, Bell Communications Research. Part A is scheduled from 7:00 p.m. to 9:00 p.m. on Wednesday, January 8, Part B from 3:30 p.m. to 5:30 p.m. on Thursday, January 9, and Part C from 7:00 p.m. to 9:00 p.m. on Friday, January 10. Total enrollment for this Minicourse is limited to 40 persons.

Multiple least squares regression is one of the most widely used and abused tools in data analysis and statistics. Its problem-solving potential requires understanding not only of least squares algorithms but also of other data analytic techniques, frequently graphical, to help select models, interpret results, and detect and adjust for frequently encountered problems. After a brief review of linear least squares regression, the course will discuss some of the following topics: preliminary data analysis, variable selection, regression diagnostics, robust regression, correlated variables, computational issues and recent advances. Lectures will alternate with discussion periods where participants will interpret results from real data examples.

Minicourse #5: *Microcomputer software for teaching linear algebra and calculus* is being organized by DAVID A. SMITH, Duke University and Benedict College and DAVID P. KRAINES, Duke University. Part A is scheduled from 10:30 a.m. to 12:30 p.m. on Saturday, January 11 and Part B from 3:30 p.m. to 5:30 p.m. on Saturday, January 11. Total enrollment for this Minicourse is limited to 30 persons.

A wide variety of instructional software is becoming available for use with IBM-compatible microcomputers. It varies in nature, and in quality. In this Minicourse various types of software which would be useful in college linear algebra or calculus courses will be demonstrated and issues related to their use will be discussed. Minicourse participants will have the opportunity to work with the software on IBM-PC microcomputers.

Minicourse #6: *Discrete algorithmic mathematics* is being organized by STEPHEN B. MAURER, Swarthmore College. Part A is scheduled from 1:00 p.m. to 3:00 p.m. on Thursday, January 9 and Part B from 8:00 a.m. to 10:00 a.m. on Friday, January 10. Total enrollment for this Minicourse is limited to 80 persons.

The organizer will present his ideas on how to give a freshman-sophomore mainstream discrete mathematics course which is neither "finite math" nor "discrete structures" and which highlights the algorithmic point of view. He will discuss how to glue the course together using induction/iteration/recursion; how to avoid the Scylla of dull play with definitions and the Charybdis of too many subtle proofs; how to make the course valuable to all students, not just computer science students; and how you don't have to be an expert in combinatorics or computer science to teach it, because it is based on ideas all mathematicians are familiar with in other contexts.

Minicourse #7: *Introductory computer science* is being organized by J. ARTHUR SEEBACH, St. Olaf College. Part A is scheduled from 1:00 p.m. to 3:00 p.m. on Thursday, January 9 and Part B from 8:00 a.m. to 10:00 a.m. on Friday, January 10. Total enrollment for this Minicourse is limited to 80 persons.

This Minicourse will present a number of the most central concepts of the conceptual core of

the 1978 Association for Computing Machinery recommended courses in machine organization and data structures. The key structural or logical issues will be presented for mathematicians, starting with the use of binary arithmetic to represent the actual state of a computer. Next the course will introduce the representation and manipulation of data. The latter part of the Minicourse will discuss what is involved in more complex and higher-level organization of data and instructions. This will include several important data structures and the concepts of assemblers and operating systems. In addition, if time and the interest of the audience permit, the course might close with a brief foray into programming languages or input/output techniques. This is not a programming course nor is a programming background expected. Binary modular arithmetic, intuitive logic, and curiosity about what all the fuss and fancy jargon are about are the appropriate tools for this course.

Minicourse #8: *Teaching experiential applied mathematics* (TEAM) is being organized by JEANNE L. AGNEW, JAMES R. CHOIKE, JOHN M. JOBE and MARVIN S. KEENER, Oklahoma State University. Part A is scheduled from 7:00 p.m. to 9:00 p.m. on Friday, January 10 and Part B from 1:00 p.m. to 3:00 p.m. on Saturday, January 11. Total enrollment for this Minicourse is limited to 80 persons.

This Minicourse will feature applied mathematics multi-media learning modules for use in college classrooms which were produced by a project called TEAM and funded by a grant to the MAA from the Fund for the Improvement of Postsecondary Education (FIPSE). TEAM learning modules consist of video cassettes, written materials, and (for some modules) microcomputer software. In these real-world industrial problems, solutions are presented by industrial representatives who have actually encountered these problems in their work. The Minicourse will introduce participants to the six TEAM learning modules produced during the first two years of this project. Of special interest to those already familiar with TEAM modules, this Minicourse will mark the first official release of three new TEAM learning modules. Each participant will receive a complete set of TEAM written material. Participants will be shown how these modules can be used (1) to present a course in applied mathematics at the upper division level or at the lower division level; (2) to offer students independent study projects; or (3) to provide a lecture presentation of an application in industry.

Minicourse #9: *Introduction to computer graphics* is being organized by JOAN P. WYZKOSKI, Fairfield University. Part A is scheduled from 10:30 a.m. to 12:30 p.m. on Friday, January 10 and Part B from 8:00 a.m. to 10:00 a.m. on Saturday, January 11. Total enrollment for this 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 #10: *The use of computing in the teaching of linear algebra* is being organized by EUGENE A. HERMAN, Grinnell College. Part A is scheduled from 7:00 p.m. to 9:00 p.m. on Friday, January 10 and Part B from 1:00 p.m. to 3:00 p.m. on Saturday, January 11. Total enrollment for this Minicourse is limited to 30 persons.

A major reason that linear algebra is now taught to so many students so early in their education is that the computer has made linear algebra much more useful to scientists than it was 35 years ago. Yet computing has not had a significant effect on how undergraduate linear algebra is usually taught. This Minicourse explores the possibilities and consequences of putting powerful matrix computation packages in the hands of beginning linear algebra students. Two such packages will be demonstrated and participants will experience using them. Topics discussed will include the mathematical algorithms incorporated in the software, the importance of the user interface, the probable changes needed in the course, the kinds of application problems that can be then assigned to students, the demands such a course puts on instructors and students, and the possible effects of the course. The capabilities possessed by the packages include: LU-factoring, QR-factoring, finding least square solutions, finding complete sets of eigenvectors and associated eigenvalues, orthonormalizing vectors, and finding Jordan and rational canonical forms.

Minicourse #11: *The teaching of applied mathematics* is being organized by W. GILBERT STRANG, Massachusetts Institute of Technology. Part A is scheduled from 7:00 p.m. to 9:00 p.m. on Thursday, January 9 and Part B from 10:30 a.m. to 12:30 p.m. on Friday, January 10. Total enrollment for this Minicourse is limited to 40 persons.

The organizer will discuss one possible framework for an introduction to modern applied mathematics. After basic courses in calculus and linear algebra, there is an important need that is not met by the traditional advanced calculus. The course should include both discrete and continuous problems, and numerical and combinatorial algorithms, bringing out their analogies

and developing the mathematical ideas that are shared by different applications. The organizer is convinced that this syllabus is also the right way to organize the mathematics needed by engineers and computer scientists; that subject does not have to be old-fashioned and boring. Topics from several areas will be presented exemplifying this unifying approach. Participants will be invited to discuss effective ways to teach applied mathematics.

Minicourse #12: *PROLOG* is being organized by FREDERICK HOFFMAN, Florida Atlantic University. Part A is scheduled from 7:00 p.m. to 9:00 p.m. on Thursday, January 9 and Part B from 1:00 p.m. to 3:00 p.m. on Friday, January 10. Total enrollment for this Minicourse is limited to 30 persons.

The intention of this Minicourse is to introduce the programming language PROLOG (PROgramming in LOGic) to an audience of mathematicians. PROLOG is many things: mechanized logic; a good programming language for beginners; a major artificial intelligence language, with applications to game playing, theorem proving, robot motion, natural language understanding and expert systems development; a powerful tool for database management; and the initial choice for the "machine language" of the Japanese Fifth Generation Computer Project. In the Minicourse, PROLOG will be described, evidence will be given that these statements are at least arguable, and some hands-on experience with microPROLOG will be provided. No computer background will be assumed; those attending should have seen a syllogism before, but no advanced knowledge of logic is required.

Participants interested in attending any of the Minicourses should complete the Minicourse Preregistration Form **and send it directly to the MAA Office at the address given on the form so as arrive prior to the November 15 deadline. DO NOT SEND THIS FORM TO PROVIDENCE.**

Please note that prepayment is required. Payment can be made by check payable to MAA (Canadian checks must be marked "in U.S. funds") or VISA or MASTERCARD credit cards.

The Minicourses are open only to persons who have registered for the Joint Mathematics Meetings and paid the Joint Meetings registration fee. **PREREGISTRATION FORMS FOR THE JOINT MEETINGS SHOULD BE MAILED TO PROVIDENCE.**

If the only reason for registering for the Joint Meetings is to gain admission to a Minicourse, this should be indicated by checking the appropriate box on the Minicourse Preregistration Form. Then, if the 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.

The registration fee for Minicourses #2, #3, #5, #9, #10, and #12 is $35 each. The registration fee for the other Minicourses is $25 each.

Contributed Papers

Papers were accepted on three topics in collegiate mathematics for presentation in contributed paper sessions. The topics, organizers, their affiliations and days they will meet are:

- Fitting discrete mathematics into the curriculum: Special problems and solutions for small colleges (Sheldon P. Gordon, Suffolk County Community College), Saturday afternoon.
- Technical mathematics: Does the supply meet the demand? (Cheryl Cleaves and Marjie J. Hobbs, State Technical Institute of Memphis), Friday morning.
- Undergraduate topology: Present trends and future prospects (Stephen Willard, University of Alberta), Thursday afternoon.

Call for papers for these contributed papers was announced in the September issue of *Focus*. The deadline for submitting papers for these sessions was **September 30. Late papers will not be accepted.**

Other MAA Sessions

The Louisiana-Mississippi Section of the MAA will hold its Business Meeting at 1:00 p.m. on Friday, January 10, and will have a session for student papers at 10:00 a.m. the same day.

Business Meeting

The Business Meeting of the MAA will take place at 4:40 p.m. on Friday, January 10. At this meeting the Chauvenet Prize, the MAA Book Prize and the Award for Distinguished Service to Mathematics will be presented. Some bylaw changes, mostly involving election procedures, will be submitted for membership approval. This meeting is open to all members of the Association.

Board of Governors

The MAA Board of Governors will meet at 8:00 a.m. on Wednesday, January 8. This meeting is open to all members of the Association.

Section Officers

There will be a Section Officers' meeting at 7:00 p.m. on Wednesday, January 8.

Films

There may be films shown at 7:00 p.m. on Friday, January 10. Further information will be available later.

Joint AMS–MAA Sessions

By invitation of the AMS-MAA Joint Program Committee (George E. Andrews, Judith V. Grabiner, W. Gilbert Strang, and William C. Waterhouse), there will be three speakers who 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 their titles will be announced later.

Activities Of Other Organizations

The **American Association for the Advancement of Science** (AAAS) will sponsor a symposium on *Mathematics and the American Association for the Advancement of Science* on Wednesday, January 8 from 7:00 p.m. to 9:00 p.m.

The mathematics community is beginning a many-pronged effort to improve the public image of the mathematics profession. One such prong should extend toward the science community, whose most conspicuous representative is probably the American Association for the Advancement of Science. The AAAS has published *Science* magazine for decades and now also publishes a more popular journal, *Science 85*. However, not many mathematicians are members of this Association, still fewer attend or speak at the annual meeting, and essentially none publish in *Science*. In recent years, there has been more reporting of mathematics news by the *Science* staff and an article or two involving mathematics have appeared in *Science 85*.

To explore the future of these and other avenues for publicizing mathematics to other scientists and for the involvement of mathematicians in broader scientific matters, the mathematics section of the AAAS has organized this session at the Joint Meetings in New Orleans to be addressed by ALLEN HAMMOND, former Science News editor of *Science* and present editor of *Science 85*, and by DANIEL E. KOSHLAND, JR., former editor of the *Proceedings* of the National Academy of Science and present editor of *Science*. The session will be chaired by DANIEL ZELINSKY, chairman of Section A of the AAAS.

This symposium offers a chance to discuss ideas on the image or the impact of mathematics in the sciences, or, more especially, on the reporting of mathematics in *Science* or *Science 85*. This is a unique opportunity to hear about these problems from science editors' points of view.

The sixth annual Emmy Noether Lecture will be presented to the **Association for Women in Mathematics** (AWM) at 11:10 a.m. on Wednesday, January 8, by YVONNE CHOQUET-BRUHAT.

The AWM Business Meeting will be held at 12:10 p.m. on Wednesday, January 8.

The AWM will sponsor jointly with AMS and MAA a session titled *In honor Julia Bowman Robinson, 1919–1985*, at 9:00 a.m. on Thursday, January 9.

A reception is being planned by AWM at 6:15 p.m. on Wednesday, January 8.

The **Consortium for Mathematics and Its Applications** (COMAP) will sponsor a session titled *For all practical purposes: Introduction to contemporary mathematics* at 7:00 p.m. on Thursday, January 9. The session will be devoted to a preview of the new 26 half-hour telecourse, *For all practical purposes*. Excerpts from several of the programs will be shown and the speakers will review the content and goals of the project. Speakers include SOLOMON GARFUNKEL, COMAP; DAVID MOORE, Purdue University; JOSEPH MALKEVITCH, York College, CUNY; and WILLIAM F. LUCAS, Claremont Graduate School.

The **Interagency Commission for Extramural Mathematics Programs** (ICEMAP) will present a session at 4:25 on Tuesday, January 7, titled *News and funding prospects from the federal agencies*. It will include reports from the National Science Foundation, Office of Naval Research, Army Research Office, and the Air Force Office of Scientific Research.

The **International Study Group on the Relations Between History and Pedagogy of Mathematics** (ISGRHPM) will sponsor a session on Friday, January 10 from 3:15 p.m. to 4:15 p.m.

The **Joint Policy Board of Mathematics** (JPBM) Committee for Mathematics Department Heads is organizing a National Meeting of Department Heads at 7:00 p.m. on Thursday, January 9. There will be two one-hour sessions. The first is a panel discussion titled *How to attract undergraduate mathematics majors*. The second session titled *Birds of a feather* will feature three parallel sessions on *Faculty burnout and dropout*; *Recruiting tenure track faculty*; and *Scholarship: How broad the definition*.

Attendance at these sessions is not restricted to department chairmen and all interested mathematicians are encouraged to attend.

The **National Association of Mathematicians** (NAM) will receive the William W. S. Claytor Lecture at 10:00 a.m. on Saturday, January 11, from J. ERNEST WILKINS, JR. who will speak on probability theory. The title of his lecture is *Some optimal gambling strategies*.

NAM will sponsor a Panel Discussion titled *Standardized tests: Indicators or nonindicators for successful performance in mathematics* at 11:15 a.m. on Friday, January 10. The panel will be moderated by Silvia Bozeman.

The NAM Business Meeting will take place at 6:30 p.m. on Friday, January 10. ROGERS J. NEWMAN will be the presider.

The **National Science Foundation** (NSF) will be represented at a booth in the exhibit area. NSF staff members will be available to provide counsel and information on NSF programs of interest to mathematicians. The booth will be open the same days and hours as the Exhibits.

The **Rocky Mountain Mathematics Consortium** (RMMC) Board of Directors will meet on Thursday, January 9 from 2:15 p.m. to 4:15 p.m.

The **TEX Users Group** (TUG) will present a brief discussion of the TEX typesetting process given

by S. BART CHILDS, Department of Computer Science, Texas A & M University, at 7:30 p.m. on Thursday, January 9. Participants who are interested in TEX should read the announcement about a one-day TEX seminar in the Special Meetings section of this issue.

Other Events Of Interest

Book Sales

Books published by the AMS and MAA will be sold for cash prices somewhat below the usual prices when these same books are sold 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 French Market Exhibit Hall. The MAA Book Sale will also be open on Saturday, January 11, in the registration area during registration hours.

Exhibits

The book and educational media exhibits will be located in the French Market Exhibit Hall and will be open Tuesday, January 7, through Friday, January 10. The exhibits will be open from 1:00 p.m. to 5:00 p.m. on Tuesday; from 9:00 a.m. to 5:00 p.m. on Wednesday and Thursday; and from 9:00 a.m. to noon Friday. All participants are encouraged to visit the exhibits during the meeting. **Participants visiting the exhibits will be asked to display their meeting badge or acknowledgement from the Mathematics Meetings Housing Bureau in order to enter the exhibit area.**

Accommodations

Hotels

The rates listed below are subject to an 11 percent hotel/motel tax. The number in parentheses after the name of the hotel is the number it carries on the map. The estimated walking distance from the hotel to the Louisiana Superdome is given in parentheses following the telephone number.

Participants should be aware that when major conventions occur in any large city, additional safety problems are created, especially at night. Those who are attending the meetings alone, or who are concerned about walking to and from the meetings after dark, are encouraged to choose a hotel in close proximity to the Louisiana Superdome. Participants are also urged to read the "Words to the Wise" in the local information insert in the program they receive at the meetings.

Reservations at these hotels cannot be made by calling the hotel directly until after **December 31.** Also, after that date, the rates below may not apply.

In all cases "single" refers to one person in one bed; "double" refers to two persons in one bed; "twin" refers to two persons in two single beds; and "twin double" refers to two persons in two double beds. A rollaway cot for an extra person can be added to double or twin rooms only; however, not all hotels are able to do so.

Participants should be aware that it is general hotel practice in most cities to hold a non-guaranteed reservation until 6:00 p.m. only. When one guarantees a reservation by paying a one-night's deposit in advance, however, the hotel usually will honor this reservation up until check-out time the following day. If the individual holding the reservation has not checked in by then, the room is then released for sale, and the hotel retains the deposit. If you hold a guaranteed reservation at a hotel, but are informed upon arrival that there is no room for you, there are certain things you can request the hotel do. First, they should provide for a room at another hotel in town for that evening, at no charge (you have already paid for the first night when you made your deposit). They should pay for taxi fares to the other hotel that evening, and back to the meetings the following morning. They should also pay for one telephone toll call so that you can let people know you are not at the hotel you expected. They should make every effort to find a

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.**

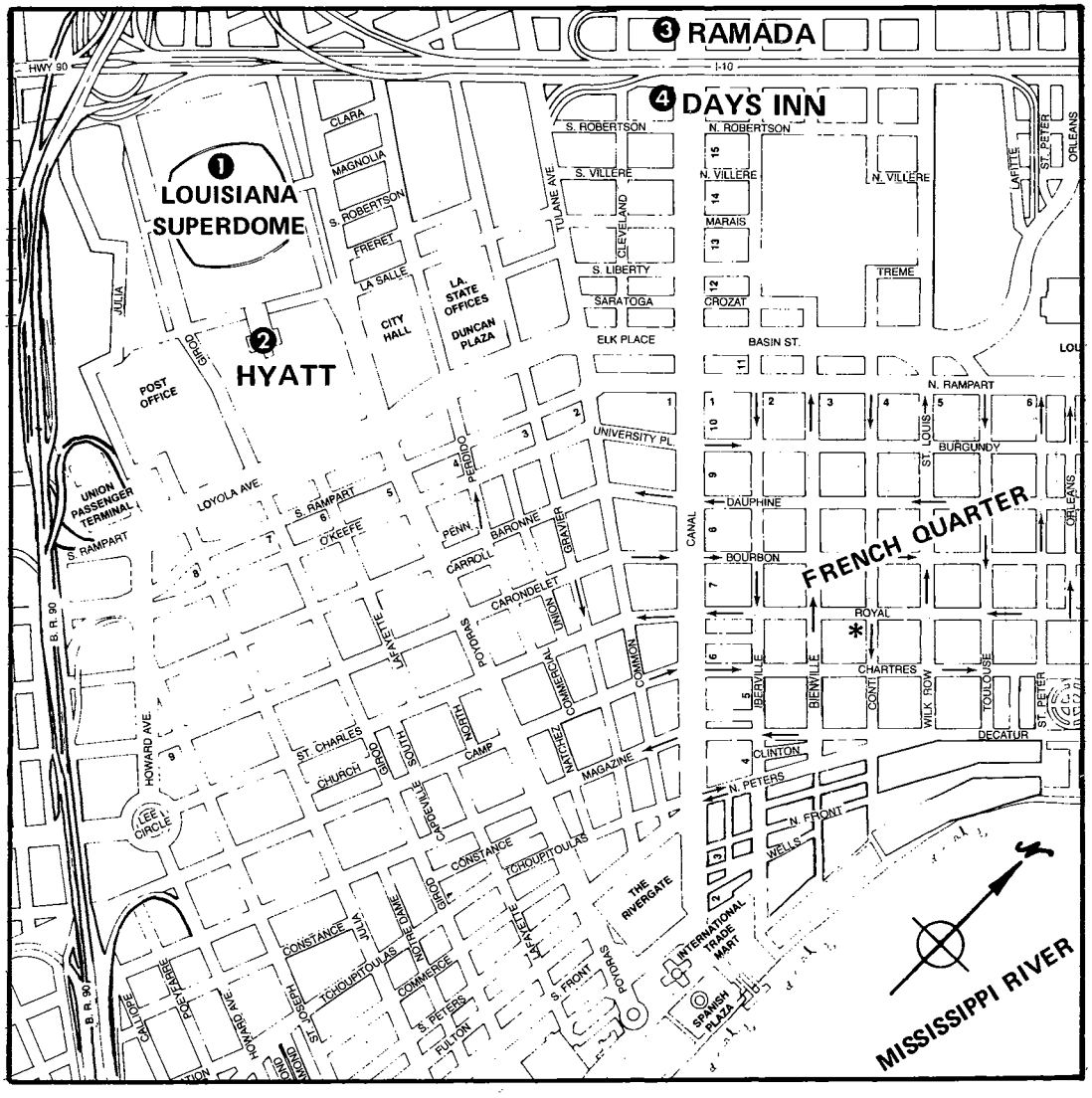
TIMETABLE

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

	AMERICAN MATHEMATICAL SOCIETY SHORT COURSE SERIES
SUNDAY, January 5	APPROXIMATION THEORY
9:00 a.m. - 2:30 p.m.	REGISTRATION
2:00 p.m. - 3:15 p.m.	Approximation of functions Ronald A. DeVore
3:45 p.m. - 5:00 p.m.	Approximation and interpolation by rational functions Edward B. Saff
MONDAY, January 6	
9:00 a.m. - 10:15 a.m.	n-widths and optimal recovery Allan M. Pinkus
10:45 a.m. - noon	Algorithms for approximation E. W. Cheney
1:30 p.m. - 2:45 p.m.	Algebraic aspects of interpolation Charles A. Micchelli
3:15 p.m. - 4:30 p.m.	Multivariate splines Klaus Höllig
4:30 p.m. - 5:15 p.m.	General discussion

	JOINT MATHEMATICS MEETINGS	
MONDAY, January 6	American Mathematical Society	Mathematical Association of America
2:00 p.m. - 10:00 p.m.	COUNCIL MEETING	
4:00 p.m. - 8:00 p.m.	REGISTRATION	
TUESDAY, January 7	AMS	MAA
	SPECIAL SESSIONS	
8:00 a.m. - noon	Mathematical modeling and computer simulation to problems in other disciplines I	
8:00 a.m. - noon	Operator method of optimal control problems I	
8:00 a.m. - noon	Convexity I	
8:00 a.m. - noon	Analytic methods in differential equations I	
8:00 a.m. - noon	Homotopy theory I	
8:00 a.m. - noon	Operator algebras and foliations I	
morning	SESSIONS FOR CONTRIBUTED PAPERS	
8:00 a.m. - 5:00 p.m.	REGISTRATION	
10:05 a.m. - 10:55 a.m.	INVITED ADDRESS Representations of p-adic groups and algebras of abelian categories Joseph N. Bernstein	
11:10 a.m. - noon	SPECIAL INVITED ADDRESS Title to be announced George F. Carrier	
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE I Title to be announced Shing-Tung Yau	
afternoon	SESSIONS FOR CONTRIBUTED PAPERS	
1:00 p.m. - 5:00 p.m.	EXHIBITS	
1:00 p.m. - 5:00 p.m.	AMS EXHIBIT AND BOOK SALE	
1:00 p.m. - 5:00 p.m.		MAA BOOK SALE
	SPECIAL SESSIONS	
2:15 p.m. - 6:00 p.m.	Mathematical modeling and computer simulation to problems in other disciplines II	
2:15 p.m. - 6:00 p.m.	Convexity II	
2:15 p.m. - 6:00 p.m.	Analytic methods in differential equations II	
2:15 p.m. - 6:00 p.m.	Homotopy theory II	
2:15 p.m. - 6:00 p.m.	Operator theory in several complex variables I	
2:45 p.m. - 6:00 p.m.	Operator algebras and foliations II	
3:20 p.m. - 4:10 p.m.	INVITED ADDRESS The role of the axiom of determinacy in set theory Alexander S. Kechris	

NEW ORLEANS – DOWNTOWN, FRENCH QUARTER



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TIMETABLE

TUESDAY, January 7	American Mathematical Society	Mathematical Association of America
4:25 p.m. - 6:00 p.m.	Interagency Commission for Extramural Mathematics Programs (ICEMAP) News and funding prospects from the federal agencies Reports from: National Science Foundation Office of Naval Research Army Research Office Air Force Office of Scientific Research	
8:30 p.m. - 9:30 p.m.	JOSIAH WILLARD GIBBS LECTURE Title to be announced L. E. Scriven	

WEDNESDAY, January 8	AMS	MAA and Other Organizations
	SPECIAL SESSIONS	
8:00 a.m. - noon	Operator method of optimal control problems II	
8:00 a.m. - noon	Operator theory in several complex variables II	
8:00 a.m. - noon	Equivalence problems and applications I	
8:00 a.m. - noon	Harmonic analysis on reductive groups I	
8:00 a.m. - noon	Determinacy and large cardinals I	
morning	SESSIONS FOR CONTRIBUTED PAPERS	
8:00 a.m. - 12:30 p.m.		MAA - BOARD OF GOVERNORS' MEETING
8:00 a.m. - 4:00 p.m.	REGISTRATION	
9:00 a.m. - 9:30 a.m.	EMPLOYMENT REGISTER ORIENTATION SESSION	
9:00 a.m. - 9:50 a.m.	INVITED ADDRESS The rigidity of classifying spaces Haynes R. Miller	
9:00 a.m. - 5:00 p.m.	EXHIBITS	
9:00 a.m. - 5:00 p.m.	AMS EXHIBIT AND BOOK SALE	
9:00 a.m. - 5:00 p.m.		MAA BOOK SALE
9:30 a.m. - 4:00 p.m.	EMPLOYMENT REGISTER REGISTRATION	
11:10 a.m. - noon		Association for Women in Mathematics EMMY NOETHER LECTURE Title to be announced Yvonne Choquet-Brůhat
12:10 p.m. - 12:40 p.m.		AWM - BUSINESS MEETING
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE II Title to be announced Shing-Tung Yau	
2:15 p.m. - 3:05 p.m.	Committee on Science Policy SPECIAL INVITED ADDRESS Title to be announced Erich Bloch, Director National Science Foundation	
3:20 p.m. - 4:10 p.m.	INVITED ADDRESS Some problems in singular perturbed ordinary differential equations Jane Cronin Scanlon	
4:20 p.m. - 5:50 p.m.	VEBLEN PRIZE SESSION AND BUSINESS MEETING	
6:15 p.m.		AWM - RECEPTION
7:00 p.m. - 9:00 p.m.	American Association for the Advancement of Science SYMPOSIUM: Mathematics and the American Association for the Advancement of Science Allen Hammond Daniel E. Koshland, Jr. Daniel Zelinsky, Chairman	
7:00 p.m. - 9:00 p.m.		MAA - MINICOURSE #3 (Part A) Discrete mathematics using difference equations James T. Sandefur, Jr.
7:00 p.m. - 9:00 p.m.		MAA - MINICOURSE #4 (Part A) Data analysis and regression Susan J. Devlin Martin A. Koschat Paul A. Tukey
7:00 p.m. - 10:00 p.m.		MAA - SECTION OFFICERS' MEETING

room for you in their hotel the following day, and, if successful, pay your taxi fares to and from the second hotel so that you can pick up your baggage and bring it to the first hotel. Not all hotels in all cities follow this practice, so your request for these services may bring mixed results, or none at all.

Please make all changes to or cancellations of hotel reservations with the Mathematics Meetings Housing Bureau in Providence **before January 1, 1986**. The telephone number in Providence is 401-272-9500 (extension 239). After that date, changes should be made directly with the hotel. **Cancellations must be made 48 hours prior to date of arrival. A deposit of $50 is required for each room reservation and may be paid by check,** VISA, **or** MASTERCARD **credit cards.** (Canadian checks should be marked "In U.S. funds".

Hyatt Regency New Orleans (2)
Headquarters Hotel
Poydras at Loyola Avenue
New Orleans, Louisiana 70140-1012
Telephone: 504-561-1234 (1 block)

Singles	$66
Doubles	$80 (1 or 2 beds)
Triples	$86 (2 or 3* beds)
Quads	$94 (2 or 3* beds)
Suites	$225–$500

Children 16 years of age and under are free in same room with parents.

(* Limited number of rollaways available on a first-come, first-served basis.)

Days Inn (4)
1630 Canal Street
New Orleans, Louisiana 70112
Telephone: 504-586-0110 (6 blocks)

Singles	$44
Twin Doubles	$44 (2 beds)
Triples	$44 (2 beds)
	$48 (2 beds with rollaway*)
Quads	$44 (2 beds)
	$48 (2 beds with rollaway*)

Single Suites–$52 (1 double bed with murphy bed) plus $4 each additional occupant

Double Suites–$56 (2 double beds with murphy bed) plus $4 each additional occupant

(Maximum of four occupants in each suite)

Children 12 years of age and under are free in same room with parents.

(* Extremely limited number of rollaways available on a first-come, first-served basis.)

A shuttle bus accommodating 44 passengers will make two trips to the Hyatt and Superdome on a first-come, first-served basis each morning and late afternoon or early evening. A schedule will be posted at the check-in desk at the Days Inn. In addition, there is also a public shuttle service (CBD) which makes regularly scheduled stops at the Days Inn, the Hyatt, and the Superdome, for 30 cents per trip.

Ramada Hotel New Orleans (3)
1732 Canal Street
New Orleans, Louisiana 70112
Telephone: 504-525-5525 (7 blocks)

Singles	$40
Doubles	$40 (1 or 2 beds)
Triples	$40 (2 beds)
Quads	$40 (2 beds)
Suites	$65 (1 king bed with studio bed, maximum 4 persons)

Children 18 years of age and under are free in same room with parents.

Shuttle service to the Hyatt Regency and the Superdome will be provided by the Ramada twice each morning and late afternoon or early evening. A schedule will be posted at the check-in desk in the hotel lobby. Public shuttle service (CBD) is also available which stops at the two places mentioned above for 30 cents per trip.

Registration Desk

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 enter the exhibit area, 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 Regency Ballroom, Hyatt Regency New Orleans, and in Rooms 8, 9, and 10 in the Louisiana Superdome on Saturday only. (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 meeting listed below are 30 percent more than the preregistration fees.

Participants wishing to attend sessions for one day only may take advantage of the new one-day fees listed below. These special fees are effective beginning Tuesday, January 7, through Saturday, January 11, and are available at the meeting only, to members and nonmembers. These fees are not applicable to student, unemployed, or emeritus participants.

Joint Mathematics Meetings

Member of AMS or MAA	$ 74
Emeritus Member of AMS, MAA	$ 20
Nonmember	$113
Student/Unemployed	$ 20

One Day Fee

Member of AMS or MAA	$ 38
Nonmember	$ 59

TIMETABLE

THURSDAY, January 9	American Mathematical Society	Mathematical Association of America and Other Organizations
8:00 a.m. - 4:00 p.m.	REGISTRATION	
9:00 a.m. - 11:00 a.m.	AWM-AMS-MAA SESSION In honor of Julia Bowman Robinson (1919-1985)	
9:00 a.m. - 5:00 p.m.	EXHIBITS	
9:00 a.m. - 5:00 p.m.	AMS EXHIBIT AND BOOK SALE	
9:00 a.m. - 5:00 p.m.		MAA BOOK SALE
9:00 a.m.	EMPLOYMENT REGISTER DISTRIBUTION OF SCHEDULES	
9:30 a.m. - 5:30 p.m.	EMPLOYMENT REGISTER INTERVIEWS	
11:10 a.m. - noon	AMS-MAA INVITED ADDRESS Speaker and title to be announced	
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE III Title to be announced Shing-Tung Yau	
afternoon	SESSIONS FOR CONTRIBUTED PAPERS	
afternoon		MAA - CONTRIBUTED PAPER SESSION Undergraduate topology: Present trends and future prospects Stephen Willard
1:00 p.m. - 3:00 p.m.		MAA - MINICOURSE #2 (Part A) muMATH Workshop Wade Ellis, Jr.
1:00 p.m. - 3:00 p.m.		MAA - MINICOURSE #6 (Part A) Discrete algorithmic mathematics Stephen B. Maurer
1:00 p.m. - 3:00 p.m.		MAA - MINICOURSE #7 (Part A) Introductory computer science J. Arthur Seebach
	SPECIAL SESSIONS	
1:00 p.m. - 6:00 p.m.	Equivalence problems and applications II	
1:00 p.m. - 6:00 p.m.	Harmonic analysis on reductive groups II	
1:00 p.m. - 6:00 p.m.	Determinacy and large cardinals II	
1:00 p.m. - 6:00 p.m.	Ordered algebras I	
1:00 p.m. - 6:00 p.m.	Mathematical biology I	
1:00 p.m. - 6:00 p.m.	Positive operators and their applications I	
2:15 p.m. - 3:05 p.m.	AMS-MAA INVITED ADDRESS Speaker and title to be announced	
2:15 p.m. - 4:15 p.m.		Rocky Mountain Mathematics Consortium BOARD OF DIRECTORS' MEETING
3:30 p.m. - 4:20 p.m.	INVITED ADDRESS On the support of harmonic measure Lennart A. E. Carleson	
3:30 p.m. - 5:30 p.m.		MAA - MINICOURSE #3 (Part B) Discrete mathematics using difference equations James T. Sandefur, Jr.
3:30 p.m. - 5:30 p.m.		MAA - MINICOURSE #4 (Part B) Data analysis and regression Susan J. Devlin Martin A. Koschat Paul A. Tukey
7:00 p.m. - 9:00 p.m.	NATIONAL MEETING OF DEPARTMENT HEADS	
7:00 p.m.	How to attract undergraduate mathematics majors	
8:00 p.m.	Birds of a feather: Faculty burnout and dropout Recruiting tenure track faculty Scholarship: How broad the definition	
7:00 p.m. - 9:00 p.m.		MAA - MINICOURSE #11 (Part A) The teaching of applied mathematics W. Gilbert Strang
7:00 p.m. - 9:00 p.m.		MAA - MINICOURSE #12 (Part A) PROLOG Frederick Hoffman

Employment Register

Employer	$100
Applicant	$ 20

AMS Short Course

Student/Unemployed	$ 10
All Other Participants	$ 30

MAA Minicourses
(if openings available)

Minicourses #2, 3, 5, 9, 10, 12	$ 35 each
Minicourses #1, 4, 6, 7, 8, 11	$ 25 each

U.S. Treasury regulation §1.162-5 allows an income tax deduction for education expenses (registration fees, cost of travel, meals, and lodging) incurred to (i) maintain or improve skills in one's employment or other trade or business or (ii) meet express requirements of an employer or a law imposed as a condition to retention of employment, job status, or rate of compensation. This is true even for education that leads to a degree.

Registration fees may be paid at the meetings in cash, by personal or travelers' check, 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

AMS Short Course
Outside Poydras A, Hyatt Regency New Orleans
Sunday, January 5 9:00 a.m. to 2:30 p.m.

Joint Mathematics Meetings
[and MAA Minicourses (until filled)]
Regency Ballroom Foyer,
Hyatt Regency New Orleans

Monday, January 6	4:00 p.m. to 8:00 p.m.
Tuesday, January 7	8:00 a.m. to 5:00 p.m.
Wednesday, January 8 through Friday, January 10	8:00 a.m. to 4:00 p.m.
Saturday, January 11	8:00 a.m. to noon

Please note that the Joint Mathematics Meetings registration desk **will not be open after noon on Saturday, January 11**.

Registration Desk Services

AMS/MAA Information

Information on the publications and activities of both organizations may be obtained at this section of the registration desk.

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 Assistance

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

Rooms where special sessions and contributed paper sessions will be held are equipped with an overhead projector and screen. **Blackboards will not be available.**

Baggage and Coat Check

Inquire at the meetings registration desk.

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 or hotels.

Local Information

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

Lost and Found

See the meeting cashier.

TIMETABLE

THURSDAY, January 9	American Mathematical Society	Mathematical Association of America and Other Organizations
7:00 p.m. - 10:00 p.m.		Consortium for Mathematics and its Applications For all practical purposes: Introduction to contemporary mathematics Solomon Garfunkel William F. Lucas Joseph Malkevitch David Moore
7:30 p.m. - 8:30 p.m.	TEX USERS GROUP S. Bart Childs	
8:30 p.m. - 11:00 p.m.	NO-HOST COCKTAIL PARTY	

FRIDAY, January 10	AMS	MAA and Other Organizations
8:00 a.m. - 8:50 a.m.		MAA - INVITED ADDRESS Elementary algorithms in number theory Peter J. Hilton
morning		MAA - CONTRIBUTED PAPER SESSION Technical mathematics: Does the supply meet the demand? Cheryl Cleaves Marjie J. Hobbs
8:00 a.m. - 10:00 a.m.		MAA - MINICOURSE #2 (Part B) muMATH Workshop Wade Ellis, Jr.
8:00 a.m. - 10:00 a.m.		MAA - MINICOURSE #6 (Part B) Discrete algorithmic mathematics Stephen B. Maurer
8:00 a.m. - 10:00 a.m.		MAA - MINICOURSE #7 (Part B) Introductory computer science J. Arthur Seebach
8:00 a.m. - 4:00 p.m.	REGISTRATION	
9:00 a.m. - 9:50 a.m.		MAA - INVITED ADDRESS Title to be announced Joseph B. Keller
9:00 a.m. - noon	EXHIBITS	
9:00 a.m. - noon	AMS EXHIBIT AND BOOK SALE	
9:00 a.m. - noon		MAA BOOK SALE
9:00 a.m.	EMPLOYMENT REGISTER DISTRIBUTION OF SCHEDULES	
9:30 a.m. - 5:30 p.m.	EMPLOYMENT REGISTER INTERVIEWS	
10:00 a.m. - noon		MAA - LOUISIANA-MISSISSIPPI SECTION Student Paper Session
10:05 a.m. - 10:55 a.m.	INVITED ADDRESS Title to be announced Sergiu Klainerman	
10:30 a.m. - 12:30 p.m.		MAA - MINICOURSE #11 (Part B) The teaching of applied mathematics W. Gilbert Strang
10:30 a.m. - 12:30 p.m.		MAA - MINICOURSE #1 (Part A) Introduction to actuarial mathematics Ellen M. Torrance
10:30 a.m. - 12:30 p.m.		MAA - MINICOURSE #9 (Part A) Introduction to computer graphics Joan P. Wyzkoski
11:10 a.m. - noon	AMS-MAA INVITED ADDRESS Speaker and title to be announced	
11:15 a.m. - 12:30 p.m.		National Association of Mathematicians PANEL DISCUSSION: Standardized tests: Indicators or nonindicators for successful performance in mathematics Silvia Bozeman (moderator)
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE IV Title to be announced Shing-Tung Yau	

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 judgement on the suitability of an announcement for display rests with the Joint Meetings Committee. It will make its judgements 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: Attention: Sales Department, Name of Participant, c/o Joint Mathematics Meetings, Hyatt Regency New Orleans, Poydras at Loyola Avenue, New Orleans, Louisiana 70140. 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.

Telephone Messages

A telephone message center is located in the registration area to receive incoming calls for participants. The center is open from January 6 through 11 only, 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 announced 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, arrival and departure dates, is maintained in the registration area.

Miscellaneous Information

Child Care

The Hyatt Hotel has babysitting services available which can be arranged through the Concierge desk located in the first floor lobby. The current rates are $4.50 per hour for one child, $5 per hour for two children, and $5.50 per hour for three children. There is a four hour minimum and an additional $6.50 transportation fee for the babysitter. There will be a list of local babysitters available at the Local Information section of the registration desk.

Local Information

The Hyatt Regency will be providing free shuttle service to and from the French Quarter each evening, from Tuesday, January 7, through Friday, January 10. Further details will be available later.

Taxis cost $1.10 plus 20 cents per fifth mile or 40 seconds (whichever comes first); there is a charge of 25 cents for each additional person per trip. Most trips in the downtown area including the French Quarter cost $3.50 to $4. The Regional Transport Authority (RTA) operates a shuttle bus throughout the central business district (CBD) at 10 minute intervals, Monday through Friday, 6:30 a.m. to 6:30 p.m. The CBD Shuttle stops at the Hyatt; the cost is 30 cents per person. With all RTA buses exact change is required. The CBD shuttle does not operate on weekends. The RTA operates an extensive bus service throughout the New Orleans area. The fare is 60 cents per person for most services; the cost for express buses which run at rush hour is 75 cents (again, exact change is required). In addition, transfers for connecting service can be purchased for 5 cents when boarding the original bus. Most services run from 5:30 a.m. to midnight; a few of the

TIMETABLE

FRIDAY, January 10	American Mathematical Society	Mathematical Association of America and Other Organizations
afternoon	SESSIONS FOR CONTRIBUTED PAPERS	
1:00 p.m. - 2:00 p.m.		MAA - LOUISIANA-MISSISSIPPI SECTION BUSINESS MEETING
1:00 p.m. - 3:00 p.m.		MAA - MINICOURSE #12 (Part B) PROLOG Frederick Hoffman
	SPECIAL SESSIONS	
1:00 p.m. - 4:30 p.m.	Ordered algebras II	
1:00 p.m. - 4:30 p.m.	Mathematical biology II	
1:00 p.m. - 4:30 p.m.	Positive operators and their applications II	
1:00 p.m. - 4:30 p.m.	Graph labelings I	
1:00 p.m. - 4:30 p.m.	Complex analysis I	
1:00 p.m. - 4:30 p.m.	Radon transforms and tomography I	
1:00 p.m. - 4:30 p.m.	Recent advances in nonlinear hyperbolic equations I	
1:10 p.m. - 2:00 p.m.		MAA - INVITED ADDRESS Title to be announced Ronald L. Graham
2:15 p.m. - 3:05 p.m.		MAA - INVITED ADDRESS Linear programming: The d-step conjecture and its relatives Victor L. Klee
3:15 p.m. - 4:15 p.m.		International Study Group on the Relations Between History and Pedagogy of Mathematics SESSION
3:30 p.m. - 4:30 p.m.	Committee on Opportunities in Mathematics for Disadvantaged Groups - PANEL DISCUSSION: Unplugging the pipeline Manuel P. Berriozabal William G. Chinn Gloria F. Gilmer (moderator) J. Arthur Jones Rogers J. Newman	
3:30 p.m. - 4:30 p.m.		MAA - RETIRING PRESIDENTIAL ADDRESS Surprising results in elementary mathematics II Ivan Niven
4:40 p.m. - 6:00 p.m.		MAA - BUSINESS MEETING
6:30 p.m. - 7:30 p.m.		NAM - BUSINESS MEETING Rogers J. Newman (presider)
7:00 p.m. - 9:00 p.m.		MAA - MINICOURSE #4 (Part C) Data analysis and regression Susan J. Devlin Martin A. Koschat Paul A. Tukey
7:00 p.m. - 9:00 p.m.		MAA - MINICOURSE #8 (Part A) Teaching experiential applied mathematics (TEAM) Jeanne L. Agnew James R. Choike John M. Jobe Marvin S. Keener
7:00 p.m. - 9:00 p.m.		MAA - MINICOURSE #10 (Part A) The use of computing in the teaching of linear algebra Eugene A. Herman
7:00 p.m. - 10:00 p.m.		MAA - FILM PROGRAM

SATURDAY, January 11	AMS	MAA and Other Organizations
morning	SESSIONS FOR CONTRIBUTED PAPERS	
8:00 a.m. - 10:00 a.m.		MAA - MINICOURSE #9 (Part B) Introduction to computer graphics Joan P. Wyzkoski
8:00 a.m. - noon	REGISTRATION	
8:00 a.m. - noon		MAA BOOK SALE

main routes such as the Canal Street Line, the St. Charles Avenue Streetcar, and the Magazine Street Line run 24 hours a day.

The Gray Line Bus Service and Southern Tours both operate sight-seeing buses in New Orleans. Such attractions as the Audubon Zoo and the New Orleans Museum of Art can be reached by RTA bus service. Canal Street and the adjacent French Quarter have numerous stores and shops. Riverboat cruises are available from the foot of Canal Street; of particular interest is the riverboat trip up river to Audubon Park and the Zoo. Information about these attractions as well as the myriad others available in the New Orleans area will be available at the Local Information section of the registration desk.

Parking

There are two highrise parking garages located adjacent to the Hyatt. The rate is $7 per night, and "in-and-out" privileges are included. Guests of the Hyatt can arrange to have the parking cost added to their hotel bill. Hourly parking is also available at these garages; the rates are $2 for the first hour or portion thereof, $3.50 for one to two hours, $5 for two to three hours, and $7 for more than 3 hours. No "in-and-out" is allowed on the hourly rates.

There are also numerous parking lots around the Hyatt. The rates are $3 to $4 per day.

There is ample parking available at the Superdome. The cost is $3.50 per 24-hour day in the southeast lot, and $1.50 per day in the northwest lot. The security guard leaves at 7:00 p.m.; cars can be taken out after that time, but not returned until the next morning at 6:30 a.m. when the lots open again. Hourly parking is also available. The rates are $1.50 for the first hour and 75 cents per hour for each additional hour, with a maximum of $5.25. There is no "in-and-out" parking available.

Parking on the premises at the Days Inn is free.

There is a $5 daily parking fee with valet parking at the Ramada.

Social Event

There will be a no-host cocktail party in the Louisiana Superdome at 8:30 p.m. on Thursday, January 9.

Travel

In January, New Orleans is on Central Standard Time.

All major domestic airlines provide service to New Orleans International Airport (MSY), which is located some 15 miles from the city center. Limousine service is available from the airport to most downtown hotels. The cost is $7 per person each way. There is also commercial Gray Line bus service between the airport and downtown; the cost is $7 per person each way. The Gray Line counter at the airport is located next to the rental car counters. The limousines and the Gray Line buses run from the airport to the downtown area on a more or less continuous basis. No reservations are required for the trip from the airport to downtown, but reservations for either the limousine services or the Gray Line bus from downtown to the airport must be made at least 24 hours in advance. Taxis are also available; the charge is $18 for three people or less, and $6 for each additional person. The trip between the airport and downtown takes approximately 20–30 minutes.

Commerical bus service from the airport to downtown is also available; the cost is 90 cents and a bus leaves every 12 to 18 minutes. This service stops only at the airport and at the corner of Tulane Avenue and Elk Place downtown, and takes approximately 45 to 60 minutes.

Most major car rental agencies maintain desks at the airport.

New Orleans can be reached by car via I-10 from the East or West; the Hyatt and the Superdome can be reached by taking any of the exits marked "Superdome" and then following the signs to the Superdome. There is a major Amtrak station in New Orleans located a few blocks from the Hyatt. Amtrak has direct service to New Orleans from Los Angeles, Chicago, and Washington, D.C.

Weather

Winters in New Orleans can vary from rather warm to rather cold. While the averge high is 62 degrees and the average low is 45 degrees, the record high is 82 degrees and the record low is 13 degrees. The average rainfall is 4.9 inches, so January tends to be a rainy month. Since the only access to the Superdome from the Hyatt is via an open walkway, it is advisable to bring warm clothing and rain gear. The pattern of weather is much easier to describe: cold fronts from the north push through the city and the weather becomes cold, dry and windy, with lows in the 20's to 30's and highs in the 40's to 50's. After a few days, the front weakens and returns as a warm front from the Gulf. The weather then becomes warm, humid and rainy. This pattern is repeated throughout the winter months.

Important information on the Employment Register immediately follows.

Frank T. Birtel
Associate Secretary

New Orleans, Louisiana

TIMETABLE

SATURDAY, January 11		MAA and Other Organizations
	SPECIAL SESSIONS	
8:00 a.m. - noon	Graph labelings II	
8:00 a.m. - noon	Complex analysis II	
8:00 a.m. - noon	Radon transforms and tomography II	
8:00 a.m. - noon	Recent advances in nonlinear hyperbolic equations II	
9:00 a.m. - 9:50 a.m.		MAA - INVITED ADDRESS Using examples in topology R. H. Bing
10:00 a.m. - 10:50 a.m.		MAA - INVITED ADDRESS School buses, baseball, and public cryptography Henry O. Pollak
10:00 a.m. - 11:00 a.m.		NAM - WILLIAM W. S. CLAYTOR LECTURE Some optimal gambling strategies J. Ernest Wilkins, Jr.
10:30 a.m. - 12:30 p.m.		MAA - MINICOURSE #5 (Part A) Microcomputer software for teaching linear algebra and calculus David P. Kraines David A. Smith
11:00 a.m. - 11:50 a.m.		MAA - INVITED ADDRESS The problems of mathematics to 2000; an attempt at prediction Gail S. Young
afternoon		MAA - CONTRIBUTED PAPER SESSION Fitting discrete mathematics into the curriculum: Special problems and solutions for small colleges Sheldon P. Gordon
1:00 p.m. - 1:50 p.m.		MAA - INVITED ADDRESS Title to be announced Cathleen S. Morawetz
1:00 p.m. - 3:00 p.m.		MAA - MINICOURSE #8 (Part B) Teaching experiential applied mathematics (TEAM) Jeanne L. Agnew James R. Choike John M. Jobe Marvin S. Keener
1:00 p.m. - 3:00 p.m.		MAA - MINICOURSE #10 (Part B) The use of computing in the teaching of linear algebra Eugene A. Herman
3:30 p.m. - 5:30 p.m.		MAA - MINICOURSE #1 (Part B) Introduction to actuarial mathematics Ellen M. Torrance
3:30 p.m. - 5:30 p.m.		MAA - MINICOURSE #5 (Part B) Microcomputer software for teaching linear algebra and calculus David P. Kraines David A. Smith

Mathematical Sciences Employment Register

January 1986 Meeting in New Orleans

The Mathematical Sciences Employment Register, held annually at the Joint Mathematics Meetings in January, provides opportunities for mathematical scientists seeking professional employment to meet employers who have positions to be filled. Job listings (or descriptions) and résumés prepared by employers and applicants are displayed at the meeting for the participants so that members of each group may determine which members of the other group they would like to have an opportunity to interview. A computer program assigns the appointments, matching requests to the extent possible, using an algorithm which maximizes the number of interviews which can be scheduled subject to constraints determined by the number of time periods available, the numbers of applicants and employers, and the pattern of requests. The report below outlines the operation of the register, indicating some of the procedures involved for the benefit of those not familiar with its operation.

The Mathematical Sciences Employment Register is apparently unique among employment services offered by professional organizations in the sciences, engineering and the humanities. The computer programs used are constructed around a matching program, devised by Donald R. Morrison and based on an algorithm described in his paper "Matching Algorithms" in *Journal of Combinatorial Theory*, volume **6** (1969), pages 20 to 32; see also "Matching Algorithms" (abstract) *Notices*, August 1967, page 630. The number of interviews arranged by the program is significantly greater than the number possible at the employment registers of other organizations, in many cases greater by an order of magnitude.

1986 Employment Register in New Orleans

The Employment Register will take place in the Louisiana Superdome on Wednesday, Thursday, and Friday, January 8, 9, and 10, 1986. A short (optional) orientation session will be conducted by the AMS-MAA-SIAM Committee on Employment Opportunities at 9:00 a.m. on Wednesday, January 8. The purpose of the orientation session is to familiarize participants with the operation of the Register and with the various forms involved. Following orientation, participants in the Employment Register should pick up their Interview Request Forms. Computer-scheduled interviews will be held on Thursday and Friday, January 9 and 10. No interviews will be held on Wednesday.

Fifteen-minute intervals are allowed for interviews, including two or three minutes between successive interviews. The interviews are scheduled in half-day sessions: Thursday morning and afternoon, and Friday morning and afternoon, amounting to four half-day sessions for interviews. There are ten time periods (9:30–11:45 a.m.) in which interviews can be scheduled in the morning and fourteen time periods (1:15–5:00 p.m.) in the afternoon. It is possible that an applicant or employer may be scheduled for the maximum number of interviews in a session. Requests for interviews will be accommodated depending on the availability of participants. The scheduling program does not have a provision allowing participants to specify particular times for interviews beyond the choice of session (day, and morning or afternoon). Such requests cannot be accommodated.

Background of Applicants

Statistics from previous Employment Registers have shown employers sought to fill approximately 180 positions, 10 of which were nonacademic jobs. For 98% of the positions, holders of doctoral degrees were preferred, for 65% of the positions only applicants with doctorates were acceptable, for 30% of the positions, holders of masters degrees were considered eligible. Few of the nonacademic employers indicated an interest in holders of bachelors degrees in mathematics.

Requests for interviews taking place during the two sessions on Thursday must be submitted on Wednesday between 9:30 a.m. and 4:00 p.m. Requests for interviews to take place during the Friday sessions must be submitted on Thursday before 4:00 p.m. Those who fail to do so cannot be included in the pool of available participants when the matching program which schedules the interviews is run on the computer that night. This applies to all employers and applicants.

On Thursday and Friday mornings at 9 a.m. all schedules for applicants and employers for the day (both morning and afternoon sessions) will be available for distribution in the Louisiana Superdome.

The Saturday afternoon session is the annual "employers' choice" session. For this session interviews will be scheduled on the basis of requests made by employers. Applicants do not submit specific interview requests for this session; but, in order to participate they must indicate their availability for the session by returning the Interview Request Form for Friday, indicating that they will attend the afternoon session that day.

Applicants should be aware of the fact that interviews arranged by the Employment Register represent only an initial contact with employers, and that hiring decisions are not ordinarily made during or immediately following such interviews. **Applicants are advised to bring a number of copies of their vitae or résumés so that they may leave them with prospective employers.**

The Mathematical Sciences Employment Register is sponsored by the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics; it is operated by members of the AMS staff under the general supervision of the joint AMS-MAA-SIAM Committee on Employment Opportunities.

Anyone with questions about the Employment Register should contact Carole Kohanski at the American Mathematical Society at 401-272-9500, extension 286. A telephone number to be used after the Register begins will be announced later. Participants should note that this number will be for those who will be participating in the Employment

Register and is not for contacting participants or taking messages. Those who wish to leave messages should call the message center telephone number found in the New Orleans meeting announcement.

Pregistration

Applicants and employers (including all interviewers) who wish to preregister for the Employment Register must also register for the Joint Mathematics Meetings. Forms for preregistration, the applicant résumé form, and the employer form are located in the back of this issue. Preregistration for the Employment Register, in addition to permitting inclusion in the printed lists, has the advantage of reduced fees and the services of the Mathematics Meetings Housing Bureau, and has the further advantage of helping to reduce waiting times at the meeting in New Orleans.

Forms must be received in Providence by **November 15, 1985**. Forms received after the November 15 deadline cannot be included in the printed booklet. For details on registration and preregistration for the New Orleans Joint Mathematics Meetings, please refer to the information on these subjects which may be found elsewhere in this issue.

Employers and applicants who have preregistered for the Employment Register may pick up their MSER material after 9:30 a.m. on Wednesday, January 8, in the Louisiana Superdome. This material includes the Interview Request Forms which are handed out at the meeting only. These are not the forms that are submitted with preregistration.

Preregistered Applicants

In addition to the Joint Meetings preregistration fee, there is an applicant fee of $15 payable prior to the November 15 deadline. These fees must be accompanied by the Preregistration/Housing Form.

Applicants' résumés will be made available to employers in printed form, so that they may be studied carefully at leisure. The December issue of *Employment Information in the Mathematical Sciences* which will be printed a few weeks before the meeting will contain photographic reproductions of the résumés of applicants who have preregistered **by November 15**. Forms not received in time cannot be included in this issue. **See the section on preparation of résumés elsewhere in this announcement.**

Employers' job listings will be posted at the meeting, so that applicants may study them when choosing which employers they wish to interview.

Preregistered Employers

In addition to the Joint Meetings preregistration fee there is a $75 fee for employers, if paid prior to the November 15 deadline. These fees must be accompanied by the Preregistration/Housing Form. This registration fee for employers covers the cost of a copy of the December Issue of *Employment Information in the Mathematical Sciences* (EIMS). This publication contains printed copies of the résumés of applicants who preregistered prior to the deadline; it also contains a copy of the Winter List of Applicants. **It is requested that employers submit both employer and Preregistration/Housing Forms with appropriate fees in the same envelope. It would also be helpful if the names of cointerviewers would be listed on the employer form. If possible, these individuals should also preregister at the same time.**

It is the policy of some institutions to pay for employer fees. These payments do not always accompany the preregistration forms but are sent in after the deadline has passed, or when the meeting is over. It is important that the institution's fiscal department indicate the name of the participating employer so that proper credit can be made in Providence.

Employers are encouraged to provide more than one interviewer, when they are able to do so, in order to increase the number of interviews which may be scheduled. **Please take care to indicate on the form the number and names of interviewers for whom simultaneous interviews may be scheduled. Note that all interviewers are expected to register for the Joint Meetings.** (If all interviewers will be interviewing for the same position, or for the same set of positions, only one form should be submitted and only one employer code number will be assigned; therefore, each interviewer would then receive a separate computer schedule and separate table number.) More than one employer code will be required if some interviewers will not interview for all positions. Thus, if there are two disjoint sets of positions, two forms are required and two employer codes will be assigned.

A coded strip at the bottom of the form summarizes the information on each form. All employers are required to complete the Summary Strip. This is used to prepare a computer-printed list of preregistered employers for distribution to the applicants.

Nonpreregistered Applicants and Employers

Employers and applicants who wish to participate in the Register who have neither preregistered nor paid the Employment Register fee must first go to the Joint Mathematics Meetings registration desk in the Regency Ballroom Foyer of the Hyatt Regency New Orleans in order to complete their registration. **No provision will be made to handle cash transactions at the site of the Employment Register in the Louisiana Superdome.** Registration for the Joint Meetings is required for participation in the Employment Register. It is also required that all participating employer interviewers register for the Joint Mathematics Meetings.

Onsite registration for the Employment Register is $100 for employers and $20 for applicants. This registration fee for employers covers the cost of a copy of the December Issue of *Employment Information in the Mathematical Sciences* (EIMS). This publication contains printed copies of the résumés of applicants who preregistered prior to the deadline and a copy of the Winter List of Applicants.

After registration has been completed, applicants and employers should come to the Louisiana Superdome to fill out the forms necessary to participate in the Employment Register.

Nonparticipating Employers

Employers who do not plan to participate in the Employment Register, but wish to display job descriptions, may obtain special forms from Carole Kohanski, MSER, P. O. Box 6248, Providence, RI 02940. These job descriptions, subject to approval, must be received in the Providence office by **November 15** in order to qualify for the reduced fee of $10. There is a $15 fee for listings received after the November 15 deadline.

Employers who attend the Joint Mathematics Meetings but do not want to interview, can post job

descriptions at the Employment Register. Postings will not be allowed in the Joint Meetings registration area. A fee of $15 will be charged payable to the cashier at the Joint Mathematics Meetings registration desk. Participants should be sure to inform the cashier that they would like to post a job description but are not planning to interview and obtain the proper receipt in order to receive the form necessary for posting at the Employment Register desk.

Applicants Not Planning to Attend

Applicants for professional positions in the mathematical sciences, who do not plan to attend the meeting in New Orleans and participate in the Employment Register, may also submit résumés for publication in the December issue if they use the MSER Form for Applicants at the back of this issue and observe the deadline of November 15. **(It is, of course, not necessary to preregister for the meeting or pay the Employment Register registration fee if one is not going to attend the meeting. Résumés will not be posted if the participant is not attending the meeting.)**

Winter Lists of Applicants and Employers

The Winter List of Applicants, which is a summary of the résumés of preregistered applicants, will be available for sale at the AMS Exhibits and Book Sale at the meeting. The price at the meeting is $3 each. Any copies remaining after the meeting will be available from the Providence office of the Society for $5 each.

The Winter List of Employers consists of summaries of the position listings submitted by the employers who preregistered for the meeting; it will be distributed to the applicants participating in the Register. Others may purchase the Winter List of Employers at the AMS Exhibits and Book Sale at the meeting or from the Providence office after the meeting. The prices are the same as stated in the previous paragraph.

Please note that these lists will not be updated with onsite employers or applicants after the Employment Register has concluded.

December Issue of Employment Information in the Mathematical Sciences

For several years the periodical *Employment Information in the Mathematical Sciences* (EIMS) has published six issues per year listing open positions in academic, governmental and industrial organizations, primarily in North America, along with a few listings from countries in other parts of the world. EIMS is a joint project of the American Mathematical Society (publisher), the Mathematical Association of America, and the Society for Industrial and Applied Mathematics.

The December issue of EIMS contains résumés of persons seeking professional positions in the mathematical sciences. Résumés of applicants taking part in the Employment Register will be included in the December 1985 issue provided they are received before the November 15 deadline and are in satisfactory condition. Other mathematical scientists who wish to be included may have their résumés printed if the same deadline is observed and if the copy supplied meets the same technical requirements described in the following section.

Copies of the December issue of EIMS will be distributed both to subscribers and to the employers who participate in the Employment Register. Job applicants planning to participate in the Employment Register in New Orleans are therefore strongly urged to preregister so that their résumés can appear in the December issue. Please note that the December issue of EIMS contains the Winter List of Applicants, but does not contain the Winter List of Employers.) Additional copies of the December Issue of EIMS will be available for sale at the AMS Book Sale at the meeting. Prices at the meeting are $6 each for the December issue. Any copies remaining after the meeting will be available from the Providence office of the Society for $11.

Preparation of Applicants' Résumés for the December issue of EIMS

The December issue of EIMS will be printed using photographic reproductions of forms completed and submitted by applicants. For this reason, special care must be exercised by those who prepare the forms in order to assure that the results are of good quality, and will be clear and legible after they have been photographed, reduced in size, and printed.

Because an employer's first impressions of an applicant are likely to be based on the appearance of the printed form, applicants are strongly advised to study the suggestions given below before the forms are filled out, so that the original copy will be neither marred nor damaged.

The forms **must** be carefully typed using a new black ribbon. The best results are obtained by using a modern typewriter with a carbon-coated polyethylene film ribbon, but satisfactory results may be obtained with a ribbon made of nylon or other woven fabric if suitable care is exercised. It is important that the keys be clean and make a sharp clear impression, which must be a uniform dark black. Gray, blue, or other colors will not reproduce and should, therefore, not be used. Do not use an eraser, as it will cause smudges which reproduce when photographed. Use a correcting typewriter, or correction tape or fluid, if necessary.

Only an original copy of the form should be submitted, a photocopy or xerographic reproduction will not reproduce as well and may not be accepted for publication. It is therefore important to exercise care in order to assure that the results are satisfactory.

Submission of copy of good quality is entirely the responsibilty of the applicant. The Society (which will print this material) must be the final judge of what copy is capable of being reproduced adequately, and therefore of what is acceptable for inclusion in the printed booklet. The Society will not correct or replace inadequate copy, and cannot prepare original copy. In the event the quality of a résumé, submitted by an applicant participating in the Employment Register, does not meet the necessary conditions for inclusion in the December issue, the résumé will be returned if time allows; otherwise the résumé will be posted at the Employment Register in New Orleans, along with those of the other participants. **Forms received past the deadline will be returned.**

Approximation Theory (January 5-6, 1986)

Synopses and Reading Lists

The following synopses are arranged in the order of presentation as currently scheduled. The final schedule will be available at the Short Course registration desk.

Approximation of Functions (R. DeVore). The famous theorem of Weierstrass says that any continuous function f on a finite interval can be approximated arbitrarily well (in the uniform norm) by algebraic polynomials. But how do we construct "good" or "best" approximations by polynomials of a fixed degree and how rapidly do these approximations converge to f? These questions were studied at the turn of the century and their solution forms the foundation of the theory of approximation of functions. It is the purpose of this lecture to describe these and other more recent results on the approximation of functions.

The first part of this lecture develops the Chebyshev alternation theorems which are then used to give the uniqueness and characterization of best approximations by polynomials of fixed degree. Some simple examples are given where best approximations can be explicitly computed.

Generally speaking, best approximations can only be computed numerically. This points out the importance of approximation methods which give "good" but perhaps not best approximants. Several such methods are discussed including interpolation schemes and linear integral operators.

For computation, polynomials are not as desirable as piecewise polynomials or spline functions. The approximation properties of these latter functions rest on estimates for approximation by polynomials of small degree in terms of the length of the interval of approximation. These can then be pieced together to provide good approximations on a fixed larger interval.

It has recently become clear that nonlinear methods of approximation can give dramatic reduction in the error of approximation for functions with singularities. Some discussion will be given of these methods, including adaptive methods, optimal knot spline approximation and approximation by rational functions.

1. C. de Boor, *A practical guide to splines*, Applied Mathematical Sciences, Vol. 27, Springer-Verlag, New York, 1978.

2. W. Cheney, *Approximation theory*, 2nd Edition, Chelsea Publishing Co., New York, 1982.

3. G. G. Lorentz, *Approximation of functions*, Holt, Rinehart and Winson, Inc., New York, 1966.

4. L. Schumaker, *Spline functions: Basic theory*, Wiley-Interscience, New York, 1981.

Approximation and Interpolation by Rational Functions (E. B. Saff). How does rational approximation compare with polynomial approximation? That is, does division really make a difference?

Physicists and engineers use rational approximation to aid in filter design and study critical point phenomena. When data is given in the form of moments (or coefficients of a power series) interpolating rationals such as Padé approximants are often used. Furthermore, rational interpolants to the exponential function provide a useful tool in the stability analysis of certain numerical methods for solving differential equations.

The goal of the lecture is to provide an introduction to the theory of rational approximation and interpolation that will emphasize the differences between the linear (polynomial) and nonlinear (rational) cases.

1. G. A. Baker, Jr., and P. Graves-Morris, *Padé approximants* I *and* II, Encyclopedia of Mathematics, Cambridge University Press, 1981.

2. E. W. Cheney, *Introduction to approximation theory*, McGraw-Hill, New York, 1966.

3. A. A. Gončar, *On the speed of rational approximation of some analytic functions*, Math. U.S.S.R. Sb. **34** (1978), 131–145.

4. D. J. Newman, *Approximation with rational functions*, CBMS Regional Conf. Ser. in Math., Vol. 41, Amer. Math. Soc., Providence, RI, 1979.

5. J. L. Walsh, *Interpolation and approximation by rational functions in the complex domain*, 5th Edition, Colloquium Publications, Vol. 20, Amer. Math. Soc., Providence, RI, 1969.

***n*-Widths and Optimal Recovery** (A. Pinkus). n-Widths and optimal recovery (estimation) are relatively new topics in approximation theory. They differ from the more classical theories in that they are concerned with problems of determining best or near best subspaces, linear operators, algorithms, or whatever (from some limited class of such objects depending on the parameter n) with which to approximate elements of an *a priori* given class.

As an illustration of one of the n-width concepts, let A be a subset of a normed linear space X. For a given n-dimensional subspace X_n of X, one measures the extent to which X_n approximates A in X by considering the distance of X_n to each element of A and then taking the supremum over all elements in A. The determination of this value is an oft-studied classical problem in approximation theory for

specific choices of A, X and X_n. The n-width, in the sense of Kolmogorov, of A in X, goes one step further in that one now varies, in the above problem, over all n-dimensional subspaces of X_n of X. In other words, one searches for a best n-dimensional subspace with which to approximate A. Thus this n-width also provides us with a lower bound on the extent to which it is possible to approximate A by n-dimensional subspaces.

The theory of optimal recovery starts from a totally different premise. To illustrate with one example from the theory, let A and X be as above. Assume that we are given the same n pieces of linear information concerning each element of A. These may, for example, be n specified point evaluations if the elements of A are continuous functions. Based on these n pieces of information, the object is to find the best algorithm with which to reconstruct (recover) elements of A.

These two seemingly independent problems are related when one wants to choose, a priori, n "optimal" pieces of information. Consequently various n-width concepts provide lower bounds for the optimal recovery problem.

In this talk we present an overview of some of the main concepts in the theory of n-widths and optimal recovery, illustrating them with various examples.

1. C. A. Micchelli and T. J. Rivlin, *A survey of optimal recovery*, Optimal Estimation in Approximation Theory, C. A. Micchelli and T. J. Rivlin (editors), Plenum Press, New York, 1977, pages 1–54.

2. A. Pinkus, *n-Widths in approximation theory: A survey*, Approximation Theory IV, C. K. Chui, L. L. Schumaker and J. D. Ward (editors), Academic Press, New York, 1980, pages 153–180.

3. A. Pinkus, *n-Widths in approximation theory*, Springer-Verlag, Berlin, 1985.

4. J. F. Traub and H. Wozniakowski, *A General Theory of Optimal Algorithms*, Academic Press, New York, 1980.

Algorithms for Approximation (E. W. Cheney). Approximation theory is partly motivated by practical problems of representing functions, and the study of algorithms therefore plays a central role. Five algorithms illustrating the diversity of the subject are these:

(A) The 2nd algorithm of Remez for approximating a continuous real-valued function on a compact interval by a polynomial of given degree.

(B) An "exchange algorithm" for uniform approximation in any space of continuous functions by elements of a finite-dimensional subspace.

(C) An algorithm for uniform approximation by generalized rational functions.

(D) The alternating algorithm of von Neumann for best approximations in the vector sum of two subspaces.

(E) The algorithm of von Golitschek for approximation by nomographic functions.

1. M. J. D. Powell, *Approximation theory and methods*, Cambridge University Press, Oxford, 1981.

2. E. H. Kaufman, Jr., S. F. McCormick and G. D. Taylor, *An adaptive differential-correction algorithm*, J. Approximation Theory **37** (1983), 197–211.

3. F. Deutsch, *von Neumann's alternating method: The rate of convergence*, Approximation Theory IV, C. Chui, L. L. Schumaker and J. D. Ward (editors), Academic Press, New York, 1984, pages 427–434.

4. M. von Golitschek, *Shortest path algorithms for the approximation by nomographic functions*, Approximation Theory and Functional Analysis, P. L. Butzer, R. L. Stens and B. Sz.-Nagy, (editors), ISNM, Vol. 65, Birkhäuser-Verlag, Basel, 1984.

Algebraic Aspects of Interpolation (C. A. Micchelli). Conceptually, interpolation is the simplest method of approximation. A particular function is selected from a class of functions by the requirement that it match given values at a finite set of points in its domain.

Applications of interpolation in science and engineering are manifold indeed. Interpolation is a basic part of many numerical methods and so a rudimentary understanding of the elements of interpolation is important. But, while univariate interpolation has been exhaustively studied, multivariate interpolation is an area of current research.

We will present some fundamental ideas for interpolation. In the first part of the lecture, we review results from univariate interpolation. We discuss polynomial interpolation, trigonometric interpolation, interpolation by spline functions, and introduce the general notion of Chebyshev system. Multivariate interpolation, the topic of the remainder of the lecture, offers a significantly harder theoretical and computational challenge. We will present some recent results on multivariate interpolation which are related to thin plate splines, a popular method for interpolation of scattered data, and to polyhedral splines, the subject of K. Höllig's lecture.

Part 1. Univariate Interpolation
- 1.1. Polynomial Interpolation
- 1.2. Trigonometric Interpolation
- 1.3. Spline Interpolation
- 1.4. Chebyshev Systems

Part 2. Multivariate Interpolation
- 2.1. Optimal Interpolation
- 2.2. Interpolation on Special Configurations
- 2.3. Radon Transform and Interpolation

1. C. de Boor, *A practical guide to splines*, Springer-Verlag, New York, 1978.

2. A. Cavaretta, C. A. Micchelli and A. Sharma, *Multivariate interpolation and the Radon transform*, Math. Z. **174** (1980), 263–279.

3. W. Dahmen and C. A. Micchelli, *On the limits of multivariate B-splines*, J. d'Analyse Math. **39** (1981), 256–278.

4. S. Karlin and W. J. Studden, *Tchebycheff systems: With applications in analysis and statistics*, Interscience, New York, 1966.

5. C. A. Micchelli, *Interpolation of scattered data: Distance matrices and conditionally positive definite functions*, IBM Research Report, 1984.

6. I. J. Schoenberg and A. Whitney, *On Pólya frequency functions, III: The positivity of translation determinants with application to the interpolation problem by spline curves*, Trans. Amer. Math. Soc. **74** (1953), 246–259.

Multivariate Splines (K. Höllig). We give an introduction to multivariate splines discussing theoretical results as well as applications to computer graphics.

Multivariate B-splines can be defined as "shadows" of convex polyhedra. From this general definition recurrence relations and properties such as local support, positivity and smoothness are easily derived. Two special cases, simplex splines and box splines, have been extensively studied and this has led to interesting results on the degree of approximation, cardinal interpolation, diophantine equations, shape preserving data fitting and subdivision algorithms for parametric surfaces.

Box splines are generalizations of tensor product splines to triangular meshes. We have used them to analyze smooth piecewise polynomials in several variables. A surprising result is that the approximation order is not always given by the degree of the polynomials which can be represented by linear combinations of locally supported basis functions. Also, the dimension of a space of piecewise polynomials is in general not determined by the combinatorial structure of the mesh alone. Both phenomena are due to the more complicated nature of smoothness constraints in several variables.

Box spline techniques have been applied in computer aided design and much of the univariate machinery for manipulating B-spline series could be generalized. We will discuss knot insertion and other refinement algorithms which are the basis for rendering of spline surfaces and computation of intersections.

1. C. de Boor, *A practical guide to splines*, Springer-Verlag, New York, 1978, Chapters 9–11.

2. C. de Boor and K. Höllig, *B-splines from parallelepipeds*, J. d'Analyse Math. **42** (1982/83), 99–115.

3. C. de Boor and K. Höllig, *Bivariate box splines and smooth pp functions on a three direction mesh*, J. Comput. Appl. Math. **9** (1983), 13–28.

4. E. Cohen, T. Lyche and R. Riesenfeld, *Discrete box splines and refinement algorithms*, Computer Aided Geometric Design **1** (1984), 131–148.

5. W. Dahmen and C. A. Micchelli, *Recent progress in multivariate splines*, Approximation Theory IV, C. K. Chui, L. L. Schumaker and J. Ward, eds., Academic Press, New York, 1984, pages 27–121.

Factorizations of $b^n \pm 1$, b = 2, 3, 5, 6, 7, 10, 11, 12 up to High Powers

John Brillhart, D. H. Lehmer, J. L. Selfridge, Bryant Tuckerman, and S. S. Wagstaff, Jr.

Every person interested in factorization has been waiting eagerly to see this book. Now and then during the past twenty or so years word has reached us about the so-called Cunningham Project, being carried out by a group of dedicated persons. No conceivable effort has been spared to make these factor tables as complete and as accurate as possible, even though their planned range surpasses the limits of what can be achieved by today's factorization algorithms and computers.

The book begins with some handy short tables for the factorizations of $2^n \pm 1$ and $10^n \pm 1$. Then follows a most readable historic account on the development of factorization methods and tools over the past years, covering 40 pages of text. The rest of the book is taken up by the Main Tables, giving all to date known factorizations of the numbers within the range set out for each of the tables.

And–best of all–update sheets containing brand new information found by the authors or communicated to the authors by other researchers are offered the owners of the book. One formal update, covering the period from autumn 1982, when the manuscript was sent to the printer, and to July 20, 1983, when the book was issued, is included in a pocket on the back inside cover. It contains such interesting factorizations as $2^{212}+1$, $2^{253}-1$, and $10^{64}+1$. After this, several "informal" sheets with further factorizations have been sent out, giving among others, the factors of $2^{211}-1$, $2^{251}-1$, and $10^{67}-1$.

– *Hans Riesel,*
Royal Institute & Technology, Stockholm

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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.

New Orleans, January 1986

Joseph N. Bernstein	Haynes R. Miller
Lennart A. E. Carleson	Jane Cronin Scanlon
Alexander S. Kechris	S. T. Yau
Sergiu Klainerman	(Colloquium Lecturer)

Indianapolis, April 1986

Steven Bell	Richard McGehee
Jean Bourgain	Niels Nygaard

Baltimore, May 1986

Demitrios Christopoulou	Anthony W. Knapp
David A. Cox	Steven M. Zucker

Organizers and Topics of Special Sessions

The list below contains all the information about Special Sessions at meetings of the Society available at the time this issue of the *Notices* went to the printer. The section below entitled **Information for Organizers** describes the timetable for announcing the existence of Special Sessions.

January 1986 Meeting in New Orleans

Associate Secretary: Frank T. Birtel

Deadline for organizers: Expired
Deadline for consideration: Expired

Gary S. Bloom and D. F. Hsu, *Graph labelings*

Richard Bronson, *Mathematical modeling and computer simulation to problems in other disciplines*

Peter L. Duren, *Complex analysis*

Robert B. Gardner and William F. Shadwick, *Equivalence problems and applications*

Eric L. Grinberg and Eric Todd Quinto, *Radon transforms and tomography*

Rebecca A. Herb and Paul J. Sally, Jr., *Harmonic analysis on reductive groups*

Alexander S. Kechris and W. Hugh Woodin, *Determinacy and large cardinals*

Sung J. Lee, *Operator method of optimal control problems*

Erwin Lutwak, *Convexity*

Jorge Martinez, *Ordered algebras*

Peter A. McCoy, *Analytic methods in differential equations*

Stephen A. Mitchell, *Homotopy theory*

Paul S. Muhly, *Operator theory and several complex variables*

Jane Cronin Scanlon, *Mathematical biology*

Claude L. Schochet and Kenneth C. Millett, *Operator algebras and foliations*

Jalal Shatah and Sergiu Klainerman, *Recent advances in nonlinear hyperbolic equations*

Lutz Weis, *Positive operators and their applications*

April 1986 Meeting in Indianapolis

Central Section

Deadline for organizers: October 15, 1985
Deadline for consideration: January 15, 1986

May 1986 Meeting in Baltimore

Eastern Section

Deadline for organizers: October 15, 1985
Deadline for consideration: January 20, 1986

Spring 1986 Meeting

Far Western Section

No meeting will be held

Spring 1986 Meeting

Southeastern Section

No meeting will be held

October 1986 Meeting in Logan

Far Western Section

Deadline for organizers: April 15, 1986
Deadline for consideration: To be announced

October 1986 Meeting in Denton

Central Section

Deadline for organizers: April 15, 1986
Deadline for consideration: To be announced

Fall 1986 Meeting

Eastern Section

Deadline for organizers: April 15, 1986
Deadline for consideration: To be announced

Fall 1986 Meeting

Southeastern Section

Deadline for organizers: April 15, 1986
Deadline for consideration: To be announced

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, which 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 the *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 the *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.

Abstracts of papers submitted for consideration for presentation at a Special Session must be received by the Providence office (Editorial Department, American Mathematical Society, Post Office 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.

Joint Summer Research Conferences in the Mathematical Sciences

University of California, Santa Cruz, June 22 to August 2, 1986

The 1986 Joint Summer Research Conferences in the Mathematical Sciences will be held at the University of California, Santa Cruz, from June 22 to August 2, 1986. It is anticipated that the series of conferences may be supported by a grant from the National Science Foundation.

There will be six conferences in six different areas of mathematics. Each week participants will arrive on Sunday and leave the following Saturday. Lectures will begin on Monday morning and end Friday afternoon. The topics and organizers for the six conferences were selected by the AMS-IMS-SIAM Commmittee on Joint Summer Research Conferences in the Mathematical Sciences. The selections were based on suggestions made by the members of the committee and individuals submitting proposals. The committee considered it important that the conferences represent diverse areas of mathematical activity, with emphasis on areas currently especially active, and paid careful attention to subjects in which there is important interdisciplinary activity at present.

The conferences will be similiar in structure to those held throughout the year at Oberwolfach. These conferences are intended to complement the Society's program of annual Summer Institutes and Summer Seminars, which have a larger attendance and are substantially broader in scope. The conferences are research conferences, and are not intended to provide an entree to a field in which a participant has not already worked.

It is expected that funding will be available for a limited number of participants in each conference. Others, in addition to those funded, will be welcome, within the limitations of the facilities of the campus. Housing accommodations will be available on campus for those attending the conferences. A brochure describing the facilities available at the University of California, Santa Cruz, will be available from the AMS office in March 1986. The brochure will include information on firm room rates, the residence and dining hall facilities, as well as local information and a reservation form to be used for requesting accommodations on campus. Each participant is expected to pay a registration fee and a social fee to cover the cost of refreshments served at breaks and for social events.

Those interested in attending one of the conferences should request an application form from Carole Kohanski, Summer Research Conference Coordinator, American Mathematical Society, Post Office Box 6248, Providence, RI 02940 (401-272-9500, extension 286), specifying which conference they wish to attend. Selection of the participants and the allocation of support will be made by the Organizing Committee for each individual conference. Women and members of minority groups are encouraged to apply and to participate in these conferences. The deadline for receipt of applications is **February 3, 1986**. Those who wish to apply for a grant-in-aid should so indicate on the application form; however, funds available for these conferences are limited and so individuals who can obtain support from other sources should do so. For information on the scientific program, interested participants should contact the chairman of the conference they plan to attend.

The Joint Summer Research Conferences in the Mathematical Sciences are under the direction of the AMS-IMS-SIAM Committee on Joint Summer Research Conferences in the Mathematical Sciences. The following committee members chose the topics for the 1986 conferences: Ronald L. Graham, Benedict H. Gross, Malcolm R. Leadbetter, Angus J. Macintyre, Jerrold E. Marsden, John R. Martin, James McKenna, Tilla Klotz Milnor, Evelyn Nelson, Katsumi Nomizu, and R. O. Wells, Jr. (chairman).

June 22 to June 28

Mathematics in general relativity

JAMES ISENBERG (University of Oregon), Chairman

General relativity has always been one of the most fruitful areas for collaboration between mathematicians and physicists. Techniques from differential geometry, from topological dynamics, and from the analysis of nonlinear systems of partial differential equations have been used to study important problems in general relativity (e.g., the positive mass question and the spacetime singularity problem) while general relativity has strongly stimulated many areas of study in mathematics (e.g., spinor analysis, and the study of self-dual Riemannian manifolds). The increasing use of general relativity and allied theories (such as Kaluza-Klein and superstrings) in astrophysics, cosmology, and particle physics has enhanced its physical interest and also enriched its mathematical content. Thus it is important that the mathematics-physics collaboration in this area be continued. The purpose of this conference is to encourage this by acquainting mathematicians with some of the problems of current interest in general relativity, and acquainting physicists with some of the recent developments in mathematics.

Members of the Organizing Committee: Gary Horowitz (University of California, Santa Barbara), Lee Lindblom (University of Chicago), and Richard Schoen (University of California, San Diego).

June 29 to July 5

Large scale data analysis via computer graphics

ANDREAS BUJA (University of Washington), Co-Chairman

WERNER STUETZLE (University of Washington), Co-Chairman

The summer conference will focus on new computing environments and computational methods for data analysis. The new environments will differ both from batch packages (such as SPSS and BMDP) and statistical languages (such as S and ISP) in a number of important aspects. We anticipate these third generation environments to be cooperative systems integrating history mechanisms, data base management, and capabilities for advising, education, and self-documentation with more standard statistical functions. Users will converse with systems

largely through high interaction graphics, rather than through alpha-numeric input and output.

We also expect that new styles of programming, such as data-driven and object-oriented programming, will have an impact on statistical computing environments. New statistical systems may allow data analysts to operate on abstractions such as signals, surfaces, and models, besides the usual vectors, matrices, and strings.

Many of the ideas mentioned above have arisen out of research in programming environments and in artificial intelligence. We will invite researchers in these areas to present tutorials, and will illicit progress reports and discussions from the participating statisticians.

July 6 to July 12

Time reversal of Markov processes and potential theory

JOSEPH GLOVER (University of Florida), Chairman

Time reversal of Markov processes emerged in the last decade as a powerful technique not only in the study of Markov processes themselves, but also in concrete applications in such closely allied areas as infinite particle systems and statistical mechanics, partial differential equations, potential theory and quantum field theory. The purpose of this conference is to speed the "cross-fertilization" of these ideas. Topics presented will be chosen to maintain a balance between theory and applications.

Members of the Organizing Committee: K. L. Chung (Stanford University) and Ronald K. Getoor (University of California, San Diego).

July 13 to July 26

Artin's braid group

JOAN S. BIRMAN (Columbia University), Chairman

Braid groups were introduced into the mathematical literature in 1925 in a seminal paper by E. Artin. In the years since, and in particular during the last 5–10 years, they have played a role in diverse and unexpected ways in widely different areas of mathematics, including knot theory, homotopy theory, singularity theory, reflection groups, dynamical systems, and most recently operator algebras, where new discoveries are closing the gap by having striking applications to knots and links. The purpose of the conference is to bring together specialists from these different areas of mathematics who have used braids in a significant way in their research, to discuss their discoveries and exchange ideas and open problems concerning this important and fundamental group.

The program will be built around a series of expository talks aimed at acquainting specialists in one area with the ways in which braids have played a role in other areas. The areas to be covered will include:

1. The theory of knots and links in the 3-sphere
2. Homotopy theory
3. Singularity theory
4. Reflection groups
5. Dynamical systems
6. Operator algebras

Members of the Organizing Committee: Ralph Cohen (Stanford University), John Franks (Northwestern University), Vaughn Jones (University of Pennsylvania), and Anatole Libgober (University of Illinois, Chicago Circle).

July 20 to July 26

Discrete and computational geometry

JACOB E. GOODMAN (City College, CUNY), Co-Chairman

RICHARD POLLACK (Courant Institute of Mathematical Sciences, New York University), Co-Chairman

Recent years have seen the solution of several long-outstanding problems in combinatorial geometry by powerful new methods, such as the Dirac conjecture on the connecting lines of a planar configuration and the characterization of the face vectors of simplicial polytopes. During the same period, there has been a growing interaction between mathematicians and computer scientists centered around the newly-flowering branch of computer science known as computational geometry, with mathematicians discovering (and sometimes even solving!) interesting and significant computational problems, and computer scientists stimulating and being stimulated by "purely" mathematical work. It is our intention, through the proposed conference, to promote this recently-begun cross-fertilization between discrete and computational geometry, by encouraging a dialogue between mathematicians and computer scientists actively working in these two areas.

Topics covered will include combinatorial geometry, design and analysis of geometric algorithms, convex polytopes, multidimensional searching and sorting, extremal geometric problems, as well as applications of these to such currently active areas as mathematical programming, computer graphics, VLSI design, and robotics.

Members of the Organizing Committee: David P. Dobkin (Princeton University) and Branko Grünbaum (University of Washington).

July 27 to August 2

Representation theory of Lie groups

WILFRIED SCHMID (Harvard University), Chairman

The conference will focus on major recent developments in the subject, including:

1. Progress towards an understanding of the unitary dual of real and p-adic groups.
2. Harmonic analysis on indefinite symmetric spaces.
3. The theory of D-modules as a tool in representation theory.

In addition we expect some discussion of applications that motivate practitioners of the subject, to number theory, geometry and mathematical physics.

Members of the Organizing Committee: Thomas J. Enright (University of California, San Diego), Henryk Hecht (University of Utah), David A. Vogan (Massachusetts Institute of Technology), Joseph A. Wolf (University of California, Berkeley), and Gregg Zuckerman (Yale University).

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 inside the front cover.)

AN ANNOUNCEMENT will be published in the *Notices* if it contains a call for papers, and specifies the place, date, subject (when applicable), and the speakers; a second 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 the *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 the *Notices* prior to the meeting in question. To achieve this, listings should be received in Providence SIX MONTHS prior to the scheduled date of the meeting.

1984–1985. **Academic Year Devoted to Nonlinear Differential Equations**, The Mittag-Leffler Institute, Djursholm, Sweden. (February 1984, p. 194)

1984–1985. **Special Year Devoted to Minimal Surfaces and their Applications to Low-Dimensional Topology**, Department of Mathematics, University of California, Santa Barbara, California. (October 1984, p. 690)

1984–1985. **Special Year Devoted to Reacting Flows: Combustion and Chemical Reactors**, Center for Applied Mathematics, Cornell University, Ithaca, New York. (April 1984, p. 333)

1984–1985. **Special Year in Mathematical Logic and Theoretical Computer Science**, University of Maryland, College Park, Maryland. (March 1985, p. 267)

1984–1985. **Special Year in Singularities and Algebraic Geometry**, University of North Carolina, Chapel Hill, North Carolina. (June 1985, p. 397)

October 7, 1984–December 14, 1985. **Mathematisches Forschungsinstitut Oberwolfach** (Weekly Conferences), Federal Republic of Germany. (October 1984, p. 689)

1985. **European Mechanics Colloquia**, Various locations. (October 1984, p. 690)

1985–1986. **Academic Year Devoted to Nonlinear Differential Equations**, Mittag-Leffler Institute, Djursholm, Sweden. (January 1985, p. 89)

1985–1986. **Special Year in Complex Analysis**, University of Maryland, College Park, Maryland. (August 1985, p. 522)

1985–1986. **Special Year in Differential Geometry**, University of Illinois, Urbana-Champaign, Illinois.

Information: S. I. Goldberg, F. Kamber, Ph. Tondeur, Department of Mathematics, University of Illinois, 273 Altgeld Hall, 1409 West Green Street, Urbana, Illinois 61801.

1985–1986. **Special Year in Operator Theory**, Indiana University, Bloomington, Indiana. (August 1985, p. 522)

1985–1986. **Year in Mathematical Logic**, University of Notre Dame, Notre Dame, Indiana.

Program: The emphasis is on model theory. Long term visitors are E. Bouscaren, B. Poizat, P. Rothmaler and S. Thomas. A conference will be held in March 1986. Funds will be available for some short term visitors.

Information: J. Knight, M. Nadel or A. Pillay, Department of Mathematics, University of Notre Dame, Notre Dame, Indiana 46556.

August 16, 1985–August 15, 1986. **Program on Stochastic Differential Equations and Their Applications**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 397)

October 1985–October 1986. **Material Instabilities in Continuum Mechanics**, Heriot-Watt University, Edinburgh, Scotland. (June 1985, p. 397)

OCTOBER 1985

5–6. **Midwest Partial Differential Equations Conference**, University of Notre Dame, Notre Dame, Indiana. (Note changes from June 1985, p. 401)

Information: N. Stanton or G. Roberts, University of Notre Dame, Notre Dame, Indiana 46556.

7–11. **National Science Foundation Regional Conference**, Oklahoma State University, Stillwater, Oklahoma. (August 1985, p. 524)

7–11. **Segundo Congreso Nacional de Matemáticas**, Universidad de Costa Rica, San José, Costa Rica.

Program: Twenty-minute talks in all fields of mathematics, pure and applied, as well as in mathematics teaching at all levels.

Information: Angel Ruiz, Escuela de Matemática, Universidad de Costa Rica, San José, Costa Rica. Telephone: 25-55-55, extension 742.

7–12. **Waves and Stability in Continuous Media**, University of Bari, Bari, Italy. (June 1985, p. 401)

10–13. **Conference on Homotopy Theory and Its Geometric Applications**, Yale University, New Haven, Connecticut.

Organizing Committee: J. R. Harper, D. W. Kahn, R. Lee, F. P. Peterson, L. Smith.

Purpose: In honor of W. S. Massey's 65th birthday. Sponsored by the National Science Foundation.

Program: About thirteen principal lectures and some shorter lectures will be given in the area of homotopy theory.

Principal Speakers: W. G. Dwyer, J. R. Harper, W. C. Hsiang, J. P. Levine, R. Lee, J. P. Lin, W. S. Massey, M. Mahowald, H. R. Miller, J. C. Moore, F. P. Peterson, L. Smith, L. Traldi.

Information: Conference on Homotopy Theory, Department of Mathematics, Yale University, Box 2155 Yale Station, New Haven, Connecticut 06520.

16–20. **International Conference on Partial Differential Equations in Complex Analysis**, State University of New York at Albany, New York. (August 1985, p. 524)

18–19. **Seventh Midwest Probability Symposium**, Northwestern University, Evanston, Illinois. (June 1985, p. 401)

20–24. **Frontiers of the Mathematical Sciences: 1985**, Courant Institute of Mathematical Sciences, New York, New York. (August 1985, p. 524)

21–23. **Artificial Intelligence in Engineering**, The George Washington University, Washington, D.C. (August 1985, p. 524)

21–23. **Twenty-Sixth Annual Symposium on Foundations of Computer Science**, Portland Marriot Hotel, Portland, Oregon. (June 1985, p. 401)

21–24. **Symposium in Honor of P. D. Lax, L. Nirenberg and J. J. Stoker**, Courant Institute of Mathematical Sciences, New York University, New York, New York. (March 1985, p. 192)

22–24. **Seventeenth National SAMPE Technical Conference**, Kiamesha Lake, New York. (October 1984, p. 694)

25–26. **Fifth Southeastern-Atlantic Regional Conference on Differential Equations**, Georgia Institute of Technology, Atlanta, Georgia. (June 1985, p. 402)

26–27. **Weyl Centennary Symposium**, University of Massachusetts, Amherst, Massachusetts.

Purpose: Talks given to commemorate the centennary of the birth of Hermann Weyl (1855–1955).

Speakers: A. Selberg, R. Bott, R. Cohen, I. Segal, S. Sternberg, R. Ackermann, A. Jaffe, H. McKean, D. Stroock, V. Guillemin, M. Berger, W. Everitt, M. Senechal, P. Werner.

Information: Contact G. Healy, Coordinator, Department of Mathematics, University of Massachusetts, Amherst, Massachusetts 01003, 413-545-0267.

28–30. **International Symposium on Advances in Nonlinear Partial Differential Equations**, Madison, Wisconsin. (March 1985, p. 272)

28–30. **SIAM 1985 Fall Meeting**, Arizona State University, Tempe, Arizona. (January 1985, p. 93)

31. **Fourteenth Annual Midwest Differential Equations Conference**, University of Missouri, Columbia, Missouri. (March 1985, p. 272)

NOVEMBER 1985

4–15. **Workshop on Large Deviation Theory**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 402)

13–19. **International Conference, Algebraic Geometry**, Humboldt-Universität, Berlin, German Democratic Republic. (August 1985, p. 524)

14–15. **Conference on Applied Analysis in Aerospace and Industrial Research**, University of Houston, Houston, Texas. (August 1985, p. 524)

18–20. **Second SIAM Conference on Parallel Processing and Scientific Computing**, Norfolk, Virginia. (January 1985, p. 93)

18–21. **Second SIAM Conference on Parallel Processing for Scientific Computing**, Omni Hotel, Norfolk, Virginia.

Program: Conference themes include supercomputer architectures, performance of algorithms, parallel and vector algorithms optimization, communication/synchronization overhead in parallel systems, modeling on supercomputers, high performance computing, parallel methods for differential equations, parallel linear system solvers, programming environments for parallel systems and algorithms and computer architectures. There will be demonstrations of hardware and software products and services at the conference.

Information: To receive material on the conference, please contact the Conference Coordinator, SIAM, 117 South 17th Street, Suite 1400, Philadelphia, Pennsylvania 19103-5052, 215-564-2929.

18–22. **Conference on Function-Theoretic Operator Theory**, Indiana University, Bloomington, Indiana. (August 1985, p. 524)

21–22. **Twentieth Actuarial Research Conference**, University of Texas, Austin, Texas. (June 1985, p. 402)

26–30. **Géométrie différentielle**, CIRM-Luminy, France. (August 1985, p. 524)

DECEMBER 1985

7–9. **Canadian Mathematical Society Annual Winter Meeting**, University of Calgary, Calgary, Ontario, Canada. (August 1985, p. 524)

16–19. **International Symposium on Foundations of Statistical Reference**, Mandarin Hotel, Tel-Aviv, Israel.

Program: Formal talks and informal discussions will focus on the philosophical and scientific justifications of the methods of statistical inference, on analysis and on statistical modeling as they relate to real life application in science and technology.

Information: Shulamit Cahana, Conference Unit, National Council for Research and Development, Ministry of Science and Development, Jerusalem 42700, Israel.

16–20. **Second Chilean Mathematics Symposium**, Universidad de Talca, Chile.

Program: The purpose of this International meeting is to bring together Chilean research mathematicians who work in Chile or abroad and foreign specialists in mathematical topics being developed in Chile at the present time.

Information: Write or phone Secretaría, Segundo Simposio Chileno de Matemática, Universidad de Talca, Casilla 747, Talca, Chile. Telephone: 071-31682, extension 207.

16–21. **Methods of Functional Analysis in Approximation Theory**, Indian Institute of Technology, Bombay, India. (March 1985, p. 272)

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JANUARY 1986

Workshop on Regularity of P.D.E., Harmonic Analysis, Malliavin Calculus, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota.

Organizer: D. Stroock.

Program: A variety of seminars will be given on Workshop topics during the month of January as part of the Institute's year long Program on Stochastic Differential Equations and their Applications.

Information: Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street S.E., Minnneapolis, Minnesota 55455, 617-373-0355.

6–10. **Saint-Etienne: Congrès international sur les problèmes hyperboliques: théorie, méthodes numériques, grandes applications**, Université Saint-Etienne, 23 rue Doct. P. Michelon, 42023 Saint-Etienne Cedex, France.

Organizers: C. Carasso, Rascle, Raviart, D. Serre.

Information: C. Carasso, Anal. num., Université Saint-Etienne, 23 rue Doct. P. Michelon, 42023 Saint-Etienne Cedex, France.

11. **TEX Seminar**, To be held at a location (to be announced) in the immediate vicinity of the Joint Meeting in New Orleans.

Program: The TEX Users Group will offer a one-day seminar on the TEX series of programs for preparation of scientific papers for publication. This typesetting system was developed by Donald Knuth of the Stanford University Computer Science Department. The purpose

of this seminar will be to demonstrate the use of TEX in solving problems of mathematical display and typography. A fee of $45 will be charged.

Information: TEX Users Group, Post Office Box 9506, Providence, Rhode Island 02940, 401-272-9500, extension 232.

13–17. **Fifth International Symposium on Approximation Theory**, Texas A&M University, College Station, Texas. (June 1985, p. 402)

FEBRUARY 1986

3–July 26. **Special Semester and International Conference on Holomorphic Dynamical Systems**, Instituto de Matemáticas, Universidad Nacional Autónoma de México. (August 1985, p. 525)

4–6. **Fourteenth Annual Computer Science Conference**, Cincinnati Convention Center, Cincinnati, Ohio.

Program: There will be theme-oriented keynote addresses, invited papers, refereed papers, panel sessions, and abstracts. Among the themes which are being developed for CSC '86 are Software Engineering, Fifth Generation Computers, and Artificial Intelligence.

Call for papers: Papers are sought on topics including, but not limited to, CSC '86 themes. Papers are limited to ten pages, presentations to twenty minutes. Five copies of complete papers must be received for reviewing by September 1.

Information: L. A. Crum, Program Chairman, CSC '86, Department of Computer Science, Wright State University, Dayton, Ohio 45435, 513-873-2491.

6–7. **ACM SIGCSE Symposium: Technical Symposium on Computer Science Education**, Cincinnati Convention Center, Cincinnati, Ohio.

Call for Papers: Four copies of completed papers along with a statement of intention to attend the conference are required by October 1, 1985.

Information: R. Austing, Computer Science Department, University of Maryland, College Park, Maryland 20742, 301-454-7937.

17–21. **Workshop on Disordered Systems, Percolation, and Self-Avoiding Random Walks**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 402)

MARCH 1986

3–8. **International Conference on Differential Equations and Mathematical Physics**, University of Alabama at Birmingham, Birmingham, Alabama.

Program: Topics in the general area of differential equation theory that we expect to emphasize include fluid mechanics, wave phenomena, spectral and scattering theory (including both two-body and n-body scattering, inverse theory, and qualitative properties of the spectra of singular ordinary and partial differential operators) and related applications to the equations of mathematical physics.

Speakers: S. Agmon, R. DiPerna, C. Foiaş, T. Kato, A. Majda, R. Newton, B. Simon.

Information: I. Knowles or Y. Saito, Department of Mathematics, University of Alabama at Birmingham, Birmingham, Alabama 35294, 205-934-2154, or J. Ward, Department of Mathematics, University of Alabama, University, Alabama 35486, 205-348-5071.

13–15. **The 250th Anniversary Conference on Graph Theory**, Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.

Organizers: Indiana University-Purdue University at Fort Wayne, Miami University, and Western Michigan University, with support from Central States Universities, Incorporated.

Purpose: To celebrate the 250th anniversary of the solution by Euler to the famous Königsberg bridges problem and honor F. Harary on the occasion of his 65th birthday.

Program: There wil be lectures on historical aspects of graph theory, invited talks by many leading graph theorists including F. Harary and some of his former students, and workshops conducted by experts in their fields, with emphasis on Eulerian graphs and algorithms. A limited number of contributed papers consistent with the emphasis of the conference will be considered for presentation. Publication of the proceedings is also being considered.

Information: L. W. Beineke or R. E. Pippert, Department of Mathematical Sciences, Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana 46805, 219-482-5314.

13–18. **Workshop on Holomorphic Functions and Moduli**, Mathematical Sciences Research Institute, Berkeley, California.

Program: This workshop is part of the program on Geometric Function Theory running from January to June 1986.

Information: Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720.

17–21. **Workshop on Hydrodynamic Behavior of Interacting Particle Systems**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 402)

19–22. **Matrix Theory Conference**, Auburn University, Auburn, Alabama.

Program: In addition to the hour talks given by the principal speakers, there wil be twelve invited half hour talks, as well as sessions for contributed papers.

Principal Speakers: K. Fan, G. Golub, T. Laffey, M. Marcus, G. Oliveira, O. Taussky.

Information: B. Grone or F. Uhlig, Department of Mathematics, Auburn University, Auburn, Alabama 36849.

24–26. **Fifth ACM SIGACT-SIGMOD Symposium on Principles of Database Systems**, Cambridge, Massachusetts.

Program: The conference will cover new developments in both the theoretical and practical aspects of database systems. Some suggested, although not exclusive, topics of interest are: artificial intelligence for databases, concurrency control, database design, database security, data models, data structures for databases, dependency theory, distributed databases, file organization, logic for databases, performance evaluation of database systems, query languages, and schema design.

Call for Papers: Papers are solicited which describe original and novel research about the theory, design, specification, or implementation of database systems and query languages. You are invited to submit nine copies of a detailed abstract (not a complete paper) to A. Silberschatz, Department of Computer Sciences, The University of Texas at Austin, Austin, Texas 78712, 512-471-4353. Abstracts should be no longer than ten double-spaced pages.

Deadline for Abstracts: October 11, 1985.

Information: Contact A. K. Chandra, General Chairman, IBM T. J. Watson Research Center, Post Office Box 218, Yorktown Heights, New York 10598, 914-945-1752 or A. Chan, Local Arrangements Chairman, Computer Corporation of America, 4 Cambridge Center, Cambridge, Massachusetts 02142, 617-492-8860.

24–28. **Fourth International Symposium on Numerical Methods in Engineering**, Atlanta, Georgia. (June 1985, p. 402)

APRIL 1986

2–8. **Barcelona Conference on Algebraic Topology**, Institut d'Estudis Catalans, Barcelona, Spain.

Organizers: I. James, J. Hubbuck, R. Kane, J. Aguadé, M. Castellet.

Information: M. Castellet, Centre de Recerca Matemàtica, Institut d'Estudis Catalans, Apartat 50, Barcelona, Spain.

14–18. **Joint IMA/SIAM Conference on the State of the Art in Numerical Analysis**, University of Birmingham, Birmingham, England.

Organizing Committee: G. H. Golub, K. W. Morton, M. J. D. Powell, J. Walsh, G. A. Watson, J. H. Wilkinson.

Information: The Secretary and Registrar, The Institute of Mathematics and its Applications, Maitland House, Warrior Square, Southend-on-Sea, Essex SS1 2JY, England.

MAY 1986

12–16. **Thirtieth Annual Conference of the Australian Mathematics Society**, Perth, Western Australia.

Information: R. P. Sullivan, Mathematics Department, University of Western Australia, Nedlands, Western Australia 6009.

18–21. **International Symposium on Flood Frequency and Risk Analyses**, Louisiana State University, Baton Rouge, Louisiana. (October 1984, p. 694)

18–23. **Third International Spring School on Nonlinear Analysis, Function Spaces and Applications**, Mathematical Institute, Czechoslovak Academy of Sciences, Prague, Czechoslovakia.

Organizing Committee: A. Kufner, M. Krbec, J. Rákosník.

Invited speakers: R. A. Adams, L. I. Hedberg, H. P. Heinig, J. Peetre, B. Ruf, A. Torchinksy, G. Vidossich, P. P. Zabrejko.

Deadline for application: December 31, 1985.

Information: Third Spring School, Mathematics Institute Academy of Science, Žitná 25, 115 67 Prague 1, Czechoslovakia.

19–23. **Workshop on Complexity Aspects of Parallel and Distributed Computing**, Mathematical Sciences Research Institute, Berkeley, California.

Program: This is the second of two workshops which are part of the 1985-1986 program on Computational Complexity.

Information: Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720.

19–24. **NATO Advanced Research Workshop: Infinite Dimensional Systems**, Lisbon, Portugal.

Organizing Committee: J. Hale, S.-N. Chow, K. Kirchgässner, L. Magalhães, J. Mawhin.

Information: S.-N. Chow, Mathematics Department, Michigan State University, East Lansing, Michigan 48823, 517-353-4477 or J. Hale, Division of Applied Mathematics, Brown University, Providence, Rhode Island 02912, 401-863-2209.

20–23. **International Conference on the Physics of Phase Space**, University of Maryland, College Park, Maryland. (August 1985, p. 525)

JUNE 1986

1–5. **First Japan Conference on Graph Theory and its Applications**, Tokai University, Hiratsuka, Japan.

Information: J. Akiyama, Department of Mathematics, Tokai University, Hiratsuka, 259-12 Japan.

2–4. **The Second Symposium on Computational Geometry**, IBM T. J. Watson Research Center, Yorktown Heights, New York.

Call for Papers: Papers describing either theoretical results or practical applications are solicited in all areas of computational geometry including geometric algorithms, mathematical bases for computational geometry, robotics, graphics, pattern recognition and solid modeling.

Deadline for Papers: Authors should send ten copies of an extended abstract (5–10 pages) by December 16, 1985 to the address below.

Information: D. P. Doblin, Department of Computer Science, Princeton University, Princeton, New Jersey 08544, 609-452-4620.

4–6. **1986 National Educational Computing Conference**, Town and Country Hotel, San Diego, California.

Program: Technical sessions and related activities are planned to benefit both experienced and new computer users in education, stressing the practical nature of such computer use.

Call for Papers: Original papers are solicited from all academic disciplines and research areas in educational computing. Of particular interest are papers and projects prepared by students at the secondary undergraduate and graduate levels. Authors should send an original manuscript and four copies (double-spaced, maximum 15 pages) by November 1, 1985 to NECC '86, University of San Diego, School of Education, Alcala Park, San Diego, California 92110.

Information: J. Adams, Association for Computing Machinery, 11 West 42nd Street, New York, New York 10036, 212-869-7440.

9–19. **Stochastic Differential Systems with Applications to Control Theory, Electrical/Computer Engineering, and Operations Research**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 402)

16–20. **Fifteenth International Symposium on Rarefied Gas Dynamics**, Grado, Gorizia, Italy.

Organizer: M. Tessarotto, University of Trieste, Trieste, Italy.

Abstract Deadline: December 15, 1985.

Information: Conference Secretariat, Fifteenth Rarefied Gas Dynamics Symposium, Istituto di Meccanica, Facolta' di Scienze, Universita' di Trieste, P. le Europa 1, 34127 Trieste, Italy.

17–21. **Analysis Conference**, National University of Singapore, Republic of Singapore.

Program: A conference on analysis, with emphasis on harmonic analysis and functional analysis, will be jointly organized by the Department of Mathematics, National University of Singapore and the Singapore Mathematical Society. There will be several sessions for fifteen minute oral presentations of contributed papers on topics related to analysis. A workshop will be held from June 11–16. It is expected that a UNESCO grant will be available through the Southeast Asian Mathematical Society to provide partial travel assistance for a small number of participants from countries represented in the Southeast Asian Mathematical Society Council.

Invited Speakers: E. Hewitt, University of Washington; G. Pisier, Université de Paris VI and J. J. Uhl, Jr., University of Illinois at Urbana-Champaign.

Deadline for Contributed Communications: October 15, 1985.

Information: Organizing Committee, Analysis Conference, Department of Mathematics, National University of Singapore, Lower Kent Ridge Road, Singapore 0511, Republic of Singapore.

19–23. **Combinatorics and Graph Theory**, National University of Singapore, Republic of Singapore.

Information: C. C. Chen, Department of Mathematics, National University of Singapore, Lower Kent Ridge Road, Singapore 0511, Republic of Singapore.

22–29. **Society of Women Engineers 1986 National Convention**, Sheraton Hartford and Parkview Hilton, Hartford, Connecticut.

Program: Each session will consist of three paper presentations. Each presentation will consist of a twenty minute speech and a ten minute question and answer period.

Call for Papers: Abstracts should be 150 words or less. Final papers should be 2000–3000 words in length, including a biography and an abstract. Final papers should also include information regarding visual aid equipment required.

Deadline for Abstracts: All submissions must be postmarked by October 15 in order to receive consideration.

Information: B. J. Harrod, Society of Women Engineers, 345 East 47th Street, New York, New York 10017, 212-705-7855.

24–27. **Seventh International Conference on Analysis and Optimization of Systems**, Antibes, France.

Program: The purpose of this conference is to present the advanced research in the field of systems analysis and control where the most promising applications may be expected. The topics include control of non linear systems, optimization and optimal control theory, stochastic systems, signal processing and computer aided engineering.

Call for Papers: Authors are invited to submit unpublished original papers presenting their most recent work. Full papers (about 15 pages) should be submitted in four copies. The first page of the communication must be headed with the paper title, affiliation and complete mailing address of the author(s) together with an abstract (about 200 words). The first named author will be used for all correspondence unless otherwise stated. The conference organization will hold the copyright of accepted papers which will be published in the conference proceedings. Papers should be received by the Conference Secretariat no later than November 15, 1985.

Information: INRIA, Service des Relations Extérieures, Bureau des Colloques, Domaine de Voluceau-Rocquencourt, B.P. 105-78153 Le Chesnay, Cedex, France. Telephone: 1-39-54-90-20, extension 3600. Telex: 697-033-F.

30–July 4. **Tenth Prague Conference on Information Theory, Statistical Decision Functions and Random Processes**, Institute of Information Theory and Automation of the Czechoslovak Academy of Sciences, Prague, Czechoslovakia.

Information: Tenth Prague Conference, Útia Čsav, Pod vodárenskou věží 4, 182 08 Praha 8, Czechoslovakia.

JULY 1986

7–9. **The Fourth IMA Conference on the Mathematical Theory of the Dynamics of Biological Systems**, University of Oxford, Oxford, England.

Organizing Committee: R. M. Anderson, M. S. Bartlett, H. Bondi, J. Gani, W. D. Hamilton, J. Harwood, R. W. Hiorns, A. E. Keymer, J. R. Krebs, R. M. May, J. D. Murray, J. G. Hope.

Call for Papers: Offers to contribute original papers of up to 25 minutes presentation time are invited. Abstracts (300-500 words) indicating the originality of the work should be submitted to the address below no later than December 1, 1985.

Information: The Deputy Secretary, The Institute of Mathematics and its Applications, Maitland House, Warrior Square, Southend-on-Sea, Essex SS1 2JY, England.

7–11. **The Fourth International Conference on Boundary and Interior Layers–Computational and Asymptotic Methods**, Institute of Mathematics, Siberian Branch of the U.S.S.R. Academy of Sciences, Novosibirsk, U.S.S.R.

Organizers: S. K. Godunov (Chairman), J. J. H. Miller (Co-Chairman).

Information: Participants from non-socialist countries should contact BAIL Secretariat, c/o Boole Press Limited, Post Office Box 5, 51 Sandycove Road, Dún Laoghaire, Co. Dublin, Ireland. Telephone: (+353-1) 808025; Telex: 30547 SHCN EI (Ref. BOOLE); Telegrams: BOOLEPRESS DUBLIN.

14–25. **Partial Differential Equations**, Eighth Latin American School of Mathematics, Instituto de Matemática Pura e Aplicada, Rio de Janeiro, Brazil.

Program: The School will be devoted to linear partial differential equations and nonlinear functional analysis and applications to partial differential equations.

Organizing Committee: D. G. Figueiredo, F. Cardoso.

Invited Speakers: M. S. Baouendi, H. Brézis, F. E. Browder, A. P. Calderón, J.-L. Lions, R. Melrose, L. Nirenberg, J. Sjöstrand, F. Trèves.

Information: F. Cardoso, Departamento de Matemática, Universidad Federal de Pernambuco, 50000 Recife-Pernambuco, Brazil.

21–26. **International Congress on Computational and Applied Mathematics**, University of Leuven, Belgium.

Call for Papers: A limited number of 20-minute talks will be accepted for presentation. Participants who would like to present a paper should submit a title and short abstract (not more than one page) not later than January 1, 1986.

Information: L. Wuytack, Department of Mathematics and Computer Science, University of Antwerp-UIA, Universiteitsplein 1, B-2610, Antwerp/Wilrijk, Belgium.

22–26. **Conference on Constructive Function Theory**, University of Alberta, Edmonton, Alberta, Canada. (August 1985, p. 525)

27–August 1. **Thirteenth International Biometric Conference**, Seattle, Washington. (June 1985, p. 402)

28–August 1. **The Seventh International Conference on Nonlinear Analysis and Applications**, The University of Texas, Arlington, Texas.

Purpose: The purpose of the conference is to bring together experts from various branches of nonlinear analysis for the purpose of exchanging information and viewpoints relevant to theory and applications.

Program: The conference will feature survey lectures and talks on topics of current interest by invited speakers from the United States and abroad. There will be sessions for contributed papers and a session to discuss open problems and new directions.

Information: V. Lakshmikantham, Department of Mathematics, University of Texas, Box 19408, Arlington, Texas 76019.

30–August 1. **Conference on Universal Algebra and Lattice Theory**, National Institutes of Health, Bethesda, Maryland.

Program: The conference is devoted to recent developments in universal algebra, lattice theory and related areas.

Call for Papers: Papers are sought for talks of at least 20 minutes. There will be a number of one-hour lectures, to be determined. Send title and abstract to the address below by April 30, 1986.

Information: G. Hutchinson, Building 12A, Room 3045, DCRT-LSM, National Institutes of Health, Bethesda, Maryland 20205.

AUGUST 1986

3–11. **International Congress of Mathematicians**, Berkeley, California. (February 1984, p. 159)

11–16. **Second International Conference on Teaching Statistics**, University of Victoria, Victoria, British Columbia, Canada. (January 1985, p. 93)

18–22. **Bifurcation, Analysis Algorithms Applications**, Universität Dortmund, Dortmund, Federal Republic of Germany.

Program: To provide a forum for the exchange of ideas we plan to organize a conference on this subject with the particular emphasis to bring together experts in this field from Analysis, Computing and its Applications.

Invited Speakers: K. Böhmer, F. Busse, J. Hale, R. Helleman, M. Golubitsky, N. Kazarinoff, H. B. Keller, K. Kirchgässner, M. Kubicek, M. Marek, J. Nye, W. Rheinboldt, C. Stuart, H. True, V. Tvergard, R. Weiss.

Information: T. Küpper, FB Mathematik, Universität Dortmund, Postfach 50 05 00, D-4600 Dortmund 50, Federal Republic of Germany.

25–29. **Sixth Prague Topological Symposium**, Prague, Czechoslovakia. (June 1985, p. 402)

25–September 13. **Microprogram on Nonlinear Diffusion Equations and their Equilibrium States**, Mathematical Sciences Research Institute, Berkeley, California.

Program: This is the first in a series of microprograms (programs much shorter than usual) at the Mathematical Sciences Research Institute.

Information: Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720.

SEPTEMBER 1986

4–7. **Polish Symposium on Interval and Fuzzy Mathematics**, Technical University of Poznań, Poznań, Poland.

Program: The Organizing Committee would like the second Polish Symposium on Interval and Fuzzy Mathematics to be an international forum for presentation and discussion of the most recent results in the theory and applications of fuzzy and interval mathematics. English is the official language of the Symposium.

Abstracts: Send to J. Albrycht at the address below.

Information: J. Albrycht, Institute of Mathematics, Technical University of Poznań, ul. Piotrowo 3a, 60-965 Poznań, Poland.

8–13. **Algebra-Tagung Halle 1986**, Martin Luther Universität, German Democratic Republic.

Information: Martin Luther Universität, Halle Wittenberg, Sektion Mathematik, Algebra Tagung 1986, German Democratic Republic 4010 Halle, Universitätsplatz 6.

8–14. **First World Congress of the Bernoulli Society for Mathematical Statistics and Probability**, Tashkent, U.S.S.R.

Information: K. Krickeberg, U.E.R. de Mathématiques, Logique Formelle et Informatique, Université de Paris V, 12 rue Cujas, F-75005 Paris, France.

OCTOBER 1986

5–9. **International Symposium on Operator Theory**, University of Michigan, Ann Arbor, Michigan.

Organizers: F. J. Beutler, D. L. Neuhoff, W. E. Stark.

Call for Papers: Both long (40 minutes) and short (20 minutes) papers will be accepted. The deadlines for submission are, for long papers, February 1, 1986 and, for short papers, March 1, 1986. All papers should be sent in triplicate to S. C. Schwartz, Department of Engineering and Applied Science, Princeton University, Princeton, New Jersey 08544.

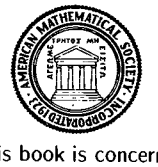
Information: F. J. Beutler, D. L. Neuhoff or W. E. Stark, Department of E.E.C.S. East Engineering Building, The University of Michigan, Ann Arbor, Michigan 48109.

JUNE 1987

15–July 3. **Microprogram on Commutative Algebra**, Mathematical Sciences Research Institute, Berkeley, California.

Program: This is the second in a series of microprograms (programs much shorter than usual) at the Mathematical Sciences Research Institute.

Information: Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720.



Pettis Integral and Measure Theory

Michel Talagrand

This book is concerned with the notion of pointwise compact sets of measurable functions and related measure-theoretic problems. The author provides an extensive self-contained development of the theory of Pettis integration, the natural field of application. Other fields of application included are Riemann-measurable functions on groups, measurability problems and empirical measures.

The main results of this work should be accessible with only a working knowledge of abstract measure theory and an elementary knowledge of functional analysis and topological measure theory. No previous knowledge of Pettis integration is required, and the reader should never have to look for a reference in specialized papers, only in basic books.

The book is organized into three parts. Chapters 1 through 7 deal with Pettis integration and topological measure theoretic tools. Abstract measure theoretic tools are used in Chapters 2, 6 and 7, but since they are more technical, their study is delayed until Chapters 8 through 14. Chapters 15 and 16 deal with applications and more specialized questions.

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Finite Groups—Coming of Age

John McKay, Editor

(Contemporary Mathematics, Volume 45)

These conference papers should dispel any post-classification pessimism about the future of the theory of finite simple groups. Having noted that the theory developed for the classification touches on so few other branches of mathematics, the editor focuses on research in finite simple groups not central to the classification and presents a broad context for the recent results in the field. The papers are aimed at researchers and graduate students in algebra. They pay special attention to current research in sporadic geometry, the Fischer-Griess Monster group, and moonshine.

Though all the papers are of high research value, the following papers of unusual significance could be singled out: Frenkel, Lepowsky and Meurman's construction of the Monster group F_1; Conway and Queen's computation of characters of $E_8(\mathbf{C})$; Norton's proof of the uniqueness of the Monster; and Mason's exploration of moonshine.

Contents

1980 *Mathematics Subject Classifications*: 20-06; 20Dxx
ISBN 0-8218-5047-4, LC 85-15049
ISSN 0271-4132
x + 350 pages (softcover), November 1985
List price $30, Institutional member $24, Individual member $18
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Distributive Lattices and their Applications in Complex Analysis

V. V. Zharinov

(Proceedings of the Steklov Institute, Volume 162)

Algebraic methods have penetrated deeply into contemporary complex analysis, having an essential influence on both the choice of problems and on the methods for solving them. This monograph deals with the applications of distributive lattices of subspaces to problems in multidimensional complex analysis. The author extends and refines Bogolyubov's "edge-of-the-wedge" theorem, which is formulated as the exactness of a definite homology sequence in various classes of holomorphic functions. He also undertakes a systematic study of two classes of analytic functionals, the so-called Fourier hyperfunctions and the Fourier ultrahyperfunctions, on the basis of distributive lattices of linear subspaces. With this goal in mind, he obtains a homology characterization of distributive lattices of submodules, along with duality formulas for dual lattices of locally convex subspaces. The book is intended for specialists in the theory of functions of several complex variables.

1980 *Mathematics Subject Classifications*: 06D99, 32A40, 32A45, 32C35, 46F05, 46F15, 46F20; 32A07, 32D10, 32D15, 42B15, 43A32, 43A99, 44A10, 44A35, 46A12, 46E15, 58G07, 81E05
ISBN 0-8218-30888-0, LC 85-11162
ISSN
82 pages (softcover), October 1985
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On $K_*(Z/n)$ and $K_*(\mathbf{F}_q[t]/(t^2))$

Janet E. Aisbett, Emilio Lluis-Puebla and Victor Snaith

(Memoirs of the AMS, Number 329)

This collection of papers on group cohomology is unified by the calculation of low-dimensional algebraic K-groups of integers modulo n and of truncated polynomial algebras over a finite field. The computation of the three-dimensional K-group provides an important source of computational information and examples upon which K-theorists may test their conjectures. The results on K_3 of truncated polynomial rings provide a good indication of the expected behavior of "higher" K-theory of singular rings. To this end, the authors use Serre spectral sequence techniques to compute many low-dimensional twisted cohomology groups of $GL_n\mathbf{F}_q$.

The book is accessible to mathematicians and graduate students who are familiar with the basic techniques of cohomology of groups.

1980 *Mathematics Subject Classification*: 18
ISBN 0-8218-, LC 85-15802
ISSN 0065-9266
vi + 200 pages (softcover), September 1985
List price $17, Institutional member $14,
Individual member $10
Shipping and handling charges must be added
To order, please specify MEMO/329N

The Classification of Minimal Graphs with Given Abelian Automorphism Group

William C. Arlinghaus

(Memoirs of the AMS, Number 330)

This Memoir provides a complete classification for minimal graphs with any finite abelian automorphism group. First the author establishes necessary conditions for a permutation to represent an automorphism in a graph with an abelian group. He then constructs candidates for minimal graphs with a given cyclic group, adapting the unpublished results of Meriwether, and shows these graphs to be minimal. He extends the development to abelian groups, where the interplay of cyclic groups of orders equal to powers of the same (small) prime provides several new exceptional results.

The book is aimed at graph theorists, especially algebraic graph theorists, and at anyone interested in seeing the role group theory plays in another field. It assumes the reader's familiarity with the concept of a graph and with the rudiments of group theory.

1980 *Mathematics Subject Classifications*:
05C25; 20B25
ISBN 0-8218-2331-0, LC 85-13537
ISSN 0065-9266
viii + 86 pages (softcover), September 1985
List price $12, Institutional member $10,
Individual member $7
Shipping and handling charges must be added
To order, please specify MEMO/330N

Fractional Dimensions and Bounded Fractional Forms

Ron C. Blei

(Memoirs of the AMS, Number 331)

In his earlier work the author introduced the concepts of fractional Cartesian products and combinatorial dimensions. Here he uses those concepts to develop a precise relationship between l^p-norms of restrictions of bounded fractional forms and combinatorial dimensions of subsets of $\mathbf{N}^J$. In the second part of the book he discusses fractional Fréchet pseudomeasures. He gives a "fractional linear" Riesz Representation Theorem and explores the relationships between variations of Fréchet pseudomeasures and dimensions of subsets of $[0,1]^J$.

The Memoir is aimed at mathematicians with an interest in analysis, probability and/or combinatorics. It assumes a basic knowledge of functional analysis and measure theory.

Contents

1980 *Mathematics Subject Classifications*:
26D15, 46G99; 05A99, 28A35
ISBN 0-8218-2332-9, LC 85-13512
ISSN 0065-9266
iv + 70 pages (softcover), September 1985
List price $11, Institutional member $9,
Individual member $7
Shipping and handling charges must be added
To order, please specify MEMO/331N

The Equational Classes Generated by Single Functionally Precomplete Algebras

Arthur Knoebel

(Memoirs of the AMS, Number 332)

The author describes the structure of the six equational classes generated by functionally precomplete algebras, which were first identified by Ivo Rosenberg. In cases where the structure was already known, new and independent proofs are often given. For most of the equational classes, the author finds a subdirect representation theorem for all the algebras in a given equational class. In general, he determines that the number of subdirectly irreducible algebras in each equational class in this study is equal to its length. He identifies as an interesting source of counterexamples the classes generated by algebras preserving h-adic relations and correlates the structure of these classes with the finite symmetric group. In conjunction with this study, some theorems on concrete categories are developed which may prove useful in future investigations of equational classes.

The author addresses mathematicians interested in universal algebra, concrete categories and systems of functions closed to composition. A course in universal algebra provides sufficient background for the material.

1980 *Mathematics Subject Classifications*: 08B15; 08, 18, 06, 15, 20
ISBN 0-8218-2333-7, LC 85-15700
ISSN 0065-9266
v + 83 pages (softcover), September 1985
List price $12, Institutional member $10, Individual member $7
Shipping and handling charges must be added
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Separable Algebroids

Barry Mitchell

(Memoirs of the AMS, Number 333)

The author describes all separable algebroids of the form $k\pi$, where k is a nonzero commutative ring and π is a small category. The description is given in terms of the idempotent completion of π, which is a category even for π monoid, thus necessitating a treatment of categories. The author also demonstrates that for isomorphism classes of k-algebroids the group of invertible elements of the corresponding quotient monoid is the Brauer group of k.

For an understanding of this material, the reader should be familiar with the concepts of category, functor and natural transformation.

1980 *Mathematics Subject Classification*:
ISBN 0-8218-2334-5, LC 85-15092
ISSN 0065-9266
iii + 95 pages (softcover), September 1985
List price $12, Institutional member $10, Individual member $7
Shipping and handling charges must be added
To order, please specify MEMO/333N

Structure of Partially Ordered Sets with Transitive Automorphism Groups

Manfred Droste

(Memoirs of the AMS, Number 334)

In this Memoir the author studies the structure of infinite partially ordered sets under several different transitivity assumptions on the corresponding automorphism group. Under these assumptions, various complicated structures are shown to exist, and using elementary combinatorial methods, the author derives a classification and characterization of these partial orders. This description of the order properties of these sets can serve as a foundation for further research into the algebraic structure of the automorphism groups.

This book is aimed at mathematicians with an interest in any of the following topics: ordered sets, infinite permutation groups, model theory, infinite automorphism groups, lattices or semilattices.

Selected Contents

1980 *Mathematics Subject Classification*:
ISBN 0-8218-2335-3, LC 85-15625
ISSN 0065-9266
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Systèmes Différentiels et Singularités

A. Galligo, M. Granger, and Ph. Maisonobe, Editors

(Astérisque, Number 130)

La théorie des $\mathcal{D}$-modules holonomes établit un lien entre la géométrie algèbrique, les systèmes d'équations aux dérivées partielles et l'étude des singularités. Ce livre constitue les actes du dernier colloque de Luminy qui a rassemblé les principaux spécialistes de ce sujet. On y trouvera des articles d'expositions de la théorie ainsi que les comptes-rendus des tous derniers développements.

List price $29, Individual member $20
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To order, please specify AST/130N

Closed Geodesics on Riemannian Manifolds

Wilhelm Klingenberg

This book contains expository lectures from the CBMS Regional Conference held at the University of Florida, August 2-6, 1982.

Contents

1980 *Mathematics Subject Classifications*: 58B20, 58D15, 58E10, 53C22.

CBMS Regional Conference Series in Mathematics
Number 53, iv + 79 pages (soft cover)
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ISBN 0-8218-0703-X; LC 83-5979
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Fluids and Plasmas: Geometry and Dynamics

Jerrold E. Marsden, Editor

The *AMS-IMS-SIAM Joint Summer Research Conference on Fluids and Plasmas: Geometry and Dynamics*, held July 17 - 23, 1983, in Boulder, Colorado, was a highly successful effort to foster interaction among people working on mathematical, numerical and physical aspects of fluid and plasma dynamics. The organizing committee, consisting of J. Marsden (Chairman), P. Holmes and A. Majda, with A. Chorin and A. Weinstein as advisors, selected 27 speakers whom they felt would help achieve this interaction; the result was a fine sense of camaraderie, with the speakers making every effort to bridge communication gaps.

Researchers using this book will be brought up to date on work being done in these areas.

The three groups of contributors are listed below.

Part I. Geometric-Analytic Methods (Hamiltonian structures, perturbation theory and nonlinear stability by variational methods)

B. Boghosian
Gerald Goldin
Darryl Holm
Robert Littlejohn
Meinhard Mayer
Philip Morrison
Alan Weinstein
R. Dewar
Miroslav Grmela
Allan Kaufman
Jerrold Marsden
Richard Montgomery
Tudor Ratiu

Part II. Analytic and Numerical Methods (contour dynamics, spectral methods, and functional analytic techniques)

Tom Beale
Andrew Majda
Peter Olver
Philippe Spalart
Yieh-Hei Wan
Norman Zabusky
Robert Glassey
Robert Miller
Harvey Segur
Walter Strauss
Stephen Wollman

Part III. Bifurcation and Dynamical Systems (experimental and numerical methods, bifurcation theory, and chaos)

John Crawford
John Guckenheimer
D. McLaughlin
Alan Newell
Eric Siggia
Harry Swinney
James Curry
P. Holmes
J. Moloney
Jürgen Scheurle
James Swift
E. Wayne

1980 *Mathematics Subject Classifications*: 58Fxx, 76Exx
Contemporary Mathematics
Volume 28, xvi + 448 pages (soft cover)
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Publication date: April 1984
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Personal Items

Mark J. Ablowitz, Chairman of Mathematics and Computer Science at Clarkson University, New York, has been appointed Dean of Science at that institution.

Frank S. Beckman, Professor and Chairman of the Department of Computer and Information Science of Brooklyn College, will assume the position of Executive Officer of the new Ph.D. Program in Computer Science at the Graduate Center of the City University of New York in fall 1985.

Jeffrey H. Dinitz of the University of Vermont has been promoted to Associate Professor of Mathematics at that institution.

Myron Goldstein, Professor of Mathematics at Arizona State University at Tempe, will be a visiting SERC Fellow at the University of Liverpool.

Peter K. Henrici of Eidgenössische Technische Hochschule, Zurich, Switzerland, has been appointed William R. Kenan, Jr., Professor of Mathematics at the University of North Carolina at Chapel Hill beginning August, 1985.

Donald E. Knuth of Stanford University received an honorary doctor of science degree from Luther College in Decorah, Iowa, at its 118th commencement.

Vadim Komkov of Winthrop College has been appointed Distinguished Professor at that institution.

Lee J. McEwan has been appointed Lecturer in Mathematics at the University of North Carolina at Chapel Hill.

Philip S. Morey, Jr., a Professor of Mathematics at Texas A&I University, has been awarded the Distinguished Research Award for his outstanding research accomplishments in the fields of applied and pure mathematics. This award is presented annually by the Texas A&I Alumni Association to recognize faculty members for their superior research achievements.

Thomas L. Przybylski has accepted a position as a mathematician at the Naval Avionics Center, Indianapolis, Indiana.

Deaths

Howard Alexander, Professor Emeritus of Mathematics at Earlham College, died on June 28, 1985, at the age of 74. He was a member of the Society for 47 years.

John A. Carpenter of Oak Ridge, Tennessee, died on October 22, 1983, at the age of 63. He was a member of the Society for 18 years.

Edward D. Conway III of Tulane University died on July 18, 1985, at the age of 48. He was a member of the Society for 22 years.

Cecil C. Craig, Professor Emeritus at the University of Michigan, died on June 16, 1985, at the age of 87. Professor Craig was President of the Institute of Mathematical Statistics in 1942 and 1943.

Loo-Keng Hua, Professor of Mathematics at Academia Sinica, Beijing, People's Republic of China, died on June 12, 1985, at the age of 75. He was a member of the Society for 38 years. (See the News & Announcements section of this issue of the *Notices*.)

Shikao Ikehara of Tokyo, Japan, died on October 10, 1984, at the age of 80. He was a member of the Society for 33 years.

William A. Johnson of Chagrin Falls, Ohio, died on June 25, 1985, at the age of 71. He was a member of the Society for 4 years.

Louise Chin Lim of the University of Arizona died on June 24, 1985, at the age of 63. She was a member of the Society for 41 years.

Otto J. Ramler, former Chairman of Mathematics at Catholic University of America, died on July 24, 1985, at the age of 98. He was a member of the Society for 61 years.

Julia B. Robinson, Ex-President of the American Mathematical Society and Professor Emeritus at the University of California, Berkeley, died on July 30, 1985, at the age of 65. She was a member of the Society for 44 years. (See the News & Announcements section of this issue of the *Notices*.)

Herbert J. Ryser of the California Institute of Technology died on July 12, 1985, at the age of 61. He was a member of the Society for 39 years.

Gabor Szegö, Professor Emeritus at Stanford University, died on August 7, 1985, at the age of 90. He was a member of the Society for 50 years. (See the News & Announcements section of this issue of the *Notices*.)

Gerhard N. Wollan, Professor Emeritus at Purdue University, died on July 16, 1985, at the age of 75. He was a member of the Society for 35 years.

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
Dougalis, Vasilios (U.S.A.)	University of Crete, Greece	Partial Differential Equations	9/85 - 4/86
Ellner, Stephen (U.S.A.)	Weizzmann Institute, Israel	Mathematical Ecology	9/85 - 12/85
Karakashian, Ohannes (U.S.A.)	University of Crete, Greece	Numerical Analysis	1/86 - 4/86
Stephenson, Kenneth (U.S.A.)	Open University, United Kingdom	Complex Analysis	1/86 - 6/86
Storvick, David (U.S.A.)	E.T.H., Switzerland	Complex Analysis	9/85 - 6/86
Triantafillou, Georgia (U.S.A.)	University of Crete, Greece	Topology	9/85 - 6/86

Visiting Foreign Mathematicians

Aimar, Hugo (Argentina)	University of Minnesota	Singular Integrals	9/85 - 6/86
Ajala, Samuel O. (Nigeria)	Institute for Advanced Study	Topology	9/85 - 4/86
Baillon, Jean-Bernard (France)	University of Southern California	Functional Analysis	9/85 - 6/86
Balser, Werner (West Germany)	University of Southern California	Ordinary Differential Equations	1/86 - 6/86
Barry, Jerard M. (Australia)	University of Tennessee	Partial Differential Equations, Numerical Analysis	1/86 - 6/86
Bertrand, Daniel Alain (France)	Institute for Advanced Study	Number Theory	3/86 - 4/86
Bhatwadekar, Shrikant Mahadeo (India)	Institute for Advanced Study	Projective Modules and Complete Intersection Ideals	7/85 - 4/86
Böhning, Dankmar (West Germany)	Pennsylvania State University	Applied Statistics	8/85 - 5/86
Buffo, Alberto (Argentina)	Institute for Advanced Study	Partial Differential Equations, Global Analysis	6/85 - 4/86
Carrillo, Humberto (Mexico)	Brown University	Stability and Nonlinear Oscillations	8/85 - 8/86
Cherrier, Pascal (France)	Institute for Advanced Study	Analysis on Manifolds	9/85 - 12/85
Chukwu, Ethelbert N. (Nigeria)	University of Tennessee	Applied Mathematics	9/85 - 8/86
Collino, Alberto (Italy)	Brown University	Algebraic Geometry	9/85 - 6/86
Cömez, Dogan (Turkey)	North Dakota State University	Ergodic Theory	9/85 - 5/86
Cwikel, Michael (Israel)	Institute for Advanced Study	Analysis	9/85 - 4/86
Ding, Ren (People's Republic of China)	Western Washington University	Convexity/Combinatorics	2/85 - 6/86
Dryja, Maksymilian (Poland)	University of Southern California	Numerical Analysis	1/84 - 12/85
Duggan, John (Australia)	University of Minnesota	Differential Geometry	9/85 - 6/86
Duval, Anne (France)	University of Southern California	Ordinary Differential Equations	9/85 - 6/86
Eplett, Walter (Great Britain)	Pennsylvania State University	Nonparametric Statistics	8/85 - 5/86
Evans, Martin (Wales)	University of Alabama	Group Theory	8/85 - 5/86
Farrell, Paul A. (Ireland)	Kent State University	Numerical Analysis	8/85 - 5/86
Giambruno, Antonio (Italy)	University of Southern California	Ring Theory	9/85 - 12/85
Gitler, Samuel (Mexico)	Institute for Advanced Study	Algebraic Topology and Supermanifolds	9/85 - 4/86
Gomez, Marcelo E. (Argentina)	Institute for Advanced Study	Real Analysis—Differential Equations	1/85 - 12/85
Gurgar, Rajendra (India)	Duke University	Algebraic Geometry	1/86 - 5/86
Gutiérrez, Cristian (Argentina)	University of Minnesota	Singular Integrals	9/85 - 6/86
Hain, Richard M. (Australia)	Institute for Advanced Study	Topology and Geometry	9/85 - 4/86
Hausmann, Jean-Claude Robert (Switzerland)	Institute for Advanced Study	Topology of Manifolds and Poincaré Spaces	1/86 - 4/86
Hildebrand, Adolf (West Germany)	Institute for Advanced Study	Analytic Number Theory	9/85 - 4/86
Horvath, L. (Hungary)	Carleton University	Probability	1/85 - 12/86
Huebschmann, Johannes (Germany)	Institute for Advanced Study	Algebraic Topology	9/85 - 4/86
Ito, Katzufumi (Japan)	Brown University	Estimation and Control of Distributed Parameter Systems	9/85 - 7/86
Ito, Kiyosi (Japan)	University of Minnesota	Stochastic Differential Equations	8/85 - 7/86

Name and Home Country	Host Institution	Field of Special Interest	Period of Visit
Iwaniec, Henryk (Poland)	Institute for Advanced Study	Analytic Number Theory and Automorphic Forms	1/85 - 4/87
Ize, Jorge Andres (Mexico)	University of Utah	Partial Differential Equations	7/85 - 6/86
Jain, B. N. (India)	University of Maryland, Baltimore County	Queing Networks and Communication Protocol	9/85 - 6/86
Jakobsche, Wlodzimierz (Poland)	University of Tennessee	Geometric Topology	9/85 - 8/86
Jurket, Wolfgang (West Germany)	University of Southern California	Ordinary Differential Equations	1/86 - 6/86
Kanevsky, Dimitry (West Germany)	Institute for Advanced Study	Algebraic Geometry	9/84 - 4/86
Kirchgassner, Klaus (West Germany)	University of Utah	Partial Differential Equations	7/85 - 6/86
Klebaner, Fima C. (Australia)	University of Michigan	Statistics: Branching Processes	9/85 - 4/86
Kwapien, S. (Poland)	Case Western Reserve University	Probability and Functional Analysis	7/85 - 6/86
Laczkovich, Miklós (Hungary)	St. Olaf College	Real Analysis	2/86 - 8/86
Lambrou, Michael S. (Greece)	University of Alabama	Functional Analysis	8/85 - 5/86
Liu, Ming-Chit (Hong Kong)	Institute for Advanced Study	Theory and Analysis	1/86 - 4/86
Llavona, Jose Luis Gonzalez (Spain)	Kent State University	Functional Analysis	8/84 - 12/85
Malgrange, Bernard (France)	Institute for Advanced Study	Analysis	2/86 - 4/86
Masser, David W. (United Kingdom)	Institute for Advanced Study	Number Theory	1/86 - 4/86
Mathew, Thomas (India)	University of Maryland, Baltimore County	Inference in Linear Models and Estimation of Variance Components	9/85 - 6/87
Miličić, Dragan (Yugoslavia)	Institute for Advanced Study	Theory of Semisimple Lie Groups	9/85 - 4/86
Mirković, Ivan (Yugoslavia)	Institute for Advanced Study	Group Representations	9/85 - 4/86
Nagase, Masayoshi (Japan)	Institute for Advanced Study	Global Analysis on Stratified Riemannian Spaces	9/85 - 4/86
Niino, Kiyoshi (Japan)	Institute for Advanced Study	Complex Analysis	9/85 - 4/86
Nori, Madhav V. (India)	Institute for Advanced Study	Algebraic Cycles	7/85 - 12/85
Owen, Nicholas C. (Scotland)	Brown University	Dynamical Systems	9/85 - 7/86
Philippon, Patrice (France)	Institute for Advanced Study	Transcendental Number Theory	10/85 - 2/86
Pirola, Gian Pietro (Italy)	Brown University	Algebraic Geometry	9/85 - 6/86
Rajarshi, Manohar (India)	Pennsylvania State University	Stochastic Processes	8/85 - 5/86
Rao, Ravi Achutha (India)	Institute for Advanced Study	Algebra	7/85 - 12/85
Rimon, Y. (Israel)	Brown University	Computation Fluid Dynamics and Parallel Computation	9/85 - 3/86
Ryba, Alex (United Kingdom)	Carleton University	Algebra and Related Fields	1/86 - 12/86
Sahi, Siddhartha (India)	Institute for Advanced Study	Lie Groups	9/85 - 4/86
Saito, Morihiko (Japan)	Institute for Advanced Study	Algebraic Geometry	9/85 - 4/86
Sakai, Makoto (Japan)	Institute for Advanced Study	Complex Analysis and Potential Theory	1/85 - 12/85
Schmidt, Wolfgang M. (Austria)	Institute for Advanced Study	Number Theory	9/85 - 4/86
Sieburg, Hans-Bernd (West Germany)	Institute for Advanced Study	Harmonic Analysis, Number Theory	9/85 - 4/86
Srinivas, Vasudevan (India)	Duke University	Algebraic Geometry	8/85 - 12/85
Stavrakakis, I. (Greece)	Brown University	Partial Differential Equations	9/85 - 8/86
Sumihiro, Hideyasu (Japan)	Brown University	Algebraic Geometry	10/85 - 2/86
Szulga, J. (Poland)	Case Western Reserve University	Probability and Functional Analysis	10/85 - 6/86
Todorcevic, Stevo (Yugoslavia)	Institute for Advanced Study	Set Theory—Combinatorics	9/85 - 4/86
Tong, Wenting (People's Republic of China)	Brown University	Algebra	9/84 - 11/85
van Geemen, Bert (The Netherlands)	Institute for Advanced Study	Geometry and Arithmetic of Abelian Varieties	9/85 - 4/86

Name and Home Country	Host Institution	Field of Special Interest	Period of Visit
Wakamatsu, Takayoshi (Japan)	Carleton University	Algebra	9/85 - 4/86
Waldschmidt, Michel (France)	Institute for Advanced Study	Transcendental Number Theory	9/85 - 12/85
Wang, Yuan (People's Republic of China)	Institute for Advanced Study	Analytic Number Theory	9/85 - 4/86
Weder, Ricardo A. (Mexico)	University of Utah	Partial Differential Equations	7/85 - 6/86
Wustholz, Gisbert (West Germany)	Institute for Advanced Study	Arithmetic Algebraic Geometry	1/86 - 4/86
Xu, Jiao-mo (People's Republic of China)	Brown University	Numerical Analysis and Mechanics	12/84 - 12/85
Yang, S. L. (People's Republic of China)	SUNY at Buffalo	Topology	8/85 - 6/86
Ycart, Bernard (France)	Case Western Reserve University	Applied Probability	10/85 - 6/86
Yu, Jung Ok (Korea)	Case Western Reserve University	Topological Dynamics	8/85 - 6/86
Zwiesler, Hans J. (West Germany)	Syracuse University	Differential Equations	9/85 - 1/86

Distributions of Values of Holomorphic Mappings

(Translations of Mathematical Monographs, Volume 61)

B. V. Shabat

A vast literature has grown up around the value distribution theory of meromorphic functions, synthesized by Rolf Nevanlinna in the 1920s and singled out by Hermann Weyl as one of the greatest mathematical achievements of this century. The multidimensional aspect, involving the distribution of inverse images of analytic sets under holomorphic mappings of complex manifolds, has been much less fully treated in the literature. This volume thus provides a valuable introduction to multivariate value distribution theory and a survey of some of its results, rich in relations to both algebraic and differential geometry and surely one of the most important branches of the modern geometric theory of functions of a complex variable.

Shabat presumes only the reader's familiarity with the elements of multidimensional complex analysis. A knowledge of the classical theory of value distribution is not required, since the book begins with preparatory material from the contemporary geometric theory of functions. After proving the two main theorems of value distribution theory, the author goes on to investigate further the theory of holomorphic curves and to provide generalizations and applications of the main theorems, focusing chiefly on the work of Soviet mathematicians.

1980 *Mathematics Subject Classifications*: 32H30; 32H25
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Application Deadlines for Grants and Assistantships

Many fellowship programs have deadlines for receipt of applications. These deadlines are noted in news items and in the Stipends Section of the December *Notices*. They are listed below for your convenience, and as a reminder since many of these deadlines occur before the publication date of the special December issue on *Assistantships and Fellowships*. Dates taken from the 1984 special issue have been updated with information received in preparation for the December 1985 issue. For information about the various programs, the reader is referred to the appropriate part of the Stipends Section of the December 1984 *Notices* as follows: [GS] = Graduate Support Section; [PS] = Postdoctoral Support Section; [TSA] = Travel and Study Abroad Section; [SFN] = Study in the U.S. for Foreign Nationals.

* Information from the December 1984 issue not yet confirmed for this year.

• Refers to a news item in this issue of the *Notices*.

October 1

American Philosophical Society [PS]

John Simon Guggenheim Memorial Foundation Fellowships [PS]

* Rotary Foundation (Graduate and Undergraduate Scholarships) [TSA]

October 15

Bunting Institute of Radcliffe College (Science Scholar Fellowships) [PS]

Fulbright Teacher Exchange Program [TSA]

October 25

Kennedy Scholarships [SFN]

November 1

American-Scandinavian Foundation [TSA]

Fannie and John Hertz Foundation Fellowships [GS]

North Atlantic Treaty Organization (Postdoctoral Fellowships) [TSA]

November 15

• NSF Mathematical Sciences Postdoctoral Research Fellowships [PS]

Weizmann Institute of Sciences (Feinberg Graduate School Postdoctoral Fellowships) [TSA]

November 21

NSF Graduate Fellowships [GS]

NSF Minority Graduate Fellowships [GS]

November 30

North Atlantic Treaty Organization [TSA]

December 1

American Philosophical Society [PS]

* Lady Davis Fellowship Trust [TSA]

Lady Davis Visiting Professorships [TSA]

* Royal Norwegian Council for Scientific and Industrial Research (Postdoctorate Fellowships) [TSA]

* Sigma Delta Epsilon, Graduate Women in Science (Eloise Gerry Fellowship) [GS]

* University of California, San Diego (S. E. Warschawski Assistant Professorship) [PS]

December 3

AMS Research Fellowships [PS]

December 15

Los Alamos National Laboratory (J. Robert Oppenheimer Research Fellowship) [PS]

December 31

Institute for Advanced Study Memberships [PS]

Massachussetts Institute of Technology (C. L. E. Moore Instructorships in Mathematics) [PS]

* University of Wisconsin, Madison (Van Vleck Assistant Professorship in Mathematics) [PS]

January 1

AMS-MAA-SIAM Congressional Science Fellowship [PS]

* Brown University (Jacob David Tamarkin Assistant Professorships) [PS]

Courant Institute (Instructorships in Mathematics) [PS]

Courant Institute (Postdoctoral Visiting Memberships) [PS]

Harvard University (Benjamin Peirce Lectureships) [PS]

Indiana University, Bloomington (Václav Hlavatý Research Assistant Professorships) [PS]

Mathematical Sciences Research Institute [PS]

University of California, Los Angeles (Earle Raymond Hedrick Assistant Professorships in Mathematics) [PS]

January 6

University of Michigan, Ann Arbor (T. H. Hildebrandt Research Assistant Professorships) [PS]

January 15

* Dartmouth College (John Wesley Young Research Instructorships) [PS]

Minna-James-Heinemann-Stiftung (Research Abroad) [TSA]

IBM Thomas J. Watson Research Center (Mathematical Sciences Department Postdoctoral and Junior Faculty Research Fellowships) [PS]

* Institute for Mathematics and its Applications [PS]

* Kosciuszko Foundation [GS] [SFN]

* Kosciuszko Foundation (Graduate and Postgraduate Exchange with Poland) [TSA]
National Research Council (Research Associateship Programs) [PS]
* Natural Sciences and Engineering Research Council of Canada (Visiting Fellowships) [TSA]
Rice University (Griffith Conrad Evans Instructorships) [PS]
Rutgers University (Hill Assistant Professorships) [PS]
Smithsonian Institution (Predoctoral Fellowships) [GS]
Smithsonian Institution (Postdoctoral Fellowships) [PS]
University of Chicago (Leonard Eugene Dickson Instructorships in Mathematics) [PS]
* University of Pittsburgh (Andrew Mellon Postdoctoral Fellowships) [PS]

January 16

California Institute of Technology (Harry Bateman Research Instructorships) [PS]
Fulbright Program (Collaborative Research Grants) [TSA]

January 17

Committee on Institutional Cooperation (Minorities Fellowships in the Sciences, Mathematics and Engineering) [GS]
National Research Council (Postdoctoral Fellowships for Minorities) [PS]

January 28

National Center for Atmospheric Research (Advanced Study Program) [PS]

January 30

Centro de Investigacion del IPN (Solomon Lefschetz Research Instructorships) [TSA]

January 31

Yale University (Josiah Willard Gibbs Instructorships) [PS]

February 1

* AAAS Science, Engineering and Diplomacy Fellowships [PS]
AAAS Summer Fellowship [GS]
American Philosophical Society [PS]
* American Society for Engineering Education (NASA-ASEE Summer Faculty Fellowships) [PS]
* American Society for Engineering Education (Navy- and DOE-ASEE Summer Faculty Research Programs) [PS]
* American Society for Engineering Education (ONR Graduate Fellowship Program) [GS]
* Sigma Delta Epsilon, Graduate Women in Science (Grants-in-Aid) [GS]
University of Cincinnati (Charles Phelps Taft Postdoctoral Fellowships) [PS]

February 11

California State Graduate Fellowships [GS]

February 15

University of California, Irvine (Visiting Irvine Lectureship) [PS]

February 28

Australian Institute of Nuclear Science and Engineering (Research Fellowships) [PS]

March 1

American Philosophical Society [PS]

March 15

Hubert H. Humphrey Doctoral Fellowships [GS]
Weizmann Institute of Sciences (Feinberg Graduate School Postdoctoral Fellowships) [TSA]

March 31

North Atlantic Treaty Organization [TSA]

April 1

American Philosophical Society [PS]

June 15

Indo-American Fellowship Program [TSA]

August 1

American Philosophical Society [PS]

August 15

North Atlantic Treaty Organization [TSA]

August 31

Australian Institute of Nuclear Science and Engineering (Research Fellowships) [PS]

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.

S. Tucker Taft (1986) has been appointed chairman of the *Visiting Committee on Computer Operations and Facilities* by Chairman of the Board of Trustees, Ronald L. Graham. Continuing members of the committee are Lee P. Neuwirth (1985) and Peter J. Weinberger (1987).

Melvin Henriksen (1987), Irwin Kra (1987), Jill P. Mesirov (1989), and Hugo Rossi (1988) have been appointed to the *Committee on Membership* by Chairman of the Board of Trustees, Ronald L. Graham. Continuing members of the committee are Frederick W. Gehring (1986), chairman, and Jack K. Hale (1985).

Hyman Bass, Ramesh A. Gangolli, Everett Pitcher, Vera S. Pless, and Harold M. Stark have been appointed by President Irving Kaplansky to a *Search Committee for the Position of Secretary.* Professor Gangolli will serve as chairman.

Lawrence A. Shepp (1987) has been appointed to the *Proceedings of Symposia in Applied Mathematics Editorial Committee* and Richard E. Ewing (1986) has been appointed chairman by President Irving Kaplansky. The continuing member of the committee is William A. Massey (1985).

Hermann Flaschka (1988) and John P. Hempel (1988) have been appointed to the *Committee to Select the Winner of the Steele Prize* and Harold M. Edwards (1986) has been appointed chairman by President Irving Kaplansky. Continuing members of the committee are Richard W. Beals (1987), Jerry L. Bona (1987), Charles W. Curtis (1986), Frederick W. Gehring (1986), Lawrence E. Payne (1987), George B. Seligman (1986) and Patricia Lilaine Sipe (1986).

A. O. L. Atkin has been appointed by President Irving Kaplansky to the AMS-SIAM *Organizing Committee for a Symposium on Computer Algebra.* Other members of the committee are D. Chudnovsky and R. Jenks.

Reports of Past Meetings

The March Meeting in Chicago

The eight hundred and seventeenth meeting of the American Mathematical Society was held at the University of Illinois at Chicago, Chicago, Illinois on Friday and Saturday, March 22-23, 1985. All sessions took place in the Lecture Center. There were 253 registrants, including 209 members of the society.

Invited Addresses. By invitation of the Committee to Select Hour Speakers for Central Sectional Meetings, there were four invited addresses. The speakers, their affiliations and the titles of their addresses are as follows:

GRAHAM HIGMAN, Oxford University and the University of Illinois, Urbana-Champaign, *Inflexions in characteristic* 3.

MICHAEL MARCUS, Texas A&M University, College Station, *Random Fourier series.*

J. MARSHALL OSBORN, University of Wisconsin, Madison, *What are nonassociative algebras?*

ROGER PENROSE, Oxford University and Rice University, *Some results of twistor theory in general relativity.*

The presiding officers at these addresses were Saunders MacLane, Donald Burkholder, Louis Solomon and Mark Ronan, respectively.

Special Sessions. By invitation of the same committee, there were eight special sessions of selected twenty-minute papers. The topics of these special sessions and the names of the organizers are as follows:

Plethysms, JOSEPH BRENNAN, Michigan State University.

Periodic and almost periodic solutions of differential equations, T. A. BURTON, Southern Illinois University, Carbondale.

History of logic, THOMAS L. DRUCKER, University of Wisconsin, Extension.

K-theory, HENRI GILLET, University of Illinois, Chicago.

Mathematical computer science, WOLFGANG MAASS, University of Illinois, Chicago.

Stochastic analysis and related topics, PHILIP PROTTER, Purdue University.

Borel structures and classical measure theory, K. P. S. BHASKARA RAO and RAE MICHAEL SHORTT, Michigan Technological University.

Groups and geometries, MARK A. RONAN and STEPHAN D. SMITH, University of Illinois, Chicago.

Eight papers listed in the program were not delivered. There were four additional late papers in these special sessions.

Contributed Papers. There were five sessions of contributed ten-minute papers; Irving Anellis, Louis Kauffman, Charles Lin, Uri Peled and David Radford served as presiding officers. All the ten-minute papers listed in the program were delivered.

Association for Women in Mathematics. The Association for Women in Mathematics held a luncheon meeting on March 23 during the meeting of the Society.

Committee. The Local Arrangements Committee consisted of Herbert Curtis. The undersigned Associate Secretary is very appreciative of the assistance of Professor Curtis for help in preparing the announcement of the meeting and for assistance during the meeting. His help is greatly appreciated.

Robert M. Fossum
Urbana, Illinois — Associate Secretary

The April Meeting in Worcester

The eight hundred and nineteenth meeting of the American Mathematical Society was held at the College of the Holy Cross in Worcester, Massachusetts on Saturday and Sunday, April 20-21, 1985. There were 202 registrants, including 167 members of the Society.

Invited Addresses. By invitation of the Committee to Select Hour Speakers for Eastern Sectional Meetings, there were four invited one-hour addresses. The speakers, their affiliations and the titles of their talks are as follows:

WILLIAM ABIKOFF, University of Connecticut, Storrs, *Kleinian groups—an invitation to mathematics.*

IRA M. GESSEL, Brandeis University, *Recent work in enumerative combinatorics.*

ROBERT W. THOMASON, Johns Hopkins University, *Algebraic and topological K-theory.*

STEPHEN S.-T. YAU, Yale University and University of Illinois, Chicago, *Isolated singularities and finite dimensional solvable Lie algebras.*

The four speakers were introduced by Lipman Bers, Richard Stanley, Charles A. Weibel and Peter Orlik, respectively.

Special Sessions. By invitation of the same committee, there were 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 lists of speakers, are as follows:

Geometric function theory, WILLIAM ABIKOFF and IRWIN KRA, State University of New York, Stony Brook. The speakers were William Abikoff, Lipman Bers, Clifford Earle, Frederick Gardiner, Frederick Gehring, Jane Gilman, Andrew Haas, Blaise Heltai, Eric Jablow, Linda Keen, Irwin Kra, John Marafino, Albert Marden, Bernard Maskit, Howard Masur, Robert Riley, Caroline Series and Scott Wolpert.

Differential geometry of submanifolds, THOMAS E. CECIL, The College of the Holy Cross, and STEPHEN S.-T. YAU. The speakers were Kinetsu Abe, Thomas Banchoff, David Blair, Carol Blomstrom, Thomas Cecil, B.-Y. Chen, Richard Escobales, Robert Fisher, Jr., Michael Gage, Detlef Gromoll, David Hoffman, Gerald Ludden, Martin Magid, Katsumi Nomizu, Patrick Ryan and Chuu-Lian Terng.

Singularities and complex geometry, THOMAS E. CECIL, The College of the Holy Cross, and STEPHEN S.-T. YAU. The speakers were Shreeram Abhyankar, Max Benson, Denis Blackmore, Alan Durfee, Robert Ephraim, Y.-N. Gau, Anatoly Libgober, T. T. Moh, Peter Orlik, Donal O'Shea, Mark Spivakovsky, Alphonse Vasquez and Bun Wong.

Enumerative combinatorics, IRA M. GESSEL. The speakers were George Andrews, Anders Björner, David Bressoud, D. I. A. Cohen, Paul H. Edelman, Ian Goulden, Gil Kalai, Gilbert Labelle, Pierre Leroux, S. G. Mohanty, Bruce Sagan, Louis Shapiro, Richard Stanley, Dennis Stanton and Dennis White.

Fractal geometry, BENOIT B. MANDELBROT, IBM T. J. Watson Reserch Center and Harvard University. The speakers were M. Barnsley, M. Benedicks, Daniel J. Bessis, P. Blanchard, P. Cvitanovic, R. L. Devaney, Adrian Douady, S. Dubuc, W. J. Gilbert, J. Hubbard, C. Itzykson, Benoit Mandelbrot, R. P. McGehee, S. James Taylor, N. Tongling and C. Tricot.

Methods of K-theory, ROBERT W. THOMASON. The speakers were T. Fischer, J. F. Jardine, Roy Joshua, Christian Kassel, Ronnie Lee and L. N. Vaserstein.

Contributed Papers. There were, in addition, two sessions for 10-minute contributed papers: one in *Geometry and topology* chaired jointly by Diana Kalish and S. Swaminathan, and one general sessions chaired jointly by J. S. Rno and Emilio O. Roxin.

Committee. The Local Arrangements Committee consisted of Thomas E. Cecil and Leonard Sulski (chairman).

W. Wistar Comfort
Middletown, Connecticut — Associate Secretary

1985 Symposium on Some Mathematical Questions in Biology
Plant Biology

The nineteenth annual symposium on Some Mathematical Questions in Biology was held on Monday, May 27, 1985, in the Garden East Room of the Los Angeles Hilton Hotel.

The symposium was held in conjunction with the annual meeting of the American Association for the Advancement of Science (AAAS). The symposium was sponsored by the American Mathematical Society (AMS), the Society for Industrial and Applied Mathematics (SIAM), and Sections A (Mathematics), G (Biological Sciences), and O (Agriculture) of the AAAS. The program was arranged by an organizing committee consisting of H. Thomas Banks (Brown University); Gail A. Carpenter, (Northeastern University); Joel E. Cohen (Rockefeller University); Joseph B. Keller (Stanford University); Robert M. Miura (University of British Columbia), chairman; Garrett M. Odell (Rensselaer Polytechnic Institute); Charles S. Peskin (Courant Institute, New York University); and John Rinzel (National Institutes of Health).

The theme of the symposium was Plant Biology. There were two half-day sessions, each including three one-hour lectures. Forty-two people registered for the symposium.

Support was provided by a grant from the National Science Foundation (NSF).

1985 AMS-SIAM Summer Seminar
Reacting Flows: Combustion and Chemical Reactors

The American Mathematical Society and the Society for Industrial and Applied Mathematics cosponsored the 1985 AMS-SIAM Summer Seminar at Cornell University, Ithaca, New York, from June 30–July 13, 1985. The seminar was supported by the Air Force Office of Scientific Research; Army Research Office; National Science Foundation; and the Office of Naval Research.

The purpose of the seminar was to synthesize the theory of reacting flows into a firm foundation for future large-scale computing.

There were 60 invited addresses and informal seminars were held throughout the seminar, on the initiative of interested parties.

There were 81 mathematicians who registered for the seminar, 7 of whom were accompanied by some member(s) of their families for at least part of the time which included 6 spouses and 7 children. According to the registration cards of those at the seminar, 15 attended during the first week only, 19 during the second week only, and 47 for up to two weeks.

Seven countries not in North America were represented by the following numbers of participants: Czechoslovakia (1), Denmark (1), England (1), France (4), Israel (1), Italy (2), New Zealand (1), Spain (3), and West Germany (1).

As with previous summer seminars, the Society will publish formal proceedings in the series *Lectures in Applied Mathematics*, which will include papers by most of the speakers.

The topic of this seminar was selected by the AMS-SIAM Committee on Applied Mathematics, whose members at the time were Roger W. Brockett (Harvard University), C. K. Chu (Columbia University), Alan G. Konheim (University of California, Santa Barbara), Alan C. Newell, chairman, (University of Arizona), George C. Papanicolaou (Courant Institute of Mathematical Sciences, New York University), and Robert F. Warming (NASA).

The Organizing Committee included Donald S. Cohen (Caltech), G. S. S. Ludford, chairman, (Cornell University), Andrew J. Majda (Princeton University), and Forman A. Williams (Princeton University). The members of the Advisory Committee included Rutherford Aris (University of Minnesota, Minneapolis), John D. Buckmaster (University of Illinois, Urbana), Harry A. Dwyer (University of California, Davis), John M. Guckenheimer (Cornell University), Ingo Müller (Technical University Berlin), Basil Nicolaenko (Los Alamos National Laboratory), and Herschel Rabitz (Princeton University).

1985 Summer Research Institute
Algebraic Geometry

The American Mathematical Society held its thirty-third Summer Research Institute at Bowdoin College, Brunswick, Maine, from July 8–26, 1985. The institute was partially supported by grants from the National Science Foundation.

The institute was conceived as an opportunity for a broad view of Algebraic Geometry, following the tradition of the summer research institutes at Arcata, California (1974), Woods Hole, Massachusetts (1964), and Boulder, Colorado (1954), and in particular to survey the progress made in the field since the Arcata conference.

There were nine series of expository lectures in the mornings which presented surveys of the recent developments in particularly active areas, and a somewhat larger number of afternoon and evening seminars which provided more detailed presentations and reports on very recent work.

A total of 310 mathematicians registered for the institute, 73 of whom were students. Thirty-one participants were accompanied by one or more family members for at least part of the time. Twenty countries not in North America were represented by the following numbers of participants: Australia (1), Belgium (1), Brazil (3), Denmark (1), England (8), France (17), India (2), Israel (3), Italy (25), Japan (21), Mexico (4), Netherlands (17), Norway (3), Poland (1), Saudi Arabia (1), Spain (7), Sweden (5), Taiwan (1), Venezuela (1), and West Germany (19), for a total of 141 participants from other countries.

As with previous summer research institutes, the Society will publish formal proceedings in the series *Proceedings of Symposia in Pure Mathematics*. A copy of the proceedings will be provided to each person who registered.

The topic for the 1985 summer institute was selected by the 1983 AMS Committee on Summer Institutes, whose members at the time were Michael Artin, Thomas H. Brylawski, Robert Osserman (chairman), George C. Papanicolaou, Harold M. Stark, and Stephen Wainger.

The Organizing Committee for the institute included Spencer Bloch, David Eisenbud, (chairman), William Fulton, David Gieseker, Joe Harris, Robin Hartshorne, and Shigefumi Mori.

The Council Meeting in Laramie

The Council met on 11 August 1985 at 5:00 P.M. in the Rendezvous Room of the Washakie Center on the campus of the University of Wyoming. President Kaplansky was in the chair.

The Council passed the following resolution.

> The Council of the Society records with deepest sorrow the death on Tuesday, 30 July 1985, of Ex-President Julia B. Robinson, who served as President from 1 January 1983 to 31 December 1984. Members of the Council remember with gratitude her devoted service to the Society and her contributions to mathematics.

It was announced that an article of appreciation is scheduled for the November *Notices*. It was further announced that President Robinson had established the Alfred Tarski Fund with the Regents of the University of California in honor of her teacher and had requested interested persons to contribute to it. The Society itself made a contribution.

The Committee to Monitor Problems in Communication was designated by the Council as the editorial committee for books not in series. This includes dictionaries, books about mathematics, review volumes, and other items, possibly including textbooks. The interest is "to make the Society's system for getting a wide variety of nonserial books into print more flexible, responsive, and consistent."

The Council approved an amendment to the bylaws establishing again a version of life membership. It is to be available to persons of age at least 62 who have been members for at least 20 years and who make a one time payment equal to five times the higher level dues for the coming year. The amendment will go to the business meeting of January 1986 in New Orleans.

The Council approved an amendment to the bylaws concerning the amendment procedure. Currently, an amendment is recommended by the Council and ratified by a business meeting. The proposed change will allow ratification by either a business meeting or a mail ballot of the membership. This amendment will also go to the business meeting in New Orleans.

The Council endorsed the principle that programs in mathematics aimed at extremely talented youngsters be established and will look for ways to do this and for sources of funds.

The current Secretary, always supposing that he is nominated and elected for another term, had expressed a wish not to serve beyond 1988. At the request of the Executive Committee and the Board of Trustees, the Council authorized the formation of a search committee for a successor so that an orderly transition can be effected. The Chairman of the committee is Ramesh Gangolli, who is a Trustee.

The size of the Editorial Committee for *Transactions* and *Memoirs* was increased by three. There had been no distinction between editor and associate editor with respect to duties toward the journal and with this change there is no distinction in title. The Council elected Ronald L. Graham (1986), Peter W. Jones (1987), and Kenneth Kunen (1987) to be members of the Editorial Committee effective 2 January 1986, with terms ending in December of the indicated year.

Professor Calvin C. Moore, having assumed the position of assistant vice-president for academic personnel and planning for the University of California, resigned as editor of the *Bulletin* and member of the Council. The Council, subject to approval by the Trustees, elected Professor Wu-chung Hsiang to replace him. In the division of labor among *Bulletin* editors, Professor Hsiang will be editor for research announcements.

The Council recommended that the Business Meeting pass a resolution of protest concerning a South African mathematician named Ismail Mohamed. The text is in the report of the Business Meeting.

The Council instructed the Secretary to publish in the *Notices* a report on the status of E. P. Gil'bo, whose doctor's degree was rescinded. It will be found elsewhere in this section of the *Notices*.

The Council resolved that the Society shall annually assemble information on the numbers of men and women in several categories, including membership, invited hour speakers, speakers at special sessions, and members of editorial boards of AMS journals. The manner of doing this is to be explored. As with all Council actions involving the potential expenditure of funds, action on this proposal is subject to approval by the Trustees.

The Council made two additional nominations for the position of member-at-large of the Council, namely

Bruce L. Rothschild Robert F. Williams

There was an intermission for dinner from 6:45 to 7:45 P.M. The Council adjourned at 8:50 P.M.

The Business Meeting in Laramie

The Business Meeting was held on 14 August 1985 in the auditorium of the Agriculture Building on the campus of the University of Wyoming following the presentation of the Steele Prizes. President Kaplansky was in the chair.

The Secretary reported on items of interest among actions of the Council of 19 April 1985 (see the *Notices* for June 1985, p. 425) and of 11 August 1985 (reported above).

The Business Meeting approved the amendments to the bylaws that were presented to the membership on pp. 478-479 of the *Notices* for August 1985. The amendment accomplished a reduction in the size of the Council and instituted remission of dues for longstanding members with long term disability.

The Business Meeting, on recommendation of the Council, approved the following resolution.

> The 89th Summer Meeting of the American Mathematical Society is concerned that the government of South Africa has arrested Ismail Mohamed, Professor of Mathematics at the University of the Witwatersrand, Johannesburg, along with several other leaders of the United Democratic Front, accusing them of high treason. We fear that the charges against Professor Mohamed are ultimately based on actions which we would consider legitimate political activities, and that drastic penalties may be imposed for what elsewhere would be considered nothing more

than the reasonable exercise of freedom of speech. Since high treason is a capital offense, we want to express our particular and continuing concern that international standards of justice and due process be observed in this case. The American Mathematical Society intends to follow closely subsequent developments in this case.

Associate Secretary Robert Fossum offered the following resolution.

> The 89th Summer Meeting of the American Mathematical Society records its appreciation and great thanks to the University of Wyoming, its Department of Mathematics and the Local Arrangements Committee for their superb efforts made in hosting this meeting for an excellent job well done.

It was passed by acclamation.

The meeting adjourned at 5:45 P.M.

Everett Pitcher
Secretary

Bethlehem, Pennsylvania

Report of the Committee on Human Rights of Mathematicians

In 1982 there were a few cases of Soviet advanced degrees being revoked. This did not become a regular practice, and we do not know of any recent instances; but we do not know that any degree once revoked has been restored. One of the victims was Dr. Evgeniĭ P. Gil'bo of the Leningrad Polytechnic Institute, co-author of a book (1975) on signal processing, with many other publications in this area. The Committee has been told that Dr. Gil'bo, a Jew, had applied with his family to emigrate in February 1981 and had been refused. It has been suggested that others at the Institute sought the revocation of his degrees as a pretext for removing him from his position as Senior Scientist; however this may be, his degrees were annulled on 22 January 1982, and he was pressured into resigning from the Institute on 5 March 1982. His wife, an economist at Leningrad State University, was also forced out and their daughter, till then a top student, was failed and expelled.

Pursuant to an AMS Council action at its August 1983 meeting, the then President of the Society, Julia Robinson, wrote to V. S. Vladimirov. Professor Vladimirov is a well-known mathematician, and the senior mathematical member of the committee which vets all advanced degrees in the Soviet Union. This letter read in part,

> ...it is reported that the scientific degrees of E. P. Gil'bo have been annulled. We are aware of scientific publications by E. P. Gil'bo over a period of almost twenty years, including the 1975 book in collaboration with I. B. Čelpanov; we are not aware that anyone has raised doubts of the quality of these publications, or of the quality of his work at the Leningrad Polytechnic Institute. The whole world will naturally assume that the degrees awarded to E. P. Gil'bo were fairly earned; annulling his degrees will not have diminished the honor with which he is regarded by scientists. We wonder, therefore, why such an action as annulling his degrees should be taken. It may cause him personal difficulties, but we cannot see that it can serve any legitimate scientific purpose. We would be grateful for a reply as we are eager to know your views on this question.

Professor Vladimirov replied, denying knowledge of the case. Further urging, in letters by Professor Robinson and the present President Irving Kaplansky, have not elicited any substantive reaction from him.

Meanwhile, we have received first-hand news of Dr. (let us still call him Doctor) Gil'bo. A young American, Mark Yesley, not a mathematician, visited the Gil'bo family early in 1985. He reports that Evgeniĭ, after a long period of unemployment, found, through a friend, a job keeping books for an apartment building. Mrs. Gil'bo knits to make money and their daughter babysits. Delivery of mail from abroad has been unreliable, but there has been contact by telephone. Mr. Yesley comments that there is no future in the Soviet Union for this family; certainly they see no prospect of resuming their former professional life. Their most recent application to emigrate was submitted 3 June 1985 and denied ten days later.

Chandler Davis, Chairman

Classified Advertisements

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

THE RATE IS $.55 per word with a minimum of $5.00. The same ad in 6 consecutive issues is $3.00 per word. Type will be set solid unless centering and spacing are requested. A centered line of any length or the equivalent in white space is $5.00. A word is defined as a group of characters with space at each end. Prepayment is required of individuals but not of institutions. For an additional $10.00 charge, announcements can be placed anonymously. Correspondence will be forwarded.

DEADLINES are listed on the inside front cover.

U. S. LAWS PROHIBIT discrimination in employment on the basis of color, age, sex, race, religion or national origin. "Positions Available" advertisements from institutions outside the U. S. cannot be published unless they are accompanied by a statement that the institution does not discriminate on these grounds whether or not it is subject to U. S. laws. Details and specific wording may be found following the Classified Advertisements in the January and August issues of the *Notices*.

SITUATIONS WANTED ADVERTISEMENTS from involuntarily unemployed mathematicians are accepted under certain conditions for free publication. Call toll-free 800-556-7774 and speak to Wahlene Siconio for further information.

SEND AD AND CHECK TO: Advertising Department, AMS, P. O. Box 6248, Providence, Rhode Island 02940. Individuals are requested to pay in advance, institutions are not required to do so.

POSITIONS AVAILABLE

HOUSTON BAPTIST UNIVERSITY
Department of Mathematics and Physics

Applications are invited for a full-time position in mathematics at Houston Baptist University beginning in December, 1985. Applicants should have a PhD in mathematics and a strong commitment to Christian education. Rank and salary will depend on qualifications. Send resume and three letters of reference to Dr. Jerry Gaultney, Associate Dean of the College of Science and Health Professions, Houston Baptist University, 7502 Fondren Road, Houston, Texas, 77074-3298. Telephone: 713-774-7661, ext. 2375.

Chairperson
Department of Mathematics
Southwest Texas State University

Southwest Texas State University has reopened the search for chairperson of the Department of Mathematics. Candidates should have an outstanding record of scholarly research and high quality instruction as well as related professional activities. They must be able to provide strong academic leadership for a diverse department which is involved in both pure and applied mathematics, mathematical education, and diagnostic testing and placement of students. The Department currently has almost forty FTE faculty with over 200 majors at the bachelors and masters levels. Some 6500 students per semester enroll in the Department's courses; a large number of these are in service courses for the School of Business and the School of Education.

Southwest Texas is a regional university of over 19,000 undergraduate and graduate students in eight schools. It is located in San Marcos, a friendly residential community of 35,000 located midway between Austin and San Antonio in the hill and lake country of Texas.

The position of chairperson at Southwest Texas State is a twelve-month appointment with a rank of associate or full professor depending upon qualifications. The current salary range for chairpersons is $55,400 to $57,300. Applicants should send a letter of intent and a complete vita, and should arrange to have at least three current letters of reference sent to:

Dr. B. J. Yager, Chairman
Mathematics Search Committee
Southwest Texas State University
San Marcos, Texas 78666

The closing date for applications is November 30, 1985. The position will become available no later than September 1, 1986.

Southwest Texas State University is an Affirmative Action, Equal Opportunity Educational Institution.

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
DEPARTMENT OF MATHEMATICS

Applications for a tenure track position are invited. Mathematicians with major research in one of the areas of nonlinear analysis, mathematical physics, or dynamical systems are particularly encouraged to apply. Applicants should be strong or promising researchers, good teachers and able to interact with other researchers in the department. Rank and salary are open. The teaching load for researchers is competitive. Applicants should send C. V. and have at least three letters of reference sent to Roger T. Lewis, Mathematics Department, University of Alabama at Birmingham, Birmingham, AL 35294, by January 1, 1986. UAB is an Affirmative Action/Equal Opportunity Employer.

MATH SCI PRESS, 53 Jordan Rd, Brookline MA, 02146, 617-738-0307. Just published: Proceedings of the Berkeley-Ames Conference on Nonlinear Problems in Control and Fluid Dynamics, L. R. Hunt and C. F. Martin, (eds), 450 pages, $50. (Lie Groups Series B: Systems Information and Control, vol. II). Topics in the Geometric Theory of Linear Systems, by Robert Hermann, $50. (Interdisciplinary Mathematics, v. 22). The Geometric theory of Ordinary Differential Equations and Algebraic Functions, by G. Valiron, $75. (Lie Groups, v. 14). Topics in the Geometry Theory of Integrable Systems, $65, by Robert Hermann (Interdisciplinary Mathematics, v. 23.). Write or call for special prices on back list.

DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE
RUTGERS UNIVERSITY AT NEWARK
PROFESSOR OF MATHEMATICS

The Department of Mathematics and Computer Science anticipates an opening at the Rank of Professor beginning Fall 1986. Candidates should exhibit strong research accomplishments. Salary and teaching load are negotiable.

Applicants from all fields are invited. Areas of research interest in the department include number theory, representation theory and automorphic forms, combinatorics and logic, and low dimensional topology and Teichmuller theory.

Candidates should send a résumé and the names of three references to:

Jane Gilman, Chair
Department of Mathematics & Computer Science
Rutgers — The State University
Newark, New Jersey 07102

The closing date for applications is January 15, 1986. Rutgers University is an equal opportunity, affirmative action employer.

POSITIONS AVAILABLE

INSTITUTE FOR DEFENSE ANALYSES
COMMUNICATIONS RESEARCH DIVISION

Applications are invited from Ph.D. level mathematicians for research positions on our technical staff. Initial appointment would be for one or two years, possibly leading to a permanent position.

Additionally, we also organize each year a summer program (SCAMP) for which places are available. Wide mathematical interests, and the ability to motivate one's own work are more important than knowledge of specific areas of mathematics. Facility in computer programming and some knowledge of statistics would be definite assets.

Salaries will be competitive and commensurate with experience and qualifications.

IDA/CRD is an equal opportunity/affirmative action employer, and encourages applications from women and members of minority groups. Send résumé and publication list to:

Dr. N. J. Patterson
Deputy Director
IDA/CRD
Thanet Road
Princeton, NJ 08540

U.S. citizenship required.

THE UNIVERSITY OF WYOMING
HEAD—DEPARTMENT OF MATHEMATICS

The Department of Mathematics at the University of Wyoming invites applications for the position of Department Head. The University is the sole four-year institution of higher education in the state of Wyoming with an enrollment of 10,000 students. The mathematics program offers degrees in mathematics, applied mathematics, and several joint-degree options at the bachelor, master and doctoral levels. The department has a growing major research component in applied mathematics including a petroleum research institute with funding from major industrial supporters. Other active research areas in the department include numerical analysis, partial differential equations, functional analysis, optimization theory, dynamical systems, rigidity theory, and combinatorics.

Candidates should have a strong research record compatible with department interests and a commitment to excellence in instruction. Applicants should submit a current curriculum vitae and the names of at least three suitable references to:

W. G. Bridges, Chair
Search Committee
Mathematics Department
University of Wyoming
Laramie, WY 82070

Applications will be considered through January 31, 1986. The University of Wyoming is an equal opportunity employer.

M. W. Baldoni Silva, J. J. Benedetto, A. Berenstein, II, C. Berenstein, B. E. Blank, R. Blei, G. Brown, R. Brummelhuis, R. Burger, J. L. Clerc, R. R. Coifman, M. Cowling, A. H. Dooley, P. Eymard, J. Faraut, H. G. Feichtinger, M. Gatesoupe, G. I. Gaudry, S. Helgason, A. Iozzi, R. Johnson, P. Jones, J. P. Kahane, A. W. Knapp, T. H. Koornwinder, A. Koranyi, R. A. Kunze, J. J. Manfredi, O. C. McGehee, Y. Meyer, M. A. Picardello, G. Pisier, E. Prestini, H. M. Reimann, R. Rochberg, J. L. Rubio de Francia, C. Sadosky, P. Sjolin, S. Wainger, G. Weiss.

Two volumes for 541 + 536 pages, $80.00.

Orders must be prepaid and should be addressed to:

Istituto Nazionale di Alta Matematica Francesco Severi
P. le Aldo Moro 5
Città Universitaria
00185 ROMA, Italia.

POSITION OPEN
CHAIRPERSON
DEPARTMENT OF MATHEMATICAL SCIENCES

Loyola University of Chicago invites nominations and applications for the position of Chairperson of the Department of Mathematical Sciences. The position will be open on or about July 1, 1986.

Loyola is the oldest university in Chicago and one of the largest and most complex of 236 Catholic Church–related colleges and universities in the United States.

More than 15,000 students attend classes on four campuses: the Lake Shore Campus, the Water Tower Campus in downtown Chicago, the Medical Center in Maywood, Illinois, and the Rome Center in Rome, Italy.

The Department of Mathematical Sciences offers Bachelor's degrees in the following areas: mathematics; computer science; mathematics and computer science; mathematics and statistics. Master's degrees are offered in mathematics and in computer science.

The Department has 22 full-time faculty, and about 530 undergraduate majors and 100 graduate students. In addition, it provides service courses for approximately 2,100 students per semester.

Candidates must have an earned Doctorate, teaching experience, a record of scholarly activity and commitment to the goals and traditions of Jesuit education.

Closing date for applications is December 1, 1985. Letters of application and a *curriculum vitae* should be sent to the following address:

Ralph L. Pearson
Dean, University College
Loyola University of Chicago
820 North Michigan Avenue
Chicago, Illinois 60611

AN EQUAL OPPORTUNITY, AFFIRMATIVE ACTION EMPLOYER

UCLA DEPARTMENT OF MATHEMATICS
TEMPORARY POSITIONS

One or two E. R. Hedrick Assistant Professors. Applicants must show strong promise in research and must have received the Ph.D. during the past three or four years (but may be of any age): no restrictions as to field; anticipated salary $33,400. Three year appointment: research supplement of $3,700 first summer. Teaching load: Four quarter courses per year, which may include one advanced course in candidates field. Deadline for applications is January 1, 1986.

Also, subject to administrative approval, a few adjunct assistant professorships; two year appointment; strong research and teaching background; no restriction as to field. Anticipated salary $28,700 for academic year. Teaching load: Five quarter courses per year.

Also several positions for visitors and lecturers.

To apply, write to Yiannis N. Moschovakis, Chair, Los Angeles, CA 90024.

UCLA is an equal opportunity/affirmative action employer.

UNIVERSITY OF SOUTH FLORIDA
Department of Mathematics

Tenure-track teaching and research positions are available beginning August, 1986. Applicants must possess a Ph.D. degree. Applicants specializing in Approximation Theory, Computer Science, Differential Equations, Logic, Numerical Analysis, Probability, or Statistics are preferred. Rank and salary will depend on credentials. To apply send curriculum vitae and have three letters of recommendation sent to Kenneth L. Pothoven, Chairman, Tampa, FL 33620. The University of South Florida is an equal opportunity employer.

POSITIONS AVAILABLE

UCLA DEPARTMENT OF MATHEMATICS
REGULAR POSITIONS
IN APPLIED/COMPUTATIONAL MATHEMATICS

Three or four regular positions in applied and computational mathematics. Preference will be given to candidates in numerical analysis, mathematical modeling, and scientific/engineering computing. Very strong research and teaching background required. Positions initially budgeted at the assistant professor level. Sufficiently outstanding candidates at higher levels and/or in other fields will also be considered. Teaching load: Five quarter courses per year.

To apply, write to Yiannis N. Moschovakis, Chair, Los Angeles, CA 90024. Attention: Faculty Search Committee.

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UCLA DEPARTMENT OF MATHEMATICS
REGULAR POSITIONS IN PURE MATHEMATICS

Three or four regular positions in pure mathematics. Preference will be given to candidates in number theory (including modular forms) and probability (including statistical mechanics). Other fields of particular interest include analysis, geometry/topology, differential equations, and algebra (especially representation theory). Very strong research and teaching background required. Positions initially budgeted at the assistant professor level. Sufficiently outstanding candidates at higher levels and/or in other fields will also be considered. Teaching load: Five quarter courses per year.

To apply, write to Yiannis N. Moschovakis, Chair, Los Angeles, CA 90024. Attention: Faculty Search Committee.

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UNIVERSITY OF CALIFORNIA, IRVINE
DEPARTMENT OF MATHEMATICS
IRVINE, CALIFORNIA 92717

Two faculty positions at the level of Assistant Professor in Applied Mathematics, available beginning academic year 1986-87. A Ph.D. degree, publications, and evidence of active interest in quality teaching are required. Examples of preferred research areas: partial differential equations, nonlinear phenomena, applied functional analysis, and numerical analysis. Send applications, a curriculum vitae, and the names of three or more references to Professor Martin Schechter Department of Mathematics, University of California, Irvine, CA 92717. An Affirmative Action/Equal Opportunity Employer.

Computer Science Faculty
New England College

Full-time permanent position at Assistant Professor rank, beginning January 1, 1986 or September, 1986. Teach Computer Science courses, freshman through senior. Master's degree required in Computer Science, Electronics, Mathematics, Physics, or Electrical Engineering with Ph.D. in Computer Science or Mathematics preferred. Excellence in teaching highest priority; opportunity to extensively influence an expanding Computer Science program. Ability to teach mathematics courses considered a plus. Send resume, transcripts, and names of three references by November 1, 1985 to David French, Vice President for Academic Affairs, New England College, Henniker, New Hampshire 03242. An Equal Opportunity Employer.

FACULTY POSITION to be filled for Fall, 1986 in Operations Research, Statistics, or Probability. Rank and salary open. Strong research interests and good teaching ability required. Send resume by November 15, 1985, to Professor Noam Gordon, Department of Mathematics, City College of CUNY, Convent Ave., & 138th St., New York, NY 10031. Affirmative Action Employer.

The Department of Mathematics, University of California at Davis, is seeking to fill one or more tenure track positions beginning July 1, 1986.

We are particularly interested in applicants with broad backgrounds in one of the following areas:

1. Functional Analysis and Partial Differential Equations
2. Dynamical Systems and the Geometric Theory of Differential Equations

These positions are at the Assistant Professor level. Requirements are a doctorate in mathematics or in a closely related field and evidence of achievement or potential in research and teaching.

Candidates should send a letter of application, a vitae, and the NAMES ONLY of three referees to:

Chair, Search Committee
Department of Mathematics
University of California
Davis, California 95616

Applications must be postmarked no later than January 13, 1986.

The University of California is an equal opportunity/affirmative action employer.

UCLA DEPARTMENT OF MATHEMATICS
REGULAR POSITIONS
IN MATHEMATICAL COMPUTER SCIENCE

One or two positions in mathematical computer science. Preference will be given to candidates in analysis of algorithms, coding theory, computational complexity, and the theory of programming languages. Very strong research and teaching background required. Positions initially budgeted at the assistant professor level. Sufficiently outstanding candidates at higher levels and/or in other fields will also be considered. Teaching load: Five quarter courses per year.

To apply, write to Yiannis N. Moschovakis, Chair, Los Angeles, CA 90024.

UCLA is an equal opportunity/affirmative action employer.

UNIVERSITY OF CALIFORNIA, SANTA BARBARA
DEPARTMENT OF MATHEMATICS

Applications are invited for several Special Visiting Assistant Professorships for the 1986/87 academic year. These two-year positions involve research and a 2-2-1 teaching load with an anticipated salary of $28,000. Candidates must possess a Ph.D. degree by September, 1986. Successful candidates must have a strong commitment to mathematical research and superior teaching ability. We also anticipate a few senior level, one-year visiting positions. Applicants should send vitae and publication lists, and arrange for three letters of recommendation to be sent to: Professor James Robertson, Chairman, Department of Mathematics, University of California, Santa Barbara, California, 93106. Applications must be received by January 15, 1986, or until the positions are filled. An Affirmative Action/Equal Opportunity Employer.

Applications are encouraged for anticipated tenure-track, tenured positions, and visiting positions at all levels for the academic years 1986-87 and 1987-88. Application, vita, and three letters of recommendation should be sent to William A. Kirk, Chair, Department of Mathematics, University of Iowa, Iowa City, Iowa 52242. Selections will be based on evidence of the applicants' effective teaching and research achievements and potential; instructional needs of the Department; and the potential for interaction with the faculty at the research level. Special attention will be given to applicants in partial differential equations, differential geometry, and numerical analysis. The selection process will begin as applications are received. The University of Iowa is an Affirmative Action and Equal Opportunity Employer and specifically encourages applications from women and minorities.

POSITIONS AVAILABLE

MATHEMATICS
UNIVERSITY OF MARYLAND BALTIMORE COUNTY

The UMBC Mathematics Department invites applications for tenure and tenure-track faculty positions in Applied Mathematics, beginning September 1, 1986. Candidates should have a Ph.D. and research and teaching experience commensurate with position applied for. Faculty with strengths in Control and Communication, Operations Research or Scientific Computing and Modeling will be preferred. The department has a faculty of about 25 at present. Applications should be received at the earliest, but no later than January 15, 1986. Send curriculum vitae, reprints and/or preprints, names of at least three referees, and a summary of current research activity to: Professor Nam P. Bhatia, Chairman Faculty Recruiting, Department of Mathematics, UMBC, Catonsville, MD 21228. EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER. MINORITIES AND WOMEN ARE ENCOURAGED TO APPLY.

STATISTICS
UNIVERSITY OF MARYLAND BALTIMORE COUNTY

The UMBC Mathematics Department invites applications for tenure and tenure-track faculty positions in Statistics, beginning September 1, 1986. Candidates should have Ph.D., strong teaching ability and demonstrable research potential in either mathematical or applied statistics. The department offers M.S. and Ph.D. programs in Applied Mathematics and Statistics and undergraduate major program in mathematics leading to the baccalaureate degrees. The department has a faculty of about 25 at present. Applications should be received at the earliest, but no later than January 15, 1986. Send curriculum vitae, reprints and/or preprints, names of at least three referees, and a summary of current research activity to: Professor Nam P. Bhatia, Chairman Faculty Recruiting, Department of Mathematics, UMBC, Catonsville, MD 21228. EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER. MINORITIES AND WOMEN ARE ENCOURAGED TO APPLY.

THE OHIO STATE UNIVERSITY
CHAIR IN SCIENTIFIC COMPUTATION

The Department of Mathematics has been awarded a Chair in Scientific Computation. Applications are invited from individuals with outstanding credentials in any area of applied mathematics whose research activities make significant use of high speed computers. The appointee will hold the academic rank of Professor of Mathematics and will be expected to provide the academic leadership in the developing field of scientific computation at Ohio State.

Individuals interested in this position should contact

Alan Woods, Chairman
Department of Mathematics
The Ohio State University
231 W. 18th Avenue
Columbus, Ohio 43210
Telephone: 614/422-7173

DEPARTMENT OF MATHEMATICS
THE OHIO STATE UNIVERSITY

The Department of Mathematics of The Ohio State University hopes to fill several positions at all ranks, both visiting and permanent, effective Autumn Quarter 1986. Candidates in areas of applied and pure mathematics are invited to apply. Significant research accomplishments or exceptional research promise and evidence of good teaching ability will be expected of successful applicants.

Please send credentials and have letters of recommendation sent to Professor Alan Woods, Department of Mathematics, The Ohio State University, 231 W. 18th Avenue, Columbus, Ohio 43210. Review of resumes will begin immediately.

The Ohio State University is an Equal Opportunity/Affirmative Action Employer.

ISTITUTO NAZIONALE DI ALTA MATEMATICS
FRANCESCO SEVERI
ROME – ITALY

Recent publications:

Free boundary problems

Proceedings of a seminar held in Pavia – September–October 1979, by:

S. Albertoni, H. W. Alt, A. Ambrosetti, L. Amerio, I. Athanasopoulos, C. Baiocchi, J. Bear, M. Biroli, P. Boieri, C. M. Brauner, H. Brezis, M. Bulgarelli, L. A. Caffarelli, J. R. Cannon, A Capelo, G. Capriz, V. Casulli, J. Cea, M. Chipot, G. Cimatti, L. Citrini, L. Collatz, V. Comincioli, B. Coppi, P. Cortey-Dumont, C. W. Cryer, B. D'Acunto, A. Damlamian, E. De Giorgi, A. S. Demidov, E. Di Benedetto, J. Douglas, G. Duvaut, A. Fasano, A. Franchi, J. Frehse, A. Friedman, F. Gastaldi, G. Geymonat, G. Gilardi, B. Glowinski, L. Guerri, C. Guillopé, W. Hager, G. D. Ianculescu, R. Jensen, S. Kamin, J. L. Lions, P. L. Lions, G. Maier, U. Maione, G. Meyer, J. C. Miellou, M. Miranda, U. Mosco, B. Nicolaenko, J. A. Nitsche, J. R. Ockendon, G. A. Pozzi, M. Primicerio, G. Prouse, J. W. Rogers, L. I. Rubinstein, G. Sacchi, A. Taroni, R. Temam, F. Tomarelli, A. Torelli, B. Turkington, P. Villaggio, A. Visintin.

Two volumes for 523 + 606 pages, $70.00.

Monge-Ampère equations and related topics

Proceedings of a seminar held in Firenze – September–October 1980, by:

T. Aubin, I. Bakelman, B. Bojarski, R. Dwilewicz, A. Kumpera, V. I. Oliker, C. Pucci, G. Talenti.

One volume, 248 pages, $25.00.

Topics in modern harmonic analysis

Proceedings of a seminar held in Torino and Milano – May–June 1982, by:

Rice University invites applications for at least one Griffith C. Evans Instructorship beginning July 1, 1986. Applicants with strong research credentials in one or more of the areas of analysis, geometry, mathematical physics, or topology are asked to write for application forms to Junior Appointments Committee, Mathematics Department, Rice University, Box 1892, Houston, TX 77251. Rice University is an equal opportunity, affirmative action employer.

Rice University invites applications for at least one anticipated position at the level of Assistant Professor, Associate Professor, or Professor of Mathematics. Applicants with outstanding research accomplishments in one or more of the areas of analysis, geometry, mathematical physics, or topology are asked to write for application forms to Senior Appointments Committee, Mathematics Department, Rice University, Box 1892, Houston, TX 77251. Rice University is an equal opportunity, affirmative action employer.

THE UNIVERSITY OF WESTERN ONTARIO
DEPARTMENT OF MATHEMATICS

The Department of Mathematics invites applications for a tenure track appointment at either Assistant Professor or Associate Professor level. Candidates should hold a Ph.D. and have demonstrated research ability in an area of Analysis. The appointment is expected to commence July 1, 1986 and is subject to the availability of funds. Duties will include teaching and research. In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian Citizens and Permanent Residents of Canada. Applications, including the names of three referees, should be sent to:

Dr. D. Borwein, Head
Department of Mathematics
Middlesex College
The University of Western Ontario
London, Ontario N6A 5B7
Canada

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An affirmative action, equal opportunity employer.

DEPARTMENT OF MATHEMATICS, UNIVERSITY OF MISSOURI-KANSAS CITY, seeks an outstanding senior faculty member to fill the position of Department Chair; salary open. The successful candidate will have an established reputation and a record which reflects dedication to quality, an innovative spirit, and activity in research. The Chair must represent the department effectively within the University and in the community and must be an able and imaginative leader. The Department offers degrees through the Ph.D. Candidates should send a letter of interest, a vita, and at least three letters of recommendation by January 1, 1986, to: Dr. George Phillip Barker, Search Committee Chair, Department of Mathematics, College of Arts and Sciences, University of Missouri-Kansas City, 5100 Rockhill Road, Kansas City, Missouri 64110. UMKC is an affirmative action/equal opportunity institution.

UCLA DEPARTMENT OF MATHEMATICS
TEMPORARY POSITIONS

One or two E. R. Hedrick Assistant Professors. Applicants must show strong promise in research and must have received the Ph.D. during the past three or four years (but may be of any age): no restrictions as to field; salary $34,000. Three year appointment: research supplement of $3,778 first summer. Teaching load: Four quarter courses per year, which may include one advanced course in candidates field. Deadline for applications is January 1, 1986.

Also, subject to administrative approval, a few adjunct assistant professorships; two year appointment; strong research and teaching background; no restriction as to field. Salary $29,400 for academic year. Teaching load: Five quarter courses per year.

Also several positions for visitors and lecturers.

To apply, write to Yiannis N. Moschovakis, Chair, Los Angeles, CA 90024. Attention: Faculty Search Committee.

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CHAIRPERSON
Department of Mathematics

The University of Southern California invites applications and recommendations for the faculty position of Chairperson of the Department of Mathematics. The department has a faculty of about 40 members, representing many areas in pure and applied mathematics. In addition to the Ph.D. in mathematics, it offers graduate programs in statistics and in applied mathematics with special options including biomathematics and numerical analysis. It also has a computer assisted learning center for undergraduates and a statistics laboratory. Candidates for the position must have an outstanding record of research and scholarship and must be ready to assume academic leadership and administrative direction of a broadly based university department. If interested, send a vita and names of references to:

Theodore E. Harris, Chair-Search Committee
Department of Mathematics, DRB 306
University of Southern California
Los Angeles, CA 90089-1113

Applications are invited for a tenure-track position at the Assistant Professor level starting July, 1986. Requirements are a Ph.D. and proven ability or demonstrated potential for research and teaching. Starting salary approximately $30,316 (Canadian) per annum. Send vitae and arrange for three letters of reference to be sent to: J. W. Macki, Chairman, Department of Mathematics, University of Alberta, Edmonton, Alberta, T6G 2G1. The University of Alberta is an equal opportunity employer, but in accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents. Closing date for applications is January 31, 1986.

FACULTY APPOINTMENT

The Department of Mathematical Sciences invites applications for a tenured professorship in the area of operations research, effective Fall 1986. Specializations of particular interest include decision science, production and distribution systems, mathematical programming, stochastic models, network flow, algorithms, combinatorial optimization, simulation methods, and reliability. Candidates should be active researchers with outstanding accomplishments in research, teaching and/or innovative applications. Interested persons are asked to send their vitas to Robert J. Serfling, Search Committee, Department of Mathematical Sciences, The Johns Hopkins University, Baltimore, Maryland 21218. The Johns Hopkins University is an Equal Opportunity/Affirmative Action Employer. Employment is offered without discrimination on the basis of race, color, religion, sex or national origin.

LAWRENCE UNIVERSITY
DEPARTMENT OF MATHEMATICS

Tenure-track position at the assistant professor level starting fall 1986. The Department seeks candidates specializing in differential geometry or probability, but will consider especially strong candidates in any area. Lawrence is a liberal arts college with a national reputation, small classes, and excellent students. Teaching load two courses each ten week term. Salary competitive. Send résumé, transcripts, and three or four supporting letters to Bruce Pourciau, Chair, Department of Mathematics, Lawrence University, Appleton, WI 54912. These letters should provide specific evidence on the candidate's potential for outstanding undergraduate teaching and continued research. Deadline January 15 but application by December 20 makes possible an interview at the January AMS meeting in New Orleans. Equal Opportunity Employer.

DEAN, RUTGERS COLLEGE: Rutgers, The State University of New Jersey, invites nominations and applications for the position of Dean of Rutgers College. Rutgers College, established in 1766, is the oldest and largest of the four liberal arts colleges on the New Brunswick campus with a student enrollment of approximately 8,350. The Dean is responsible for shaping and guiding all aspects of the life of the college and for providing leadership to the college fellows in defining the college mission and developing courses and programs that realize that mission; establishing admissions criteria, setting general education and degree requirements and standards for graduation; regulating student life; and maintaining relations with alumni. Candidates must have a distinguished scholarly record commensurate with appointment to the rank of professor in an appropriate University department and demonstrated leadership and a strong commitment to fostering excellence in undergraduate education. Salary is open and competitive. Send nominations and applications by November 15, 1985 to: Dr. Paul G. E. Clemens, Chair, Search Committee, c/o Office of the Vice President for University Personnel, RUTGERS, The State University of New Jersey, New Brunswick, New Jersey 08903. An Affirmative Action/Equal Opportunity Employer.

POSITIONS AVAILABLE

UNIVERSITY OF CALIFORNIA, DEPARTMENT OF MATHEMATICS, BERKELEY, CA 94720

Subject to budgetary approval, applications are invited for a position effective July 1st, 1986, at tenure level (Associate or full Professor) in the areas of algebra, analysis, applied mathematics, foundations, or geometry. Applicants should have demonstrated substantial achievements in research and teaching. Send by September 30, 1985 curriculum vitae, list of publications, a few selected reprints or preprints, and the names of three references to Vice Chair for Faculty Appointments, at the above address. The University of California is an Equal Opportunity, Affirmative Action Employer.

NAVAL POSTGRADUATE SCHOOL
FACULTY POSITION IN OPERATIONS RESEARCH

The Operations Research Department invites applicants for either visiting or tenure track faculty positions. Duties in either case include teaching (graduate level), thesis direction (mainly Master of Science), and research. In the case of tenure track our preference is for junior applicants, but consideration will be given to a senior applicant with a strong research record. A Ph.D. is required, not necessarily in Operations Research. Areas of emphasis within the OR Department include statistics, stochastic modelling, math programming, human factors, simulation, combat modelling, systems analysis, logistics, and war gaming.

Located in Monterey, the Naval Postgraduate School is a graduate institution offering degrees in science, engineering, and administration. Excellent research and teaching facilities include an IBM 3033/AP (16MB), a secure war gaming laboratory with a DEC-VAX 11/780 and extensive graphics, and other computational facilities. The OR Department has 28 civilian and 7 military faculty. Faculty appointments follow AAUP guidelines. Please send detailed resume with names, addresses, and telephone numbers of three or more references to:

Chairman, Department of Operations Research
Naval Postgraduate School
Monterey, CA 93943-5100
(408) 646-2381/2594

The Naval Postgraduate School is an Equal Opportunity Affirmative Action Employer.

THE GEORGIA INSTITUTE OF TECHNOLOGY

The School of Mathematics expects to have available some visiting and tenure-track positions beginning in the Fall of 1986. Priority will be given to applicants in statistics, scientific computing (parallel and vector computing, graphics, robotics) and ordinary differential equations. Excellent accomplishments or potential in research is required. Send resume and four letters of reference to W. F. Ames, Director, School of Mathematics, Georgia Institute of Technology, Atlanta, Georgia 30332. Georgia Tech, a unit of the University System of Georgia, is an Equal Opportunity/Affirmative Action Employer.

UNIVERSITEAT ZUERICH
MATHEMATISCHES INSTITUT

There is a vacancy from 15.10.87 for a

PROFESSOR IN GEOMETRY

(with emphasis towards Analysis), to complement the existing areas of teaching and research. Applicants should be expert in a field such as Differential Geometry, Differential Topology, Global or Harmonic Analysis.

Applications, with curriculum vitae and list of publications, should reach the Dekanat der Philosophischen Fakultät II, Universität Zürich, Rämistrasse 71, 8006 Zürich, Switzerland, before 31.10.1985. Applications from overseas may be accepted until the end of December 1985.

UCLA DEPARTMENT OF MATHEMATICS
REGULAR POSITIONS
IN MATHEMATICAL COMPUTER SCIENCE

One or two positions in mathematical computer science. Preference will be given to candidates in analysis of algorithms, coding theory, computational complexity, and the theory of programming languages. Very strong research and teaching background required. Positions initially budgeted at the assistant professor level. Sufficiently outstanding candidates at higher levels and/or in other fields will also be considered. Teaching load: Five quarter courses per year.

To apply, write to Yiannis N. Moschovakis, Chair, Los Angeles, CA 90024. Attention: Faculty Search Committee.

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The Ohio State University
Department of Mathematics
Research Instructorships in Mathematics

Applications are invited for the position of research instructor in mathematics for the academic year 1986-87. Candidates should hold a Ph.D. (or equivalent) in mathematics and show strong research promise.

Please send credentials and have letters of recommendation sent to Professor Alan Woods, Department of Mathematics, The Ohio State University, 231 W. 18th Avenue, Columbus, Ohio 43210. The Ohio State University is an Equal Opportunity/Affirmative Action Employer.

University of Georgia
Department of Mathematics
Athens, GA 30602

The department has some tenure track positions available for the 1986-87 academic year. The rank and salary will be commensurate with the applicants abilities and experience. The principal requirement is excellence in teaching and research. Some preference will be given to areas in which the department is already well represented. Send curriculum vitae and four letters of recommendation to Ray A. Kunze, Head (address above) by November 30, 1985. UGA is an Equal Opportunity/Affirmative Action Employer.

DEPARTMENT OF MATHEMATICS
University of Kansas

Applications are invited for tenure-track and temporary positions at all levels, commencing 8/16/86 or as negotiated. First preference will be given to numerical analysts, and then to candidates in other applied areas related to those represented in the department. Require Ph.D. or Ph.D. dissertation accepted with only formalities to be completed.

Application, detailed resume with description of research, and three recommendation letters should be sent to C. J. Himmelberg, Chairman, Department of Mathematics, University of Kansas, Lawrence, KS 66045-2142.

Deadlines: 11/01/85 for first consideration, then monthly until August 1, 1986.

The University of Kansas is an AA/EOE.

Applied Mathematics
University of Virginia

Tenure-track assistant professorships and possible senior positions for January, 1986 and later. Preferred areas are partial differential equations, numerical analysis and applied probability. Ph.D. required with strong research and teaching ability. Applicants for senior positions must have established record of research and grant support. Send resume and names of three references to J. M. Ortega, Chairman, Department of Applied Mathematics, Thornton Hall, University of Virginia, Charlottesville, VA 22901. An EO/AA Employer.

POSITIONS AVAILABLE

UNIVERSITY OF ILLINOIS AT CHICAGO
Department of Mathematics
Statistics and Computer Science
Box 4348, Chicago, IL 60680

Applications are invited for tenure-track or tenured positions in pure mathematics, applied mathematics and numerical analysis, probability and statistics, and theoretical computer science. Outstanding research record required: junior candidates with post-doctoral experience preferred. Applications are also invited for visiting positions of 1 or more quarters, especially in connection with a planned 1986–87 emphasis year in Combinatorics and Complexity. Send vita and direct 3 letters of reference to John Wood, Chairman, Search Committee (address above). Availability of positions contingent on budgetary allocations. AA/EOE.

UNIVERSITY OF ILLINOIS AT CHICAGO
MATHEMATICS AND COMPUTER EDUCATION

The Department of Mathematics, Statistics, and Computer Science invites applications for tenure-track, tenured or visiting positions in Mathematics and Computer Science Education.

The Department offers the stimulating environment of a highly rated Mathematics Department along with a strong commitment to the improvement of pre-college education. It currently has a number of successful programs in the area of pre-college mathematics and computer education. These include undergraduate programs for the certification of elementary and secondary teachers; an M.S.T. degree program; a Doctor of Arts program; courses for gifted pre-college students; and extensive teacher in-service and continuing education programs.

The department has received funding to expand and improve these programs and to set up a center for further development of the following activities: research in the teaching and learning of mathematics; study of the impact and applications of new technology such as microcomputers; curriculum improvement in pre-college mathematics and computer instruction; in-service programs for the enhancement of primary and secondary teachers.

Applicants must have a Ph.D. in Mathematics, Mathematics Education, Computer Science, or related field, an outstanding research and publication record, experience in undergraduate and graduate teaching and previous involvement with teacher education programs. Applications are also invited for visiting positions of 1 or more quarters. Send vita and direct 3 letters of reference to John Wood, Chairman, Search Committee, Dept. of Mathematics, Statistics, and Computer Science, Univ. of Illinois at Chicago, Box 4348, Chicago, IL 60680. AA/EOE.

DEPARTMENT OF MATHEMATICS
UNIVERSITY OF TORONTO

Applications are invited for limited term Assistant Professorships, beginning July 1, 1986, for a term of up to three years. Duties consist of research and teaching and candidates must demonstrate clear strength in both.

Applications should be sent to Professor D. K. Sen, Associate Chairman, Department of Mathematics, University of Toronto, Toronto, Ontario, Canada M5S 1A1, and should include a complete curriculum vitae, and the names of at least three referees. The deadline is February 15, 1986.

In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents.

UNIVERSITY OF CALIFORNIA, SANTA BARBARA
DEPARTMENT OF MATHEMATICS

Applications are invited for an assistant professor position in the area of either differential geometry or geometric topology. Effective July 1, 1986. Successful candidates must have demonstrated outstanding research potential and have superior teaching ability. Candidates must possess a Ph.D. degree by September, 1986. Senior applicants of exceptional stature will be considered, with salary and rank dependent upon qualifications. Applicants must send vitae and publication lists, and arrange for three letters of recommendation to be sent to: The Geometry/Topology Committee, Department of Mathematics, University of California, Santa Barbara, California, 93106. Applications must be received by *January 15, 1986.*

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MATHEMATICS DEPARTMENT
UNIVERSITY OF COLORADO

The Department of Mathematics of the University of Colorado invites applications for faculty positions beginning in the Fall of 1986. Although these positions are primarily at the assistant professor level, we also welcome strong applications at the associate professor level. Preference will be given to those whose research would complement the interests of our current faculty. Salary range: $24,000 to $35,000. Applications should be completed by November 1, 1985.

Inquiries should be addressed to: New Appointments, Department of Mathematics, Box 426, University of Colorado, Boulder, CO 80309.

The University of Colorado is an Affirmative Action/Equal Opportunity Employer.

FOR SALE

INTEGER PRESS, P.O. Box 6613, Station J, Ottawa, Canada K2A 3Y7. Just published – *The Green Book*: 100 *practice problems for undergraduate mathematics competitions, compiled with hints and solutions by Kenneth Hardy and Kenneth S. Williams,* 170 pages, $12.

Foundations of Semiological Theory of Numbers
H. A. Pogorzelski and W. J. Ryan

Volume 1 (1982), General Semiology, 597 pp., $29.95
Volume 2 (1985), Semio. Functions, 695 pp., $34.95

UMO Press, Univ. of Maine, Orono, ME 04469
(Post free within US if check included)

Our two latest books are: THE EQUIVALENCE OF SOME COMBINATORIAL MATCHING THEOREMS, by Philip Reichmeider (Hall's theorem, Dilworth's theorem, Menger's theorem, the integrity theorem, etc.) 127 pages, hardcover, $15.50 and ALEX, a 1-act play about Euclid by Ian D. Macdonald, 32 pages, paperback, $3.95. Polygonal Publishing, 210 Broad Street, Washington, NJ 07882.

Mathematics library. Request list. Bert Ross, University of New Haven, West Haven, Ct. 06516.

OFFER TO DONATE

Math Reviews unbound 1980-84, plus indexes 1940–1978. Thomas Jech, 814-865-7527.

INSTITUTE FOR MATHEMATICS AND ITS APPLICATIONS
UNIVERSITY OF MINNESOTA
SCIENTIFIC COMPUTATION
AUGUST 16, 1986 TO JULY 31, 1987

Organizing Committee: B. Engquist (chairman), R. Glowinski, M. Luskin, A. Majda
See the article in the October Notices for details of the program.

VISITING MEMBERSHIPS AVAILABLE

POSTDOCTORAL MEMBERSHIPS will normally be for the 12-month period beginning August 16, 1986. All requirements for a doctorate should be completed by this date. Applicants must show evidence of mathematical excellence, but they do not need to be specialists in scientific computation or even "applied mathematicians".

The following materials must be submitted:

(1) Personal statement of scientific interests, research plans, and reasons for wishing to participate in this program. (This is an essential part of the application.)

(2) Curriculum vitae and a list of publications.

(3) Three letters of recommendation, to be sent directly to the IMA.

All material should arrive by January 15, 1986.

SENIOR MEMBERSHIPS are also available. Preference will be given to supplementary support for persons with sabbatical leaves, fellowships, or other stipends.

All correspondence should be sent to

HANS WEINBERGER, DIRECTOR, INSTITUTE FOR MATHEMATICS AND ITS APPLICATIONS, UNIVERSITY OF MINNESOTA, 514 VINCENT HALL, 206 CHURCH STREET, MINNEAPOLIS, MN 55455-0436 – PHONE: (612) 373-0355.

The University of Minnesota is an equal opportunity educator and employer, and specifically invites and encourages applications from women and minorities.

The Department of Mathematics expects to appoint at least one Assistant Professor for a term beginning September 1, 1986. Salary will be competitive. Outstanding applicants in all fields of mathematics are encouraged to apply; priority will be given to applicants in algebraic/geometric topology, numerical analysis/applied mathematics, differential geometry/Lie groups/harmonic analysis, and ring/module theory. We seek applicants with high research potential and a strong commitment to teaching.

Applicants should send any supporting information and have four letters of recommendation sent to:

Dr. Jonathan Bell
Search Committee Chairman
Department of Mathematics
SUNY/Buffalo
106 Diefendorf Hall
Buffalo, New York 14214

The deadline for applications is December 1, 1985. Late applications will be considered until positions are filled.

SUNY/Buffalo is an Equal Opportunity/ Affirmative Action Employer. We are interested in identifying prospective minority and women candidates. No person, in whatever relationship with the State University of New York at Buffalo, shall be subject to discrimination on the basis of age, creed, color, handicap, national origin, race, religion, sex, marital or veteran status.

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MATHEMATICAL SCIENCES RESEARCH INSTITUTE
BERKELEY, CALIFORNIA

The Institute solicits applications for memberships in the Institute for the 1986-87 year, which begins in September 1986.

In 1986-87 there will be a single enlarged yearlong program. The field will be Number Theory with Connections to Algebraic Geometry. The program committee consists of Benedict Gross (chairman), Nicholas Katz, Barry Mazur, Ken Ribet, and John Tate. Topics will include

a) the relationship between the arithmetic of algebraic varieties and the analytic properties of their L-series; the conjectures of Tate, Birch and Swinnerton-Dyer, Deligne, and Beilinson,

b) finiteness theorems for curves and abelian varieties,

c) the arithmetic of Shimura varieties and automorphic forms,

d) p-adic analysis and uniformization.

Although this area will receive the major emphasis, applications from candidates in all fields will be welcome.

Two "microprograms" will take place at the beginning and end of the 1986-87 academic year:

Nonlinear Diffusion Equations and Their Equilibrium States (August 25 - September 13, 1986). The program committee consists of W.-M. Ni, L. Peletier, and J. Serrin (chairman).

Commutative algebra (June 15 - July 3, 1987). The program committee consists of M. Hochster (chairman), C. Huneke, and J. Sally.

The mathematical public is cordially invited to participate in these short programs. There will be separate posters giving more details about each.

During 1986-87 MSRI will also inaugurate sabbatical type awards to midcareer mathemeticians. This was announced some months ago and the deadline for applications is early: October 1, 1985.

The Institute does not use formal application forms. However, an information sheet for prospective applicants is available on request. Write to the *Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, CA 94720.* Applicants' files should be completed by January 1, 1986.

For 1987-88 the Institute plans yearlong programs on Classical Analysis and on Representations of Lie Groups; in addition a microprogram on the Structure of Banach Spaces is planned. Suggestions for programs for future years are welcome.

The Institute is committed to the principles of Equal Opportunity and Affirmative Action.

DIRECTOR

INSTITUTE FOR MATHEMATICS AND ITS APPLICATIONS

UNIVERSITY OF MINNESOTA

The Board of Governors of the Institute for Mathematics and its Applications (IMA) and the University of Minnesota seek a new Director of the IMA. The new Director will be offered a Professorship in the School of Mathematics of the University of Minnesota. Candidates should have the qualifications to provide scientific and administrative leadership to the IMA. Distinguished academic credentials and a record of scientific leadership are required. Salary and term as Director of the IMA are negotiable. Nominations and applications should be sent to Professor Frederick Gehring, Chair, IMA Director Search Committee, Department of Mathematics, University of Michigan, Ann Arbor, Michigan 48109, by 15 January 1986.

The University of Minnesota is an Equal Opportunity Educator and Employer and specifically invites and encourages applications from women and minorities.

UNIVERSITY OF FLORIDA

DEPARTMENT OF MATHEMATICS

seeks

CHAIR

Applications and nominations are invited. Candidates should have distinguished scholarly records and the administrative potential to lead a department in a period of expansion. If interested, send a curriculum vita and names of at least four references to:

Professor Irena Lasiecka
Search Committee for Chair
Department of Mathematics
University of Florida
Gainesville, FL 32611

Applications received after December 1, 1985 cannot be guaranteed consideration. Salary will be competitive.

The University of Florida is an Equal Opportunity, Affirmative Action Employer.

ANDREW G. COWLES DISTINGUISHED PROFESSORSHIP IN MATHEMATICS

Trinity University
San Antonio, Texas

Trinity University seeks candidates for the Andrew G. Cowles Distinguished Professorship in Mathematics. The Cowles Professor should have an outstanding record as a teacher and scholar and be an individual with a broad grasp of mathematics and an appreciation of the goals of liberal arts education. The successful candidate will be selected from applicants in any field of mathematics, and will be granted the rank of Professor, with tenure, in the Department of Mathematics.

Trinity University is an independent institution with a substantial endowment, committed to excellence in liberal arts and sciences and selected professional programs. Available facilities include a well-equipped Computer Center, and a large library featuring automated equipment, computer search services and an aggressive acquisitions program.

Nominations and applications should be received by December 20, 1985, and should be mailed to:

Dr. Donald Bailey, Chairman
Department of Mathematics
Trinity University
715 Stadium Drive
San Antonio, Texas 78284

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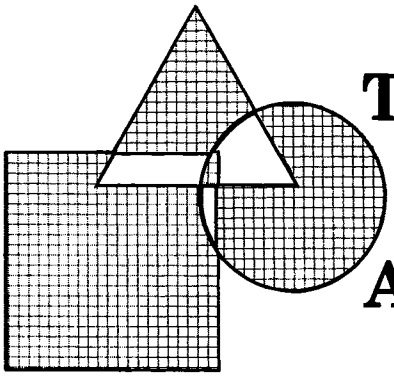

The Latest Titles in Mathematics from Academic Press

Random Graphs
BÉLA BOLLOBÁS

October 1985, 464 pp., $58.50
ISBN: 0-12-111755-3 (Cloth)
October 1985, 464 pp., $29.95
ISBN: 0-12-111756-1 (Paper)

CONTENTS: Probability theoretic preliminaries. Models of random graphs. The degree sequence. Small subgraphs. The evolution of random graphs—sparse components. The evolution of random graphs—the giant component. Connectivity and matchings. Long paths and cycles. The automorphism group. The diameter. Cliques, independent sets and colouring. Ramsey theory. Explicit constructions. Sequences, matrices and permutations. Sorting algorithms. Random graphs of small order. References. Subject index.

A Volume in the LONDON MATHEMATICAL SOCIETY MONOGRAPHS Series...

Free Rings and Their Relations
Second Edition
P. M. COHN

1985, 612 pp., $80.00/ISBN: 0-12-179152-1

CONTENTS: Some terminology, notations and conventions used throughout the book. Preliminaries. Firs, semifirs and *n*-firs. The weak algorithm. Factorization. Rings with a distributive factor lattice. Modules over firs and semifirs. Centralizers, subalgebras and automorphisms. Skew fields of fractions. Principal ideal domains. Appendix. Bibliography and author index. Subject index.

The Mathematics of Finite Elements and Applications V
MAFELAP 1984
Edited by
JOHN R. WHITEMAN

1985, 672 pp., $59.00/ISBN: 0-12-747255-X

Proceedings of the fifth conference on The Mathematics of Finite Elements and Applications, held at the Brunel University, May 1984

FROM THE PREFACE: As with previous conferences in the MAFELAP series, the intention was to bring together mathematicians and engineers, with common interests in the broad field of finite elements, to discuss finite element techniques, their theory, their application and their implementation... In addition to the main themes of the field, it was decided that boundary element techniques should be included and that the finite element/computer aided design interface should again be featured.

A Volume in the MATHEMATICS IN SCIENCE AND ENGINEERING Series...

Stability of Functional Differential Equations
V. B. KOLMANOVSKII V. R. NOSOV

February 1986, c. 196 pp., in preparation
ISBN: 0-12-417940-1

CONTENTS: Theoretical foundations of functional differential equations. Stability of retarded equations. Stability of neutral functional differential equations. Stability of stochastic functional differential equations. References. Index.

A Volume in the PURE AND APPLIED MATHEMATICS Series...

Eigenvalues in Riemannian Geometry
ISAAC CHAVEL

With contributions by
BURTON RANDOL JOZEF DODZIUK

1984, 384 pp., $62.00/ISBN: 0-12-170640-0

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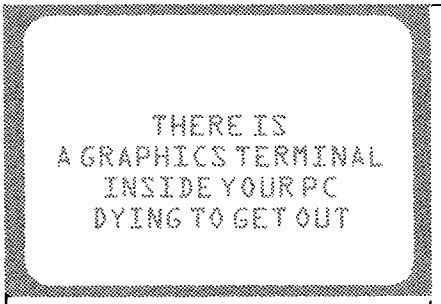

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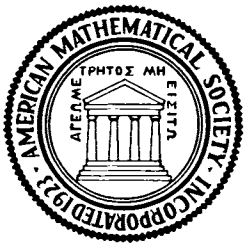

Reviews in K-theory

Bruce Magurn, Editor

Reviews in K-theory is a collection of about 3,000 reviews from *Mathematical Reviews* of papers and books on this exciting and relatively new research area, together with a listing of about 1,200 papers in the subject published before 1985 but not yet reviewed.

The reviews are organized by subject, according to a new classification scheme developed by Professor Magurn and his collaborators. This classification system will probably be introduced into *Mathematical Reviews* in 1986, as a secondary classification only. If that happens, papers dealing with the subject can henceforth be located either through the annual subject index or through the online service, MathSci, in the same way as in the present book.

K-theory is of course strongly cross-disciplinary in nature, touching as it does on linear algebra, algebraic number theory, algebraic geometry, topology, category theory, and functional analysis and operator algebras. As a result, it has been difficult in the past to connect papers with close conceptual relationships, because the classification scheme of *MR* was not well suited to the purpose. With the appearance of this book and the adoption of the new scheme, these difficulties will be relieved.

Under each chapter heading in the book is a description of other chapters and sections where related papers are reviewed; each section has a list of papers elsewhere having secondary classifications in that section. Many reviews are followed by a "See also" list of reviews cited in or relevant to the paper at hand. A second list, of papers citing the current one, is also provided, and *Zentralblatt* review numbers are given when available.

Research mathematicians and fairly advanced graduate students will find the book accessible, and through it will gain access to the most current research related to K-theory. Less sophisticated readers will find the many reviews of introductory texts especially useful.

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Four-Manifold Theory

Cameron Gordon and Robion C. Kirby, Editors

(Contemporary Mathematics, Volume 35)

These are the proceedings of the Summer Research Conference on 4-manifolds held at Durham, New Hampshire, July 1982, under the auspices of the AMS and National Science Foundation.

The conference was highlighted by the breakthroughs of Michael Freedman and S. K. Donaldson, and Frank Quinn's completion at the conference of the proof of the annulus conjecture (We commend the AMS committee, particularly Julius Shaneson, who had the foresight in spring 1981 to choose the subject, 4-manifolds, in which such remarkable activity was imminent.) Freedman and several others spoke on his work; some of their talks are represented by papers in this volume. Donaldson and Clifford H. Taubes gave surveys of their work on gauge theory and 4-manifolds and their papers are also included herein. There were a variety of other lectures, including Quinn's surprise, and a couple of problem sessions which led to the problem list.

A background of basic differential topology is adequate for potential readers.

Contents

I. R. Aitchison and **J. H. Rubinstein**, *Fibered knots and involutions on homotopy spheres*
Selman Akbulut, *A fake 4-manifold*
Frederic D. Ancel, *Approximating cell-like maps of S4 by homeomorphisms*
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Frank Quinn, *The embedding theorem for towers*
Frank Quinn, *Smooth structures on 4-manifolds*
Daniel Ruberman, *Concordance of links in S^4*
Lee Rudolph, *Constructions of quasipositive knots and links, II*
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Restricted Orbit Equivalence
Daniel J. Rudolph
(Memoirs of the AMS, Number 323)

These notes develop a theory of restricted orbit equivalence which has as particular examples Ornstein's isomorphism theorem for Bernoulli processes, Dye's orbit equivalence theorem for ergodic processes and the theory of Kakutani equivalence developed by Feldman, Ornstein, Weiss and Katok. Other examples are also given. A number of results from the Bernoulli theory are shown to be true for any restricted orbit equivalence.

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Recursion Theory

Anil Nerode and Richard A. Shore, Editors

(Proceedings of Symposia in Pure Mathematics, Volume 42)

This Proceedings of the 1982 AMS Summer Research Institute in Recursion Theory, co-sponsored by the Association for Symbolic Logic at Cornell University, June 28 to July 17, represents the largest and broadest meeting ever devoted to recursion theory. It should be a landmark in the subject, as was the AMS Institute at Cornell in 1957.

Anyone from graduate students to active researchers with interests in any aspects of recursion theory, including its interactions with set theory, model theory, constructive mathematics, foundations of mathematics and computer science, will be interested in this book. The background required varies with the papers; some require a basic course in logic or recursion theory only, others advanced research.

The book contains major surveys with expository papers as well as important new research in the general area of recursion theory. From the survey and expository articles a reader can get a general view of recent progress in the various areas of recursion theory, an introduction to current techniques and an idea of some of the important problems still to be solved. One should also get some picture of how recursion theory has interacted with other areas of logic, mathematics and computer science.

The organizers' intention was to consider recursion theory in the broadest sense. This is reflected in the lists of participants and lectures as well as in the contents of the book. The hour talks were roughly grouped around seven short courses—two in Classical Recursion Theory and one each in Generalized Recursion Theory, Fine Structure of L, Descriptive Set Theory, Effective Mathematics, and Complexity Theory (Computer Sciences). These series correspond to the sections of this volume except that two set-theoretic subjects have been grouped into one section and the papers on the foundational topics have been combined with those on computer science. Both of these are natural alignments since the talks in Descriptive Set Theory dealt mainly with the structure of $L(\mathbf{R})$ and the papers in complexity theory are strongly related to classical undecidability and incompleteness results.

The major research articles include the following.

Carl J. Jockusch, Jr. and **Richard A. Shore** on the minimal cover problem—a key to recent results on the degrees of unsolvability.

Wolfgang Maas on automorphisms of the lattice of r.e. sets.

Gerald Sacks and **Theodore A. Slaman** on the r.e. degrees in E-recursion theory (Post Problem and density, respectively).

H. D. Donder, R. B. Jensen and **L. J. Stanley** on combinatorial principles in L.

Jean-Yves Girard and **Jean Pierre Ressayre** on Π^1_n logic—a major paper on a subject newly developed by Girard and others which while at its root is proof theoretic seems to have important implications for and applications to generalized recursion theory, descriptive set theory and other areas.

Expository and survey articles include

Robert I. Soare, the first article presenting an accessible approach to the $0'''$ priority method introduced by Lachlan and currently being extensively exploited by Harrington and others to settle many important questions about the r.e. sets and degrees.

Richard A. Shore, a survey of recent work on the structure of the degrees of unsolvability.

Anil Nerode and **J. Remmel**, an encyclopedic survey of the lattice of r.e. substructures of effectively presented mathematical systems.

Papers by **Kenneth McAloon, Stephen S. Simpson** and **Paul Young** on the connections between logic and recursion theory on the one hand and strength of axiom systems and low level complexity of computation on the other.

Sy D. Friedman, an introduction to the fine structure of L from a recursion theoretic viewpoint with some new applications.

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7:30 – 8:15 p.m. Symmetry, entropy and coherence in chains of oscillators. NANCY KOPELL, Northeastern University

8:30 – 9:15 p.m. Sofia Kovalevskaia, a biographical sketch. ANN HIBNER KOBLITZ, University of Washington

Monday, October 28, 8:30 a.m.

8:30 – 9:15 a.m. Some geometric development related to Kovalevskaia's top. CHUU-LIAN TERNG, Northeastern University

9:30 – 10:15 a.m. Kovalevskaia's method and abelian varieties in mechanics. MARK ADLER, Brandeis University

10:45 – 11:30 a.m. Geometric analysis in crystalline media. JEAN TAYLOR, Rutgers University

11:45 – 12:30 p.m. Large time behavior of solutions to conservation laws in several space dimensions. PATRICIA BAUMAN, Purdue University

2:00 – 2:45 p.m. Some linearly induced Morse-Smale systems, the Q/R algorithm, and the Toda lattice. MICHAEL SHUB, Queens College, CUNY

3:00 – 3:45 p.m. Topology in the symplectic group. NANCY HINGSTON, University of Pennsylvania

4:15 – 5:00 p.m. The moment map of symplectic geometry and geometric invariant theory. LINDA NESS, Carleton College

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François Trèves, Editor

(Proceedings of Symposia in Pure Mathematics, Volume 43)

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MATHEMATICAL SCIENCES EMPLOYMENT REGISTER

Instructions for Applicant's Form on facing page

The form. Applicants' forms submitted for the Employment Register will be photographically reproduced in the December 1985 issue of *Employment Information in the Mathematical Sciences*. Résumés of those attending will be posted at the meeting.

The forms **must be** carefully typed using a fresh black ribbon. The best results are obtained with a carbon-coated polyethylene film ribbon, but satisfactory results may be obtained using a ribbon made of nylon or other woven fabric if suitable care is exercised. It is important that the keys be clean and make a sharp, clear impression. Do not erase—it causes smudges which reproduce when photographed. Use a correcting typewriter or correction tape or fluid if necessary. Submit the original typed version only. Copies will not reproduce properly and are not acceptable. **Hand lettered forms will be returned.**

Applicants' forms must be received by the Society by **November 15, 1985** in order to appear in the special issue of *EIMS*, and must be accompanied by the Preregistration/Housing Form printed in this issue, if attending the meeting. **See the Meeting Announcement in this issue for information. Forms received past the deadline or not completed will be returned.**

The summary strip. Information provided here will be used to prepare a printed list of applicants for distribution to employers. Please supply all information requested, and confine your characters to the boxes provided. Use the codes below. Circled letters identify corresponding items on the form and the strip.

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AL = Algebra	AN = Analysis
BI = Biomathematics	BS = Biostatistics
CB = Combinatorics	CM = Communication
CN = Control	CS = Computer Science
CT = Circuits	DE = Differential Equations
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FA = Functional Analysis	FI = Financial Mathematics
FL = Fluid Mechanics	GE = Geometry
HM = History of Math	LO = Logic
MB = Mathematical Biology	ME = Mechanics
MO = Modelling	MP = Mathematical Physics
MS = Management Science	NA = Numerical Analysis
NT = Number Theory	OR = Operations Research
PR = Probability	SA = Systems Analysis
ST = Statistics	TO = Topology

Ⓑ Career Objectives

AR = Academic Research	AT = Academic Teaching
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NS = Nonacademic Supervision	

ⒽⒾ Duties

T = Teaching	U = Undergraduate
G = Graduate	R = Research
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S = Supervision	IND = Industry
GOV = Government	DP = Data Processing

Location

E = East		S = South
C = Central		M = Mountain
W = West	O = Outside U.S.	I = Indifferent

Ⓛ U.S. Citizenship Status

C = U.S. Citizen	P = Permanent Resident
T = Temporarily in U.S.	N = Non-U.S. Citizen

APPLICANT: Name _____

Mailing address (include zip code) _____

_____

Ⓐ Specialties _____

Ⓑ Career objectives and accomplishments

ACADEMIC: ☐ Research, ☐ Teaching

NON-ACADEMIC: ☐ Research and Development, ☐ Consulting, ☐ Supervision

Near-term career goals _____

_____

Significant achievements or projects, including role _____

_____

Honors and offices _____

Other (e.g., paper to be presented at THIS meeting) _____

_____

Selected titles of papers, reports, books, patents _____

_____

Ⓒ Degree Year Institution

_____ _____ _____ Ⓓ No. of abstracts, internal reports _____

_____ _____ _____ Ⓔ No. of papers accepted _____

_____ _____ _____ Ⓕ No. of books and patents _____

EMPLOYMENT HISTORY:

	Present	Previous	Previous
Ⓖ Employer			
Position			
Ⓗ Duties			
Years	to	to	to

DESIRED POSITION: _____

Ⓘ Duties _____

Ⓙ Available mo.____ /yr.____ Location _____ Salary _____

Ⓚ References (Name and Institution)

_____

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Ⓛ Citizenship _____

Ⓜ AVAILABLE FOR INTERVIEWS:

(Interviews for Session 4 scheduled on the basis of employer's request only.)

Session 1 ☐	Session 2 ☐	Session 3 ☐	Session 4 ☐
Fri. AM 9:30-11:45	Fri. PM 1:15-5:00	Sat. AM 9:30-11:45	Sat. PM 1:15-5:00

I do not plan to attend the Winter Meeting ☐

SUMMARY STRIP

Family Name, First Name, Mailing Address,

Address (cont'd.), Address (cont'd.), State & Zip Code, Ⓐ Specialties,

Ⓑ Career objectives, Ⓒ Highest Degree, Ⓒ Yr., Ⓒ Institution, Ⓓ, Ⓔ, Ⓕ, Ⓖ Most recent employer,

Ⓗ Present duties, Ⓘ Desired duties, Ⓙ Available mo./yr., Ⓛ, Ⓜ Sessions

INSTRUCTIONS: Please read carefully before completing form below. Circled letters identify corresponding items in the FORM and the SUMMARY STRIP; abbreviations to be used are provided in the notes below. Please print or type in black ink. Block capitals are suggested. The FORM itself will be placed on display at the Register exactly as submitted. The SUMMARY STRIP will be used to prepare a computer printed list of summaries for distribution at the Register sessions. Employers are encouraged to provide more than one interviewer when they are able to do so, in order to increase the number of interviews which may be scheduled. Please take care to indicate on the Form the number of interviewers for whom simultaneous interviews may be scheduled. (If all interviewers will be interviewing for the same position, or for the same set of positions, only one form should be submitted and only one employer code number will be assigned; therefore, each interviewer would then receive a separate computer schedule and separate table number.) More than one employer code will be required if some interviewers will not interview for all positions. Thus, if there are two disjoint sets of positions, two forms are required and two employer codes will be assigned. **(Please refer to the section on the Employment Register following the New Orleans meeting announcement.)**

EMPLOYER FORM Institution_____ Dept._____

Name of Interviewer(s) 1._____ 2._____

3._____ 4._____

City, State, Zip_____

Ⓐ Title(s) of Position(s)_____ Ⓑ Number of Positions_____ Number of People Supervised_____

Ⓒ Starting Date _____/_____ (mo. / yr.) Salary_____ D Term of Appointment_____ (yrs.) Ⓔ Renewal ( ) Possible ( ) Impossible Tenure Track Position Yes ( ) No ( ) Unknown ( )

Teaching hrs./week_____ Ⓕ Specialties Sought_____

Ⓖ Degree Preferred_____ Ⓗ Degree Accepted_____ Ⓘ Duties_____ Ⓙ Experience_____ Ⓚ Citizenship Restriction_____

Ⓛ **Available for Interviews** **Session 1 ( ) Fri. AM, 9:30-11:45** **Session 2 ( ) Fri. PM, 1:15-5:00** **Session 3 ( ) Sat. AM, 9:30-11:45** **Session 4 ( )* Sat. PM, 1:15-5:00**

Ⓜ **Number of Interviewers:** _____ **Interviewers** _____ **Interviewers** _____ **Interviewers** _____ **Interviewers**

Institution, City, State, Ⓐ Title of position, ⒷNo., Ⓒ Start mo. / yr.

Ⓓ, Ⓔ, Ⓕ Specialties sought, Ⓖ, Ⓗ, Ⓘ Duties, Ⓙ Experience, Ⓚ, Ⓛ Sessions

NOTES: Ⓐ Inst, Lect, Asst Prof, Asso Prof, Prof, Dean, Open, MTS (Member Technical Staff), OPAN (Operations Analyst), PREN (Project Engineer), RESC (Research Scientist); Ⓒ Date 01/86, e.g.; Ⓔ Possible=P, Impossible=I; Ⓕ Algebra=AL, Analysis=AN, Biomathematics=BI, Biostatistics=BS, Combinatorics=CB, Communication=CM, Control=CN, Computer Science=CS, Circuits=CT, Differential Equations=DE, Economics=EC, Mathematical Education=ED, Functional Analysis=FA, Financial Mathematics=FI, Fluid Mechanics=FL, Geometry=GE, History of Mathematics=HM, Logic=LO, Mathematical Biology=MB, Mechanics=ME, Modeling=MO, Mathematical Physics=MP, Management Science=MS, Numerical Analysis=NA, Number Theory=NT, Operations Research=OR, Probability=PR, Systems Analysis=SA, Statistics=ST, Topology=TO; Ⓖ Ⓗ Bachelor=B, Master=M, Doctor=D; Ⓘ Ⓙ Teaching=T, Undergraduates=U, Graduates=G, Research=R, Consulting=C, Administration=A, Supervision=S, Industry=IND, Government=GOV, Data Processing=DP, No experience required=N; Ⓚ U.S. Citizen=C, U.S. Citizen or permanent resident=CP, No restriction=NR; Ⓛ Periods available for interviews: List 1, 2, 3, and/or 4, see the FORM above.

* Interviews are scheduled in this session on the basis of employers request only.

MAA MINICOURSE PREREGISTRATION FORM, NEW ORLEANS, LOUISIANA

January 7-11, 1986

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Contributors

M. Campanino, J. Chayes, L. Chayes, J. T. Cox, D. A. Dawson, A. DeMasi, R. Durrett, R. Ellis, P. Ferrari, P. Gacs, H. O. Georgii, S. Goldstein, L. Gray, A. Greven, D. Griffeath, G. Grimmett, M. Z. Guo, Y. Higuchi, K. J. Hochberg, R. Holley, H. Kesten, E. Key, C. Kipnis, S. Kotani, G. Lawler, N. Madras, C. Newman, S. Orey, G. Papanicolaou, G. Rost, C. Schroeder, L. Schulman, S. Schumacher, J. van den Berg, M. E. Vares, D. Wick, J. Wierman

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Section Headings

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Notas de Matemática (94), Editor: Leopoldo Nachbin

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Lecture Notes in Numerical and Applied Analysis (6), Editors: H. Fujita and M. Yamaguti

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