

Notices

of the
American Mathematical Society



August 1985, Issue 242
Volume 32, Number 4, Pages 457–568
Providence, Rhode Island USA
ISSN 0002-9920

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 office of the Society. Abstracts must be accompanied by the \$15 processing charge. 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
821	August 12–15, 1985 (89th Summer Meeting)	Laramie, Wyoming	EXPIRED	August
822	October 26–27, 1985	Amherst, Massachusetts	August 19	October
823	November 1–2, 1985	Columbia, Missouri	August 21	October
824	November 8–9, 1985	Claremont, California	August 26	October
825	January 7–11, 1986 (92nd Annual Meeting)	New Orleans, Louisiana	October 16	January
	April 11–12, 1986	Indianapolis, Indiana		
	May 3–4, 1986	Baltimore, Maryland		
	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 (October 1985 Issue) Sept. 4, 1985 (November 1985 Issue) Oct. 2, 1985 News/Special Meetings (October 1985 Issue) Aug. 19, 1985 (November 1985 Issue) Sept. 16, 1985
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Other Events Sponsored by the Society

June 23–August 31, 1985, Joint Summer Research Conferences in the Mathematical Sciences, Humboldt State University, Arcata, California.

July 8–26, 1985, AMS Summer Research Institute on Algebraic Geometry, Bowdoin College, Brunswick, Maine.

August 10–11, 1985, AMS Short Course: Actuarial Mathematics, Laramie, Wyoming. This issue, page 482.

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Notices

of the American Mathematical Society

Volume 32, Number 4, August 1985

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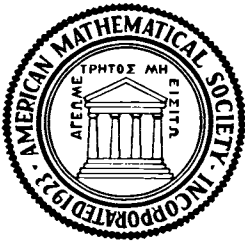
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Reviews in K -theory

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.

Reviews in K -theory, August 1985, 819 pages (softcover)

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Renewing Undergraduate Mathematics

by Lynn Arthur Steen

Undergraduate mathematics is a major educational conduit for our nation's scientific personnel—not only for future engineers, physicists, and mathematicians, but also for computer scientists, statisticians, school teachers, physicians, economists, and business executives. Some type of undergraduate mathematics is required for virtually every scientific and engineering degree. Undergraduate mathematics is to scientific research what basic research is to applied science, the supplier of intellectual resources.

As science changes, so also must the pattern of undergraduate mathematics. On top of this, mathematics itself is changing dramatically—in content, scope, and application. Powerful and ubiquitous new applications signal to the educated public that mathematics is no longer, if it ever was, the sterile, ethereal, axiomatic exercise of journalistic caricature. The truth is that mathematics is not just being applied, but is being continually created in response to challenges from science, from technology, and from other parts of mathematics itself.

Although new courses such as data analysis, operations research, and discrete mathematics are finding their place in the curriculum, very few courses in the typical undergraduate program give students a realistic sense of the true nature of contemporary mathematics, either pure or applied. Unlike their peers in the natural sciences, undergraduate mathematics students rarely move beyond classroom exercises involving mathematics that is several decades (or even centuries) old. Prevented by curricular constraints from seeing how mathematics is created, students too often view mathematics only as a powerful but static collection of tools to be learned (or worse, memorized) and then applied. They fail to see career options in a field that is presented as a *fait accompli*.

Undergraduate mathematics bears major responsibility for the future well-being of American society. Collegiate mathematics must

Lynn Arthur Steen of the Department of Mathematics, St. Olaf College, Northfield, Minnesota 55057 currently serves as President of the Mathematical Association of America (MAA). This paper has evolved from presentations made by Steen at several meetings and from ideas provided by the Committee on the Status of the Profession.

provide courses for future scientists, programs for prospective elementary and secondary school teachers, remedial courses for those entering college unprepared in mathematics, general education courses for students not majoring in a quantitative discipline, strong majors for those intending to enter graduate school, and a variety of service courses ranging from elementary statistics to advanced operations research. Moreover, in many institutions, mathematicians must also teach computer programming and elementary computer science.

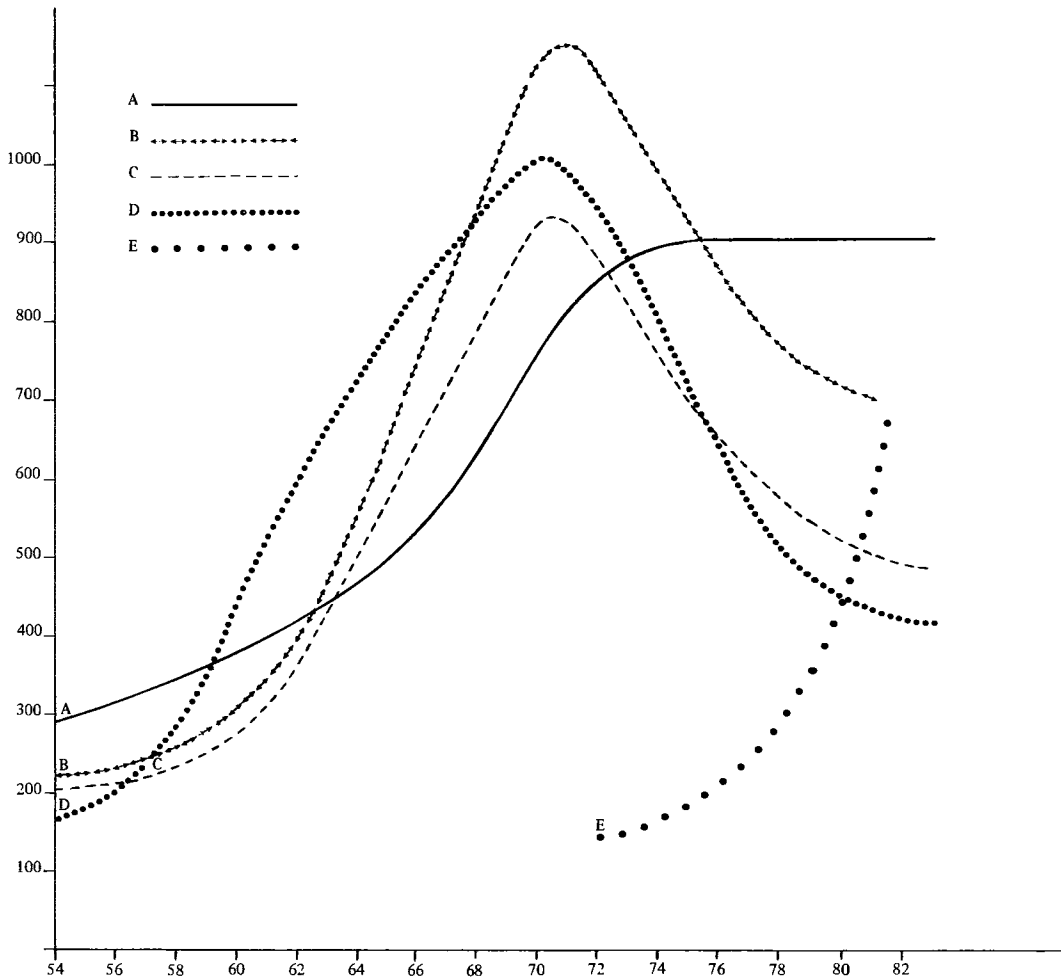
As mathematics needs to be continually created to provide new tools for science and industry, so the undergraduate curriculum needs to be continually renewed to reflect the changing nature of mathematical practice and scholarship. Yet the limited resources of undergraduate mathematics departments are now thinly spread over an enormous variety of elementary service courses, leaving virtually no time or energy for the in-depth study necessary to renew faculty initiative or to develop innovative programs.

Signs of distress are not hard to find. The number of degrees awarded in mathematics is only about half of what it was ten or fifteen years ago. Enrollments at the elementary level are double what they used to be, and faculty work loads have increased significantly. Demand for computer science is distorting enrollments and depleting the pool of young prospective mathematicians. Dual salary scales are demoralizing faculty at the same time as budgets for library resources and travel are diminishing.

It is time for the mathematical community—researchers, teachers, and users—to join in a common cause to renew undergraduate mathematics. We need to do more than stimulate the curriculum. We must examine and respond to the realities of student interests and preparation. We must articulate standards for the profession that will enhance the morale and effectiveness of college mathematics teachers. Most importantly, we must engage ourselves and our students in the excitement of creative mathematics applied to challenging scientific and societal problems.

Students

Any analysis of undergraduate mathematics must begin with informed knowledge of our students, who arrive in college having studied mathematics in some form for most of their school years.



The Rise and Fall of U.S. Mathematics Degrees. This composite graph pictures smoothed data for bachelor's and doctor's degrees for the preceding three decades:

Curve A represents the total number of bachelor's degrees awarded in the United States, in units of 1,000. Following a long period of growth, the number of degrees has stabilized during the last ten years at just over 900,000.

Curve B represents the total number of Ph.D. degrees awarded in the United States in mathematics and statistics. This number has now fallen by 40% from its peak of about 1200 in 1970-1971.

Curve C represents the number of U.S. citizens who received a Ph.D. in mathematics or statistics. As a percent of the data represented by Curve B, it has fallen from about 90% to just under 60%.

Curve D represents the total number of U.S. bachelor's degrees in mathematics, in units of 25. This number also peaked in 1970, at about 25,000; now it has dropped to half that level.

Curve E, also in units of 25, represents the growth of bachelor's degrees in computer and information sciences. This curve crossed Curve D, the bachelor's degrees in mathematics, in 1980.

The effect of this study is to add to the already great natural variance in mathematical aptitude an enormous variance in both competence and attitude. The latter two characteristics frequently overwhelm the former, and the three together produce a diversity in performance that is almost beyond comprehension: the range of mathematical performance of college freshmen spans ten years of education (grades 7–16), but the distribution is skewed decidedly towards the lower half of this range.

There are approximately four million persons in each age cohort among students of school age; that is a bit more than 1/70th of the total U.S. population. Nearly 30% do not graduate from high school. (The percent of students who finish high school has been declining slightly for the past twenty years, after increasing steadily for the past century.) Of the three million persons who do graduate, about half, approximately 1.5 million, enter college.

About two-thirds of those who enter college have not studied precalculus mathematics. This means that each year about one million students enter higher education without having completed the full program of high school mathematics. Half of those have taken a second algebra course, the other half have not. Thus half a million college students—those who never took Algebra II plus those who forgot most of what little they may have learned in that course—enter college needing extensive review of elementary algebra, sometimes including what is euphemistically called “arithmetic for college students.”

The best-prepared third of college freshmen, another half a million, are well prepared for college mathematics courses. Approximately 20%, or about 100,000, have actually taken calculus. These represent the top 3% of high school seniors, yet only about one-fourth of those learn enough calculus in high school to receive college credit for the course. Results released at the end of 1984 from the Second International Assessment of Mathematics show that U.S. high school students who have taken calculus score barely above the median when compared to the top 10–15% of students from other countries.

Here is a tabular estimate of the mathematics placement of 18 year old students in the United States:

30%	Do not finish high school
35%	Finish high school; do not go to college
12%	Enter college needing elementary algebra
10%	Enter college ready for precalculus
10%	Enter college ready for calculus
2%	Enter college having completed some calculus
1%	Enter college with some calculus credit
100%	

Last year the National Institute of Education released a report called *Involvement in Learning:*

Realizing the Potential of American Higher Education. This report highlights two other student characteristics that are crucial to an understanding of the total undergraduate environment: 40% of all students study part-time, and 40% of all students are over the age of 25. Undoubtedly there is a large overlap between these two groups. And since their impact on undergraduate enrollments is weighted by the part-time nature of their study, the overall impact on enrollment patterns is far less than 40%. But as people, as decision makers, and as voters, these older part-time students represent an important fraction of the individuals studying undergraduate mathematics.

Enrollments

Enrollment patterns in mathematics are difficult to find and interpret, partly because the mathematics profession does not spend much of its resources in keeping track of such data. By interpolating among several sources, I made the following estimates of the distribution of enrollments (in thousands) in beginning college mathematics courses:

%	Enrollment	Course
22%	700	Remedial
18%	600	Calculus
18%	600	Programming
16%	500	Precalculus
13%	400	Elementary Statistics
5%	150	Finite Mathematics
3%	100	Computer Science
3%	100	Discrete Mathematics
2%	50	Mathematics Appreciation
100%	3200	Total

(For check-point comparison, American Mathematical Society (AMS) data for 1983 indicates a total fall enrollment in mathematics and statistics courses of 2.4 million. The table above includes computer programming and elementary computer science, which about accounts for most of the extra enrollments. Since computer courses are taught in both mathematics and computer science departments, it is very difficult to account precisely for the impact that undergraduate computer courses have on mathematics enrollments. The estimate above is primarily for those computer courses taught by or in mathematics departments; it does not count computer science enrollments in departments that are totally separate from mathematics.)

In contrast to the total enrollment of about 3 million in elementary courses in the mathematical sciences, the total enrollment in advanced (postcalculus) undergraduate mathematics is only about 200,000, two-thirds in applied analysis (differential equations and related subjects), one-third in other parts of core mathematics. In other words, over 90% of the enrollments in

undergraduate mathematical science are in lower division service courses.

Much of this service load is of recent origin, driven by a society convinced that mathematics, in modest doses, is useful, and perhaps even profitable. These pragmatic forces have reshaped the whole undergraduate culture: in the last fifteen years or so, the number of bachelor's degrees awarded in the arts and sciences has declined by about 50%, while the number awarded in job-related fields has more than doubled. Whereas at the end of the 1960s bachelor's graduates roughly were divided equally between those in arts and science and those in specialty programs, now only about 20% of graduates are in the arts and sciences.

These changes have had a significant impact on enrollment patterns in mathematics. Indeed, in the past fifteen years undergraduate mathematics enrollments in the mathematical sciences have increased twice as fast as has the general undergraduate population, but this increase has occurred totally in the elementary part of the curriculum:

	<u>1970</u>	<u>1985</u>	<u>%</u>
Remedial & Precalculus	800	1800	
Calculus	450	600	
Computer Programming	50	600	
Advanced Mathematics	300	200	
Total Mathematical Sciences	1600	3200	100%
Total B.A. Degrees	780	930	20%
Total F.T.E. Undergraduates	6700	9500	42%

Graduates

About two-thirds of the students who enter college actually graduate: each year there are just under one million bachelor's degrees conferred in the United States. Of these, about 1% are in mathematics, that is, about 10,000. (Here mathematics includes statistics, but not computer science.) About twice that number are now receiving bachelor's degrees in computer and information sciences. In 1970, there were about 30,000 bachelor's degrees in the mathematical sciences awarded in the United States—90% (27,000) in mathematics, 10% in computer and information science. Since then mathematics degrees have steadily declined and computer science degrees have steadily increased, with the total staying relatively constant. Now there are about 11,000 bachelor's degrees in mathematics, and over 20,000 in computer science.

As bachelor's degrees in mathematics have declined, so have Ph.D. degrees. But even more important, the percentage of U.S. citizens receiving the Ph.D. in mathematics has also

declined, from about 80% to under 60%. This has led to a compound decrease of about 50% in the number of Americans receiving doctoral degrees in mathematics. In fact, the number of degrees to U.S. citizens in core mathematics is now as low as it was in the 1960s. Here is a comparison, in round numbers:

	<u>1962</u>		<u>1972</u>		<u>1982</u>	
	<u>Total</u>	<u>U.S.</u>	<u>Total</u>	<u>U.S.</u>	<u>Total</u>	<u>U.S.</u>
Mathematics Ph.D.'s						
Core						
Mathematics	400	370	920	720	510	310
Applied						
Mathematics	50	40	120	100	120	80
Statistics	50	40	150	110	150	90
Mathematics & Statistics						
Total	500	450	1190	930	780	480
Computer Science	--	--	170	130	260	160
Mathematical Sciences						
Total	500	450	1360	1060	1040	640

Faculty

There are currently about 25,000 full time mathematics faculty members in United States institutions of higher education. One fourth are in Ph.D. granting institutions, one half in master's and bachelor's degree institutions, and one fourth in two year colleges. In addition, there are another 20,000 persons who teach mathematics part-time: 9,000 in the two year colleges, 5,000 in the four year institutions, and 6,000, mostly teaching assistants, in the universities.

About two-thirds of all full-time mathematics faculty hold doctoral degrees. In 1965 only 35% of the faculty appointments at the four-year colleges were filled by persons with a doctorate; that percentage has now doubled, partly in response to a national effort in the late 1960s to improve faculty credentials in mathematics. The large load of precalculus instruction coupled with increasing demand for computer science instruction—where Ph.D. degrees are rare—suggests the current percentage of Ph.D. faculty may represent a stable long-term balance of faculty preparation with teaching needs.

	<u>Mathematics Faculty</u>			
	<u>2 Year</u>	<u>4 Year</u>	<u>Ph.D.</u>	<u>Total</u>
Full Time	6,000	12,000	7,000	25,000
Part Time	9,000	5,000	6,000	20,000
F.T.E.	8,000	13,000	9,000	30,000
Ph.D.	1,000	8,500	7,000	16,500
% of F.T.E.	15%	70%	100%	66%
Total Faculty	15,000	17,000	13,000	45,000

For comparison, the U.S. membership in the Mathematical Association of America (MAA) is about 18,000, and in the AMS about 14,000; together, about 25,000 U.S. residents belong to one or the other of these major professional mathematics societies. That is more or less the same as the total full-time mathematics faculty, although of course neither group is quite identical with the other.

The age distribution of the mathematics faculty is very uneven: 20% are older than fifty-five; 50% are between forty and fifty-five; only 30% are younger than forty. Far from being uniform, the age distribution of the mathematics faculty is almost bell-shaped. Just from the Ph.D. faculty alone, there will be 200 retirements per year for the next few years, rising to about 400 per year by the year 2000. Overall, higher education has to replace over 3000 Ph.D. mathematicians during the next fifteen years, about half of what will be produced at present rates.

Recent AMS data shows that only two-thirds of the new doctorates accept first jobs in colleges or universities. The median starting salary for such academic positions is \$23,000. The undergraduates that these new Ph.D.'s teach, leaving college with only a bachelor's degree, receive median starting (12 month) salaries of \$23,400. The corresponding salary to a new mathematics Ph.D. in industry is about \$36,000.

Finally, I note that the "David Report", *Renewing U.S. Mathematics* (National Academy of Sciences, 1984) [reprinted in the *Notices*, August 1984, pages 435–466; October 1984, pages 570–616] documents U.S. plans to introduce several hundred supercomputers during the next decade into academic, industrial and government facilities. Each such machine requires, on average, about a dozen mathematical scientists with sophisticated knowledge of the mathematics of computation. Several hundred such machines will require several thousand new mathematicians. The implications of this demand for the supply of undergraduate faculty are staggering.

Undergraduate Mathematics

The mathematics covered these days in typical undergraduate programs can be divided roughly into three parts: the elementary, the old-fashioned, and the experimental. That may sound unfair, and it may be; but it has a grain of truth. As enrollment data shows, many courses are really not appropriate to collegiate level instruction. Many others frequently contain little or no hint of modern mathematics. And the rest are new courses whose contribution to a unified curriculum is totally untested.

We need courses like these. We need elementary courses to meet students on their own terms; we need traditional courses to convey the classics of mathematics; and we need experimental courses

to probe for new areas worthy of undergraduate study. But the nature of contemporary mathematics demands something more.

In an essay titled "Ordering the Universe: The Role of Mathematics," an appendix to the David Report, Arthur Jaffe writes about the enormous breadth of modern mathematics, pure and applied. Here is a sample from his survey:

- Fourier analysis, from fast Fourier transform to pseudodifferential equations;
- Simple groups and number theory, applied to algorithms and computational complexity;
- Numerical mathematics, used for nuclear reactors and computerized tomography;
- Compact groups, used in mathematical physics to represent quarks and supersymmetry;
- Fibre bundles and connections, used for gauge theory in electrodynamics;
- Poincaré conjecture, in four dimensions, yielding exotic Euclidean spaces and explanations of solitons;
- Algebraic geometry, applying the Riemann-Roch theorem to generate error-correcting codes;
- Time series analysis used for seismic exploration for oil;
- Chaotic behavior in dynamical systems, related to the onset of turbulence as well as to the theory of fractals;
- Parallel computation and unbounded memory, suggesting radically new algorithms for numerical mathematics.

This list of current mathematical research topics is neither elementary, nor old-fashioned, nor experimental. It consists of classical mathematics—analysis, algebra, topology—mixed heavily with physics and engineering, employing modern computer tools to model significant scientific phenomena. It shows a vigorous science rooted in the rich soil provided by generations of mathematical giants.

We cannot teach all this mathematics to undergraduates. But we must, somehow, teach the foundations of this mathematics, while at the same time providing glimpses of the structure that this foundation can support. To do that will require a new synthesis of classical and modern topics, not merely the unstructured aggregation of traditional courses with experimental alternatives.

It is not my intent here to discuss the many curricular changes affecting undergraduate mathematics. The enrollment patterns cited above indicate the extent to which the rushing waters of mathematics have moved from a narrow deep gorge to a flat broad plain. Twenty years ago the Committee on the Undergraduate Program in Mathematics (CUPM) helped guide the undergraduate curriculum to a stable consensus on a core of undergraduate mathematics. Today that consensus is shattered: in its most recent statement CUPM reported that there is no longer any consensus on specific advanced subjects that

should constitute the core of undergraduate mathematics.

Mathematics is not the only discipline suffering from a dissolution of consensus on purpose and direction. A recent report by the Association of American Colleges (AAC) called *Integrity in the College Classroom* decries what it calls the "decline and devaluation" of undergraduate education: "A consequence of the dispersal of authority over the curriculum is...unhappy disarray, the loss of integrity in the bachelor's degree." The AAC report cites the narrow graduate-school professionalism of faculties as the root cause of the identity crisis in undergraduate teaching, and seeks "to revive the responsibility of the faculty as a whole for the curriculum as a whole."

Mathematics is a party to the decline of undergraduate education, sharing both in responsibility for the decline as well as in its consequences. What used to be a focused albeit narrow curriculum is now too often a smorgasbord of unrelated courses. As demand for new applications proliferate, the focus of the undergraduate curriculum disintegrates. In many departments mathematics faculty now devote more teaching effort to computer programming than to calculus.

This curricular change is a two-edged sword. While it has diminished the strength of traditional core mathematics—what most of us were trained in during our graduate studies—it has at the same time multiplied the linkages between mathematics and other disciplines. No longer are the concepts of mathematics only used in physics and engineering. Now they can be found in linguistics, medicine, psychology, agriculture, music—virtually every subject taught in an undergraduate curriculum. The connections between mathematics and other subjects are often mediated by computer science, but real mathematics lurks immediately beneath the surface. Although most of us do not yet realize it, and many may not even welcome it, the mathematics faculty has within its discipline a legitimate responsibility for linkages to the whole undergraduate curriculum. Mathematics as a discipline is uniquely positioned to help play a major role in the renewal of undergraduate education.

Teaching and Research

The renewal of collegiate mathematics will require imaginative effort in curricular reform, both within the mathematics major and in various interdisciplinary programs. It will require exciting new approaches that attract the best young minds of the next generation, as well as a continual struggle to encourage good students to pursue graduate work in the mathematical sciences. But most of all, it will require sound and productive programs of faculty evaluation and faculty development for those 25,000 members of our current mathematics faculties.

In every field, the vitality of undergraduate education depends on effective links between teaching and research. Such links are especially important in mathematics, because the field is changing so rapidly. They are also especially difficult to form, since the frontier of mathematical research is so remote from the reality of undergraduate courses. The links between teaching and research in mathematics are long, fragile, and easily broken. Especially for this reason, the relation between teaching and research is an important and crucial aspect of faculty renewal and faculty evaluation.

Renewing U.S. Mathematics calls for vast increases in support for mathematics research, especially in the leading Ph.D. granting institutions: "The health of the mathematical enterprise in the United States hinges on the strength and vitality of the departments in the leading research universities." This report also contains a careful analysis of research productivity in the mathematical sciences, cross-checked in several different ways. It concludes that the number of productive research mathematicians is about 3,000, including 2,600 established and 400 young investigators. One measure of "productivity" was three papers in five years that were reviewed in *Mathematical Reviews*; another was peer review that judged their work equivalent to that already being supported through National Science Foundation (NSF) and Department of Defense (DOD) research grants. It is clear from this study that only a small minority—about 10% of the total, or 20% of the Ph.D. holders—of U.S. mathematics faculty are productive researchers according to these criteria. This observation has important implications for faculty renewal and faculty evaluation.

Every college and university sets standards of professional work for permanent members of its faculty. Research universities usually have three distinct missions: teaching, research, and service; faculty responsibilities at these institutions parallel the mission of the institution, requiring significant contributions in each area for its own sake.

The majority of post-secondary institutions, however, define teaching as their primary mission. Yet even most of these institutions, at least all the four year institutions, require significant professional activity of faculty to insure that they remain intellectually alive and actively in contact with their discipline. The vast majority of faculty at these schools engage in research and professional activity not so much to advance the frontiers of research as to maintain their vitality as teachers and to provide, by example and by experience, a context in which their students can taste the excitement of creative mathematics. It is this aspect of professional work that is especially important in mathematics, yet too often overlooked in faculty tenure and promotion reviews.

The relation of teaching to research in mathematics is crucially important and virtually unique among undergraduate disciplines. Professional activity is enormously important in mathematics because of the rapid growth of the mathematical sciences. Teaching that is divorced from professional activity may be effective and popular, but it cannot long remain intellectually honest. The only way for a curriculum in the mathematical sciences to remain current is for the faculty to remain professionally active.

For too long mathematics and mathematics teachers have suffered from a rigid, narrow definition of professional activity. To save face with our peers in the sciences and humanities, we expect of ourselves a productive research program; to save face with our peers in mathematics, we adopt the mathematician's elite definition of research. The result too often is confusion, frustration, and well-intentioned hypocrisy in faculty tenure and promotion proceedings.

Morris Kline argued forcefully in his provocative 1977 book, *Why the Professor Can't Teach*, that mathematics must re-establish respect for scholarship, for research in its traditional meaning. In this view, a teacher's time and energy should be devoted both to instruction and to that kind of scholarship which is the complementary aspect of good teaching. The breadth of the mathematical sciences, the importance of renewed links between teaching and research, the rapid creation of new mathematics, as well as the David report's conclusion that only 10% of college mathematicians are productive researchers—these and other signs suggest that it is time to establish a new definition of professional work for college mathematicians.

Professional Work in Mathematics

Professional work in mathematics, as in any field, must be public—that's the root of the word "publication." But it need not be restricted to narrow, traditional research publications. It should embrace all published works (texts, research papers, reviews, expository articles, classroom notes), presentations at meetings and at other institutions, leadership in professional organizations, arranging professional workshops, and consulting for government, industry or academic institutions. The important common element is the scrutiny and review afforded by public presentation: this is vital to both the individual and the institution as an external measure of the significance of the work. Moreover, public presentation imposes on the individual a healthy discipline in organizing ideas and thinking systematically about key issues in the mathematical sciences.

The creation of new mathematics expresses as nothing else can the fundamental processes of mathematics, and an active research program in

a department can help stimulate not only new ideas but also new modes of thought. But it is not something we can demand as a *sine qua non* for either promotion or tenure. It is, rather, one option among many.

To balance my appeal to authority, I add supporting evidence from Peter Hilton, who once wrote a scathing review of Kline's book. But on this issue they seem to agree: "I believe," writes Hilton, "that promotion and tenure should be the reward of outstanding work of an imaginative and innovative nature. Such outstanding work could be in the field of mathematical research, but does not have to be. Thus it is perfectly possible and, today, more important than ever, to show imagination, energy and enterprise in the development of new courses and the modernization of old ones."

Directly or indirectly, all professional activity relates to teaching. Teachers who are active imbue their courses with a spirit of current thought. Yet only rarely in mathematics will the content of significant research translate into material suitable for undergraduate instruction. It is in this respect that mathematics differs from most other fields. A Shakespeare scholar can relate current research to undergraduate courses, as can a biochemist studying techniques of recombinant DNA. But the mathematician working on shock waves or gauge fields cannot readily relate this work to any typical course in the undergraduate curriculum. However, the process of mathematics is continually renewed by professional activity, and it is the process more than the content that matters in effective teaching.

The gulf between undergraduate instruction and mathematical research is much easier to span in the newer applied subjects than in traditional core mathematics. These subjects appeal to students not only because they are new and applicable, but also because they are near the frontier. Undergraduates need to experience the euphoria of discovery in order to taste the true nature of mathematics. The ability of instructors to lead students to the brink of unsolved problems in these newer areas is in itself a substantial reason to emphasize these topics in the undergraduate curriculum. Moreover, what is good for students is also good for the faculty: interdisciplinary work applying mathematics to problems in other fields provides a marvelous opportunity for college mathematics teachers to become professionally active.

Typically, the links between scholarship and teaching that emerge in mathematics relate to development of new courses or entire new curriculum structures, to the integration of computing and applied techniques into traditional mathematics, to supervision of independent study in areas that reach into unfamiliar territory, to development of innovative curriculum materials for new courses, or to development of computer

software and documentation. . In cases such as these, professional work is often focused on local issues and, for this reason, may not lead to significant public exposure. It is, nevertheless, important for the department and for the individual.

We, the mathematical community, must work to establish effective mechanisms to evaluate and reward professional activity in the context of each institution's special mission and objectives. Evaluation must recognize the varied purposes of research and professional activity. Some research—the minority—benefits mathematics directly by advancing the frontiers of knowledge. Most research and professional activity benefits mathematics indirectly by invigorating the faculty, stimulating students, and refreshing the curriculum. Both are necessary for mathematics to thrive, and both must be recognized and suitably rewarded.

An Agenda for Renewal

Successful undergraduate mathematics requires a faculty that is active, scholarly, and vigorous. To revitalize undergraduate mathematics we must infuse the undergraduate years with the spirit if not the details of contemporary mathematical activity. We must support exemplary programs that encourage students to major in mathematics. We must encourage creativity in developing programs for prospective school teachers as well as for prospective scientists. We must reward those who provide effective courses in “mathematical literacy” for future lawyers, politicians, and citizens. And perhaps most important, we must establish standards for faculty evaluation that promote innovation in teaching and scholarship in mathematics.

To be specific, an agenda for renewal should include such things as:

- Undergraduate scholarly activities, to provide for mathematics students what the laboratory does for science students and the stage for drama students.
- Curriculum modernization, to bring into the undergraduate curriculum the most exciting ideas of modern applied mathematics.
- Interdisciplinary efforts, to show how mathematical ideas can illuminate many of the broad issues—energy policy, economic theory, strategic doctrine—that capture the imagination of undergraduate students.
- Redefinition of the core of undergraduate mathematics, to determine what subjects all mathematics majors should know.
- Recognition of scholarship rather than narrow research as the true mark of professional activity for college mathematics teachers.

For the rest of this decade mathematics departments will continue under great stress. We live in the shadow of computer science, the glamor stock of academia. In contrast to computing, mathematics appears as a cerebral abstraction, isolated from reality.

Industry is hiring mathematics graduates as never before; society is pressuring the schools to stress mathematics; and the scientific research community has endorsed mathematics as one of the priority areas for support in years ahead. It is important that we not let these opportunities slip away.

Teachers of undergraduate mathematics must make every effort to convey not only to our students but also to our colleagues and to the general public the contributions mathematics is making to society. The great lesson of the past twenty years is that the most abstract ideas are the most powerful, and the most abstract thinkers the most versatile.

Mandelbrot Awarded Barnard Medal

The seventeenth award of Columbia University's Barnard Medal was made to Benoit Mandelbrot at Columbia's commencement exercises on May 15, 1985. The medal, which is awarded at five-year intervals, "... to such person, whether a citizen of the United States or any other country, as shall ... have made such discovery in physical or astronomical science, or such novel application of science to purposes beneficial to the human race, as in the judgement of the National Academy of Sciences of the United States shall be deemed most worthy of the honor." Mandelbrot was cited for his theory of the Fractal Geometry of Nature.

The first Barnard Medal was awarded to Lord Rayleigh and Sir William Ramsey in 1895. Most recipients have been physicists or astronomers, including Einstein, Bohr, Heisenberg, Hubble, Fermi, Rabi, Fowler. The recipient in 1980 was André Weil.

Mandelbrot is an IBM Fellow in the Physical Sciences Department at the IBM Thomas J. Watson Research Center in Yorktown Heights, New York, where he has been a member of the staff since 1958. He is currently in residence as Professor of the Practice of Mathematics at Harvard University. He was born in Warsaw, November 20, 1924, a nephew of the mathematician Szolem Mandelbrojt. He was educated at l'École Polytechnique, Paris (Engineer, 1947), California Institute of Technology (M.S., 1948 and Aeronautical Engineer, 1949), and the University of Paris (Docteur és Sciences Mathématiques, 1957). Before joining the staff of the IBM Watson Research Center, he held positions at the Institute for Advanced Study (1953-1954), the Institut Henri Poincaré (1954-1955), the University of Geneva (1955-1957), and University of Lille and l'École Polytechnique, Paris (1957-1958). While on leave from the IBM Watson Research Center, he has served as Visiting Professor of Economics and later of Applied Mathematics at Harvard, of Engineering at Yale, of Physiology at Albert Einstein College of Medicine, and of Mathematics at University of Paris-Sud, and has been at M.I.T., first in the Electrical Engineering Department and later as Institute Lecturer. He has also been a Fellow of the Guggenheim Foundation, Trumbull Lecturer at Yale, Samuel Wilks Lecturer at Princeton, and Abraham Wald Lecturer at Columbia.

Mandelbrot is one of the subjects of the recent book *Mathematical People*, edited by Donald J. Albers and Gerald L. Alexanderson, published by Birkhäuser Boston in collaboration with the Mathematical Association of America. He has been invited to give an invited talk at one of the

joint AMS-MAA sessions at the Summer Meetings in Laramie; his title for that talk is "Fractal Geometry: Setting, Birth and Growth."

A press release issued by the IBM Watson Research Center described Mandelbrot's work in fractal geometry, for which he won the Barnard Medal, as giving "insight into the complex shape and structure of the natural world: the turbulence of liquids, the symmetry of living forms, the branching of crystals or rivers, the fluctuations of radio static and the stock market.

"Twenty years ago, Mandelbrot began to investigate disparate elements discovered by mathematicians of the past, unifying them into a new geometry. For example, lines so convoluted that they are more than one-dimensional and surfaces so jagged that they have more than two dimensions were regarded as 'mathematical monsters' that defied common sense.

"Fractal geometry, to the contrary, uses these and other irregular shapes as the starting point of a new mathematics of form, as well as the starting point of many specific theories that find a measure of order in areas previously reputed to be thoroughly chaotic.

"The theory of Fractals, which developed from Mandelbrot's studies of irregularity and chaos—in linguistics, economics, physics, biology, and other areas—was first put forward in his book *Les objets fractals: form, hazard et dimension* (Paris & Montréal, Flammarion, 1975) and, more fully in his book, *The Fractal Geometry of Nature* (San Francisco, W. H. Freeman, 1982)."

The earlier book cited above, which was developed from lectures presented at the Collège de France in 1973 and 1974, appeared in a much modified and augmented second version in 1977 as *Fractals; Form, Chance and Dimension* (San Francisco, W. H. Freeman).

Bers Received New York City Award

Lipman Bers is one of five New York scholars who were the first recipients of the Mayor's Award of Honor for Science and Technology. The presentations took place at Gracie Mansion, the official residence of New York Mayor Edward I. Koch, on Tuesday, May 21, 1985.

Bers, who was born in Latvia, was a member of the mathematics faculty of New York University for twenty-five years before being appointed Davies Professor of Mathematics at Columbia University. He is currently a visiting professor of mathematics at City University of New York. Bers was president of the American Mathematical Society in 1975 and 1976, and served for several years thereafter as chairman of the Society's Committee on Human Rights of Mathematicians.

The citation for the Mayor's award referred to Bers' work in "giving special encouragement to women mathematicians" and to his service "as a tireless fighter for the human rights of persecuted scientists throughout the world."

Edward E. David, Jr., Honored

The Conference Board of the Mathematical Sciences (CBMS), acting on behalf of the nation's mathematical scientists, has presented its first Public Service Award to Edward E. David, Jr., President of Exxon Research and Engineering Company.

David, an engineer, headed a committee of scientists and mathematicians at the National Research Council during an intensive three-year investigation of Federal support for research in the mathematical sciences. The committee found both "a dazzling record of accomplishments" in mathematics research over the last several decades and "an astonishing decline" in support, which has thrown support for this area markedly out of balance with related scientific and technological efforts. The committee attributed the lack of support to a flawed public perception that "mathematics voyages in such splendid isolation that society can afford not to pay passage in times of budget stringency," and to inadequate appreciation of the fact that "the 'high technology' that is so celebrated today is essentially *mathematical* technology."

In June 1984, the committee released a report, *Renewing U.S. Mathematics—Critical Resource for the Future*, in which it documented the accomplishments and the problems of U.S. mathematics, and offered a series of major recommendations aimed at its rejuvenation. The report was widely reported and commented on in the national press. Copies may be obtained without charge from: Board on Mathematical Sciences, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, DC 20418; 202-334-2421.

Last December, the National Science Board passed a formal resolution commending David and his committee "for their timely and compelling report" and noted that "the very core of most sciences and engineering efforts is dependent on mathematics and owes many advancements to sophisticated application of the techniques of mathematicians." The National Science Foundation budget request for FY 1986 called for significantly higher levels of support for mathematics research. —CBMS News Release

David has also been selected as the recipient of the 1984 Arthur M. Bueche Medal presented by the National Academy of Engineering for statesmanship in the field of technology. The award is conferred on David for his seminal influence on engineering and science policy and in recognition of his outstanding accomplishments

stemming from his varied roles as advisor to President, leader of industrial research, upholder of engineering education, participant in industry-government-university relationships and catalyst for international collaboration in science and technology. Edward E. David, Jr., is the U.S. Representative to the NATO Science Committee.
—NATO Newsletter

Ralph E. Gomory Awarded Medal

Ralph E. Gomory, Senior Vice President and Director of Research, IBM Corporation, Yorktown Heights, New York, received the Industrial Research Institute Medal at the Institute's 1985 Annual Meeting at the Broadmoor Hotel, Colorado Springs, Colorado on May 7, 1985.

Established in 1945, the Industrial Research Institute Medal is presented by the Institute to recognize and honor outstanding accomplishment in leadership or management of industrial research which contributes broadly to the development of industry and to the benefit of society.

Gomory was cited for outstanding contributions to the nation's scientific enterprise, and for his exemplary guidance and direction of one of the country's premiere industrial research organizations.

—Industrial Research Institute News Release

Newly Elected Members of the National Academy of Sciences

The following mathematical scientists have been elected to membership in the U.S. National Academy of Sciences: ROBERT J. AUMANN, Hebrew University of Jerusalem; EUGENE B. DYNKIN, Cornell University; RONALD L. GRAHAM, AT&T Bell Laboratories, Murray Hill, NJ; VICTOR W. GUILLEMIN, Massachusetts Institute of Technology; SERGE LANG, Yale University; and ROBERT STEINBERG, University of California, Los Angeles. JOHN F. ADAMS,

Queries to Expand Coverage

The Editorial Committee of the *Notices* has decided to expand the Queries column to include a wider coverage of fields in the mathematical sciences. In order to accomplish this, Professor Stuart Antman of the University of Maryland has been appointed as a second associate editor of the column. He joins Professor Hans Samelson of Stanford University who has been an associate editor of the Queries column for ten years.

All queries and responses for this column should be sent to:

Queries Column
American Mathematical Society
P.O. Box 6248
Providence, Rhode Island 02940

Cambridge University, England, was elected a foreign associate of the Academy.

Newly Elected Members of the American Academy of Arts and Sciences

The following mathematicians were elected to the American Academy of Arts and Sciences in May 1985: JOHN BACKUS, International Business Machines Research Laboratory; MICHAEL FREDMAN, University of California at San Diego, La Jolla; WASSILY HOFFDING, University of North Carolina, Chapel Hill; RICHARD M. KARP, University of California, Berkeley; HEINZ O. KREISS, California Institute of Technology; HANS LEWY, University of California, Berkeley; JULIA BOWMAN ROBINSON, University of California, Berkeley; W. GILBERT STRANG, Massachusetts Institute of Technology; and KAREN K. UHLENBECK, University of Chicago. YVONNE CHOQUET-BRUHAT, University of Paris and D. W. MOORE, University of London, were elected foreign honorary members.

— *The Chronicle of Higher Education*

Conference on New Directions in Applied and Computational Mathematics

This conference, in honor of Gail S. Young on his 70th birthday, focuses on the interaction among pure mathematics, applied mathematics, and computer science that is rapidly and dramatically changing the nature of all three disciplines. It is being held at the University of Wyoming, Laramie, August 8–10, 1985 and is being sponsored by the Sloan Foundation, the National Science Foundation (NSF) and the Air Force Office of Scientific Research (AFOSR). The lectures will address applications of quite pure mathematics that have arisen in recent years; for example, the role of combinatorics, algebra, and recursive function theory in computer science, application of algebraic geometry to control theory, the use of number theory in coding problems, the role of algebraic topology in applied mathematics, and others. The conference will emphasize the far-reaching effects of computing, for example, in the areas of numerical analysis and nonlinear partial differential equations which, in turn, have pervasive scientific and engineering applications. The speakers are as follows: Henry Pollak (Bell Communications Research), *Pure and applied mathematics from an industrial perspective*; Ismael Herrera (Universidad Nacional Autónoma de México), *Some unifying concepts in applied mathematics*; Daniel Kleitman (Massachusetts Institute of Technology), *Combinatorics and applications, a mutual enrichment*; Christopher Byrnes (Arizona State University), *The role of algebraic geometry in control theory*; Peter Hilton (State University of New York, Binghamton), *Teaching and research—The history of a pseudo-conflict*; Clyde Martin

(Texas Technological University), *Number theory and the generation of random numbers*; Jacob T. Schwartz (Courant Institute of Mathematical Sciences, New York University), *Problems of shape recognition*; Anil Nerode (Cornell University), *A survey of recursive functions*; Thomas F. Banchoff (Brown University), *Computer graphics applications in geometry: "Because the light is better over here"*; Richard Ewing (University of Wyoming), *Mathematical modelling and large-scale computing in energy and environmental research*; Stephen Smale (University of California, Berkeley), *When and how fast can Newton's method be expected to converge?*. The conference will conclude with a panel discussion on *Implications for undergraduate and graduate education in mathematics*. It is anticipated that the proceedings of this conference will be published.

With the conference timed for the three days prior to the start of the Annual Summer Meetings, those planning to attend the annual meetings should consider arriving early to attend this conference. A limited amount of funding will be available to partially defray expenses.

In connection with the conference, there will be a banquet in honor of Gail S. Young on Saturday, August 10. The cost of the banquet is \$15. For information contact Kenneth I. Gross, Director, Conference on New Directions in Applied and Computational Mathematics, Department of Mathematics, University of Wyoming, Laramie, Wyoming 82701, 307-766-6577.

Rollo Davidson Trust

The Trustees of the Rollo Davidson Trust have announced that they have awarded Rollo Davidson Prizes to each of the following:

PIET GROENEBOOM of the Centre for Mathematics and Computer Science, Amsterdam, for his work on Brownian motion with a parabolic drift;

TERENCE JOHN LYONS, Colin Maclaurin Professor of Pure Mathematics at the University of Edinburgh, for his work on chain-manifold correspondences and on the spectral discrimination of boundedly related riemannian metrics.

The first Rollo Davidson Prize was awarded in 1976, and fourteen prizes in all have now been awarded. Among the previous winners were M. T. Barlow and L. C. G. Rogers (1984), Edwin Perkins (1983), Persi Diaconis and Ruben Ambarzumian (1982), and John Charles Gittens (1981). The work of the Trust is supported by royalties associated with the two books *Stochastic Analysis* and *Stochastic Geometry*, and by individual donations. Communications relating to the work of the Trust should be addressed to its Secretary, The Bursar, Churchill College, Cambridge CB3 0DS, England.

Richard F. Hespos New Executive Director of ACM

The Association for Computing Machinery (ACM) is pleased to announce the appointment of Richard F. Hespos to the position of Executive Director at ACM Headquarters in New York City. Hespos replaces Sidney Weinstein, who is retiring from ACM after ten years of service.

Hespos has spent thirty years in a variety of technical, consulting and management positions, including: Senior Vice President of the Continental Corporation; Vice President-Technology at Dun and Bradstreet, Inc., and management consultant for McKinsey & Company.

He is a member of the Board of Directors of Quotron Systems, Inc., and is Chairman of the Advisory Council of the Princeton University Computer Center. He received his B.S. in Engineering from Princeton (1955), an M.B.A. from Harvard University (1959), and the degree of Doctor of Engineering Science from Columbia University (1966).
—ACM News Release

W. M. Keck Foundation Awards \$225,000 Grant to Dartmouth

Dartmouth College has been awarded \$225,000 from the W. M. Keck Foundation to develop educational software in the sciences for use on the Apple Macintosh and other personal computers. The W. M. Keck Foundation grant complements a similar project at Dartmouth for the development of computer software in the humanities and social sciences funded in 1983 by the Alfred P. Sloan Foundation.

The grant will be used to convert existing science programs now operating on Dartmouth's time-sharing system to the College's new personal computer environment, as well as to create new educational software for science courses. In order to avoid duplication, the projects will be done in consultation with members of at least three educational consortia of which Dartmouth is a member: Apple, Carnegie-Mellon and Sloan New Liberal Arts. All software developed under the new grant will be made available to other educational institutions for handling and copying costs only.
—Dartmouth News Release

AMS Research Fellowships Invitation for Applications, 1986-1987

These fellowships are open to individuals five to ten years past the Ph.D. degree (or equivalent), regardless of age, but below the academic rank of professor. Applicants should have received the Ph.D. degree between January 1, 1976, and December 31, 1981. Moreover, the vita must include the equivalent of at least three full years postdoctoral teaching or industrial experience, i.e., non-fellowship years.

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

The number of fellowships depends on the amount of money contributed to the program. The Trustees have arranged the matching program from general funds in such fashion that funds for at least one fellowship are guaranteed.

The deadline for receipt of applications is **December 2, 1985**. Awards will be announced late in January 1986.

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

Institute for Advanced Study Memberships

The School of Mathematics will grant a limited number of memberships, some with financial support, for research in mathematics at the Institute during the academic year 1986-1987. Candidates must have given evidence of ability in research comparable at least with that expected for the Ph.D. degree. Application blanks may be obtained from the Administrative Officer of the School of Mathematics, Institute for Advanced Study, Princeton, New Jersey 08540, and should be returned (whether or not funds are expected from some other sources) by **December 31, 1985**.

Sloan Research Fellowships

Nominations for candidates for Sloan Research Fellowships are due by **September 15, 1985**. Candidates must be members of the faculty at a college or university in the United States or Canada and must be at an early stage of their research careers. For information write: Sloan Research Fellowships, Alfred P. Sloan Foundation, 630 Fifth Avenue, New York, New York 10111.

Michigan Society of Fellows

The Michigan Society of Fellows offers three-year, postdoctoral fellowships in the arts, sciences,

and professions at the University of Michigan to begin September 1986. Four fellowships are to be awarded.

The purpose is to support individuals who show scholarly accomplishment and professional promise in the arts and sciences.

Candidates should be at the beginning of their professional careers, not more than three years beyond completion of their degrees. The Ph.D. or comparable professional degree is required.

Fellows are appointed with departmental affiliation as Assistant Professors/Postdoctoral Scholars. One-third salary and time support departmental teaching; the balance is devoted to independent research.

Yearly stipend/salary is \$18,000 with anticipated annual increments, plus faculty benefits.

Deadline for applications is **November 14, 1985**. Address inquiries and requests for application materials to Michigan Society of Fellows, 3030 Rackham Building, The University of Michigan, Ann Arbor, Michigan 48109; 313-763-1259.

U.S. Mathematical Olympiad Winners

Eight U.S. students have earned Olympiad medals in a mathematics competition involving nearly 400,000 high school students. The final round in this competition was the Fourteenth USA Mathematical Olympiad (USAMO) in which sixty-four students competed in a challenging examination designed to test ingenuity as well as mathematical background. The finalists were the top performers in the American High School Mathematics Examination and the American Invitational Mathematics Examination which were held in high schools throughout the United States and Canada in February and March 1985.

The eight USAMO winners are Joseph G. Keane, Pittsburgh, Pennsylvania; Waldemar P. Horwat, Hoffman Estates, Illinois; John A. Overdeck, Columbia, Maryland; Yeh Ching-Tung, Saratoga, California; Bjorn M. Poonen, Winchester, Massachusetts; Zinkoo Han, Brooklyn, New York; Jeremy A. Kahn, New York, New York; and John P. Dalbec, Youngstown, Ohio.

Following an awards ceremony, the eight winners and sixteen other students who did well in the USAMO participated in an intensive three-week

Request for Photos

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

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

seminar at the U.S. Military Academy at West Point in preparation for the 1985 International Mathematical Olympiad held in Helsinki, Finland in July.

The Mathematical Olympiad and the High School Mathematics Contests are sponsored by several major organizations in the mathematical sciences. —MAA News Release

Reciprocity Agreement with Sociedade Paranaense de Matemática

The American Mathematical Society and the Sociedade Paranaense de Matemática, Brazil, have recently concluded a "reciprocity agreement" under which members of either of these societies may join the other at reduced dues. Members of the Sociedade Paranaense de Matemática receive as privileges of membership a free subscription to *Boletim da Sociedade Paranaense de Matemática* and *Monografias da Sociedade Paranaense de Matemática*.

See the section entitled **Reciprocity Agreements** in this issue of *Notices* for further details.

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.

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

331. Culbreth Sudler, Jr. (11952 Dorothy Street, Los Angeles, CA 90049). Is it known for which n there are indecomposable (= only trivial direct factors) groups of order n (beyond the trivial case, cyclic of prime power order)?

332. A. W. Chatters (School of Mathematics, University Walk, Bristol BS8 1TW, England). Let R be a commutative Noetherian unique factorisation domain with an automorphism such that the height-one prime ideals of R form a single orbit under the action of the automorphism. Is R necessarily a principal ideal domain? I would appreciate any information about the history or solution of this problem. The answer can easily be proved to be "Yes" if R is an algebra over an uncountable field.

333. Charles Small (Department of Mathematics and Statistics, Jeffery Hall, Queen's University, Kingston, Canada K7L 3N6). It is not hard to prove that a formal power series (over any ring) is a rational function if and only if its coefficients eventually satisfy a linear recurrence relation. When was the earliest statement, who first proved it and when, and where does it appear explicitly in print? References for subsequent re-discoveries of the theorem over the years are also wanted.

334. Elmer Eisner (Texaco Inc., Houston Research Center, 3901 Briarpark, PO Box 770070, Houston TX 77215-0070). A. Let $\epsilon > 0$ be given. Does there exist an N such that for any given real polynomial $p(x)$ satisfying $p(0) = 1$, there exists a polynomial $\hat{p}(x)$ of the form $\hat{p}(x) = \prod_{i=1}^N (1 + a_i x^{M_i})$, with real a_i , which makes

the coefficients of the polynomial $p(x) - \hat{p}(x)$ all bounded in absolute value by ϵ ? Is there a procedure to find the minimum such N and the associated a_i and M_i ? (Approximate factorization)

B. In R^N , find the M unit vectors e_1, \dots, e_M which minimize $E = \max\{|e_i \cdot e_j|; i \neq j, i, j = 1, \dots, M\}$. What can be said about $E(M, N)$? (Approximate orthogonality)

Responses

323, part C. (vol. 32, p. 198, March 1985, Vladik Ya. Kreinovich) Are there notions of dual programs for the new programming methods (ellipsoid, Karmarkar)? **Reply:** Dual variables exist in both cases. They are roughly the coefficients used to express the basic functions as linear combinations of functions coming from the constraints. A detailed exposition is contained in Tech. Report #648 by M. J. Todd-B. P. Burrell, and Tech. Report #626 by B. P. Burrell-M. J. Todd, School of Operations Research and Industrial Engineering, College of Engineering, Cornell University, Ithaca, NY 14850. (Contributed by M. J. Todd)

328. (vol. 32, p. 379, June 1985, Badih Ghusayni) Is a non-zero subspace V of $L_2(\mathbf{R})$ necessarily equal to $L_2(\mathbf{R})$, if it satisfies (1) $f \in V, g \in L_2(\mathbf{R}), |g| \leq |f|$ a.e. $\Rightarrow g \in V$, (2) $f \in V \Rightarrow$ the Fourier transform \hat{f} is in V ? **Reply:** This is a problem on Lee Rubel's list of 1974. The answer is yes; the proof uses the fact proved in 1977 by deLeeuw, Kahane, and Katznelson that every l_2 -sequence is majorized by the Fourier coefficients of some continuous function. Details available through the AMS office. (Contributed by Y. Katznelson)

National Science Foundation

News & Reports

NSF Awards Grants

The National Science Foundation (NSF) has made 203 awards totalling about \$5 million to 172 institutions in the first year of the agency's College Science Instrumentation Program (CSIP). The awards were made to institutions in 40 states and Puerto Rico from among 1,348 proposals. Out of the 203 awards, seven were in mathematics.

CSIP was established by the NSF to strengthen and support science and engineering instruction in predominantly undergraduate four-year colleges and universities.

Mathematical scientists who received awards and their institutions follow: MICHAEL R. CULLEN, Loyola Marymount University; EDMUND GALLIZZI, Eckerd College; E. SHARON JONES, Towson State University; THOMAS L. NAPS, Lawrence University; DAVID NIXON, University of North Carolina, Charlotte; MELVIN C. TEWS, College of the Holy Cross; THOMAS P. WHALEY, Central University of Iowa.

—NSF News Release

U.S.-Industrialized Countries Exchange Program

In order to develop scientific, engineering and technical cooperation between the U.S. and other industrialized countries, a program for the exchange of scientists and engineers is jointly sponsored by the NSF and counterpart agencies in other industrialized countries. The purposes of this program are to promote the progress of science and to support the establishment of bases for continuing collaborative research relationships between the science and engineering communities of the U.S. and other industrialized countries, including all Western European countries, Australia, New Zealand, and Japan. Awards will be made for research in any field of science, including the mathematical sciences.

Further information and applications may be obtained from Division of International Programs, National Science Foundation, Washington, DC 20550.

Grants to Give Researchers Easier Access to Supercomputers

The National Science Foundation (NSF) has announced awards totalling \$4.4 million to three institutions as part of a program to give scientists and engineers easier access to supercomputers, thus helping them with their research.

Colorado State University in Fort Collins and AT&T Bell Laboratories in Murray Hill, New

Jersey, were given awards of \$2 million each, and Vector Production of Los Angeles, a division of Digital Productions, was awarded \$400,000.

The three awards, made through NSF's Office of Advanced Scientific Computing (OASC), resulted from a competitive solicitation. They bring to six the number of such supercomputer facilities supported by NSF. In 1984 awards were made to the University of Minnesota, Purdue University and Boeing Computer Services of Bellevue, Washington.

In another supercomputer-related program, NSF recently announced the establishment of four National Advanced Scientific Computing Centers. They are at the University of California at San Diego, La Jolla, the University of Illinois at Urbana-Champaign, Cornell University and Princeton University.

—NSF News Release

Science, Engineering Employment Outpaces All

Employment of scientists and engineers in the U.S. increased about 50 percent between 1976 and 1983, nearly twice as fast as that of all professional workers and about three times as fast as the overall work force, according to a newly released report by the National Science Foundation (NSF).

The 89-page report, titled "Science and Engineering Personnel: A National Overview," presents an overview of the employment status and other characteristics of U.S. scientists and engineers. It examines the status of women and racial-ethnic minorities engaged in science and engineering activities. It also contains a discussion of the dynamics of the science and engineering labor markets, including an assessment of the quality of precollege mathematics and science training.

Copies of the report (NSF 85-302) are available free from the Division of Science Resources Studies, National Science Foundation, 1800 G Street, N.W., Washington, DC 20550; 202-634-4622.

—NSF News Release

Engineering Personnel Shortages Increase

A fall 1984 survey of major industrial employers of scientists, engineers, and computer specialists (SEC) revealed an increase in personnel shortages since 1983 in some engineering fields. More than 10% of companies in four fields surveyed reported shortages: electrical engineering (19 percent); computer engineering (15 percent); electronics engineering (12 percent) and nuclear engineering (12 percent). In no SEC field has the shortage reached the level of severity that existed in 1981.

Reflecting the impact of higher defense spending, over one-half of the defense-related firms reported more openings for SEC personnel in 1983-1984 and two-thirds reported shortages. Most of the shortages continued to be for experienced scientists and engineers. About two-thirds or more of the reports in most fields were for experienced personnel, and in no case did the proportion of shortages for new graduates exceed one-half the total.

-NSF Science Resource Studies Highlights

New Deadline for the Visiting Professorships for Women Program

The newly-established deadline for submitting proposals to the Visiting Professorships for Women (VPW) program is **October 1, 1985**. Proposals submitted for consideration in fiscal year 1986 should be postmarked no later than October 1, 1985. Further information can be obtained from Margrete Klein, Director, Visiting Professorships for Women Program, National Science Foundation, Washington, DC 20550; 212-357-7734.

-NSF Bulletin

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

Staff Change

The National Science Foundation has announced that W. Richards Adrion is now Deputy Director, Division of Computer Research.

-NSF Bulletin



Ordered Fields and Real Algebraic Geometry

D. W. Dubois and T. Récio, Editors

"The book's most significant contribution is its breadth. It encompasses the entire spectrum of present research in ordered fields and real algebraic geometry. The field is very active, and this is the first attempt at such a comprehensive coverage."

- W. Vogel (Halle)

Periodica Mathematica Hungarica, V. 15(2) 1984

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Providence, RI 02901-1571, or call toll free 800-556-7774 to charge with VISA or MasterCard

Letters to the Editor

Scientific Cooperation with Vietnam

I am compelled to protest the smug and misguided "Editorial Note" appended to Neal Koblitz's letter (*Notices*, March 1985, page 200) regarding the killing of E. L. Cooperman, the Chairman of the U.S. Committee for Scientific Cooperation with Vietnam. Upon rereading the letter, the Editors will notice that in fact Koblitz doesn't offer any "theories as to the motivation for Professor Cooperman's murder." Rather, he is interested solely in blunting the negative effects it may have on cooperative research with Vietnamese scientists. Obviously the circumstances he cites are more germane to this than any possibly "nonpolitical" ones. The coy editorial allusion to such theories undercuts this worthy effort, and puts the Society in a political posture with which many members may have little sympathy.

Haynes Miller
University of Washington
(Received March 21, 1985)

COMMENT FROM THE SECRETARY OF THE AMS: The editorial note with the letter of Neal Koblitz (*Notices*, March 1985, page 200) was in fact an editorial error. The letter as submitted contained some passages to which the note was directed. During the consideration of the letter by the editorial committee, the note was appended. In the editing, the passages in question were deleted but the note, no longer pertinent, remained.

E. Pitcher

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.

AMS-MAA Joint Meetings

In a recent issue of *Focus*, the Newsletter of the Mathematical Association of America (MAA) (vol. 5, No. 1, 1985), I read about the possible discontinuance in the future of the joint summer meetings with AMS. As a foreign member of both AMS and MAA permit me to make the following suggestion—hold a joint *annual* meeting in *September*. Many foreign members visit North America during this period and I am sure most of them would appreciate the possibility of participating in a joint meeting. In fact, this is the most convenient period for most of us in Europe—for reasons too obvious to enumerate here in detail. I hope that our American colleagues would find the suggestion acceptable.

S. D. Chatterji
École Polytechnique Fédérale
Lausanne
(Received March 5, 1985)



Multiple Trigonometric Sums

G. I. Arhipov, A. A. Karacuba and V. N. Čubarikov

CONTENTS

Basic Notation

Introduction

- I. Theorem on the mean value
- II. Estimates for multiple trigonometric sums
- III. Applications of the theory of multiple trigonometric sums

1980 *Mathematics Subject Classifications*: 10G10; 10B15, 12C25

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1985 AMS Elections

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

Two vice-presidents and five members-at-large of the Council will be elected by the Society in a contested election in the fall of 1985.

The vice-presidents will serve for a term of two years effective January 1, 1986. The Council has nominated four candidates for the two positions. They are:

Richard A. Askey	Linda Keen
Daniel Gorenstein	Olga Taussky-Todd

Nominations by petition may have appeared since this note was prepared.

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

James G. Arthur	Philip C. Kutzko
Charles Herbert Clemens	Boris Mityagin
Jane P. Gilman	Chuu-Lian Terng
Vadim Komkov	William A. Veech

If nominations by petition do not appear bringing the total number of nominees to at least ten, it will be brought to ten by the Council before the ballot is circulated.

President's Candidates for the Nominating Committee 1986 and 1987

Four members of the Nominating Committee are to be elected in the fall of 1985. Continuing members are:

Vera S. Pless, chairman	Michael Shub R. O. Wells, Jr.
Mary Ellen Rudin	

President Irving Kaplansky has named six candidates for the other four places. They are:

John T. Baldwin	Paul S. Muhly
Richard E. Block	Catherine L. Olsen
James W. Cannon	Burton Rodin

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

Bethlehem, Pennsylvania

Everett Pitcher
Secretary

Prescribing the Curvature of a Riemannian Manifold

Jerry L. Kazdan

(CBMS Regional Conference Series, Number 57)

These notes were the basis for a series of ten lectures given from January 6–10, 1984 at Polytechnic Institute of New York under the sponsorship of the Conference Board of the Mathematical Sciences and the National Science Foundation. The lectures were aimed at mathematicians who knew either some differential geometry or partial differential equations, although others could understand the lectures.

Author's Summary: Given a Riemannian Manifold (M, g) one can compute the sectional, Ricci, and Scalar curvatures. In other special circumstances one also has mean curvatures, holomorphic curvatures, etc. The inverse problem is, given a candidate for some curvature, to determine if there is some metric g with that as its curvature. One may also restrict ones attention to a special class of metrics, such as Kähler or conformal metrics, or those coming from an embedding. These problems lead one to (try to) solve nonlinear partial differential equations. However, there may be topological or analytic obstructions to solving these equations. A discussion of these problems thus requires a balanced understanding between various existence and non-existence results.

The intent of this volume is to give an up-to-date survey of these questions, including enough background, so that the current research literature is accessible to mathematicians who are not necessarily experts in PDE or Differential Geometry.

The intended audience is mathematicians and graduate students who know either PDE or differential geometry at roughly the level of an intermediate graduate course.

Contents

- I. Gaussian Curvature
 - II. Scalar Curvature
 - III. Ricci Curvature
 - IV. Boundary Value Problems
- Some Open Problems

1980 *Mathematics Subject Classifications*:

35Jxx, 53Cxx

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Election Information

The ballots for election of members of the Council and Board of Trustees of the Society for 1986 will be mailed on or shortly after August 26, in order for members to receive their ballots well in advance of the November 11 deadline. Prior to casting their ballots members are urged to consult the following articles and sections of the Bylaws of the Society: article I, section 1; article II, sections 1, 2; article III, sections 1, 2, 3; article IV, sections 1, 2, 4; article VII, sections 1, 2, 5. The complete text of the Bylaws appears on pages 809–813 of the November 1983 issue of the *Notices*. A list of the members of the Council and Board of Trustees serving terms during 1985 appears in the **AMS Reports and Communications** section of this issue.

SUGGESTIONS FOR 1986 NOMINATIONS

Each year the members of the Society are given the opportunity to propose for nomination the names of those individuals they deem both qualified and responsive to their views and needs as part of the mathematical community. Candidates will be nominated by the Council to fill positions on the Council and Board of Trustees to replace those whose terms expire December 31, 1986. See the **AMS Reports and Communications** section of this issue for the list of current members of the Council and Board of Trustees. Members are requested to write their suggestions for such candidates in the appropriate spaces on the form in the next column.

REPLACEMENT BALLOTS

This year ballots for the AMS election will be mailed August 26, 1985 or within a day or two thereafter. 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.

SUGGESTIONS FOR 1986 NOMINATIONS Council and Board of Trustees

Vice President (1)

Secretary (1)

Associate Secretaries (2)

Treasurer (1)

Associate Treasurer (1)

Member of the *American Journal of Mathematics* Editorial Committee (1)

Member of the *Bulletin* Editorial Committee (1)

Member of the *Colloquium* Editorial Committee (1)

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

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

Members of the *Mathematics of Computation* Editorial Committee (2)

Member of the *Proceedings* Editorial Committee (1)

Members of the *Transactions and Memoirs* Editorial Committee (3)

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

Members-at-large of the Council (5)

Member of the Board of Trustees (1)

The completed form should be addressed to AMS Nominating Committee, Post Office Box 6248, Providence, RI 02940, to arrive no later than **November 11, 1985**.

Amendments to the Bylaws for Presentation at the Business Meeting of 14 August 1985 in Laramie

There are two amendments to the bylaws recommended by the Council to come before the Laramie Business Meeting. The first revises the wording of Articles III and IV to reduce the size of the Council. As a secondary effect, the complexity that has been inherent in a roll call vote is eliminated. The second is a modification of Article IX, Section 8. There are also editorial changes to make the wording in other places consistent with these changes.

~~Overseered material~~ is to be deleted; **boldface material** is to be inserted.

Article III

~~Publications and Communications Committees~~

Section 1. ~~There shall be eight publications committees, which shall be the eight editorial committees specified in Section 2 of this Article.~~

~~Section 2.~~ There shall be eight editorial committees as follows: committees for the *Bulletin*, for the *Proceedings*, for the *Colloquium Publications*, for *Mathematical Surveys and Monographs*, for *Mathematical Reviews*; a joint committee for the *Transactions* and the *Memoirs*; a committee consisting of the representatives of the Society on the Board of Editors of the *American Journal of Mathematics*; and a committee for *Mathematics of Computation*.

Section 2. There shall be a Science Policy Committee.

Section 3. There shall be a communications committee called the Committee to Monitor Problems in Communication.

Section 4. The size of each ~~publications committee and communications~~ committee shall be determined by the Council.

Article IV

Council

Section 1. The Council shall consist of fifteen members-at-large and the following *ex officio* members: the officers of the Society specified in Article I, **except that it shall include only one associate secretary, the members chairman of each of the publications editorial committees and the chairman of the communications committee and of the Science Policy Committee specified in Article III**, any former secretary for a period of two years following his terms of office, and members of the Executive Committee (Article V) who remain on the Council by the operation of Article VII, Section 4.

The chairman of any committee designated as a Council member may name a deputy from the committee as substitute. The associate secretary shall be the one charged with the scientific program of the meeting at which the Council meets except that at a meeting associated with no scientific meeting of the Society the secretary may designate the associate secretary.

There is one exception. Council members by virtue of membership on an editorial committee or as associate secretary on January 1, 1986 shall remain members of the Council through their elected terms. This paragraph is no longer effective after December 31, 1989 and shall then be deleted.

Section 2. The Council shall formulate and administer the scientific policies of the Society and shall act in an advisory capacity to the Board of Trustees.

Section 3. In the absence of the secretary from any meeting of the Council, ~~one of the associate secretaries present~~ a member may be designated as acting secretary for the meeting, either by written authorization of the secretary, or, failing that, by ~~majority agreement among the associate secretaries present~~ the presiding officer.

Section 4. All members of the Council shall be voting members. **Each member, including deputies and the designated associate secretary, shall have one vote.** The method for settling matters before the Council at any meeting shall be by majority vote of the members present. If the result of a vote is challenged, it shall be the duty of the presiding officer to determine the true vote by a roll call. In a roll call vote, each Council member shall vote only once (although he may be a member of the Council in several capacities), ~~and he shall state before the vote in which capacity he votes. The group consisting of the four associate secretaries shall have one vote, and it shall be divided equally among those who vote as associate secretaries.~~ **Each of the eight publications committees shall have one vote, and it**

shall be divided equally among those who vote as members of the respective publications committees. All other members of the Council shall have one vote each. Fractional votes shall be counted.

Section 5. Any group of five members of the Council who have a total of five votes as defined in Section 4 of this Article for a vote by roll call shall constitute a quorum for the transaction of business at any meeting of the Council.

Section 6. Between meetings of the Council, business may be transacted by a mail vote. Votes shall be counted as in the case of a roll call as specified in Section 4 of this Article, "members present" being replaced by "members voting." An affirmative vote by mail on any proposal shall be declared if, and only if, (a) more than half of the total number of possible votes is received by the time announced for the closing of the polls, and (b) at least three-quarters of the votes received by then are affirmative. If five or more members who have a total of five or more votes request postponement at the time of voting, action on the matter at issue shall be postponed until the next meeting of the Council, unless either (1) at the discretion of the secretary, the question is made the subject of a second vote by mail, in connection with which brief statements of reason, for and against, are circulated; or (2) the Council places the matter at issue before the Executive Committee for action.

Section 7. The Council may delegate to the Executive Committee certain of its duties and powers. Between meetings of the Council, the Executive Committee shall act for the Council on such matters and in such ways as the Council may specify. Nothing herein contained shall be construed as empowering the Council to divest itself of responsibility for formulating and administering the scientific policies of the Society.

Section 8. The Council shall also have power to speak in the name of the Society with respect to matters affecting the status of mathematics or mathematicians, such as proposed or enacted federal or state legislation; conditions of employment in universities, colleges, or business, research or industrial organizations; regulations, policies, or acts of governmental agencies or instrumentalities; and other items which tend to affect the dignity and effective position of mathematics.

With the exception noted in the next paragraph, a favorable vote of two-thirds of the entire membership of the Council, taken in accordance with the provisions of a vote by roll call as specified in Section 4 of this Article, shall be necessary to authorize any statement in the name of the Society with respect to such matters. With the exception noted in the next paragraph, such a vote may be taken only if written notice shall have been given to the secretary by the proposer of any such resolution not later than one month prior to the Council meeting at which the matter is to be presented; and the vote shall be taken not earlier than one month after the resolution has been discussed by the Council.

If, at a meeting of the Council, there are present twelve members, having a total of twelve votes, as specified for a vote by roll call in Section 4 of this Article, then the prior notification to the secretary may be waived by unanimous consent. In such a case, a unanimous favorable vote by those present shall empower the Council to speak in the name of the Society.

The Council may also refer the matter to a referendum by mail of the entire membership of the Society, and shall make such reference if a referendum is requested, prior to final action by the Council, by two hundred or more members. The taking of a referendum shall act as a stay upon Council action until the votes have been canvassed, and thereafter no action may be taken by the Council except in accordance with a plurality of the votes cast in the referendum.

Article IX

Dues and Privileges of Members

Section 8. After retirement from active service on account of age or on account of long term disability, any ordinary or contributing member who is not in arrears of dues and with membership extending over at least twenty years may, by giving proper notification to the secretary, have his dues remitted, on the understanding that he will thereafter receive the *Notices* but not the *Bulletin*.

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.

Laramie Meetings, August 10-15, 1985

Program

The August 1985 Joint Mathematics Meetings, including the 89th Summer Meeting of the AMS, the 65th Summer Meeting of the Mathematical Association of America, the 1985 Annual Meeting of Pi Mu Epsilon, and the 1985 Summer Meeting of the Association for Women in Mathematics, will be held August 12-15, 1985 (Monday-Thursday), at the University of Wyoming, Laramie. The meetings will be preceded by the AMS Short Course on August 10 and 11 (Saturday and Sunday), 1985. Sessions will take place on the campus of the University of Wyoming, Laramie.

The members of the Local Arrangements Committee are Sandy H. Adams, Myron B. Allen (chairman), Lois Kline, William J. LeVeque (ex-officio), Melfried Olson (publicity director), and Kenneth A. Ross (ex-officio).

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IMPORTANT DEADLINES

AMS Abstracts,	
For consideration for special sessions	Expired
Of contributed papers	Expired
MAA Abstracts,	
Of contributed papers	Expired
Joint Meeting Preregistration and Housing	Expired
MAA Minicourse Preregistration	Expired
Summer List of Applicants	Expired
Motions for AMS Business Meeting	Expired
Housing Cancellations (100% refund)	Expired
MAA Banquet (50% refund)	Expired
Preregistration cancellations (50% refund)	August 9
Dues credit for nonmembers/students	September 15

89th Summer Meeting of the AMS August 12-15, 1985

Colloquium Lectures

There will be a series of four Colloquium Lectures presented by KAREN K. UHLENBECK of the University of Chicago. The title of this lecture series is *Mathematical gauge field theory*. The lectures will be given at 1:00 p.m. daily, Monday-Thursday, August 12-15.

Prize Session

The 1985 LeRoy P. Steele Prizes will be awarded at a session at 4:30 p.m. on Wednesday, August 14.

Invited Addresses

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

STUART S. ANTMAN, University of Maryland, College Park, *Global bifurcation problems from mechanics*, 2:15 p.m. Wednesday;

RICHARD E. BLOCK, University of California, Riverside, *Simple Lie algebras of prime characteristic*, 3:30 p.m. Thursday;

ROBERT L. BRYANT, Rice University, *Surfaces in conformal geometry*, 8:30 a.m. Wednesday;

DAVID B. MACQUEEN, AT&T Bell Laboratories, *Theory of types in programming languages*, 8:30 a.m. Monday;



Karen K. Uhlenbeck, Colloquium Lecturer

American Mathematical Society Short Course Series

Introductory Survey Lectures on
Actuarial Mathematics

Laramie, Wyoming, August 10–11, 1985

The American Mathematical Society, in conjunction with its eighty-ninth Summer Meeting, will present a one and one-half day short course entitled *Actuarial Mathematics* on Saturday and Sunday, August 10 and 11, at the University of Wyoming, Laramie. Cecil J. Nesbitt of the University of Michigan, James C. Hickman of the University of Wisconsin, and Elias Shiu of the University of Manitoba will serve as organizers of the course. Six lectures are planned, and it is anticipated that proceedings will be published in the series *Proceedings of Symposia in Applied Mathematics*.

A number of forces have been shaping actuarial mathematics in the latter part of the twentieth century. Clearly, the on-going developments of computers have had a major influence. At the same time, the clarification of concepts of probability and statistical theory have provided a much richer foundation for actuarial theory. These concepts apply in related fields such as biostatistics, demography, economics and reliability engineering. Life tables are no longer simply actuarial tools but have been explored and utilized in those other fields. The mathematical theory of risk has flourished with the concurrent development of stochastic processes. Still more recently, developments in the theory of finance may eventually be assimilated into actuarial mathematics.

A basic textbook in preparation for the Society of Actuaries co-ordinates risk theory and classical actuarial mathematics. J. C. Hickman will introduce the audience to some ideas from this book. H. H. Panjer will follow with a lecture on models in risk theory pertaining to aggregate insurance losses, while Stuart Klugman will discuss distributions of individual losses. Credibility theory is devoted to models for combining information from several sources in determining insurance premiums. P. M. Kahn, who has co-chaired two Berkeley conferences on credibility theory, will present a survey of that topic. Graduation, the process of constructing a smoothed version of data, is an important topic in actuarial mathematics. Reflecting the influence of the work of T. N. E. Greville, E. S. Shiu will give a survey of graduation theory. A new emphasis in actuarial practice is on actuarial projections of insurance and annuity funds. J. A. Beekman will address this topic by giving an overview of the array of processes used in actuarial projections for U.S. Social Security.

The course will conclude with a general discussion which may include comments by C. J. Nesbitt on the 1960-1982 experience under TIAA-CREF annuities and the studies being undertaken by the recently formed Commission on College Retirement. Synopses of the talks and accompanying reading lists appeared in the March issue of the *Notices*.

The mathematics involved will be at the undergraduate and early graduate level. Some background in probability, statistics and computing will be helpful. Actuarial mathematics deals with a wide diversity of complex applications and a short course thereon will necessarily be only an overview.

The short course is open to all who wish to participate upon payment of the registration fee. There are reduced fees for students and unemployed individuals. Please refer to the section entitled **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, Barbara L. Osofsky, and Philip D. Straffin, Jr..

DENNIS W. STANTON, University of Minnesota, Minneapolis, *Orthogonal polynomials and association schemes*, 3:20 p.m. Tuesday;

RONALD J. STERN, University of Utah, *Gauge theories and the topology of 4-manifolds*, 11:00 a.m. Monday;

JERROLD B. TUNNELL, Rutgers University, *Elliptic curves and diophantine problems*, 2:15 p.m. Thursday; and

LAI SANG YOUNG, Michigan State University, *Hyperbolicity in dynamical systems*, 3:20 p.m. Monday.

Special Sessions

By invitation of the same committee, there will be eight 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 lists of speakers are as follows:

Combinatorics and special functions, RICHARD A. ASKEY, University of Wisconsin, Madison, 1:00 p.m. Wednesday and 8:00 a.m. Thursday. Eiichi Bannai, Ira Gessel, Yiming Hong, Mourad E. H. Ismail, Jacques Labelle, Judith Q. Longyear, Aaron D. Meyerowitz, Stephen C. Milne, Mizanur Rahman, Donald St. P. Richards, and Paul Terwilliger.

Dynamical systems and ergodic theory, MARCY BARGE, University of Wyoming and ROBERT F. WILLIAMS, Northwestern University, 2:15 p.m. and 4:30 p.m. Monday, 8:30 a.m. and 2:15 p.m. Tuesday, and 9:40 a.m. and 3:15 p.m. Wednesday. Roy L. Adler, Kirby A. Baker, Louis Block, Joe Christy, Robert W. Easton, David Fried, Sue Goodman, Glen R. Hall, David Hart, Morris W. Hirsch, Philip Holmes, Irene Mulvey, Daniel Rudolph, Stephen Schecter, R. C. Swanson, and Susan Williams.

Commutative algebra and algebraic geometry, FRANK R. DE MEYER, Colorado State University and RICK MIRANDA, Bedford, Massachusetts, 2:15 p.m. Monday, 8:30 a.m. and 2:15 p.m. Tuesday. David A. Cox, Bruce Crauder, Timothy Ford, Robert M. Fossum, Robert Gilmer, Brian Harbourne, Craig Huneke, Eliot Jacobson, William E. Lang, Pablo Lejarraga, Andy R. Magid, David R. Morrison, David J. Saltman, Loring Tu, Roger Wiegand, and Sylvia Wiegand.

Gauge theories and 4-manifolds, RONALD A. FINTUSHEL, Tulane University, 2:15 p.m. Tuesday and Wednesday. N. P. Buchdahl, D. Burns, Andrzej Derdzinski, Ronald Fintushel, Martin Guest, Mitsuhiro Itoh, Claude Le Brun, and Pankaj Topiwala.

The geometry of configurations, GEORGE B. PURDY, Texas A&M University, 2:15 p.m. Monday and 8:00 a.m. Tuesday. Fan Chung, Paul Erdős, Jacob E. Goodman, Branko Grünbaum, Robert E. Jamison, Gil Kalai, L. M. Kelley, Richard Pollack, George B. Purdy and Asia Ivic Weiss.

Numerical approximation theory and applications, V. M. SEHGAL, University of Wyoming and S. P. SINGH, Memorial University of Newfoundland,

2:15 p.m. Tuesday, 9:00 a.m. and 2:15 p.m. Wednesday. J. C. Dunn, Shusheng Fu, Paul M. Gauthier, David J. Leeming, Attila Máté, R. N. Mohapatra, G. M. Phillips, Simeon Reich, B. E. Rhoades, V. M. Sehgal, K. L. Singh, P. W. Smith, G. D. Taylor, and J. L. Ullman.

Mechanics and bifurcation theory, SCOTT J. SPECTOR, Southern Illinois University, Carbondale, and University of Minnesota, Minneapolis, 8:30 a.m. and 1:00 p.m. Thursday. Giles Auchmuty, S. N. Chow, Martin Golubitsky, Henry W. Haslach, Jr., Philip Holmes, J. H. Maddocks, Michael Renardy, D. Sather, Henry Simpson, Scott J. Spector, and Y. H. Wan.

Analysis of one complex variable, CHUNG-CHUN YANG, Naval Research Laboratory, Washington, DC, 8:30 a.m. and 2:00 p.m. Thursday. Afton Cayford, W. H. Chen, Chi-Tai Chuang, Chongji Dai, Albert Edrei, Paul M. Gauthier, Cai Hai-Tao, Peter Lappan, Charles F. Osgood, J. R. Quine, John Rossi, Ranjan Roy, Linda R. Sons, and Shlomo Strelitz.

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 August 14, 1985, receive the service offered by the committee in the most effective manner, it should have been in the hands of the secretary by July 15, 1985.

Everett Pitcher, Secretary

May 7 was the deadline for submission of abstracts for consideration for inclusion in these special sessions.

Contributed Papers

There will be sessions for contributed papers on Tuesday morning and afternoon. **May 28 was the deadline for submission of abstracts for contributed papers.**

Late papers will not be accepted.

Other AMS Sessions

AMS Committee on Employment and Educational Policy

CEEP will sponsor a fact-finding open discussion at 7:00 p.m. on Wednesday, August 14, on *Computer science in mathematics departments*. DONALD C. RUNG, Pennsylvania State University, will moderate. The program will feature an introductory presentation by BARNET M. WEINSTOCK, University of North Carolina, Charlotte, to be followed by an open discussion by those attending on the problems encountered in this area. The committee is seeking to learn about the problems in this area in order to formulate possible committee action. All chairpersons or other interested faculty are urged to attend.

Council Meeting

The Council of the Society will meet at 5:00 p.m. on Sunday, August 11.

Business Meeting

The Business Meeting of the Society will take place immediately following the Steele Prize Session at 4:30 p.m. on Wednesday, August 14. 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.

65th Summer Meeting of the MAA August 12–15, 1985

Hedrick Lectures

The 34th Earle Raymond Hedrick Lectures will be given by ARTHUR M. JAFFE of Harvard University. The title of this series of three lectures is *Towards the reunification of theoretical physics with mathematics*. These lectures will be given at 11:00 a.m. on Tuesday, Wednesday, and Thursday, August 13–15.

Invited Addresses

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

Interactive computer graphics in elementary differential geometry, THOMAS F. BANCHOFF, Brown University, 2:15 p.m. Wednesday.

Truth and meaning in mathematics, REUBEN HERSH, University of New Mexico, 8:40 a.m. Thursday.

The nervous system: Some recent work in mathematical biology, FRANK C. HOPPENSTEADT, University of Utah, 8:40 a.m. Tuesday.

Women in the American mathematical community: The pre-1940 Ph.D.'s, JEANNE LADUKE, DePaul University, 1:00 p.m. Wednesday.

Integration: Why you can and why you can't, HENRY P. MIRANDA, Colorado State University, 3:20 p.m. Wednesday.

The place of the Riemann hypothesis in modern prime number theory, HUGH L. MONTGOMERY, University of Michigan, 2:15 p.m. Tuesday.

Karmarkar's algorithm and other recent developments in linear programming, MICHAEL SAKS, Bell Communications Research, 2:15 p.m. Monday.

Minicourses

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

Minicourse #1: *Geometry for college teachers* is being organized by BRANKO GRÜNBAUM, University of Washington. Part A is scheduled from 8:30 a.m. to 10:30 a.m. and Part B from 7:30 p.m. to 9:30 p.m. on Monday, August 12. Total enrollment for this Minicourse is limited to 45 persons. Geometry instruction at the college level has practically disappeared. Many people find this an intolerable loss, which imposes heavy and unnecessary handicaps on future professionals of all kinds. The Minicourse will attempt to present a practicing geometer's views on what should be the philosophical and educational underpinnings of college level geometry courses, what should be the aims of such courses, what kinds of topics can be presented with chances of success, and what difficulties will have to be overcome if the feeling for spatial relations is not to atrophy completely in the next few generations.

Minicourse #2: *Applied mathematics via classroom experiments* is being organized by HERBERT R. BAILEY, Rose-Hulman Institute of Technology. Part A is scheduled for 8:30 a.m. to 10:30 a.m. and Part B from 7:30 p.m. to 9:30 p.m. on Wednesday, August 14. Total enrollment for this Minicourse is limited to 80 persons. This Minicourse is based on a junior level applied mathematics course which has been developed to encourage students to combine their knowledge of physics, calculus, and differential equations. Students are asked to derive and solve the equations that model simple classroom experiments. For example, the first experiment is to let a ball bounce until it stops. The problem is to relate "percent rebound" and

“time to stop bouncing.” The student must combine the concepts of time of fall and summation of geometric series. The full course includes five units: I—The Chain, II—Rotation, III—Fluid Flow, IV—Heat Flow, and V—Calculus of Variations. The Minicourse will begin with a brief description of each unit including demonstrations of most of the experiments. Participants will then be asked to work through some of the units either individually or in small groups. Each participant will be given a writeup and a solution manual for each of the units. The writeups include review sections covering the necessary mathematics and physics.

Minicourse #3: *Teaching experiential applied mathematics* (TEAM) is being organized by JAMES R. CHOIKE, Oklahoma State University. Part A is scheduled from 2:15 p.m. to 4:15 p.m. on Monday, August 12 and Part B from 2:15 p.m. to 4:15 p.m. on Tuesday, August 13. 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, 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 materials. Participants will be shown how these modules can be used (i) to present a course in applied mathematics at the upper division level or at the lower division level; (ii) to offer students independent study projects, or (iii) to provide a lecture presentation of an application in industry.

Minicourse #4: *Computing in undergraduate linear algebra* is being organized by EUGENE A. HERMAN, Grinnell College. Part A is scheduled from 8:30 a.m. to 10:30 a.m. on Tuesday, August 13 and Part B from 8:30 a.m. to 10:30 a.m. on Wednesday, August 14. 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. We will demonstrate and give participants experience using one such

package. We will discuss 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 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 #5: *Microcomputer software in mathematics instruction* is being organized by ROY E. MYERS, Pennsylvania State University, Kensington. Part A is scheduled from 2:15 p.m. to 4:15 p.m. on Monday, August 12 and Part B from 2:15 p.m. to 4:15 p.m. on Tuesday, August 13. Total enrollment for this Minicourse is limited to 30 persons. A wide variety of instructional software is becoming available for use with microcomputers. It varies in nature, including drill and practice, tutorial, and materials for use as lecture aids. Software is available for use in courses from introductory algebra through calculus, statistics, differential equations, and linear algebra. In this Minicourse, various types of software will be demonstrated, and issues relating to their uses will be discussed. It is planned that a large variety of software will be available and that Minicourse participants will have the opportunity to work with the software on microcomputers.

Interested participants who have not preregistered should see the Minicourse Cashier in case there are still openings.

Contributed Papers

Papers were accepted on four topics in collegiate mathematics for presentation in contributed paper sessions at the MAA Summer Meeting in Laramie. The topics, session leaders, their affiliations and days they will meet are:

- *The role of the history of mathematics in the undergraduate curriculum* (DUANE D. BLUMBERG, University of Southwestern Louisiana), Tuesday morning, August 13.
- *What's happening in college geometry courses? What should?* (LESTER H. LANGE, San Jose State University), Wednesday morning, August 14.
- *Experience with innovation in solving the discrete/continuous mathematics dilemma* (MICHAEL G. MURPHY and NANCY T. RICH, University of Houston—Downtown), Monday morning, August 12.
- *What's new in teaching statistics?* (ANN E. WATKINS, Los Angeles Pierce College), Monday afternoon, August 12.

Individuals wishing to submit papers for any of these sessions in Laramie should have done so **before May 28**.

Late papers will not be accepted.

Other MAA Sessions

The MAA Film Program will take place on Monday, August 12, at 7:00 p.m.

The Joint CTUM-CCIME Panel on Computers and Technology in Mathematics Instruction will sponsor a panel discussion on the *Use of computing in the teaching of linear algebra*. This panel, being moderated by EUGENE A. HERMAN, Grinnell College, will take place on Monday, August 12 at 9:00 a.m. The panelists include Howard Anton, Drexel University, Garry Helzer, University of Maryland, and Alan Tucker, SUNY at Stony Brook.

A presentation on *The use of symbolic manipulation programs in undergraduate mathematics education*, sponsored by the Committee on Computers in Mathematics Education, will take place at 2:30 p.m. on Tuesday, August 13. The moderator is GERALD J. PORTER, University of Pennsylvania. Speakers include John Hosack, Colby College and Mary K. Heid, Pennsylvania State University.

Business Meeting

The Business Meeting of the MAA will take place at 4:35 p.m. on Tuesday, August 13 at which the 1985 Carl B. Allendoerfer, Lester R. Ford, and George Pólya Awards for expository writing will be presented. Awards of Certificates for Meritorious Service will be announced. This meeting is open to all members of the Association.

Board of Governors

The MAA Board of Governors will meet at 9:00 a.m. on Sunday, August 11. This meeting is open to all members of the Association.

Section Officers

There will be a Section Officers' Meeting at 3:30 p.m. on Monday, August 12.

Banquet for 25-year Members

The MAA is planning its tenth annual banquet for individuals who have been members of the Association for twenty-five years or more for Wednesday, August 14. Dinner will be served at 7:00 p.m. The menu includes fresh fruit cup, Western cut of prime rib of beef, salad, vegetable, potato, rolls, dessert, coffee, tea, Sanka, iced tea. Dinner will be preceded by a reception; no alcohol will be served.

Tickets (which include gratuities) are \$17.25 each. For those who are residing in the residence halls and are subject to the three-meal plan, the price of the banquet ticket is \$12.75 since a credit of \$4.50 will be allowed. There may still be some tickets available at the Transparencies section of the registration desk.

Joint AMS-MAA Sessions

By invitation of the AMS-MAA Joint Program Committee (Jeanne L. Agnew, George E.

Andrews, Paul F. Baum, and William P. Ziemer), the following speakers will address the joint meeting of the AMS and MAA on the history and development of mathematics. The names of some of the speakers, their affiliations, and their titles are:

RICHARD A. ASKEY, University of Wisconsin, *The Bieberbach conjecture, now de Brange's theorem*, 9:45 a.m. Wednesday.

SAUNDERS MAC LANE, University of Chicago, *The 20th century revolutions in geometry and topology*, 9:45 a.m. Monday.

BENOIT B. MANDELBROT, IBM and Harvard University, *Fractal geometry: Setting, birth and growth*, 9:45 a.m. Tuesday.

ACTIVITIES OF OTHER ORGANIZATIONS

Association for Women in Mathematics (AWM). The AWM will sponsor a panel discussion at 8:30 a.m. on Tuesday, August 13, on *Ethical problems in mathematical life*. The moderator is LINDA KEEN. Speakers include ANNE LEGGETT, SUSAN MONTGOMERY, MARIAN POUR-EL, JEAN TAYLOR, AUDREY TERRAS, and GAIL YOUNG. The AWM Membership Meeting will follow at 9:30 a.m. The AWM Open Dessert Party will follow the barbecue on Tuesday evening, August 13.

Pi Mu Epsilon (PiME) will hold its annual meeting on Tuesday and Wednesday, August 13 and 14. The J. Sutherland Frame Lecture will be given by ERNST SNAPPER, Dartmouth College, at 8:30 p.m., on Wednesday, August 14. The title of his lecture is *The philosophy of mathematics*. There will also be sessions for contributed papers on Tuesday afternoon and Wednesday morning.

The Division of Mathematical Sciences of the **National Science Foundation (NSF)** will sponsor a presentation on *Mathematics research and education at the National Science Foundation* at 4:30 p.m. on Monday, August 12. Speakers will include JOHN C. POLKING, Division Director and JOHN THORPE, Science and Engineering Education.

Participants interested in the conference on *New directions in applied and computational mathematics*, and banquet to be held at the University of Wyoming, August 8-10, in honor of GAIL S. YOUNG's 70th birthday, should refer to the news item in the News and Announcements section in this issue of the *Notices*. This announcement includes information on speakers and titles of their lectures.

OTHER EVENTS OF INTEREST

National Meeting of Department Heads

The Joint Policy Board for Mathematics (JPBM) has created a new committee, the Committee for Mathematics Department Heads. This committee is organizing a National Meeting of Department Heads on Monday, August 12, at 7:00 p.m. There will be two one-hour sessions. The first is titled *Preliminary report from the AMS-MAA-SIAM Joint*

TIMETABLE

AB = Agriculture Building
 AS = Arts & Sciences Building
 CB = Classroom Building

(Mountain Daylight Saving Time)

CE = College of Education Building
 WC = Washakie Center

The final version of the Timetable and Program, including room assignments, will be distributed at the meeting.

AMERICAN MATHEMATICAL SOCIETY SHORT COURSE SERIES		
SATURDAY, August 10	ACTUARIAL MATHEMATICS	
9:00 a.m. - 2:30 p.m.	REGISTRATION (Short Course Only) Outside CB 103	
2:00 p.m. - 3:15 p.m.	Updating actuarial mathematics James C. Hickman	
3:45 p.m. - 5:00 p.m.	Models in risk theory Harry H. Panjer	
SUNDAY, August 11		
9:00 a.m. - 10:15 a.m.	Loss distributions Stuart A. Klugman	
10:45 a.m. - noon	Overview of credibility theory Paul M. Kahn	
1:30 p.m. - 2:45 p.m.	A survey of graduation theory Elias S. Shiu	
3:15 p.m. - 4:30 p.m.	Actuarial assumptions and models for social security projections John A. Beekman	
4:30 p.m. - 5:15 p.m.	General discussion	
JOINT MATHEMATICS MEETINGS		
SUNDAY, August 11	American Mathematical Society	Mathematical Association of America
9:00 a.m. - 4:00 p.m.	BOARD OF GOVERNORS' MEETING	
4:00 p.m. - 8:00 p.m.	REGISTRATION WC, Wyoming Room	
5:00 p.m. - 10:00 p.m.	COUNCIL MEETING	
MONDAY, August 12	AMS	MAA and Other Organizations
morning		MAA - CONTRIBUTED PAPER SESSION Experience with innovation in solving the discrete/continuous mathematics dilemma Michael G. Murphy Nancy T. Rich
8:00 a.m. - 4:30 p.m.	REGISTRATION WC, Wyoming Room	
8:15 a.m. - 8:25 a.m.	WELCOME ADDRESS	
8:30 a.m. - 9:30 a.m.	INVITED ADDRESS Theory of types in programming languages David B. MacQueen	
8:30 a.m. - 10:30 a.m.		MAA - MINICOURSE #1 (Part A) Geometry for college teachers Branko Grunbaum
9:00 a.m. - 10:30 a.m.		MAA - PANEL DISCUSSION Sponsored by Joint CTUM-CCIME Panel on Computers and Technology in Mathematics Instruction: Use of computing in the teach- ing of linear algebra Howard Anton Garry Helzer Eugene A. Herman (moderator) Alan Tucker

Committee on the Status of the Profession. The second one-hour session is titled *On management and leadership in the mathematics department.*

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.

Exhibits

The book and educational media exhibits will be open from 1:00 to 5:00 p.m. on Monday, August 12 and from 8:30 a.m. to 4:30 p.m. on Tuesday and Wednesday, August 13 and 14. All participants are encouraged to visit the exhibits during the meeting.

MATHSCI

MATHSCI (formerly MATHFILE) will be demonstrated in the exhibit area during regular exhibit hours.

MATHSCI now contains three new components in addition to *Mathematical Reviews: Current Mathematical Publications* (CMP), *Current Index to Statistics* (CIS), and the *Tukey Index to Statistics and Probability*. The MR component of MATHSCI has also been increased with the addition of 200,000 author and title entries from MR 1959–72, bringing the size of MATHSCI to approximately 700,000 references.

CMP provides information on new articles and books within two months of their publication. The *Current Index to Statistics*, published jointly by the American Statistical Association and the Institute of Mathematical Statistics, brings to MATHSCI works which were not reviewed in MR. The *Tukey Index* covers the statistics literature from 1902 to 1968.

MATHSCI now makes it possible to search simultaneously four printed publications: MR (back to 1959), the current issues of CMP, CIS (back to 1975) and the *Tukey Index* (1902–1968).

Summer List of Applicants

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

Copies of the 1985 summer list of applicants will be available at the Transparencies section of the registration desk for \$2. Following the meeting, they may be purchased from the AMS office in Providence for \$3. This list should prove useful to

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.**

employers who have last-minute openings in the latter part of the summer or in the fall.

The deadline for receipt of applicant forms to appear in this summer list was June 14.

Instead of an Employment Register at the Summer Meeting in Laramie, there will be an opportunity for posting of both applicant résumés forms and employers' announcements of open positions in or near the main meeting registration area. There will be no special room set aside for interviews. No provisions will be made by the Society for interviews: arrangements will be the responsibility of each employer and applicant. Messages may be left in the message box located in the registration area.

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

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

Accommodations

University Housing

Participants in the Joint Mathematics Meetings may occupy residence hall rooms at the University

TIMETABLE

AB = Agriculture Building
 AS = Arts & Sciences Building
 CB = Classroom Building

CE = College of Education Building
 WC = Washakie Center

MONDAY, August 12	American Mathematical Society	MAA and Other Organizations
9:45 a.m. - 10:45 a.m.	AMS-MAA INVITED ADDRESS The 20th century revolutions in geometry and topology Saunders Mac Lane	
11:00 a.m. - noon	INVITED ADDRESS Gauge theories and the topology of 4-manifolds Ronald J. Stern	
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE I Mathematical gauge field theory Karen K. Uhlenbeck	
afternoon		MAA - CONTRIBUTED PAPER SESSION What's new in teaching statistics? Ann E. Watkins
1:00 p.m. - 5:00 p.m.	EXHIBITS	
1:00 p.m. - 5:00 p.m.	AMS BOOK SALE	MAA BOOK SALE
	SPECIAL SESSIONS	
2:15 p.m. - 3:05 p.m.	Dynamical systems and ergodic theory I	
2:15 p.m. - 5:35 p.m.	Commutative algebra and algebraic geometry I	
2:15 p.m. - 5:35 p.m.	The geometry of configurations I	
2:15 p.m. - 3:05 p.m.		MAA - INVITED ADDRESS Karmarkar's algorithm and other recent developments in linear programming Michael Saks
2:15 p.m. - 4:15 p.m.		MAA - MINICOURSE #3 (Part A) Teaching experiential applied mathematics (TEAM) James R. Choike
2:15 p.m. - 4:15 p.m.		MAA - MINICOURSE #5 (Part A) Microcomputer software in mathematics instruction Roy E. Myers
3:20 p.m. - 4:20 p.m.	INVITED ADDRESS Hyperbolicity in dynamical systems Lai Sang Young	
3:30 p.m. - 5:30 p.m.		MAA - SECTION OFFICERS' MEETING
	SPECIAL SESSION	
4:30 p.m. - 5:20 p.m.	Dynamical systems and ergodic theory II	
4:30 p.m. - 5:30 p.m.	Mathematics research and education at the National Science Foundation John C. Polking, Director John Thorpe, Science & Engineering Education Division of Mathematical Sciences, NSF	
7:00 p.m. - 9:00 p.m.		MAA - FILM PROGRAM
7:00 p.m. - 8:00 p.m.	NATIONAL MEETING OF DEPARTMENT HEADS Preliminary report from the AMS-MAA-SIAM Joint Committee on the Status of the Profession On management and leadership in the mathematics department	
8:00 p.m. - 9:00 p.m.		
7:00 p.m. - 10:00 p.m.		Pi Mu Epsilon - RECEPTION
7:30 p.m. - 9:30 p.m.		MAA - MINICOURSE #1 (Part B) Geometry for college teachers Branko Grunbaum

of Wyoming during the period August 9 to August 16 only. **All must check out by August 16.** A limited number of rooms on campus will be available for those participants who do not preregister but plan on attending the Laramie meeting and registering on site. All rooms on campus are offered only through a **Room/Board Package that provides three meals.**

Participants requesting housing on the University of Wyoming campus during the meetings will be assigned to the Washakie Complex residence halls. (Please refer to the section below titled Room and Board Rates.)

Families with children will be allowed to stay in the dormitories. Sleeping bags for children of any age will not be permitted; however, parents can bring portacribs for infants and small children. All children (other than those in portacribs) must occupy a bed in a room with a parent and pay the same rate as an adult. (See section on **Motel Accommodations** below for alternate housing for families.)

Dormitories at the University of Wyoming are not air-conditioned and windows do not have screens. There are elevators in each of the residence halls. Sleeping rooms are good sized, very well maintained, and contain two single beds, desks, chairs, closets (with a limited number of hangers), and overhead lights. There are no reading lamps; however, a few lamps are available on request at the check-in desk. Rooms will be prepared for occupancy in advance. In addition to bed linen, pillow and blanket, participants will receive one wash cloth, towel, hand towel, ashtray, soap and drinking glass. These may be replaced on request at the check-in desk. There is no daily maid service in the sleeping rooms.

There are two bathrooms with showers on each floor; one for each gender. Walls separate shower stalls and curtains screen the interiors. Hooks are placed on the outside of stall dividers where robes may be hung. A changing area is located several feet from the showers.

No pets are allowed in the residence halls. Alcoholic beverages are permitted provided the 21 year age limit is observed. There will be no telephone service in any of the university accommodations; however, there are pay telephones and campus phones in the public areas. Participants will be held responsible for any room damage incurred.

Smoking is permitted in dormitory rooms; however, there are areas where it is restricted. There are fire code approved doors in the residence halls which are unlocked until 2:00 a.m. The university is tied into the city alarm system in the event of fire.

Check-In Locations and Times

A check-in desk will be maintained in the lobby of each residence hall assigned for our use in the Washakie Center which is located on 15th Street and Grand Avenue. These desks will be staffed

from 7:00 a.m. to 2:00 a.m. daily. The closest parking lot to Washakie Center is located across from the residence halls on 15th Street; another is adjacent to the Wyoming Union.

At the time of check-in, participants will be required to fill out a card for university records which will enable them to receive a room key. Spouses desiring a room key must follow this procedure also. **Please note that, although there is no deposit required for keys, a penalty of \$20 will be imposed for each key lost or not returned.** It is the responsibility of the Mathematics Meetings Housing Bureau to collect this penalty. Therefore, it is requested that proper caution be exercised to avoid this charge. At checkout, all keys must be returned to the main desk in the lobby. Should the clerk not be present, please ensure that your name is left with the key.

A computerized meal card will be issued to each person who has paid the required room and board fee(s). This card will entitle holders to breakfast, lunch, and dinner each day in the Washakie Cafeteria. Meals start with breakfast on the day following receipt of meal card.

Room and Board Rates

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

Rates for adults and children (other than those occupying a portacrib); including three meals, are as follows:

	Singles	Doubles (two persons)
1 day	\$ 25	\$ 40
2 days	\$ 50	\$ 80
3 days	\$ 75	\$120
4 days	\$ 90	\$145
5 days	\$104	\$171
6 days	\$117	\$195
7 days	\$130	\$219

Food Services

All meals for those participants staying in the residence halls will be served in Washakie Cafeteria in Washakie Center. Dining hours are:

Breakfast	6:45 a.m. to 8:30 a.m.
Lunch	11:30 a.m. to 1:00 p.m.
Dinner	5:00 p.m. to 6:30 p.m.

Meals in the cafeteria are generous and well prepared. A typical breakfast would be fruit juices, fresh fruit, cold or hot cereals, eggs, sweet rolls, and assorted beverages. Lunch would be soup, a casserole, grilled sandwiches, salad bar with assorted dressings, desserts, fresh fruit and assorted beverages. Three entrees are offered for dinner together with vegetable, salad bar, fresh fruit, pie or cake, assorted rolls and beverages.

It will be possible for a limited number of participants not residing on campus to purchase a three-meal plan for \$12.25 per day, if they wish. (This rate includes 3 percent tax.) These

TIMETABLE

AB = Agriculture Building
 AS = Arts & Sciences Building
 CB = Classroom Building

CE = College of Education Building
 WC = Washakie Center

TUESDAY, August 13	American Mathematical Society	MAA and Other Organizations
morning		MAA - CONTRIBUTED PAPER SESSION The role of the history of mathematics in the undergraduate curriculum Duane D. Blumberg
	SPECIAL SESSION	
8:00 a.m. - 10:50 a.m.	The geometry of configurations II	
8:30 a.m. - 9:30 a.m.		Association for Women in Mathematics PANEL DISCUSSION - Ethical problems in mathematical life Linda Keen (moderator) Susan Montgomery Jean Taylor Audrey Terras
8:30 a.m. - 10:30 a.m.		MAA - MINICOURSE #4 (Part A) Computing in undergraduate linear algebra Eugene A. Herman
	SPECIAL SESSIONS	
8:30 a.m. - 10:50 a.m.	Dynamical systems and ergodic theory III	
8:30 a.m. - 10:50 a.m.	Commutative algebra and algebraic geometry II	
8:30 a.m. - 4:30 p.m.		REGISTRATION WC, Wyoming Room
8:30 a.m. - 4:30 p.m.		EXHIBITS
8:30 a.m. - 4:30 p.m.	AMS BOOK SALE	MAA BOOK SALE
8:40 a.m. - 9:30 a.m.		MAA - INVITED ADDRESS The nervous system: Some recent work in mathematical biology Frank C. Hoppensteadt
	SESSIONS FOR CONTRIBUTED PAPERS	
8:45 a.m. - 10:55 a.m.	Analysis	
9:00 a.m. - 10:40 a.m.	Algebra and number theory	
9:30 a.m. - 10:00 a.m.		AWM - MEMBERSHIP MEETING
9:45 a.m. - 10:45 a.m.		AMS-MAA INVITED ADDRESS Fractal geometry: Setting, birth and growth Benoit B. Mandelbrot
11:00 a.m. - noon		MAA - THE EARLE RAYMOND HEDRICK LECTURES: Lecture I Towards the reunification of theoretical physics with mathematics Arthur M. Jaffe
noon - 1:00 p.m.		IIME - COUNCIL LUNCHEON
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE II Mathematical gauge field theory Karen K. Uhlenbeck	
afternoon		IIME - CONTRIBUTED PAPER SESSION
	SESSIONS FOR CONTRIBUTED PAPERS	
2:15 p.m. - 3:10 p.m.	Numerical methods	
2:15 p.m. - 3:10 p.m.	Set theory and graph theory	
	SPECIAL SESSION	
2:15 p.m. - 4:05 p.m.	Gauge theory and 4-manifolds I	

CAMPUS MAP



UNIVERSITY OF WYOMING



← TRAVELODGE

CLASSROOM BUILDING

SCIENCE LIBRARY

ARTS & SCIENCES

FLINT

BRADLEY

AGRICULTURE BUILDING

PREXY'S PASTURE

ROSS HALL

WYOMING UNION

LEWIS

PARKING

FRATERNITY ROW

SORORITY ROW

9th STREET

15th STREET

10th STREET

11th STREET

12th STREET

13th STREET

14th STREET

IVINSON AVENUE

PARKING

GRAND AVENUE

WHITE HALL

DOWNEY HALL

WYO

LARAMIE INN (formerly RAMADA INN)

HOLIDAY INN

WASHAKIE CENTER

0 200 400 600 800 1000 feet
SCALE

CIRCLE S →

TIMETABLE

AB = Agriculture Building
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TUESDAY, August 13	American Mathematical Society	MAA and Other Organizations
	SESSION FOR CONTRIBUTED PAPERS	
2:15 p.m. - 4:25 p.m.	Geometry	
	SPECIAL SESSIONS	
2:15 p.m. - 4:30 p.m.	Dynamical systems and ergodic theory IV	
2:15 p.m. - 4:30 p.m.	Numerical approximation theory and applications I	
2:15 p.m. - 4:30 p.m.	Commutative algebra and algebraic geometry III	
2:15 p.m. - 3:05 p.m.		MAA - INVITED ADDRESS The place of the Riemann hypothesis in modern prime number theory Hugh L. Montgomery
2:15 p.m. - 4:15 p.m.		MAA - MINICOURSE #3 (Part B) Teaching experiential applied mathematics (TEAM) James R. Choike
2:15 p.m. - 4:15 p.m.		MAA - MINICOURSE #5 (Part B) Microcomputer software in mathematics instruction Roy E. Myers
2:30 p.m. - 4:00 p.m.		MAA PRESENTATION - Sponsored by the Committee on Computers in Mathematics Education: The use of symbolic manipulation programs in undergraduate mathematics education Mary K. Heid John Hosack Gerald J. Porter (moderator)
3:20 p.m. - 4:20 p.m.	INVITED ADDRESS Orthogonal polynomials and association schemes Dennis W. Stanton	
4:35 p.m. - 5:35 p.m.		MAA - BUSINESS MEETING
5:30 p.m. - 7:30 p.m.		BARBECUE
8:30 p.m. - 10:30 p.m.		AWM - OPEN DESSERT PARTY
WEDNESDAY, August 14	AMS	MAA and Other Organizations
morning		IIME - CONTRIBUTED PAPER SESSION
morning		MAA - CONTRIBUTED PAPER SESSION What's happening in college geometry courses? What should? Lester H. Lange
8:00 a.m. - 9:00 a.m.		IIME - DUTCH TREAT BREAKFAST
8:30 a.m. - 9:30 a.m.	INVITED ADDRESS Surfaces in conformal geometry Robert L. Bryant	
8:30 a.m. - 10:30 a.m.		MAA - MINICOURSE #2 (Part A) Applied mathematics via classroom experiments Herbert R. Bailey
8:30 a.m. - 10:30 a.m.		MAA - MINICOURSE #4 (Part B) Computing in undergraduate linear algebra Eugene A. Herman
8:30 a.m. - 4:30 p.m.		REGISTRATION WC, Wyoming Room
8:30 a.m. - 4:30 p.m.		EXHIBITS
8:30 a.m. - 4:30 p.m.	AMS BOOK SALE	MAA BOOK SALE

tickets may be purchased at the **Housing Desk at the Joint Meetings Registration Desk** in Washakie Center. In addition, tickets for individual meals in Washakie Cafeteria will be available for cash purchase at the Washakie Center Control Desk.

For those participants who wish to get their meals off-campus, please be advised that there are only a few restaurants within walking distance. Among these are a pizza parlor and a fast food place featuring hot dogs.

Motel Accommodations

Since most of the motels in Laramie are not within walking distance of the campus, it is recommended that participants planning to stay in a motel plan to provide their own transportation. There are fast food as well as other type restaurants in the motel areas.

The following is a partial list of motels and their approximate distance from the University of Wyoming campus. A 3 percent tax applies to room rates. Rates quoted are firm.

WYO Motel—5 blocks

1720 Grand Avenue
Laramie, Wyoming 82070
Telephone: 307-742-6633

Single	\$22.50—1 bed
Double	\$25.20—1 bed
Double	\$27.70—2 beds
Triple	\$31.50—2 beds

Children 12 and under are free

Airconditioned, outdoor pool. AE, VISA and MC accepted

Circle S—12 blocks

2440 Grand Avenue
Laramie, Wyoming 82070
Telephone: 307-745-4811

Single	\$23.50—1 bed
Double	\$28—1 bed
Double	\$32—2 beds
Triple	\$36—2 beds

Children 12 and under are free

Airconditioned, outdoor pool. All major credit cards accepted.

Travelodge—6 blocks

262 North Third Street
Laramie, Wyoming 82070
Telephone: 307-745-4853 or 800-255-3050

Single	\$32—1 bed
Double	\$37—1 bed
Double	\$48—2 beds

Children 17 and under are free

Airconditioned, outdoor pool. AE, VISA, MC and Carte Blanche accepted.

Holiday Inn—2 miles

South Third Street
Laramie, Wyoming 82070
Telephone: 307-742-6611

Children 16 and under are free

Single	\$42—king bed
Double	\$44—2 beds
Double	\$46—king bed

Airconditioned, outdoor pool, restaurant, coffee shop, lounge. AE, VISA, MC, and Diner's Club accepted

Laramie Inn (formerly Ramada Inn)—2 miles

421 Boswell
Laramie, Wyoming 82070
Telephone: 307-742-3721

Single	\$36—1 bed
Double	\$38—1 or 2 beds

Children 16 and under are free

Airconditioned, outdoor pool, coffee shop, dining room. AE, VISA, and MC accepted.

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 obtain discounts at the AMS and MAA Book Sales, to cash a check with the meeting cashier, and to attend sessions scheduled in Room 127 in the Arts and Sciences Building. (If a preregistrant should arrive too late in the day to pick up his/her badge, he/she may show the acknowledgment received from the Mathematics Meetings Housing Bureau as proof of registration.) The fees for Joint Meetings registration at the meetings (listed below) are 30 percent more than the preregistration fees.

Joint Mathematics Meetings

Member of AMS, MAA, IIME	\$ 72
Emeritus Member of AMS, MAA	\$ 18
Nonmember	\$109
Student/Unemployed	\$ 18

AMS Short Course

Student/Unemployed	\$ 10
All Other Participants	\$ 30

MAA Minicourses

(if openings available)

Minicourses #1, #2, and #3	\$ 25 each
Minicourses #4 and #5	\$ 35 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.

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WEDNESDAY, August 14	American Mathematical Society	MAA and Other Organizations
	SPECIAL SESSIONS	
9:00 a. m. - 10:50 a. m.	Numerical approximation theory and applications II	
9:40 a. m. - 10:30 a. m.	Dynamical systems and ergodic theory V	
9:45 a. m. - 10:45 a. m.	AMS-MAA INVITED ADDRESS The Bieberbach conjecture, now de Brange's theorem Richard A. Askey	
11:00 a. m. - noon		MAA - THE EARLE RAYMOND HEDRICK LECTURES: Lecture II Towards the reunification of theoretical physics with mathematics Arthur M. Jaffe
1:00 p. m. - 1:50 p. m.		MAA - INVITED ADDRESS Women in the American mathematical community: The pre-1940 Ph.D.'s Jeanne LaDuke
1:00 p. m. - 2:00 p. m.	COLLOQUIUM LECTURE III Mathematical gauge field theory Karen K. Uhlenbeck	
	SPECIAL SESSION	
1:00 p. m. - 3:20 p. m.	Combinatorics and special functions I	
	INVITED ADDRESS	
2:15 p. m. - 3:15 p. m.	Global bifurcation problems from mechanics Stuart S. Antman	
2:15 p. m. - 3:05 p. m.		MAA - INVITED ADDRESS Interactive computer graphics in elementary differential geometry Thomas F. Banchoff
	SPECIAL SESSIONS	
2:15 p. m. - 4:00 p. m.	Numerical approximation theory and applications III	
2:15 p. m. - 4:05 p. m.	Gauge theory and 4-manifolds II	
3:15 p. m. - 4:30 p. m.	Dynamical systems and ergodic theory VI	
3:20 p. m. - 4:10 p. m.		MAA - INVITED ADDRESS Integration: Why you can and why you can't Henry P. Miranda
4:30 p. m. - 6:00 p. m.	STEELE PRIZE SESSION AND BUSINESS MEETING	
6:15 p. m.		MAA - BANQUET FOR 25-YEAR MEMBERS
6:30 p. m. - 8:15 p. m.		IME - BANQUET
7:00 p. m.	Committee on Employment & Educational Policy OPEN DISCUSSION: Computer science in mathematics departments Barnet M. Weinstock Donald C. Rung (moderator)	
7:30 p. m. - 9:30 p. m.		MAA - MINICOURSE #2 (Part B) Applied mathematics via classroom experiments Herbert R. Bailey
8:30 p. m. - 9:30 p. m.		IME - J. SUTHERLAND FRAME LECTURE The philosophy of mathematics Ernst Snapper

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

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

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

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

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

Nonmembers who register at the meetings and pay the \$109 nonmember registration fee are entitled to a discount of the difference between the member registration fee of \$72 and the nonmember registration fee of \$109 as a \$37 credit against dues in either the AMS or MAA or both, provided they apply for membership before September 15, 1985.

Nonmember students who register at the meetings and pay the \$18 registration fee are entitled to a discount of the difference between the student preregistration fee of \$14 and the registration fee of \$18 as a \$4 credit against dues in either the AMS or MAA or both, provided they apply for membership before September 15, 1985.

Nonmembers and nonmember students who thus qualify may apply for membership at the meetings, or by mail afterward up to the deadline.

Registration Dates, Locations, and Times

AMS Short Course

Outside Room 103, Classroom Building
Saturday, August 10 9:00 a.m. to 2:30 p.m.

Joint Mathematics Meetings
[and MAA Minicourses (until filled)]
Wyoming Room, Washakie Center

Sunday, August 11 4:00 p.m. to 8:00 p.m.

Monday, August 12 8:00 a.m. to 4:30 p.m.

Tuesday, August 13,
and 8:30 a.m. to 4:30 p.m.

Wednesday, August 14

Assistance and Information Desk

Outside Room 127, Arts & Sciences Building
Thursday, August 15 8:30 a.m. to 1:00 p.m.

Please note that the Joint Mathematics Meetings registration desk will not be open on Thursday, August 15, and that the telephone message center will not be in operation that day.

Other services provided during the meeting at the registration desk will also no longer be available (see section below on **Registration Desk Services**). There will, however, be a small desk set up outside Room 127 in the Arts & Sciences Building, where local information will be available and where a staff member will provide limited assistance to participants. No registration or cash transactions will be possible at this desk.

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 meetings director, 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 will be equipped with an overhead projector, screen, and blackboard.

Presenters of ten- or twenty-minute papers are strongly urged to use the overhead projector rather than the blackboard for their presentation in order to obtain maximum visibility by all members of the audience of the material being presented.

Baggage and Coat Check

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

Check Cashing

The meeting cashier will cash personal or travelers' checks up to \$50, upon presentation of the official meeting registration badge, provided there is enough cash on hand. Due to the increased use of credit cards, cash availability may be lower than at other meetings. It is strongly advised that participants bring travelers' checks which are honored by banks and most restaurants. Canadian checks must be marked for payment in U.S. funds.

Local Information

This section of the desk will be staffed by members of the Local Arrangements Committee and

TIMETABLE

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THURSDAY, August 15	American Mathematical Society	Mathematical Association of America
	SPECIAL SESSIONS	
8:00 a.m. - 10:50 a.m.	Combinatorics and special functions II	
8:30 a.m. - 10:50 a.m.	Mechanics and bifurcation theory I	
8:30 a.m. - 10:50 a.m.	Analysis of one complex variable I	
8:30 a.m. - 1:00 p.m.	ASSISTANCE & INFORMATION DESK	
8:40 a.m. - 9:30 a.m.		INVITED ADDRESS Truth and meaning in mathematics Reuben Hersh
11:00 a.m. - noon		THE EARLE RAYMOND HEDRICK LECTURES: Lecture III Towards the reunification of theoretical physics with mathematics Arthur M. Jaffe
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE IV Mathematical gauge field theory Karen K. Uhlenbeck	
	SPECIAL SESSIONS	
1:00 p.m. - 3:50 p.m.	Mechanics and bifurcation theory II	
1:30 p.m. - 5:50 p.m.	Analysis of one complex variable II	
	INVITED ADDRESS	
2:15 p.m. - 3:15 p.m.	Elliptic curves and diophantine problems Jerrold B. Tunnell	
	INVITED ADDRESS	
3:30 p.m. - 4:30 p.m.	Simple Lie algebras of prime characteristic Richard E. Block	

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.

other volunteers from the Laramie mathematical community.

Lost and Found

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

Mail

All mail and telegrams for persons attending the meetings should be addressed to the participant, c/o Joint Mathematics Meetings, Department of Mathematics, University of Wyoming, Laramie, Wyoming 82071. 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 will be located in the registration area to receive incoming calls for participants. The center will be open from August 11 through 14 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 is 307-745-3407.

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. **Please note that this service will be not be available on Thursday, August 15.**

Visual Index

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

MISCELLANEOUS INFORMATION

Athletic Facilities

Half-Acre Gymnasium has lockers, weight-room, basketball courts, racquetball courts, and an indoor track. These will be open from 8:00 a.m. to 6:00 p.m. The university maintains quite a few tennis courts east of campus off Willett Drive. Also east of campus are playing fields and a public golf course. Hours and access rules will be available before the meetings begin.

Participants and their families can use any of the athletic facilities provided they have a guest pass. This pass costs \$2 per day or \$10 per week, per person, including children. The pool will be open for public swimming from noon to 1:00 p.m. and from 4:00 p.m. to 6:00 p.m.

Book Store

The University of Wyoming Bookstore is located in the Wyoming Union. Business hours are Monday through Friday from 7:30 a.m. to 4:30 p.m. Other bookstores and novelty shops are located close to campus and downtown.

Camping and RV Facilities

K.O.A., Northwest of Laramie at Curtis and I-80 exit. 742-6553. Full hookups and other services available.

N & H Trailer Ranch, 1360 North Third Street, 742-3158.

Laramie Meeting—SuperPhone Exclusive

800-556-6882



Save 25 Percent to 45 Percent
On Your Air Travel To The Joint Mathematics Meetings
August 10–15, 1985

SuperPhone exclusive does it again.... since flights are limited into Laramie, special discounts have been arranged with USAIR and UNITED Airlines for flights going into Denver. In addition a special discount has been arranged with ALAMO RENT A CAR. It is suggested that auto rental is the least expensive and most efficient method to transfer from Denver to Laramie.

To be eligible for these discounts you must purchase your ticket 14 days prior to your travel *.

Sample Possible Fares to Denver Using SuperPhone **

Originating City	Coach Fare	SuperPhone Fares
Boston	\$766	\$300
Chicago	548	332
Dallas	484	323
Houston	530	334
Los Angeles	530	334
New Orleans	610	384
New York City	698	250

Depending on circumstances, it may be possible for even lower fares than those above, but this must be determined on an individual basis.

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Curt Gowdy State Park, approximately 25 miles east of Laramie off Happy Jack Road (take I-80 east from Laramie). There are several primitive campgrounds here, available for \$2 per night on a first-come basis. For more information call the Wyoming Recreation Commission in Cheyenne. 307-777-7550.

U.S. Forest Camping Facilities, 7-8 miles east of Laramie off Happy Jack Road, Tie City, Pole Creek and Yellow Pines. All have drinking water and spaces for tents or small trailers. 71 spaces available. No reservations needed. There are also many campgrounds in the Medicine Bow National Forest roughly 30-40 miles west of Laramie. Maps and other information are available from the U.S. Forest Service, Skyline Drive, Laramie, WY 82070, 307-745-8971.

Child Care

There are several state-licensed day nurseries and child care facilities. Please make your own reservations by calling any of the following centers:

ABC, 620 E. Fremont, 742-7272

Basic Beginnings, 1474 North 19th, 745-5755

Creative Childcare, 710 Garfield, 742-7502

Kids Connection, 506 South 21st, 742-0127

Sonshine House, 416 Hancock, 745-7985

Crib Rental

Portacribs can usually be rented directly from Taylor Rental Center, 1015 South Second, 745-3889. Some motels have rollaways for customer use upon request. Please note that no cots or cribs other than portacribs are allowed in the university residence halls.

Handicapped

Most (not all) university facilities are accessible to the handicapped. People with special requirements for campus housing should have made these clear when submitting preregistration forms. People with special questions regarding handicapped access should contact Myron B. Allen, Mathematics Department, University of Wyoming, at 307-766-4221.

Libraries

Science Library (including mathematics): Biological Sciences Building

University Library: Coe Library

Geology Library: Knight Geology Building

Albany County Public Library: 310 S. 8th

Local Information

Laramie, with a population of about 25,000, is the third largest city (after Casper and Cheyenne) in Wyoming. Laramie sits at an elevation of 7,200 feet on a high, rolling prairie separating two mountain ranges. About 8-10 miles east of town are the Sherman Mountains of the Laramie Range, reaching 9,000 feet in elevation, and about 35 miles to the west rises the Snowy Range of

the Medicine Bow Mountains, reaching 12,000 feet in elevation. The city began in 1868 when the first transcontinental railroad crossed the Laramie River, which afforded access to the railroad ties from forests in the Medicine Bow Mountains.

Because of its intermountain setting, Laramie is close to a wide range of outdoor activities. Within a 50-mile radius there is a remarkable variety of scenery: high, open plains; rocky, sage-covered foothills; densely forested mountains; alpine lakes, and many unusual geologic formations. The Happy Jack Road exit off I-80, about 10 miles east of Laramie, gives access to several hiking trails. Following Happy Jack Road about 12 miles leads to Curt Gowdy State Park, offering camping, hiking, and excellent fishing in Crystal and Granite Reservoirs. Further east along I-80, about 20 miles from Laramie, is the Vedawoo exit, giving access to Vedawoo Glen, a picnic area amidst huge, bizarre sub-rounded granite formations that challenge expert rock climbers. Across I-80 from Vedawoo is the Ames Monument, a stone pyramid commemorating the ghost town of Sherman, the highest point on the original transcontinental railroad.

West of Laramie, about 30 miles along Rte. 130, lies the small town of Centennial. Once a center for gold and platinum mining, Centennial today is largely a stopping place for hikers, fishermen, hunters, and skiers visiting the Medicine Bow Mountains. The hamlet boasts a small museum, several taverns, and a good restaurant (the Old Corral). Closer to Laramie along Rte. 130, near where it crosses the Little Laramie River, is the Vee-Bar Guest Ranch, offering horseback riding, ranch-style meals and accommodations. West of Centennial, Rte. 130 climbs into the Medicine Bow Mountains, giving access to several National Forest Service campgrounds, excellent hiking and fishing, and picnic grounds nestled among high mountain lakes beneath the sheer cliffs of the Snowy Range. Rte. 130 eventually leads to Saratoga, with its thermal springs.

North of Laramie, Route 287 leads about 40 miles to Como Bluffs, site of a large fossil bed that has yielded thousands of dinosaur bones. About 10 miles further along Rte. 287 is the town of Medicine Bow, setting for Owen Wister's novel, *The Virginian*. Today Medicine Bow is home of the Virginian Hotel, with its remarkable period furniture, and large wind turbines used to generate electricity. About 18 miles north of Laramie on Rte. 287 is the junction with Rte. 34, a cutoff leading northeast through Morton Pass and the rugged Sybille Canyon. About 40 miles from town is Wyoming's Game and Fish Experimental Station, where visitors can see elk, deer, moose, and bighorn sheep. Sharp navigators can find their way to Johnson Reservoir, north of Rte. 34 via dirt road, where there are campsites, fishing, and picnicking among the Laramie Hills.

To the south, about two-and-one-half hours' drive from Laramie, is Rocky Mountain National

Park, some of whose peaks are visible from Laramie on clear days.

Within Laramie's city limits there are also many attractions. The block of Ivinson Avenue between First and Second Streets is a refurbished district with several specialty shops, a couple of restaurants, and a saloon. Further east on Ivinson Avenue is the Laramie Plains Museum, located in the home of one of Laramie's more prosperous early citizens. Upstairs in the museum is the Overland Trail Art Gallery. The university campus itself offers Geology, Anthropology, and Art Museums, along with the American Heritage Center, The Rocky Mountain Herbarium, containing over 300,000 plant specimens, and a planetarium.

Laramie has a public golf course, the Red Jacoby course on Willett at the eastern edge of town. There are 23 public tennis courts maintained by the university. There are several public parks, including Washington Park, three blocks south of campus off 15th; La Bonte Park, five blocks north of campus off of 9th, and Undine Park, 8 blocks southwest of campus off of 7th.

For further information about Laramie and environs, write to the Laramie Chamber of Commerce, 312 West Grand Avenue, Laramie, Wyoming 82070, or call 307-745-7339. For general information about Wyoming, write the Wyoming Travel Commission, I-25 at College Drive, Cheyenne, Wyoming 82002-0660, or call 307-777-7777. Further information on Laramie and surrounding areas will be available at the Local Information Section of the meeting registration desk.

Medical Services

Ivinson Memorial Hospital is located east of campus at 255 N. 30th; its telephone number is 742-2141.

Parking

The parking lot closest to Washakie Center is on 15th Street opposite the residence halls. There is additional parking adjacent to the Wyoming Union. Parking in these lots is free. No stickers are required.

Social Event

A beef barbecue, prepared by the Albany County Cowbelles, will be held on Tuesday, August 13, 1985, from 5:30 p.m. to 7:30 p.m. in Washington Park, approximately 8 blocks from the campus of the University of Wyoming. The Cowbelles are famous in the Laramie area for their barbecues and serve only beef raised on their own ranches.

The menu includes barbecued beef on buns, baked beans, cole slaw, potato chips, cake or brownies, beer, lemonade, and coffee. Tickets are \$8.50 per person.

It is anticipated that a form of entertainment, typical of their lifestyle as ranchers, will be provided by the Cowbelles.

Those planning to attend the barbecue should purchase their tickets as much in advance as possible so that a guarantee may be given. Please check at the Transparencies section of the registration desk for further details regarding the location on campus from which an organized departure is being planned to made the guided walk to Washington Park enjoyable for all.

Travel

In August, Laramie is on Mountain Daylight Saving Time.

The local airport, Brees Field, is four miles west of the campus. At the moment, only Centennial Airlines offers service connecting Laramie to Denver's Stapleton International Airport. There are, however, a very limited number of seats available on Centennial, and participants are urged to consider other means of transportation from Stapleton to Laramie, as outlined below.

If, however, one is fortunate enough to obtain a seat on Centennial, there is taxi service available at Brees Field. Also, Avis and National maintain car rental desks at the airport in Laramie.

There are several types of ground transportation available at Stapleton International Airport which will take one to Laramie, approximately 120 miles to the northwest. Participants should consider sharing a rental car. This is probably the most advantageous form of transportation since it will be available to the renters throughout the entire meeting period. (It is worth mentioning that many scenic attractions in the Laramie area require travel by car.) Avis, National, and Dollar maintain desks at Stapleton. Current rates being quoted for compact cars range from \$139 to \$235/week. However, Alamo Rent A Car is making a special offer to participants at the Laramie meeting where they will provide an economy-sized car for \$21/day or \$89/week. This includes unlimited mileage; there is an additional charge of \$7.95 for insurance. Since Alamo does not have an office in Laramie, you must return the car to the Denver office. There is a courtesy van which will take one to and from Alamo's Denver office and Stapleton. In order to take advantage of these special rates, participants must request Group Number 14651, and Plan Code G9 when making reservations. Reservations may be made by calling 800-732-3232, toll-free.

The shortest and most scenic route is I-25 north to Fort Collins, then Colorado 14 west to Route 287, which runs north alongside the Rockies into Laramie. Driving time is approximately two-and-one-half hours.

One can also take the Front Range Airporter (pickup in baggage area at airport) from Stapleton to Fort Collins, and connect with the Laramie Cab Corporation's limousine service from there to Laramie. Passengers can request to be dropped off at their accommodations, whether on campus or at a nearby motel. The total cost is \$36 one way, and reservations **MUST** be made in

advance. Reservations for the entire trip can be made by calling Laramie Cab Corporation at 307-745-4840. The trip takes about three hours, and service is available from Stapleton at 9:30 a.m., 3:30 p.m., and 7:30 p.m. daily. Return service from Laramie is at 6:00 a.m., 10:00 a.m., and 4:00 p.m. Laramie Cab will pick participants up at their accommodations early enough to be on the road to Fort Collins at 6:00 a.m. Again, reservations are a must.

Greyhound offers four buses daily. The trip takes about two-and-one-half hours, and the present fare is \$24 one way or \$45.60 round trip.

Weather

In August, Laramie's daytime highs average around 80°F; the average nighttime low is around 48°F. Laramie's altitude (7,200 feet above sea level) makes hot weather fairly rare. Humidity is generally quite low; however, afternoon thunder-showers are common throughout the summer.

Presenters of Papers

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

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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 August 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.

Monday, August 12, 1985, 8:30 a.m.

Invited Address

- 8:30– 9:30 (1) *Theory of types in programming languages*. DAVID B. MACQUEEN, AT&T Bell Laboratories, Murray Hill (821-68-136)

Monday, August 12, 1985, 9:45 a.m.

AMS-MAA Invited Address

- 9:45–10:45 (2) *The 20th century revolutions in geometry and topology*. SAUNDERS MACLANE, University of Chicago

Monday, August 12, 1985, 11:00 a.m.

Invited Address

- 11:00–12:00 (3) *Gauge theories and the topology of 4-manifolds*. RONALD J. STERN, University of Utah (821-57-128)

Monday, August 12, 1985, 1:00 p.m.

Colloquium Lectures: Lecture I

- 1:00– 2:00 (4) *Mathematical gauge field theory*. KAREN K. UHLENBECK, University of Chicago

Monday, August 12, 1985, 2:15 p.m.

Special Session on Dynamical Systems and Ergodic Theory, I

- 2:15– 2:35 (5) *Transitivity and the center for maps of the circle*. ETHAN M. COVEN, Wesleyan University, and IRENE MULVEY*, Swarthmore College (821-54-119)
2:45– 3:05 (6) *ω -limit sets for maps of the interval*. LOUIS BLOCK*, University of Florida, and ETHAN M. COVEN, Wesleyan University (821-54-45)

Monday, August 12, 1985, 2:15 p.m.

Special Session on Commutative Algebra and Algebraic Geometry, I

- 2:15– 2:35 (7) *Embedding problems, tori, and Galois theory*. Preliminary report. DAVID J. SALTMAN, University of Texas, Austin (821-12-66)
2:45– 3:05 (8) *Homomorphisms of progenerator modules*. Preliminary report. FRANK DEMEYER, Colorado State University, and TIMOTHY FORD*, Florida Atlantic University (821-13-37)
3:15– 3:35 (9) *Invariants of finite group schemes*. ROBERT M. FOSSUM, Institute for Algebraic Meditation, Illinois (821-14-121)
3:45– 4:05 (10) *Chain conditions in commutative semigroup rings*. Preliminary report. ROBERT GILMER, Florida State University (821-13-40)
4:15– 4:35 (11) *The Brauer ring of a field*. ELIOT JACOBSON, Ohio University, Athens (821-16-41)
4:45– 5:05 (12) *Cancellation over coordinate rings of singular curves*. Preliminary report. ROGER WIEGAND* and SYLVIA WIEGAND, University of Nebraska, Lincoln (821-14-31)
5:15– 5:35 (13) *Stable isomorphisms of modules over one-dimensional rings*. ROGER WIEGAND and SYLVIA WIEGAND*, University of Nebraska, Lincoln (821-13-49)

Monday, August 12, 1985, 2:15 p.m.

Special Session on the Geometry of Configurations, I

- 2:15– 2:35 (14) *Greedy configurations*. Preliminary report. ROBERT E. JAMISON, Clemson University (821-51-12)

- 2:45– 3:05 (15) *Upper bounds for configurations and polytopes in R^d* . JACOB E. GOODMAN*, City College, City University of New York, and RICHARD POLLACK, Courant Institute of Mathematical Sciences, New York University (821-52-30)
- 3:15– 3:35 (16) *Some graph theoretic problems involving convex polytopes*. GIL KALAI, Massachusetts Institute of Technology (821-52-130)
- 3:45– 4:05 (17) *Inequalities involving the number of points, lines and planes in three dimensional space*. GEORGE B. PURDY, Texas A&M University, College Station (821-51-129)
- 4:15– 4:35 (18) *Some problems and results in combinatorial and metrical geometry*. PAUL ERDŐS, Hungarian Academy of Sciences, Hungary (821-51-131)
- 4:45– 5:35 (19) *Sylvester-Gallai and desmic configurations*. L. M. KELLY, Michigan State University (821-99-145) (Sponsored by George B. Purdy)

Monday, August 12, 1985, 3:20 p.m.

Invited Address

- 3:20– 4:20 (20) *Hyperbolicity in dynamical systems*. LAI SANG YOUNG, Michigan State University (821-58-107)

Monday, August 12, 1985, 4:30 p.m.

Special Session on Dynamical Systems and Ergodic Theory, II

- 4:30– 5:50 (21) *The classification of hyperbolic attractors in three dimensional flows*. Preliminary report. JOE CHRISTY, Northwestern University (821-58-92)
- 5:00– 5:20 (22) *A rank-1 rigid simple prime map*. DANIEL RUDOLPH*, University of Maryland, College Park, and ANDRES DEL JUNCO (821-60-117)

Tuesday, August 13, 1985, 8:00 a.m.

Special Session on the Geometry of Configurations, II

- 8:00– 8:20 (23) *Incidence-polytopes with toroidal cells*. ASIA IVIĆ WEISS, York University (821-51-23)
- 8:30– 8:50 (24) *Polynomial realizations of pseudoline arrangements*. JACOB E. GOODMAN, City College, City University of New York, and RICHARD POLLACK*, Courant Institute of Mathematical Sciences, New York University (821-51-43)
- 9:00– 9:20 (25) *Minimum Steiner trees on grid points*. FAN CHUNG, Bell Communications Research, Inc., Morristown, New Jersey (821-51-132)
- 9:30– 9:50 (26) *Fifty years of anisohedral tilings*. BRANKO GRÜNBAUM*, University of Washington, and G. C. SHEPHARD, University of East Anglia, England (821-51-63)
- 10:00–10:50 Problem Session

Tuesday, August 13, 1985, 8:30 a.m.

Special Session on Commutative Algebra and Algebraic Geometry, II

- 8:30– 8:50 (27) *Cohomology of rings with algebraic group actions*. ANDY R. MAGID, University of Oklahoma, Norman (821-13-87)
- 9:00– 9:20 (28) *Strong factorization of birational morphisms*. BRUCE CRAUDER, University of Pennsylvania and University of Utah (821-14-95)
- 9:30– 9:50 (29) *Multiple fibres on rational elliptic surfaces*. Preliminary report. BRIAN HARBOURNE*, University of Texas, Austin, and WILLIAM E. LANG, University of Minnesota, Minneapolis (821-14-67)
- 10:00–10:20 (30) *An analogue of the logarithmic transform in characteristic p* . WILLIAM E. LANG, University of Minnesota, Minneapolis (821-14-135)
- 10:30–10:50 Problem Session

Tuesday, August 13, 1985, 8:30 a.m.

Special Session on Dynamical Systems and Ergodic Theory, III

- 8:30– 8:50 (31) *Period multiplying and iterated torus knots in nonlinear oscillations*. Preliminary report. PHILIP HOLMES, Cornell University (821-58-08)
- 9:00– 9:20 (32) *A class of third-order ODE's with chaotic dynamics*. Preliminary report. DAVID HART, University of Florida (821-34-34)
- 9:30– 9:50 (33) *The evidence for Williams' conjecture*. KIRBY A. BAKER, University of California, Los Angeles (821-15-97)
- 10:00–10:20 (34) *Covers of sofic systems*. SUSAN WILLIAMS, University of South Alabama (821-58-118)

- 10:30–10:50 (35) *Geodesic flow and maps of the interval*. ROY L. ADLER*, IBM T. J. Watson Research Center, Yorktown Heights, and LEOPOLD FLATTO, AT&T Bell Laboratories, Murray Hill (821-28-62)

Tuesday, August 13, 1985, 8:45 a.m.

Session on Analysis

- 8:45– 8:55 (36) *Derivation of frequency equations for circular plates and plates in the form of a sector*. J. S. BAKSHI, University of the District of Columbia (821-73-143)
- 9:00– 9:10 (37) *On Fourier integrals via Laplace transforms*. Preliminary report. S. VERMA, University of Nevada, Las Vegas (821-44-125) (Sponsored by Lewis J. Simoff)
- 9:15– 9:25 (38) *Normal solutions to a Beltrami equation*. JOSEPH A. CIMA*, University of North Carolina, Chapel Hill, and WILLIAM R. DERRICK, University of Montana (821-30-06)
- 9:30– 9:40 (39) *On positive solutions of higher order equations*. WITOLD KOSMALA, Appalachian State University (821-34-85)
- 9:45– 9:55 (40) *An extremal elliptic Dirichlet problem*. Preliminary report. J. K. ODDSON, University of California, Riverside (821-35-113)
- 10:00–10:10 (41) *On products of sequence spaces*. MARTIN BUNTINAS, Loyola University of Chicago (821-40-126)
- 10:15–10:25 (42) *Maximal ideals and generalized Dirichlet integrals*. Preliminary report. KWANG-NAN CHOW* and DAVID PROTAS, California State University, Northridge (821-43-75)
- 10:30–10:40 (43) *Conditions for Perron and Lebesgue integrability*. ARLO SCHURLE, University of Petroleum and Minerals, Saudi Arabia (821-28-02)
- 10:45–10:55 (44) *Existence of optimal control for generalized dynamical systems*. REZA AHANGAR* and VICTOR M. BOGDAN, Catholic University of America (821-49-01)

Tuesday, August 13, 1985, 9:00 a.m.

Session on Algebra and Number Theory

- 9:00– 9:10 (45) *Lagrange inversion over finite fields*. Preliminary report. JOHN GREENE, Southern Illinois University, Carbondale (821-11-56)
- 9:15– 9:25 (46) *Generalized recurrence formulas*. JOSEPH ARKIN, Spring Valley, New York (821-11-58)
- 9:30– 9:40 (47) *Necessary and sufficient conditions for simple A-bases*. CARL SWENSON, Seattle University, and CALVIN LONG*, Washington State University (821-11-109)
- 9:45– 9:55 (48) *Computation of local cohomology modules*. FREDERICK W. CALL, University of Sheffield, England (821-13-89)
- 10:00–10:10 (49) *A uniformly strongly prime radical*. Preliminary report. DWIGHT M. OLSON, John Carroll University (821-16-88)
- 10:15–10:25 (50) *Representations of semigroup actions*. Preliminary report. WALTER S. SIZER, Moorhead State University (821-20-110)
- 10:30–10:40 (51) *A sufficient condition for a monoid to be a group*. KRISHNANAND VERMA, University of Nevada, Las Vegas (821-20-124) (Sponsored by Lewis J. Simoff)

Tuesday, August 13, 1985, 9:45 a.m.

AMS-MAA Invited Address

- 9:45–10:45 (52) *Fractal geometry: Setting, birth and growth*. BENOIT B. MANDELBROT, IBM and Harvard University

Tuesday, August 13, 1985, 1:00 p.m.

Colloquium Lectures: Lecture II

- 1:00– 2:00 (53) *Mathematical gauge field theory*. KAREN K. UHLENBECK, University of Chicago

Tuesday, August 13, 1985, 2:15 p.m.

Special Session on Gauge Theory and 4-Manifolds, I

- 2:15– 2:35 (54) *Representation of instantons as holomorphic curves in the loop space of a Lie group*. MARTIN GUEST, Arkansas State University (821-14-71)
- 2:45– 3:05 (55) *Instantons on CP_2* . N. P. BUCHDAHL, Tulane University (821-32-82) (Sponsored by Ronald A. Fintushel)
- 3:15– 3:35 (56) *Thickenings and gauge fields*. Preliminary report. CLAUDE LEBRUN, State University of New York, Stony Brook (821-32-72)

- 3:45– 4:05 (57) *Moduli of anti-self-dual connections and complex Kähler structure*. MITSUHIRO ITOH, University of Tsukuba, Japan (821-58-22) (Sponsored by Ronald A. Fintushel)

Tuesday, August 13, 1985, 2:15 p.m.

Special Session on Dynamical Systems and Ergodic Theory, IV

- 2:15– 2:35 (58) *Trellises in the plane*. ROBERT W. EASTON, University of Colorado, Boulder (821-58-57)
- 2:45– 3:05 (59) *Invariant circles and the order structure of periodic orbits in twist maps*. Preliminary report. PHILIP L. BOYLAND and GLEN R. HALL*, Boston University (821-58-46)
- 3:15– 3:35 (60) *Melnikov's method at a saddle-node and the dynamics of the Josephson junction*. STEPHEN SCHECTER, North Carolina State University (821-34-09)
- 3:45– 4:05 (61) *Vector fields with transverse foliations*. SUE GOODMAN, University of North Carolina, Chapel Hill (821-58-27)
- 4:10– 4:30 (62) *Surface homeomorphisms with infinitely many extra periodic points*. MORRIS W. HIRSCH, University of California, Berkeley (821-34-32)

Tuesday, August 13, 1985, 2:15 p.m.

Special Session on Commutative Algebra and Algebraic Geometry, III

- 2:15– 2:35 (63) *The structure of linkage*. Preliminary report. CRAIG HUNEKE* and BERND ULRICH, Northwestern University (821-13-39)
- 2:45– 3:05 (64) *Infinitesimal variation of Hodge structures and elliptic surfaces*. Preliminary report. DAVID A. COX, Amherst College (821-14-38)
- 3:15– 3:35 (65) *The moduli of rational elliptic surfaces*. PABLO LEJARRAGA, Brandeis University (821-14-68)
- 3:45– 4:05 (66) *Uniformization of open complex surfaces*. Preliminary report. DAVID R. MORRISON, Princeton University (821-14-122)
- 4:10– 4:30 (67) *Macaulay's theorem and local Torelli for weighted hypersurfaces*. Preliminary report. LORING TU, Johns Hopkins University, Baltimore (821-99-146)

Tuesday, August 13, 1985, 2:15 p.m.

Special Session on Numerical Approximation Theory and Applications, I

- 2:15– 2:35 (68) *Weak limits of zeros of orthogonal polynomials*. J. L. ULLMAN* and MATTHEW F. WYNEKEN, University of Michigan, Ann Arbor (821-31-42)
- 2:45– 3:05 (69) *Best L_1 -approximation of L_1 -approximately continuous functions on $(0,1)^n$ by nondecreasing functions*. Preliminary report. RICHARD B. DARST and SHUSHENG FU*, Colorado State University (821-41-98)
- 3:15– 3:35 (70) *On the convergence of projected gradient processes to singular critical points*. J. C. DUNN, North Carolina State University (821-49-79)
- 3:45– 4:05 (71) *The roots of the Bernoulli polynomials*. DAVID J. LEEMING, University of Victoria (821-41-86) (Sponsored by H. M. Srivastava)
- 4:10– 4:30 (72) *Extensions of Szegő's theory of orthogonal polynomials*. ATTILA MÁTÉ*, Brooklyn College, City University of New York, and PAUL NEVAI and VILMOS TOTIK, Ohio State University, Columbus (821-42-80)

Tuesday, August 13, 1985, 2:15 p.m.

Session on Set Theory and Graph Theory

- 2:15– 2:25 (73) *A negative solution of Hilbert's first problem*. GERHARD F. KOHLMAYR, Mathmodel Consulting Bureau, Connecticut (821-03-103)
- 2:30– 2:40 (74) *$P = NP$ is + forced*. CYRUS F. NOURANI, GTE Laboratories, Waltham (821-03-13)
- 2:45– 2:55 (75) *Extendibility tests for squarefree words*. ROBERT O. SHELTON, Michigan Technological University (821-05-111) (Sponsored by Deborah Frank Lockhart)
- 3:00– 3:10 (76) *k -gracefulness of a class of planar graphs*. SIN-MIN LEE and HO KUEN NG*, San Jose State University (821-05-76)

Tuesday, August 13, 1985, 2:15 p.m.

Session on Numerical Methods

- 2:15– 2:25 (77) *Romberg integration with unequal spacing*. DONALD R. SNOW, Brigham Young University (821-65-48)
- 2:30– 2:40 (78) *A note on nondifferentiable symmetric duality*. Preliminary report. BRUCE D. CRAVEN, University of Melbourne, Australia (821-90-50)

- 2:45– 2:55 (79) *Objective space analysis of multiple objective linear programs*. Preliminary report. JERALD P. DAUER and YI-HSIN LIU*, University of Nebraska, Lincoln (821-90-105)
- 3:00– 3:10 (80) *Mathematical problems in medical imaging*. Preliminary report. DAVID ISAACSON, Rensselaer Polytechnic Institute (821-92-61)

Tuesday, August 13, 1985, 2:15 p.m.

Session on Geometry

- 2:15– 2:25 (81) *Standard dissections of convex polyhedra into tetrahedra*. RODNEY T. HOOD, Franklin College (821-51-106)
- 2:30– 2:40 (82) *Complete, spacelike hypersurfaces of deSitter space with constant mean curvature*. Preliminary report. JAYAKUMAR RAMANATHAN, University of Michigan, Ann Arbor (821-53-77) (Sponsored by Daniel M. Burns)
- 2:45– 2:55 (83) *Almost arcwise connectivity and arc components in unicoherent continua*. ELDON VOUGHT, California State University, Chico (821-54-100)
- 3:00– 3:10 (84) *Deeper into the Effros theorem*. Preliminary report. JAMES T. ROGERS, JR., Tulane University (821-54-101)
- 3:15– 3:25 (85) α -embeddings. CHARLES AULL, Virginia Polytechnic Institute and State University (821-54-116)
- 3:30– 3:40 (86) *Yang-Mills equations with gauge group Spin(8) and base manifold S^4* . Preliminary report. FRANK D. (TONY) SMITH, JR., Cartersville, Georgia (821-55-17)
- 3:45– 3:55 (87) *A new polynomial invariant for knots and links*. Preliminary report. CHI F. HO, California Institute of Technology (821-57-16)
- 4:00– 4:10 (88) *Some interesting Cayley graph embeddings*. THOMAS W. TUCKER, Colgate University (821-57-102)
- 4:15– 4:25 (89) *The classifying space for codimension-one, piecewise-linear foliations*. PETER A. GREENBERG, North Dakota State University, Fargo (821-58-36)

Tuesday, August 13, 1985, 3:20 p.m.

Invited Address

- 3:20– 4:20 (90) *Orthogonal polynomials and association schemes*. DENNIS W. STANTON, University of Minnesota, Minneapolis (821-05-59)

Wednesday, August 14, 1985, 8:30 a.m.

Invited Address

- 8:30– 9:30 (91) *Surfaces in conformal geometry*. ROBERT L. BRYANT, Rice University (821-53-51)

Wednesday, August 14, 1985, 8:30 a.m.

Special Session on Numerical Approximation Theory and Applications, II

- 8:30– 8:50 (92) *Approximation by solutions of differential equations*. PAUL M. GAUTHIER, Université de Montréal (821-35-139)
- 9:00– 9:20 (93) *Saturation results for a class of linear operators II*. R. N. MOHAPATRA, University of Central Florida (821-41-112)
- 9:30– 9:50 (94) *General compound means*. Preliminary report. D. M. E. FOSTER and G. M. PHILLIPS*, University of St. Andrews, Scotland (821-99-142) (Sponsored by V. M. Singh)
- 10:00–10:20 (95) *Chebyshev summability of Fourier series*. B. E. RHOADES*, Indiana University, Bloomington, and XIANLIANG SHI, Hangzhou University, People's Republic of China (821-42-93)
- 10:30–10:50 (96) *Some variants of a result of Ky Fan*. V. M. SEHGAL*, University of Wyoming, and S. P. SINGH, Memorial University of Newfoundland (821-47-78)

Wednesday, August 14, 1985, 9:40 a.m.

Special Session on Dynamical Systems and Ergodic Theory, V

- 9:40–10:00 (97) *Quaternion word maps*. DAVID FRIED, Boston University (821-58-134)
- 10:10–10:30 (98) *Nonconjugacy of hyperbolic sectors in planar vector fields*. D. S. SHAFER, University of North Carolina, Charlotte, and R. C. SWANSON* and R. B. WALKER, Montana State University (821-58-35)

Wednesday, August 14, 1985, 9:45 a.m.

AMS-MAA Invited Address

9:45–10:45 (99) *The Bieberbach conjecture, now de Branges's theorem.* RICHARD A. ASKEY, University of Wisconsin, Madison (821-30-24)

Wednesday, August 14, 1985, 1:00 p.m.

Colloquium Lectures: Lecture III

1:00–2:00 (100) *Mathematical gauge field theory.* KAREN K. UHLENBECK, University of Chicago

Wednesday, August 14, 1985, 1:00 p.m.

Special Session on Combinatorics and Special Functions, I

1:00–1:20 (101) *On distance-regular graphs with fixed valency.* Preliminary report. EIICHI BANNAI*, Ohio State University, Columbus, and TATSURO ITO, Joetsu University at Education, Japan (821-05-33)

1:30–1:50 (102) *A geometric characterisation of P and Q -polynomial association schemes.* PAUL TERWILLIGER, Ohio State University, Columbus (821-05-94)

2:00–2:20 (103) *The nonexistence of unknown perfect e -codes and tight $2e$ -designs in Hamming schemes $H(n, q)$ for $e \geq 3$ and $q \geq 3$.* YIMING HONG, Ohio State University, Columbus (821-05-114)

2:30–2:50 (104) *Feasible parameters for partial geometric lattices.* AARON D. MEYEROWITZ, Ohio State University, Columbus (821-05-96)

3:00–3:20 (105) *Round Robin Hood's barn.* Preliminary report. JUDITH Q. LONGYEAR, Wayne State University (821-05-05)

Wednesday, August 14, 1985, 2:15 p.m.

Special Session on Gauge Theory and 4-Manifolds, II

2:15–2:35 (106) *Stable harmonic maps to P^n .* Preliminary report. D. BURNS* and P. DEBARTHOLOMEIS, University of Michigan, Ann Arbor (821-53-99)

2:45–3:05 (107) *Riemannian manifolds with harmonic curvature.* Preliminary report. ANDRZEJ DERDZINSKI, Mathematical Sciences Research Institute (821-53-120) (Sponsored by Ronald A. Fintushel)

3:15–3:35 (108) *A twistor approach to the Einstein metric on $K3$.* PANKAJ TOPIWALA, University of Michigan, Ann Arbor (821-53-60)

3:45–4:05 (109) *Gauge theory and pseudofree circle actions.* RONALD FINTUSHEL, Tulane University (821-57-81)

Wednesday, August 14, 1985, 2:15 p.m.

Special Session on Numerical Approximation Theory and Applications, III

2:15–2:35 (110) *Application of fixed points to approximation theory.* Preliminary report. K. L. SINGH, Fayetteville State University (821-41-123)

2:45–3:05 (111) *Curve fitting with convexity constraints.* P. W. SMITH, Old Dominion University (821-41-54)

3:15–3:35 (112) *Existence of pole-free rational approximations on supersets.* Preliminary report. G. D. TAYLOR, Colorado State University (821-41-18) (Sponsored by Eugene L. Allgower)

3:40–4:00 (113) *Nearest point mappings.* SIMEON REICH, University of Southern California, and Technion, Israel (821-47-140)

Wednesday, August 14, 1985, 2:15 p.m.

Invited Address

2:15–3:15 (114) *Global bifurcation problems from mechanics.* STUART S. ANTMAN, University of Maryland, College Park (821-34-83)

Wednesday, August 14, 1985, 3:15 p.m.

Special Session on Dynamical Systems and Ergodic Theory, VI

3:15–4:30 Problem Session

Thursday, August 15, 1985, 8:00 a.m.

Special Session on Combinatorics and Special Functions, II

8:00–8:20 (115) *Basic hypergeometric series very well poised in $U(n)$.* STEPHEN C. MILNE, Texas A&M University, College Station (821-33-144)

- 8:30– 8:50 (116) *Some variants of Selberg's integrals*. DONALD ST. P. RICHARDS, University of North Carolina, Chapel Hill (821-33-11)
- 9:00– 9:20 (117) *Some combinatorics of classical orthogonal polynomials*. JACQUES LABELLE, Université du Québec, Montréal (821-33-104)
- 9:30– 9:50 (118) *On sieved orthogonal polynomials*. MOURAD E. H. ISMAIL, Arizona State University (821-33-14)
- 10:00–10:20 (119) *Product and addition formulas for Rogers' q -ultraspherical polynomials*. MIZAN RAHMAN*, Carleton University, and ARUN VERMA, University of Roorkee, India (821-33-44)
- 10:30–10:50 (120) *A symbolic approach to hypergeometric series*. Preliminary report. IRA GESSEL, Brandeis University (821-33-115)

Thursday, August 15, 1985, 8:30 a.m.

Special Session on Mechanics and Bifurcation Theory, I

- 8:30– 8:50 (121) *Bifurcations of subharmonics*. Preliminary report. S. N. CHOW* and S. W. SHAW, Michigan State University (821-34-90)
- 9:00– 9:20 (122) *Stability and folds*. J. H. MADDOCKS, University of Maryland, College Park (821-49-53)
- 9:30– 9:50 (123) *Post-buckling stability of orthotropic, linear elastic, rectangular plates under biaxial loads*. HENRY W. HASLACH, JR., University of Wisconsin, Madison (821-73-26)
- 10:00–10:20 (124) *Stability and bifurcation in flows of two fluids*. MICHAEL RENARDY* and YURIKO RENARDY, University of Wisconsin, Madison, and DANIEL D. JOSEPH, University of Minnesota, Minneapolis (821-76-15)
- 10:30–10:50 (125) *Slowly varying oscillators*. PHILIP HOLMES* and STEPHEN WIGGINS, Cornell University (821-34-07)

Thursday, August 15, 1985, 8:30 a.m.

Special Session on Analysis of One Complex Variable, I

- 8:30– 8:50 (126) *A conjecture of Pólya concerning zeros of successive derivatives*. ALBERT EDREI, Syracuse University (821-30-69)
- 9:00– 9:20 (127) *Value distribution for functions with unbounded characteristic in the disk*. LINDA R. SONS, Northern Illinois University (821-30-21)
- 9:30– 9:50 (128) *Some recent results on value distribution theory at East China Normal University*. CHONGJI DAI, East China Normal University, China (821-30-70) (Sponsored by Chung-Chun Yang)
- 10:00–10:20 (129) *Dirichlet integral, star-function, and isoperimetric inequalities in n dimensions*. Preliminary report. J. R. QUINE, Florida State University (821-30-28)
- 10:30–10:50 (130) *An n small function theorem*. CHARLES F. OSGOOD, Naval Research Laboratory (821-30-84)

Thursday, August 15, 1985, 1:00 p.m.

Colloquium Lectures: Lecture IV

- 1:00– 2:00 (131) *Mathematical gauge field theory*. KAREN K. UHLENBECK, University of Chicago

Thursday, August 15, 1985, 1:00 p.m.

Special Session on Mechanics and Bifurcation Theory, II

- 1:00– 1:20 (132) *Bifurcation analysis of the equilibria of rotating self-gravitating fluids*. Preliminary report. GILES AUCHMUTY, University of Houston, University Park (821-85-127)
- 1:30– 1:50 (133) *A variational principle for Hill spherical vortex*. Preliminary report. Y. H. WAN, State University of New York, Buffalo (821-76-74) (Sponsored by William R. Zame)
- 2:00– 2:20 (134) *Primary and secondary steady flows of the Taylor problem*. Preliminary report. D. SATHER, University of Colorado, Boulder (821-76-64) (Sponsored by Scott J. Spector)
- 2:30– 2:50 (135) *Degenerate Hopf bifurcation with $O(2)$ symmetry*. Preliminary report. MARTIN GOLUBITSKY*, University of Houston, University Park, and MARK ROBERTS, University of Warwick, England (821-34-91)
- 3:00– 3:20 (136) *On bifurcation in finite elasticity: buckling of a rectangular rod*. Preliminary report. HENRY SIMPSON*, University of Tennessee, Knoxville, and SCOTT SPECTOR, Southern Illinois University, Carbondale (821-73-73)
- 3:30– 3:50 (137) *On bifurcation for three-dimensional elastic bars*. SCOTT J. SPECTOR, Southern Illinois University, Carbondale (821-73-65)

Thursday, August 15, 1985, 1:30 p.m.

Special Session on Analysis of One Complex Variable, II

- 1:30– 1:50 (138) *Complex approximation*. PAUL M. GAUTHIER, Université de Montréal (821-30-138)

- 2:00– 2:20 (139) *On differential polynomials*. Preliminary report. CHI-TAI CHUANG, Peking University, China (821-30-47)
- 2:30– 2:50 (140) *Second order differential equations with transcendental coefficients*. JOHN ROSSI, Virginia Polytechnic Institute and State University (821-30-20)
- 3:00– 3:20 (141) *A new approach in the Wiman-Valiron theory*. SHLOMO STRELITZ, University of Haifa, Israel (821-30-133)
- 3:30– 3:50 (142) *Some results on the growth property and normality of entire functions*. HAI-TAO CAI, Central-South Institute of Mining and Metallurgy, People's Republic of China (821-30-55) (Sponsored by Chung-Chun Yang)
- 4:00– 4:20 (143) *Value distribution for rotation automorphic functions*. Preliminary report. RAUNO AULASKARI, University of Joensuu, Finland, and PETER LAPPAN*, Michigan State University (821-30-10)
- 4:30– 4:50 (144) *On the existence of essential singularities*. Preliminary report. ERNST STRAUS, University of California, Los Angeles, and AFTON CAYFORD*, University of British Columbia (821-30-25)
- 5:00– 5:20 (145) *On the existence of Nevanlinna direction of an algebroidal function*. W. H. CHEN*, Nanjing Normal University, China, and Y. N. LÜ, Institute of Mathematics, China (821-30-03) (Sponsored by Chung-Chun Yang)
- 5:30– 5:50 (146) *Meromorphic functions of μ -bounded index*. Preliminary report. RANJAN ROY*, Beloit College, and S. M. SHAH, University of Kentucky (821-30-29)

Thursday, August 15, 1985, 2:15 p.m.

Invited Address

- 2:15– 3:15 (147) *Elliptic curves and diophantine problems*. JERROLD B. TUNNELL, Rutgers University, New Brunswick (821-11-52)

Thursday, August 15, 1985, 3:30 p.m.

Invited Address

- 3:30– 4:30 (148) *Simple Lie algebras of prime characteristic*. RICHARD E. BLOCK, University of California, Riverside (821-17-108)

Urbana, Illinois

Robert M. Fossum
Associate Secretary



Contributions to Group Theory
Kenneth I. Appel, John G. Ratcliffe and Paul E. Schupp, Editors

This book, produced as a tribute to Roger Lyndon on his 65th birthday, contains five short articles on the man and his mathematics, and twenty-seven research papers on topics in combinatorial group theory, particularly those areas to which he himself had made important contributions (which is virtually no restriction at all). The more historical articles include an authoritative account by Saunders Mac Lane of the beginnings of the theory of spectral sequences. Among the topics which recur frequently in the research papers are cohomology, automorphism groups, the solubility of equations over groups, and connections with geometry, both classical and modern. Naturally, these papers vary in weight, but none is trivial, and some are important. Only the most determinedly finite of group theorists will want to ignore this book: most of us will enjoy it immensely.

– Graham Higman
University of Illinois, Urbana-Champaign

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Amherst, October 26–27, University of Massachusetts

Second Announcement of 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.

On Friday, October 25, the Valley Geometry Seminar will sponsor a series of four expository lectures on recent progress in different areas of geometry. The speakers will include JOHN MORGAN of Columbia University and JOSEPH HARRIS of Brown University. Full details will appear in the October issue of the *Notices*.

In honor of the Hermann Weyl centenary, a special program is being planned for Saturday evening by the University of Massachusetts, Amherst, Center for Mathematical Science.

The AMS meeting will be followed by a symposium at Harvard University to commemorate the accomplishments of Sonia Kovalevskaia, organized by the Association for Women in Mathematics in cooperation with the Mary Ingraham Bunting Institute of Radcliffe College.

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, *A connection between von Neumann algebras and knot theory*, 1:30 p.m. Sunday.

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

NGAIMING MOK, Princeton 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 eleven special sessions of selected twenty-minute papers. The topics of these special sessions, names of the organizers, and partial lists of speakers, are as follows:

An introduction to quasi-crystals, JEAN TAYLOR, Rutgers University. The speakers will include Enrico Bombieri, John Cahn, Paul Steinhardt, and William Thurston.

Nonlinear problems arising in physics and geometry, LESLEY M. SIBNER, Polytechnic Institute of New York. The speakers will include

Lipman Bers, Josef Dodziuk, Lisa Goldberg, Carolyn Gordon, David Hoffman, Kathryn Kuiken, Marie-Louise Michelsohn, Tilla Milnor, Richard Palais, Thea Pignataro, Emma Previato, Lesley M. Sibner, Joel Spruck, Jean Taylor, and Chu Lian Terng.

Sonia Kovalevskaia: Major currents in 19th century mathematics, JANE CRONIN SCANLON, Rutgers University.

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 tentative speakers include M. E. Adams, M. Bayer, M. K. Bennett, Garrett Birkhoff, Anders Björner, K. P. Bogart, G. Gordon, C. Greene, M. Halsey, M. F. Janowitz, R. Piziak, R. Stanley, and T. 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 tentative speakers include Melvyn Berger, H. Fischer, A. Jaffe, H. McKean, I. Segal, A. Selberg, M. Senechal, S. Sternberg, and D. Stroock.

Transcendental algebraic geometry, DAVID COX, Amherst College, and ALAN DURFEE, Mount Holyoke College.

Braids, links and operator algebras, RICHARD H. HERMAN, Pennsylvania State University, and VAUGHAN F. R. JONES. The tentative speakers are Joel Anderson, Paul Baum, Joan Birman, Peter J. Freyd, Fred Goodman, David Handelman, Richard H. Herman, Jim Hoste, Vaughan F. R. Jones, Richard Kadison, Hideki Kosaki, Ken Millett, Andrean Ocneanu, Robert Powers, Jon Rosenberg, Lee Rudolph, William Thurston, Hans Wenzl, and David Yetter.

**-fields, Hermitian forms, and *-valuations*, SAMUEL S. HOLLAND, JR., University of Massachusetts, Amherst, and MAURICE CHACRON, Carleton University.

Representations of reductive Lie groups, JAMES E. HUMPHREYS, University of Massachusetts, Amherst. The tentative speakers will be Dan M. Barbasch, David H. Collingwood, Rebecca A. Herb, Anthony W. Knap, Bertram Kostant, Wilfried Schmid, David A. Vogan, Jr., Nolan R. Wallach, Floyd L. Williams, and Gregg J. Zuckerman.

Functional equations and iteration, BERTHOLD SCHWEIZER, University of Massachusetts, Amherst. The tentative speakers are Janos D. Aczel, John B. Baillieul, Paul R. Blanchard, Thomas Erber, Paul Fischer, Bruno Forte, Maurice J. Frank, Jr., Ramesh Korwar, Jürg Rätz, Lester J. Senechal, Howard Sherwood, and Abe Sklar.

Categorical methods in homotopy theory, MILES TIERNEY, Rutgers University. The tentative speakers are Michael Barr, Peter J. Freyd, Alex Heller, Miles Tierney, Andre Joyal, F. William Lawvere, Robert W. Thomason, and Donovan H. van Osdol.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone submitting an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract form and submit it by **July 29, 1985**, three weeks before the deadline for contributed papers, in order that it may be considered for inclusion. All abstracts must be accompanied by payment of \$15 to cover a portion of the processing costs. Participants are reminded that a charge of \$12 is also imposed for retyping abstracts that are not in camera-ready form.

Contributed Papers

There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in Departments of Mathematics. Abstracts should be sent to the Editorial Department, American Mathematical Society, Providence, Rhode Island 02940, so as to arrive before the **August 19, 1985**, abstract deadline. All abstracts must be accompanied by payment of the \$15 processing charge. Participants are reminded that a charge of \$12 is also imposed for retyping abstracts that are not in camera-ready form. It appears unlikely that late papers can be accommodated.

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 Monday, October 28, following the meeting of the American Mathematical Society 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 academic year 1985-1986 marks the fifteenth anniversary of the AWM and the twenty-fifth anniversary of the Bunting Institute.

The lectures will cover a broad selection of topics related to Kovalevskaia's work. These include: reaction-diffusion equations, theory of vibrations, Hamiltonian systems, dynamical systems and turbulence, Backlund transformations, singularities in Yang-Mills fields, topological entropy, theory of solitons, minimal immersions and submanifolds, geometric measure theory, geometric invariant theory, and boundary problems. The speakers will include Mark Adler, Patricia Bauman, Nancy Hingston, Ann Hibner Koblitz, Nancy Kopell, Linda Ness, Michael Shub, Jean Taylor, Chuu Lian Terng, and Karen Uhlenbeck.

The symposium will begin on Sunday evening, October 27, in Cronkhite Hall, Harvard University, with registration from 5:00 to 7:00 p.m. and dinner

at 7:00 p.m., followed by the opening lecture. Registration fees are \$3 for AWM members, \$5 for nonmembers, and \$1 for students or unemployed mathematicians.

The Organizing Committee includes Bernice Auslander, University of Massachusetts, Boston; Pamela Coxson, Mary Ingraham Bunting Institute, Radcliffe College; Linda Keen (co-chairperson), Herbert H. Lehman College, CUNY; Linda Rothschild (co-chairperson), University of California, San Diego; and Michele Vergne, Massachusetts Institute of Technology.

A block of rooms has been reserved for symposium participants at the Quality Inn, 1651 Massachusetts Avenue, Cambridge, Massachusetts 02138. Reduced rates of \$60 for single rooms and \$71 for double rooms are available if booked before September 26. Early reservations are advised, and participants should mention the Kovalevskaia Symposium when making reservations. The telephone numbers are 1-800-321-2828 and 617-491-1000. Additional information about other accommodations (including bed and breakfast) will be sent upon request. Reservations for the dinner on Sunday, October 27, must be sent to Margaret Munroe, Association for Women in Mathematics, Box 178, Wellesley College, Wellesley, MA 02181, before October 13. A form for preregistration, dinner reservations, and to request other information appears in the back of this issue of the *Notices*.

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 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 Laramie 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

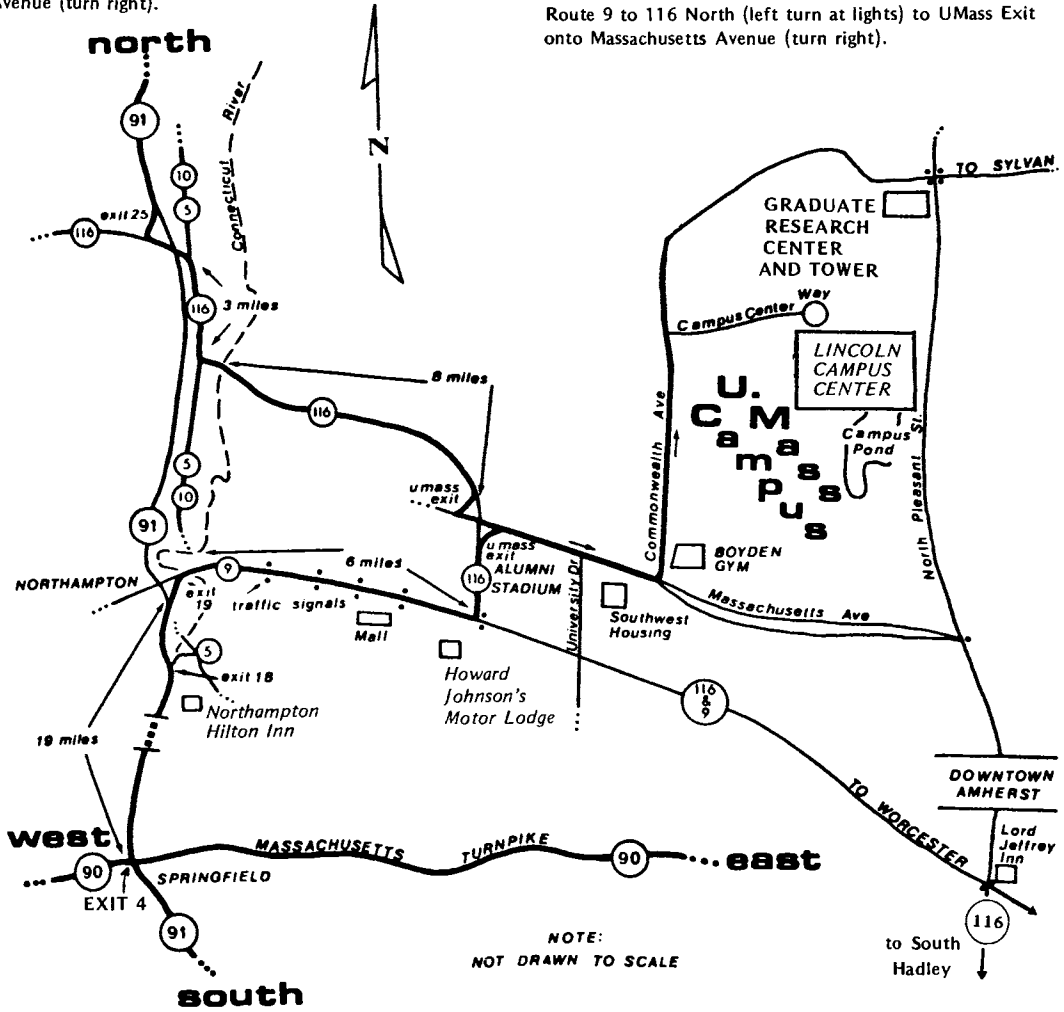
Single \$38 Double \$48
Triple \$54

Approaches to the University of Massachusetts Campus

FROM EAST or WEST: Massachusetts Turnpike (Route 90) to Exit 4 (West Springfield) onto Route 91 North (Holyoke Exit) to Exit 19 (Amherst) onto Route 9 to Route 116 North (left turn at lights) to UMass Exit onto Massachusetts Avenue (turn right).

FROM NORTH: Route 91 South to Exit 25 (So. Deerfield) onto Route 116 South to UMass Exit onto Massachusetts Avenue.

FROM SOUTH: Route 91 North to Exit 19 (Amherst) onto Route 9 to 116 North (left turn at lights) to UMass Exit onto Massachusetts Avenue (turn right).



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.

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 (PVRTA) 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.

W. Wistar Comfort
Associate Secretary

Middletown, Connecticut

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

Second Announcement of 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 are as follows:

ERIK FRIEDLANDER, Northwestern University, Title to be announced.

CARLOS KENIG, University of Minnesota, Minneapolis, *Compactness methods in nonlinear diffusions*.

ANDREW SOMMESE, University of Notre Dame, *A survey on hyperplane sections of projective varieties*.

MICHAEL TALAGRAND, Ohio State University, *Empirical processes and measure theory*.

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 partial lists of speakers, are as follows:

Ordinary differential equations, **CALVIN D. AHLBRANDT**, University of Missouri, Columbia. The tentative speakers include Shui-Ni Chow, Steve Dunbar, Herb Freedman, Louis Grimm, Evans Harrell, John Hooker, Gary Jones, Hans Kaper, Marvin Keener, Bruce Luxon, Ken Meyer, Gary Meisters, Richard Miller, Angelo Mingerelli, Larry Perko, George Seifert, and George Sell.

Differential geometry, **JOHN KELLEY BEEM** and **PAUL EHRlich**, University of Missouri, Columbia. The tentative speakers include Stephanie Alexander, Dean Allison, Richard Bishop, Robert Blumenthal, Lawrence Conlon, Gregory Galloway, Samuel Goldberg, Carolyn Gordon, Steven Harris, James Hebda, Gary Jensen, Franz Kamber, Marek Kossowski, Ravi Kulkarni, Kishore Marathe, Bahram Mashhoon, Phillip Parker, Thomas Powell, Brian Smyth, Abraham Taub, and Philippe Tondeur.

Inverse scattering theory, **BRIAN DE FACIO**, University of Missouri, Columbia. The tentative speakers include Mark Ashbaugh, Margaret Cheney, James P. Corones, Gerhard Kristensson, R. J. Krueger, D. A. Lee, Roger G. Newton, and Vaughn H. Weston.

Commutative algebra, **RICHARD FEDDER**, **JAMES A. HUCKABA**, and **IRA J. PAPICK**, University of Missouri, Columbia. The tentative list of speakers includes Kaan Akin, Daniel Anderson, David

Anderson, James Brewer, Al Dixon, David Dobbs, Eloise Hamann, William Heinzer, Melvin Hochster, Sam Huckaba, Craig Huneke, Jon Johnson, Bernie Johnson, Daniel Katz, David Lantz, Andy Magid, Bruce Magurn, Mary Martin, Bernd Ulrich, Roger Weigand, and Sylvia Weigand.

Mazimal functions in harmonic analysis, **BJORN JAWERTH**, Washington University, and **ALBERTO TORCHINSKY**, Indiana University.

Banach spaces and related topics, **ELIAS SAAB**, University of Missouri, Columbia. The tentative speakers include Dale Alspach, Kevin Andrews, Jean Bourgain, Donald Burkholder, William Davis, Joe Diestel, Stephen Dilworth, G. A. Edgar, William Johnson, Dan Lewis, Nassif Ghoussoub, E. Odell, Tenny Peck, Larry Riddle, Richard Rochberg, Haskell Rosenthal, Joel Shapiro, S. Szarek, N. Tomczak-Jaegermann, Jerry Uhl, Lutz Weis, Guido Weiss, and Robert F. Wheeler.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone submitting an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract form and submit it by **July 31, 1985**, three weeks before the deadline for contributed papers, in order that it may be considered for inclusion. All abstracts must be accompanied by payment of \$15 to cover a portion of the processing costs. Participants are reminded that a charge of \$12 is also imposed for retyping abstracts that are not in camera-ready form.

Contributed Papers

There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in Departments of Mathematics. Abstracts should be sent to the Editorial Department, American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02940, so as to arrive before the **August 21, 1985**, abstract deadline. All abstracts must be accompanied by payment of the \$15 processing charge. Participants are reminded that a charge of \$12 is also imposed for retyping abstracts that are not in camera-ready form.

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 Laramie 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

Telephone: 314-449-4121

Single \$30.28 Double \$41.09

Food Service

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 Hearnese 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 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.

Robert M. Fossum

Associate Secretary

Urbana, Illinois

Claremont, November 8–9, 1985, The Claremont Colleges

First Announcement of 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 are:

BRUCE BLACKADAR, University of Nevada, Reno
JAMES CARRELL, University of British Columbia

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 and the names of the organizers are as follows:

Algebraic geometry and control theory, CHRISTOPHER I. BYRNES, Arizona State University.

Differential equations, STAVROS BUSENBERG, Harvey Mudd College, and KENNETH COOKE, Pomona College.

Industrial mathematics, ELLIS CUMBERBATCH, Claremont Graduate School.

Multifunctions, hyperspaces, and their application, GERALD BEER, California State University, Los Angeles, and RICHARD A. VITALE, Claremont Graduate School. The tentative speakers include Z. Artstein, B. Flajnik, G. Fournier, E. Giné, R. Hansell, N. P. Jewell, M. Martelli, E. Michael, P. Morales, K. Prikry, M. L. Puri, S. Simons, and F. Van Vleck.

Operator algebra theory, BERNARD RUSSO, University of California, Irvine.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone submitting an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract form and submit it by August 5, 1985, three weeks prior to the deadline for contributed papers, in order that it may be considered for inclusion in the appropriate special session. Each abstract must be accompanied by payment in the amount of \$15 to cover a portion of the processing costs. Participants are reminded that a charge of \$12 is also imposed for retyping abstracts that are not in camera-ready form.

Contributed Papers

There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the

standard AMS form available from the AMS office in Providence or in Departments of Mathematics. Abstracts should be sent to the Editorial Department, American Mathematical Society, Providence, Rhode Island 02940, so as to arrive **before the August 26, 1985 deadline**. These abstracts must also be accompanied by payment of the \$15 processing charge. Participants are reminded that a charge of \$12 is also imposed for retyping abstracts that are not in camera-ready form.

Registration

The location of the registration desk will be announced in the October issue of the *Notices*, which will also include the program of the meeting. The registration fees are \$10 for members of the AMS or MAA, \$16 for nonmembers, and \$5 for students or unemployed mathematicians.

Petition Table

A petition table will be set up in the registration area. Additional information can be found in a box in the Laramie 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.

Hugo Rossi

Salt Lake City, Utah

Associate Secretary



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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(Published with support from the National Science Foundation)

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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.

Amherst, October 1985

Vaughan F. R. Jones Ngaiming Mok
André Joyal Robert T. Seeley

Columbia, November 1985

Eric Friedlander Andrew Sommese
Carlos Kenig Michael Talagrand

Claremont, November 1985

Bruce Blackadar James Carrell

New Orleans, January 1986

Joseph N. Bernstein Naynes R. Miller
Lennart A. E. Carleson Jane Cronin Scanlon
Alexander S. Kechris S. T. Yau
Sergiu Klainerman (Colloquium Lecturer)

Baltimore, May 1986

Dimitrios 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.

October 1985 Meeting in Amherst

Eastern Section

Deadline for organizers: Expired

Deadline for consideration: July 29, 1985

- M. K. Bennett and Garrett Birkhoff, *Lattice theory, geometry and combinatorics*
Melvyn S. Berger and Donal O'Shea, *The mathematical science of Hermann Weyl: A centenary tribute*
David Cox and Alan Durfee, *Transcendental algebraic geometry*
Richard H. Herman and Vaughan F.R. Jones, *Braids, links and operator algebras*
Samuel S. Holland, Jr. and Maurice Chacron, **-fields, Hermitian forms, and *-valuations*
James E. Humphreys, *Representations of reductive Lie groups*
Jane Cronin Scanlon, *Sonia Kovalevskaia: Major currents in 19th century mathematics*
Berthold Schweizer, *Functional equations and iteration*
Lesley M. Sibner, *Nonlinear problems arising in physics and geometry*

Jean Taylor, *An introduction to quasi-crystals*
Miles Tierney, *Categorical methods in homotopy theory*

November 1985 Meeting in Columbia

Central Section

Deadline for organizers: Expired

Deadline for consideration: July 31, 1985

- Calvin D. Ahlbrandt, *Ordinary differential equations*
John Kelley Beem and Paul Ehrlich, *Differential geometry*
Brian de Facio, *Inverse scattering theory*
Richard Fedder, James A. Huckaba, and Ira J. Papick, *Commutative algebra*
Bjorn Jawerth and Alberto Torchinsky, *Maximal functions in harmonic analysis*
Elias Saab, *Banach spaces and related topics*

November 1985 Meeting in Claremont

Far Western Section

Deadline for organizers: Expired

Deadline for consideration: August 5, 1985

- Gerald Beer and Richard Vitale, *Multifunctions, hyperspaces, and their application*
Stavros Busenberg and Kenneth Cooke, *Differential equations*
Christopher I. Byrnes, *Algebraic geometry and control theory*
Ellis Cumberbatch, *Industrial mathematics*
Bernard Russo, *Operator algebra theory*

Fall 1985 Meeting

Southeastern Section

No meeting will be held

January 1986 Meeting in New Orleans

Associate Secretary: Frank T. Birtel

Deadline for organizers: Expired

Deadline for consideration: September 25, 1985

- Gary Bloom and D. F. Hsu, *Labeled graphs*
Richard Bronson, *Mathematical modeling and computer simulation*
Peter Duren, *Complex analysis*
Robert Gardner, *Equivalence problems and applications*
Eric Grinberg and Eric Todd Quinto, *Radon transforms and tomography*
Alexander S. Kechris and Hugh Woodin, *Terminacy and large cardinals*
Sung Lee, *Operator method of optimal control problems*
Erwin Lutwak, *Convexity*
Jorge Martinez, *Ordered algebras*
Peter McCoy, *Classical partial differential equations*
Steven Mitchell, *Homotopy theory*
Paul Muhly, *Complex variables and operator theory*
Paul Sally and Rebecca Herb, *Harmonic analysis on reductive groups*
Jane Cronin Scanlon, *Mathematical biology*

Claude Schochet and Kenneth Millett, *Operator algebra perspectives*

Jalal Shatah and Sergiu Klainerman, *Recent advances in nonlinear hyperbolic equations*

Lutz Weis, *Positive operators and their applications*

Spring 1986 Meeting in Baltimore

Eastern Section

Deadline for organizers: October 15, 1986

Deadline for consideration: To be announced

April 1986 Meeting in Indianapolis

Central Section

Deadline for organizers: October 15, 1986

Deadline for consideration: To be announced

Spring 1986 Meeting

Far Western Section

No meeting will be held

Spring 1986 Meeting

Southeastern Section

Deadline for organizers: October 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.



The Structure of Shock Waves in Magnetohydrodynamics

Mahmud Hesaaraki

In the presence of magnetic induction and electrical fields, several types of discontinuities may exist in an electrically conducting fluid. These phenomena can be described by the laws of conservation of mass, momentum, and energy, Maxwell's electromagnetic equations, and Ohm's law. Those discontinuities which can be characterized by the conditions that both the temperature and density change across them are different from zero are called *magneto-hydrodynamic shock waves*. This monograph is concerned with the study of such types of discontinuities.

The mathematical question of the existence of structure for "fast", "slow", "intermediate", "switch-on" and "switch-off" magnetohydrodynamic shock waves is stated in terms of a system of four ordinary differential equations which contains four non-negative viscosity parameters, μ, ν, μ_1 and κ and four constants $\delta, J < 0, \epsilon \geq 0$ and E . This system, under some hypotheses, admits (at most) four rest points, say, $u_i, 0 \leq i \leq 3$, ordered by increasing density. The problems considered are the following: 1) Showing that, for all values of the viscosities there is an orbit running from u_0 to u_1 (fast shocks) and likewise an orbit running from u_2 to u_3 (slow shocks). 2) Showing that, for the limiting case when $\epsilon = 0$, and for all values of the viscosities, there is an orbit running from \bar{u}_0 to \bar{u}_1 (switch-on shocks) and similarly, an orbit running from \bar{u}_2 to \bar{u}_3 (switch-off shocks). Here \bar{u}_i is the limit of u_i as ϵ tends to 0. 3) The investigation of the "lim sup" of the orbits running from u_i to u_{i+1} (for $i = 0$ and 2) corresponding to viscosity parameters $\lambda_n = (\mu_n, \nu_n, \mu_{1n}, \kappa_n) > 0$, in the limiting cases $\lambda_n \rightarrow \lambda$, where $\lambda = (\mu, \nu, \mu_1, \kappa) \geq 0$.

By using results of Germain together with a theorem of Conley and Smoller, Hesaaraki solves the above problems. Moreover, he shows that intermediate shocks between u_1 and u_2 cannot occur when ϵ is small, and obtains uniqueness results for most cases. Finally, he shows that "subshocks" can indeed occur; here it is necessary that $\mu_1 = 0$.

1980 *Mathematics Subject Classifications*: 76E25, 76L05, 58F12, 58F10, 35L75, 58G16, 34C35

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Publication date: May 1984

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Special Meetings

THIS SECTION contains announcements of meetings of interest to some segment of the mathematical public, including *ad hoc*, local, or regional meetings, and meetings or symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. (Information on meetings of the Society, and on meetings sponsored by the Society, will be found 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)

September 1, 1984–August 31, 1985. **Program on Continuum Physics and Partial Differential Equations**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota. (August 1984, p. 521)

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.

Organizers: C. Berenstein, D. Hamilton, J. A. Hummel, and L. Zalcman.

Program: The focus for the fall semester will be on the function theory of one variable. In the spring semester, the focus will be on complex analysis in several variables.

Information: C. Berenstein, University of Maryland, Department of Mathematics, College Park, Maryland 20742.

1985–1986. **Special Year in Operator Theory**, Indiana University, Bloomington, Indiana.

Program: There will be three conferences during the year on function-theoretic operator theory, non-selfadjoint operator algebras and invariant subspaces, and C^* algebras and single operators. There will also be a number of visitors who will stay for varying lengths of time.

Information: J. B. Conway, C. Foias, J. G. Stampfli, Indiana University, Bloomington, Indiana 47405.

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)

AUGUST 1985

1–3. **Combinatorica: A Conference on Discrete Mathematics**, Brigham Young University, Provo, Utah.

Program: The conference focus will be to relate the disciplines of discrete mathematics; algorithms, combinatorics, design, geometry, graph theory, and number theory.

Speakers: B. Grunbaum, University of Washington; M. Hall, California Institute of Technology; S. Hedetniemi, Clemson University; W. M. Kantor, University of Oregon; C. Spiro, State University of New York, Buffalo; and H. S. Wilf, University of Pennsylvania.

Information: R. W. Forcade or L. K. Tolman, 292 TMCB Brigham Young University, Provo, Utah 84602, 801-378-2379 or 801-378-2336.

4–10. **Conference on Near-rings and Near-fields**, Tübingen, Federal Republic of Germany. (January 1985, p. 92)

4–10. **Rencontre Internationale de la Commission pour l'Étude et l'Amélioration de l'Enseignement des Mathématiques**, Leiden, The Netherlands. (June 1985, p. 400)

5–9. **Second Seminar on Random Graphs and Probabilistic Methods in Combinatorics**, Poznań, Poland. (October 1984, p. 694)

5–9. **12th International Symposium on Mathematical Programming**, Cambridge, Massachusetts. (March 1985, p. 271)

5–16. **Georgia Topology Conference**, University of Georgia, Athens, Georgia. (October 1984, p. 694)

5-16. **T_EX Users Group Annual Conference**, Stanford University, Palo Alto, California.

Program: The program will include updates on the status of T_EX, WEB, and Metafont; a macro wizards' roundtable; presentations on output devices and drivers and commercially available macro packages; and output device manufacturers' exhibits. Several T_EX courses will also be offered.

Information: T_EX Users Group, P.O. Box 9506, Providence, Rhode Island 02940, 401-272-9500, ext. 323.

8-10. **Conference on New Directions in Applied and Computational Mathematics**, University of Wyoming, Laramie, Wyoming. (June 1985, p. 400)

11-17. **Haar Memorial Conference**, Budapest, Hungary. (March 1985, p. 271)

11-20. **4th Session of International Institute of Statistics**, Maastricht, The Netherlands. (March 1985, p. 271)

12-16. **National Science Foundation Regional Conference**, University of Nebraska, Lincoln, Nebraska.

Topics: Optimization in Operator Theory, in Analytic Function Theory and Electrical Engineering.

Speaker: J. W. Helton.

Organizer: David Larson.

Information: R. Kazarian, Public Affairs and Publications Group, National Science Foundation, Washington, D.C. 20550.

12-16. **Workshop/Conference on Hydrocodes and Other Codes on Parallel Processors**, Michigan Technological University, Houghton, Michigan. (October 1984, p. 694)

16-23. **International Conference on Radicals; Theory and Applications**, Krems/Donau, Austria. (January 1985, p. 93)

18-22. **CRYPTO '85**, Santa Barbara, California. (March 1985, p. 271)

19-23. **NSF-CBMS Regional Conference on Combinatorial Theory and Invariant Theory**, West Chester University, West Chester, Pennsylvania. (June 1985, p. 400)

19-30. **Conference on Geometry and Topology**, University of California at San Diego, La Jolla, California.

Program: Ten morning mini-courses given by experts introducing topics of current interest and informal afternoon sessions. A broad range of topics in Differential Geometry and Differential and Algebraic Topology will be included.

Organizers: M. Freedman, R. Schoen, and S. T. Yau.

Information: M. Martin, Department of Mathematics, University of California at San Diego, La Jolla, California 92093, 619-452-2218.

20-September 13. **Ecole d'Été du Cimpa, Géométrie Algébrique Réelle**, Nice, France. (June 1985, p. 400)

21-30. **Workshop on Stochastic Integrals**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 400)

23-27. **Meeting on Mathematical Statistics and Probability**, Maastricht, The Netherlands. (March 1985, p. 271)

25-31. **Second International Symposium on Probability and Information Theory**, Hamilton, Ontario, Canada. (March 1985, p. 271)

26-30. **Colloquium on Ordered Sets**, Szeged, Hungary. (November 1984, p. 803)

26-30. **6th Czechoslovak Conference on Differential Equations and their Applications**, Brno, Czechoslovakia. (March 1985, p. 272)

26-31. **International Symposium on Operator Theory**, Athens, Greece. (January 1985, p. 93)

26-September 5. **Tenth International Conference on Operator Theory**, Timisoara, Romania. (June 1985, p. 400)

26-September 28. **Equations of Fluid Mechanics: Theory and Numerical Calculus**, Ile-Ife, Nigeria. (June 1985, p. 400)

27-31. **United States-Netherlands Seminar in Representations of Semisimple Lie Groups**, University of Utrecht, The Netherlands. (June 1985, p. 400)

2-7. **Théorie des Nombre**, CIRM-Luminy, France. (June 1985, p. 400)

2-12. **NATO Advanced Study Institute: Advances in Microlocal Analysis**, Il Ciocco, Castelvecchio-Pascoli, Italy. (August 1984, p. 525)

9-12. **International Symposium on Computational Fluid Dynamics**, Tokyo, Japan. (January 1985, p. 93)

9-12. **International Workshop on Integral Functionals in Calculus of Variations**, International School for Advanced Studies, Trieste, Italy.

Topics: Existence and Regularity of Minimizers, Semi-continuity, Relaxation, Convergence of Minimizers, Stochastic Calculus of Variations, Minimal Surfaces and Geometric Problems and Integral Functionals in Elasticity.

Invited Speakers: F. J. Almgren, F. H. Clarke, B. Dacorogna, E. DeGiorgi, L. C. Evans, E. Giusti, R. V. Kohn, V. J. Mizel, U. Mosco and R. Temam.

Organizers: G. Dal Masso, International School for Advanced Studies and L. Modica, Università di Pisa. The workshop is limited to 100 participants. No registration fee is required. No financial support is available from the organizers.

Deadline for Applications: May 31, 1985.

Information: G. Dal Masso, International School for Advanced Studies, Strada Costiera 11, 34014 Trieste, Italy. Tel: 040-224159; Cable: CENTRATOM. Telex 460392 ICTP I.

9-12. **Problèmes Spectraux, Approximation, Calculs Numériques, Applications**, Sophia-Antipolis, France. (March 1985, p. 272)

9-13. **International Symposium on Variational Methods for Free Surface Interfaces**, Vallombrosa Center, Menlo Park, California. (June 1985, p. 401)

9-14. **Congrès du Groupement des Mathématiciens d'Expression Latine**, Coimbra, Portugal. (June 1985, p. 401)

9-14. **Journées Probabilistes**, CIRM-Luminy, France. (June 1985, p. 401)

12-14. **Mathematics Teaching 1985**, Edinburgh, Great Britain. (March 1985, p. 272)

16-20. **International Colloquium on Group Theory in Memory of Tibor Szele**, University of Debrecen, Bolyai Society, Hungarian Academy of Sciences. (June 1985, p. 401)

16-20. **Sixth International Meeting on Clinical Biostatistics**, Dusseldorf, West Germany. (June 1985, p. 401)

16-21. **Eleventh International Congress of the Österreichische Mathematische Gesellschaft**, Graz, Austria. (October 1984, p. 694)

16-21. **Géométrie Algébrique Réelle**, CIRM-Luminy, France. (June 1985, p. 401)

17-19. **Conference on Mathematics and Signal Processing**, University of Bath, United Kingdom. (January 1985, p. 93)

17-19. **International Symposium on Numerical Analysis**, Madrid, Spain. (August 1984, p. 525)

18-24. **Workshop on Random Media**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 401)

23-24. **Colloque International: "Approches non paramétriques en analyse chronologique"**, Brussels, Belgium. (June 1985, p. 401)

23-28. **Groupe d'Étude sur les Sommes de Kloosterman**, CIRM-Luminy, France. (June 1985, p. 401)

23-28. **International Symposium on Interval Mathematics**, University of Freiburg, Freiburg, Federal Republic of Germany. (June 1985, p. 401)

- 25–27. **Conference on Numerical Methods in Fluid Mechanics**, German Aerospace Research Establishment, Göttingen, West Germany. (June 1985, p. 401)
- 27–28. **Twelfth Annual Student Conference**, Miami University, Oxford, Ohio. (June 1985, p. 401)
- 27–28. **Thirteenth Annual Mathematics and Statistics Conference**, Miami University, Oxford, Ohio. (June 1985, p. 401)
- 30–October 5. **Fourth International Conference on Topology and its Applications**, Dubrovnik, Yugoslavia. (January 1985, p. 93)

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.
Topics: Stochastics of Species Abundance and Community Composition.
Speaker: G. P. Patil.
Information: R. Kazarian, Public Affairs and Publications Group, National Science Foundation, Washington, D.C. 20550.
- 7–12. **Waves and Stability in Continuous Media**, University of Bari, Bari, Italy. (June 1985, p. 401)
- 16–20. **International Conference on Partial Differential Equations in Complex Analysis**, State University of New York at Albany, New York.
Program: About twelve principal lectures and twenty shorter lectures will be given on topics in the area of interplay between several complex variables and partial differential equations.
Organizing Committee: K. Diederich, J. J. Kohn, R. M. Range, Y. T. Siu.
Principal Speakers: M. S. Baouendi, R. Beals, D. Catlin, J. E. Fornæss, L. Lempert, I. Lieb, T. Ohsawa, S. Nakano, N. Sibony, H. Skoda, E. M. Stein.
Information: Conference on PDE in Complex Analysis, Department of Mathematics and Statistics, State University of New York at Albany, Albany, New York 12222.
- 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.
Purpose: To celebrate its fiftieth anniversary.
Speakers: S. Agmon, M. Atiyah, H. Brezis, L. Caffarelli, A. Chorin, C. Fefferman, S. Hildebrandt, F. John, J. B. Keller, A. Majda, J. Moser, T. Nishida, R. Phillips, M. O. Rabin, I. M. Singer, S. Winograd, and S. T. Yau.
Information: Frontiers of Mathematical Science: 1985, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, New York 10012.
- 21–23. **Artificial Intelligence in Engineering**, The George Washington University, Washington, D.C.
Information: W. P. Hutzler, MITRE Corporation, MS/W-532, 1820 Dolley Madison Blvd., McLean, Virginia 22102, 703-883-6911.
- 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)
- 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.
Organizing Committee: H. Kurke, G. Pfister, W. Kleinert, and M. Roczen.
Information: H. Kurke, Humboldt-Universität, Sektion Mathematik, DDR-1086 Berlin, PSF 1297, Tel: 2093 2522.
- 14–15. **Conference on Applied Analysis in Aerospace and Industrial Research**, University of Houston, Houston, Texas.
Information: Raj Chhikara, Mathematical Sciences, University of Houston-Clear Lake, Houston, Texas 77058, 713-488-9405.
- 18–20. **Second SIAM Conference on Parallel Processing and Scientific Computing**, Norfolk, Virginia. (January 1985, p. 93)
- 18–22. **Conference on Function-Theoretic Operator Theory**, Indiana University, Bloomington, Indiana.
Program: The core of the conference will be several series of expository lectures on topics relating operator theory and analytic function theory. There will also be several 50-minute and 20-minute lectures.
Sponsors: Indiana University and the National Science Foundation.
Principal Speakers: S. Axler, Michigan State University; R. Carey, University of Kentucky; L. de Branges, Purdue University; and J. E. Thomson, Virginia Polytechnic Institute and State University.
- Organizers and Information:* J. B. Conway, C. Foias, and J. G. Stampfli, Indiana University, Bloomington, Indiana 47405.
- 21–22. **Twentieth Actuarial Research Conference**, University of Texas, Austin, Texas. (June 1985, p. 402)
- 26–30. **Géométrie différentielle**, CIRM-Luminy, France.
Information: A. Zeller-Meier, CIRM, Case 916, 70 route Léon Lachamp, 13288 Marseille Cedex 09, France.

DECEMBER 1985

- 7–9. **Canadian Mathematical Society Annual Winter Meeting**, University of Calgary, Calgary, Ontario, Canada.
Program: Special sessions on algebraic K -theory, bifurcation, geometry, operator algebras, probability and statistics, several complex variables and mathematics education.
Speakers: J. K. Hale, A. N. Shirayev, I. M. Singer, Y. T. Siu, and R. W. Thomason.
Papers: Fifteen minute papers are invited.
Information: K. Salkauskas, Department of Mathematics and Statistics, University of Calgary, 2500 University Drive Northwest, Calgary, Alberta, Canada T2N 1N4.

16-21. **Methods of Functional Analysis in Approximation Theory**, Indian Institute of Technology, Bombay, India. (March 1985, p. 272)

JANUARY 1986

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. *Information:* J. Seade, Instituto de Matemáticas, Area de la Investigación Científica, Circuito Exterior, Ciudad Universitaria, México, D.F. C.P. 04510.

17-21. **Workshop on Disordered Systems, Percolation, and Self-Avoiding Random Walks**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 402)

MARCH 1986

17-21. **Workshop on Hydrodynamic Behavior of Interacting Particle Systems**, University of Minnesota, Minneapolis, Minnesota. (June 1985, p. 402)

24-28. **Fourth International Symposium on Numerical Methods in Engineering**, Atlanta, Georgia. (June 1985, p. 402)

MAY 1986

18-21. **International Symposium on Flood Frequency and Risk Analyses**, Louisiana State University, Baton Rouge, Louisiana. (October 1984, p. 694)

20-23. **International Conference on the Physics of Phase Space**, University of Maryland, College Park, Maryland. *Program:* The conference will cover nonlinear dynamics and chaos, geometric quantization and the Wigner function.

Speakers: M. V. Berry and H. H. Will, P. Carruthers, L. Cohen, J. P. Dahl, J. Ford; M. Gotay, J. Isenberg, R. V. Jensen, J. R. Klauder, H. J. Korsch, J. E. Marsden, S. Newhouse, R. F. O'Connell, P. Pechukas, E. Remler, M. Scully, D. J. Simms, and J. A. Yorke.

Deadline for Abstracts: March 15, 1986.

Information: W. W. Zachary, Naval Research Laboratory, Washington, D.C. 20375, 202-767-2572, or Y. S. Kim, Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742, 301-454-3542.

JUNE 1986

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)

JULY 1986

22-26. **Conference on Constructive Function Theory**, University of Alberta, Edmonton, Alberta, Canada.

Program: The program includes lectures and sessions for contributed papers.

Principal Speakers: R. Askey, D. Braess, C. de Boer, P. Gauthier, D. J. Newman, F. W. J. Olver, J. Peetre, A. Sharma, and R. Varga.

Deadline for Papers: May 15, 1986.

Information: Constructive Function Theory-86, Department of Mathematics, University of Alberta, Edmonton, Alberta, Canada T6G 2G1.

27-August 1. **Thirteenth International Biometric Conference**, Seattle, Washington. (June 1985, p. 402)

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)

25-29. **Sixth Prague Topological Symposium**, Prague, Czechoslovakia. (June 1985, p. 402)



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Africa

• Nigerian Mathematical Society

Apply to: Christopher O. Imoru (Secretary), Nigerian Mathematical Society, Department of Mathematics, University of Ife, Ile-Ife, Nigeria.

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Asia

• Allahabad Mathematical Society

Apply to: P. Srivastava, Secretary, Allahabad Mathematical Society, 10, C.S.P. Singh Marg, Allahabad-211001, India.

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Privileges: The *Journal of the Society* is sent to members regularly.

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Indian Mathematical Society*

Apply to: T. Ramesan, Hon. Secretary, Indian Mathematical Society, John Armstrong Road, Richards Town, Bangalore 560005, India.

Dues: \$7 (Rupees 25/-); payable to K. M. Saxena, Hon. Treasurer, IMS, Department of Mathematics, Ranchi University, Ranchi, India.

Privileges: *Journal of Indian Mathematical Society* or *Mathematics Student*.

Officers: R. S. Mishra (President), T. Ramesan (Secretary), K. M. Saxena (Treasurer), S. R. Sinha (Academic Secretary), K. G. Ramanathan (Editor of *Journal of Indian Mathematical Society*), N. Sankaran (Editor of *Mathematics Student*).

Korean Mathematical Society

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Dues: ₩15,000 (US \$20); payable to Korean Mathematical Society.

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• Mathematical Society of Japan

Apply to: Mathematical Society of Japan, 25-9-203, Hongo 4-chome, Bunkyo-ku, Tokyo 113, Japan.

Dues: US \$24; payable to Mathematical Society of Japan.

Privileges: *Journal of the Mathematical Society of Japan*; *Sugaku* (in Japanese) for \$4.80 additional dues.

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L. A. Aizenberg and Sh. A. Dautov

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François Trèves, Editor

(Proceedings of Symposia in Pure Mathematics, Volume 43)

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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.

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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.

1980 *Mathematics Subject Classifications*:
47H15, 53C05, 53C80, 97R10, 57N99, others.
ISBN 0-8218-0708-0, LC 85-441
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H. Blaine Lawson

The author's Ph.D. thesis, written at Stanford under the direction of Robert Osserman, examined minimal surfaces in Euclidean spheres. He has since gone on to make significant contributions in the areas of Riemannian geometry, several complex variables, topology and mathematical physics, which have earned him the Steele Prize of the AMS, as well as Sloan and Guggenheim Fellowships. He served on the faculty at Berkeley from 1968 to 1980, a tenure supplemented by attendance as a visiting mathematician at I.M.P.A. in Rio de Janeiro, I.H.E.S. in Bures-sur-Yvette, Ecole Polytechnique in Palaiseau, and I.A.S. in Princeton. Now working at the State University of New York at Stony Brook, he includes among his current research interests, in addition to the theory of gauge fields, the geometry of the Dirac operator, minimal varieties, and complex varieties and calibrations.

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

Particle Systems, Random Media and Large Deviations

Richard Durrett, Editor

(Contemporary Mathematics, Volume 41)

This volume of proceedings of the 1984 AMS Summer Research Conference *The Mathematics of Phase Transitions* provides a handy summary of results from some of the most exciting areas in probability theory today: interacting particle systems, percolation, random media (bulk properties and hydrodynamics), the Ising model and large deviations. Thirty-seven mathematicians, many of them well-known probabilists, collaborated to produce this readable introduction to the main results and unsolved problems in the field; in fact, it is one of the very few collections of articles yet to be published on these topics. To appreciate many of the articles, an undergraduate course in probability is sufficient. The book will be valuable to probabilists, especially those interested in mathematical physics and to physicists interested in statistical mechanics or disordered systems.

List of Contributors

- | | |
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60K35
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List price \$32, Institutional member \$26,
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Classical Real Analysis

Daniel Waterman, Editor

(Contemporary Mathematics, Volume 42)

This book collects most of the papers presented at a special session on classical real analysis held to honor Casper Goffman at the April 1982 AMS meeting. The variety of these papers reflects Goffman's wide-ranging interests and the many areas where his influence has been felt: differentiation and integration theory, structure theory of real functions, ordered systems, surface area, Sobolev spaces, Fourier analysis, measure theory, bases, and approximation theory. Together they provide an appreciation of the directions in which real analysis has developed and of how classical techniques might be applied to problems of current interest.

Readers should have a grounding in classical analysis. Though aimed primarily at specialists in real function theory of one or several variables, the papers will also interest mathematicians working in the areas of Fourier analysis, surface area, mapping theory and control theory.

Contents

- C. Goffman.** *Cesari spaces and Sobolev spaces in surface area and localization for multiple Fourier series*
- B. Bongiorno and D. Preiss.** *An unusual descriptive definition of integral*
- A. M. Bruckner, R. J. O'Malley and B. S. Thomson.** *Path derivatives: a unified view of certain generalized derivatives*
- A. M. Bruckner, J. Marik and C. E. Weil.** *Baire one, null functions*
- R. Darst and R. Huotari.** *Monotone approximation on an interval*
- R. O. Davies.** *Two remarks on the measure of product sets*
- M. J. Evans and L. Larson.** *Monotonicity, symmetry, and smoothness*
- J. Foran.** *The structure of continuous functions which satisfy Lusin's condition (N)*
- K. Garg.** *Construction of absolutely continuous and singular functions that are nowhere of monotonic type*
- P. D. Hummel and B. S. Thomson.** *A porosity characterization of symmetric perfect sets*

- L. Larson.** *A method for showing generalized derivatives are in Baire class one*
- C. -M. Lee.** *On generalizations of exact Peano derivatives*
- D. Legg.** *Best monotone approximation in $L_\infty[0, 1]$*
- F. C. Liu.** *Representation of lattices and extension of measures*
- J. Marik.** *Transformation and multiplication of derivatives*
- J. H. Michael and W. P. Ziemer.** *A Lusin type approximation of Sobolev functions by smooth functions*
- C. J. Neugebauer.** *Some properties of Fourier series with gaps*
- T. Nishiura.** *An extension of Thunsdorff's integral inequality to a class of monotone functions*
- L. Di Piazza and C. Maniscalco.** *On generalized bounded variation*
- B. S. Thomson.** *On the level set structure of a continuous function*
- S. Wang.** *Some properties of the Littlewood-Paley g -function*
- D. Waterman.** *Change-of-variable invariant classes of functions and convergence of Fourier series*
- R. E. Zink.** *Schauder bases for $L^p[0, 1]$ derived from subsystems of the Schauder system*

1980 *Mathematics Subject Classifications:*
26-06; 26A24, 26A45
ISBN 0-8218-5045-8, LC 85-9241
ISSN 0271-4132
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Group Actions on Rings

Susan Montgomery, Editor

(Contemporary Mathematics, Volume 43)

Ring theorists and researchers in invariant theory and operator algebra met at Bowdoin for the 1984 AMS-IMS-SIAM Joint Summer Research Conference to exchange ideas about group actions on rings and to stimulate general interaction among their various fields. Collecting together the proceedings of that meeting, this interdisciplinary volume reveals many topics common to the three fields: K-theory, dual actions, semi-invariants, and crossed products. A high percentage of the papers here are expository; of particular significance are the papers by the four survey lecturers, Formanek, Hochster, Passman and Reiffel.

Contents

- Hyman Bass.** *Algebraic group actions on affine spaces*
- George M. Bergman.** *Everybody knows what a Hopf algebra is*

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Miriam Cohen, *Hopf algebras acting on semiprime algebras*

Warren Dicks, *Automorphisms of the free algebra of rank two*

Daniel R. Farkas, *Toward multiplicative invariant theory*

Joe W. Fisher, *Invariants of finite linear groups acting on relatively free algebras: a survey*

Edward Formanek, *Noncommutative invariant theory*

Robert M. Fossum, *Invariants and formal group law actions*

David Handelman, *Classification of compact group actions on locally semisimple algebras*

Richard H. Herman, *The Rohlin property for automorphism of UHF C^* -algebras*

Melvin Hochster, *Invariant theory of commutative rings*

V. F. R. Jones, *Index for subrings of rings*

Susan Montgomery, *Duality for actions and coactions of groups*

D. S. Passman, *Algebraic crossed products*

N. Christopher Phillips, *K -theoretic freeness of finite group actions on C^* -algebras*

Idun Reiten, *Skew group rings in the computation of Grothendieck groups and in the representation theory of Artin algebras*

Marc A. Reiffel, *K -theory of crossed products of C^* -algebras by discrete groups*

David J. Saltman, *Groups acting on fields: Noether's problem*

1980 Mathematics Subject Classifications:

16, 13, 14L, 46L

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Combinatorial Methods in Topology and Algebraic Geometry

**John R. Harper and Richard
Mandelbaum, Editor**

(Contemporary Mathematics, Volume 44)

This collection marks the recent resurgence of interest in combinatorial methods, resulting from their deep and diverse applications both in topology and algebraic geometry. Nearly thirty mathematicians met at the University of Rochester in 1982 to survey several of the areas where combinatorial methods are proving especially fruitful: topology and combinatorial group theory, knot theory, 3-manifolds, homotopy theory and

infinite dimensional topology, and four manifolds and algebraic surfaces. This material is accessible to advanced graduate students with a general course in algebraic topology along with some work in combinatorial group theory and geometric topology, as well as to established mathematicians with interests in these areas. For both student and professional mathematicians, the book provides practical suggestions for research directions still to be explored, as well as the aesthetic pleasures of seeing the interplay between algebra and topology which is characteristic of this field.

In several areas the book contains the first general exposition to be published on the subject at hand. In topology, for example, the editors have included M. Cohen, W. Metzler and K. Sauerman's article on "Collapses of $K \times I$ and group presentations" and Metzler's "On the Andrews-Curtis-Conjecture and related problems." In addition, J. M. Montesino has provided summary articles on both 3- and 4-manifolds.

Contents

Topology and Combinatorial Group Theory

M. Cohen, W. Metzler and K. Sauermann,

Collapses of $K \times I$ and group presentations

W. Metzler, *On the Andrews-Curtis-Conjecture and related problems*

M. Lustig and W. Metzler, *Integral representations of $\text{Aut } F^n$ and presentation classes of groups*

R. Goldstein and E. C. Turner, *A note on commutators and squares in free products*

K. B. Lee and F. Raymond, *Rigidity of almost crystallographic groups*

J. R. Stallings, *Finite graphs and free groups*

C. Tretkoff and M. Tretkoff, *A topological proof of a theorem of Brunner and Burns about M . Hall groups*

Knot Theory

D. Gabai, *The Murasugi sum is a natural geometric operation II*

L. H. Kauffman, *The Arf Invariant of classical knots*

W. B. R. Lickorish, *The unknotting number of a classical knot*

B. Trace, *A general position theorem for surfaces in Euclidean 4-space*

3-Manifolds

A. L. Edmonds, *On the equivariant Dehn lemma*

J. Hempel, *Virtually Haken manifolds*

J. M. Montesinos, *Lectures on 3-fold simple coverings and 3-manifolds*

H. S. Oh, *The Witt classes of Seifert manifolds*

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M. Scharlemann. *Outermost forks and a theorem of Jaco*

J. R. Stallings. *Surfaces in 3-manifolds*

Homotopy Theory and Infinite Dimensional Topology

M. G. Barratt. *Taming Hopf invariants*

F. R. Cohen. *Artin's braid groups and classical homotopy theory*

L. R. Rubin. *More compacta of infinite cohomological dimension*

A. Zabrodsky. *Endomorphisms in the homotopy category*

Four Manifolds and Algebraic Surfaces

S. Akbulut. *On fake $S^3 \sim \times S^1 \# S^2 \times S^2$*

N. Goldstein. *Manifolds having non-ample Norman bundles in quadrics*

R. Mandelbaum. *Lefschetz fibrations of Riemann surfaces and decompositions of complex elliptic surfaces*

B. Moishezon. *Algebraic surfaces and the arithmetic of braids. II*

J. Montesinos. *A note on moves and on irregular coverings of S^4*

1980 Mathematics Subject Classifications: 14Jxx, 20Fxx, 55Pxx, 55Sxx, 57Mxx, and others.

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Distributions of Values of Holomorphic Mappings

B. V. Shabat

(Translations of Mathematical Monographs, Volume 61)

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

ISBN 0-8218-4514-4, LC 85-9236

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vi + 225 pages (hardcover), September 1985

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Exceptional Weierstrass Points and the Divisor on Moduli Space That They Define

Steven Diaz

(Memoirs of the AMS, Number 327)

This memoir presents a procedure for studying divisors on the moduli space of curves of genus g . The author defines the divisor as the closure of the set of all points corresponding to curves possessing exceptional Weierstrass points of a certain type. Its class is then expressed as a linear combination of other standard divisor classes previously introduced by Mumford. In addition, the author considers the behavior of Weierstrass points near singular points.

1980 Mathematics Subject Classifications:

14H10; 14C20, 14D20, 14F07

ISBN 0-8218-2328-0, LC 85-9207

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iii + 69 pages (softcover), July 1985

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Nonlinear Stability of Shock Waves for Viscous Conservation Laws

Tai Ping Liu

(Memoirs of the AMS, Number 328)

The author studies the nonlinear stability of shock waves for viscous conservation laws, such as the compressible Navier-Stokes equations. He decomposes the solution into shock waves and diffusion waves, which are constructed based on the heat equation and Burger's equation, and then

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introduces a new combination of characteristic and energy methods for the stability analysis. Using these techniques, he is able to demonstrate that the essential difference between the viscous conservation laws and the hyperbolic conservation laws on the level of diffusion waves persists, even as the viscosity matrix $B(u)$ tends to zero.

1980 *Mathematics Subject Classifications*:
35K55, 76N10; 35B40, 35L65
ISBN 0-8218-2329-9, LC 85-9153
ISSN 0065-9266

iv + 108 pages (softcover), July 1985
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Topology: A Collection of Papers

P. S. Aleksandrov, Editor

(Proceedings of the Steklov Institute, Volume 154)

The history of topology has long been characterized by the synthetic interpenetration of its two main directions, the combinatorial-algebraic and the set-theoretic. The most productive work in the field has been accomplished during the intense periods of this synthesis. In this field, then, a forum such as the 1979 International Topology Conference held at the Steklov Institute is especially valuable. The 33 papers collected in this volume include some of the most interesting papers presented at that conference and represent all of the main directions in contemporary topology and its applications. A sampling of the topics under consideration includes the following: Alexander-Pontryagin duality, the Brown-Gitler spectrum, Lipschitz topology, the symplectic cobordism ring, resolutions of generalized manifolds, dimension theory, maximally resolvable spaces, normally situated subspaces, Morse functions and parametric canonical homology.

Contents

- D. O. Baladze**, *Parametric canonical homology and cohomology groups over pairs of copresheaves and presheaves, respectively*
F. V. Bauer, *The current state of Alexander-Pontryagin duality*
N. A. Berikashvili, *On the axiomatics of Steenrod-Sitnikov homology theory on the category of compact Hausdorff spaces*
E. H. Brown, Jr., and F. P. Peterson, *The Brown-Gitler spectrum, $\Omega^2 S^3$, and $\eta_j \in \Pi_2, S$*
Jussi Väisälä, *Lipschitz topology*
V. V. Vershinin, *On the symplectic cobordism ring*
Jan de Vries, *Linearization of actions of locally compact groups*

- R. J. Gardner and W. F. Pfeffer**, *Some undecidable questions involving Radon measures*
A. Dold and D. Puppe, *Duality, trace and transfer*
A. V. Zarelua, *Limits of local systems of sheaves, and zero-dimensional mappings*
V. R. Zachepa and Yu. I. Saprnov, *On local analysis of nonlinear Fredholm equations*
S. P. Zervos, *On cardinals as orbits of groups of automorphisms of ordered sets*
Soren Illman, *Equivariant engulfing and recognition of linear actions on spheres*
W. Klingenberg and Y. Shikata, *On an existence theorem for an infinite set of closed geodesics*
R. C. Lacher, *Resolutions of generalized manifolds*
Ib. Madsen, *Spherical space forms in the period dimension. I*
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Jun-iti Nagata, *A survey of dimension theory. III*
I. Prodanov, *An abstract approach to the algebraic notion of spectrum*
E. G. Pytkeev, *On maximally resolvable spaces*
T. N. Savitskaya, *Decomposition of a fibration with fiber $K(\pi, n)$ into a Postnikov system*
F. Terpe, *On a new application of topology in summation theory*
Yu. Yu. Trokhimchuk, Yu. B. Zelinskii and V. V. Sharko, *On some results in the topology of manifolds, the theory of multivalued mappings, and Morse theory*
V. G. Turaev, *Fundamental groups of three-dimensional manifold and Poincaré duality*
V. V. Filippov, *On normally situated subspaces*
Jürgen Flachsmayer, *Topological semifields and the Boolean algebras corresponding to them*
B. Hajduk, *On the construction of smooth structures and PL structures on a manifold*
J. J. Charatonik, *Some generalizations of homogeneity of spaces*
N. P. Khomenko, *The method of φ -transformations and some of its applications in graph theory*
H. Zieschang, *On subgroups of a free product of cyclic groups*
M. M. Choban, *Mappings and dimension properties of spaces*
V. V. Sharko, *Minimal resolutions and Morse functions*

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Seven Papers in Applied Mathematics*

(American Mathematical Society Translations, Series 2, Volume 125)

These papers in applied mathematics have been carefully selected by a joint committee of the AMS, the Association for Symbolic Logic (ASL), and the Institute of Mathematical Statistics (IMS) from publications not otherwise translated into English. The translated papers are carefully edited prior to publication.

Contents

- D. V. Anosov**, *Smooth dynamical systems*
V. S. Bondarchuk, *A periodic problem in the calculus of variations and deformations of Hamiltonian systems*
V. G. Babskii and **A. D. Myshkis**, *The monotonicity of the change in the first eigenvalue for a class of nonselfadjoint boundary value problems in the theory of hydrodynamical stability*
A. V. Kazhikhov and **V. B. Nikolaev**, *On the correctness of boundary value problems for the equations of a viscous gas with nonmonotone state function*
Yu. A. Eremin, **E. V. Zakharov** and **N. I. Nesmeyanova**, *The method of fundamental solutions in problems of diffraction of electromagnetic waves by bodies of revolution*
N. N. Bogolyubov, *Kinetic equations and Green's functions in statistical mechanics*
O. I. Bogoyavlenskii, *Qualitative theory of homogeneous cosmological models. II*

1980 *Mathematics Subject Classifications*:
58, 35, 34, 76, 78, 70, 82, 83, 49, 85
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* The final two papers were inadvertently omitted when this book was first announced in the *March Notices*.

Microlocal Study of Sheaves

M. Kashiwara and P. Schapira
(Astérisque, Number 128)

On a real manifold X , the micro-support of a sheaf F , denoted $SS(F)$, is a closed conic involutive subset of T^*X , describing the set of codirections where F and its cohomology, "do not propagate".

Functorial properties of the micro-support are studied, and the derived category of sheaves is localized in T^*X , which gives a meaning to the action of contact transformations on sheaves. In particular the shift of "simple sheaves" along smooth Lagrangean manifolds is calculated, by means of the Maslov index.

Applications are given to real or complex analytic constructible sheaves, regular holonomic Modules (direct images in the non proper case), microdifferential systems (characteristic variety, wave front set of $\prod_j (f_j + i0)^{\lambda_j}$, propagation theorems, etc. ...).

Finally, quantized contact transformations are performed for the sheaf \mathcal{O}_X , with applications to Sato's microlocalization of \mathcal{O}_X along real submanifolds.

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Pinceaux de Variétés Abéliennes

L. Moret-Bailly
(Astérisque, Number 129)

Ce travail a pour objet l'étude des "variétés abéliennes dégénérantes" à réduction semi-stable au-dessus d'un schéma. On s'intéresse en particulier aux propriétés de certains faisceaux inversibles relativement amples sur de tels schémas en groupes, et de leur image directe; on obtient ainsi une formule généralisant le fait que (sur \mathbb{C}) les thêta-constants sont des formes modulaires.

On donne des applications de ces résultats aux variétés abéliennes sur les corps de fonctions, avec comme corollaire le théorème de finitude de Zarhin lorsque le corps de base est fini.

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Personal Items

M. Bhaskaran of Girrawheen, Australia, received \$20 from Professor M. Cowling of the University of New South Wales as an award for his contribution to Cowling's unsolved problem concerning the area of a certain region.

Vladislav V. Goldberg of the New Jersey Institute of Technology has been awarded the Harlan J. Perlis Award for Excellence in Research by his institution.

R. Bradford Murphy, statistical consultant, AT&T Bell Laboratories, Holmdel, New Jersey, was named a 1985 recipient of the Award of Merit by ASTM.

Frank Quinn III, professor of mathematics at Virginia Polytechnic Institute and State University, has been named a University Distinguished Professor. This is an honor which is bestowed upon no more than 1% of the faculty at Virginia Polytechnic Institute and State University.

Monty J. Strauss Associate Chairman and Associate Professor at Texas Technical University, has been promoted to a professorship at that institution.

Deaths

Edward S. Allen, Professor Emeritus, Iowa State University, died on May 8, 1985, at the age of 97. He was a member of the Society for 70 years.

L. M. Gluskin of Charkov Institute for Radioelectronics, Kharkov, USSR, died on April 15, 1985, at the age of 63. He was a member of the Society for 3 years.

Laura Guggenbuhl of Bronxville, New York, died on March 8, 1985, at the age of 83. She was a member of the Society for 61 years.

Tjalling C. Koopmans, the Alfred Cowles Professor Emeritus of Economics at Yale University and co-winner of the 1975 Nobel Prize in Economic Science, died on February 26, 1985, at the age of 74. He was a member of the Society for 35 years.

Earl J. Mickle, Professor Emeritus, Ohio State University, died on April 11, 1985, at the age of 74. He was a member of the Society for 42 years.

M. Richard Porter of California State University, Sacramento, died on July 13, 1984, at the age of 55. He was a member of the Society for 28 years.

Complex contour integral representation of cardinal spline functions

Walter Schempp

This book contains a very comprehensive treatment of most of the author's original results in the theory of complex integral representation of cardinal spline functions.

The basic idea of the book is to use a suitable inverse integral transform instead of the direct transform itself and then to have recourse to the methods of complex analysis applied to cardinal exponential splines and cardinal logarithmic splines. The method of complex contour integral representation yields a unified treatment of both cases. Besides presenting an outline of inverse integral transform technique, the book investigates several related topics. These include: (1) various complex integral representations of the basis spline functions. (2) a useful complex contour integral representation of the Euler-Frobenius polynomials and its consequences, and (3) the classical Méray-Runge phenomenon.

This approach to cardinal spline functions provides a very instructive illustration of the application of inverse integral transform techniques combined with complex variable methods to recent problems arising in approximation theory. Each section of the book ends with a few references and comments. In the reviewer's opinion, this book will be very useful to a broad audience, interested in present developments of approximation theory.

In the reviewer's opinion, this book will be very useful to a broad audience, interested in present developments of approximation theory.

— Gheorghe Micula (Cluj-Napoca)

MR85c:41020

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Visiting Mathematicians (*Supplementary List*)

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

American Mathematicians Visiting Abroad

<u>Name and Home Country</u>	<u>Host Institution</u>	<u>Field of Special Interest</u>	<u>Period of Visit</u>
Robinson, Donald W. (U.S.A.)	Rijksuniversiteit-Gent, Belgium	Algebra	2/86 - 6/86

Visiting Foreign Mathematicians

Aliabadi, Reza-Ali (Iran)	University of California, Berkeley		8/84 - 9/85
Aydin, Ali Pasa (Turkey)	University of California, Berkeley	Differential Geometry	8/84 - 9/85
Brillinger, Peter (United Kingdom)	University of California, Berkeley		8/85 - 8/86
Bruna, Joaquim (Spain)	University of Wisconsin-Madison	Analysis	8/85 - 1/86
Cannarsa, Piermarco (Italy)	Brown University	Partial Differential Equations, Probability and Control	5/85 - 11/85
Carreras, Pedro (Spain)	Kent State University	Functional Analysis	9/85 - 12/85
Castro, Helena (Brasil)	University of California, Berkeley		4/85 - 4/86
Cendra, Hernan (Argentina)	University of California, Berkeley	Geometry with Applications	8/84 - 8/86
Chan, P. H. (Taiwan)	University of California, Berkeley	Algebraic Topology	8/85 - 8/86
Chen, Zu-Chi (People's Republic of China)	University of California, Berkeley	Partial Differential Equations	4/83 - 12/85
Chin, Shee-Sze (Singapore)	University of California, Berkeley	Algebraic Theory of Graphs, Statistics	4/85 - 1/86
Csirmaz, Laszlo (Hungary)	McGill University	Mathematical Logic	9/85 - 8/86
daVeiga, Hugo Beirao (Italy)	University of Wisconsin-Madison	Analysis	8/85 - 1/86
Decker, Wolfram (Germany)	University of California, Berkeley	Stable Vector Bundles	9/85 - 5/86
Eiermann, Michael (West Germany)	Kent State University	Numerical Analysis	1/85 - 12/85
Erdoğan, Mehmet (Turkey)	University of California, Berkeley	Fluid Mechanics	9/85 - 9/86
Falconer, Kenneth (England)	Oregon State University	Convex Bodies, Geometric Measure Theory, X-Ray Tomography	9/85 - 6/86
Fernandez-Margarit (Spain)	University of California, Berkeley		9/85 - 6/87
Futaki, Akito (Japan)	University of California, Berkeley	Differential Geometry	8/84 - 7/86
Gauchman, Hillel (Israel)	University of California, Berkeley	Differential Geometry	9/85 - 9/86
Globevnik, Josip (Yugoslavia)	University of Wisconsin-Madison	Analysis	8/85 - 1/86
Hedenmalm, Håken (Sweden)	SUNY at Albany	Complex Analysis	9/85 - 6/86
Honary, Bahman (Iran)	University of California, Berkeley	Dynamical Systems	9/84 - 9/85
Hsiao, Sherman (Taiwan)	University of California, Berkeley	Catastrophe Theory, Relativity	11/83 - 11/85
Ibort, Alberto (Spain)	University of California, Berkeley	Mathematical Structures Related to the Dynamical Systems with Symmetries	9/85 - 9/86
Iorio, Rafael Jose (Brasil)	University of California, Berkeley	Partial Differential Equations, Scattering Theory	9/84 - 6/86
Ito, Masami (Japan)	University of Western Ontario	Automata, Formal Languages	7/85 - 10/85
Itoh, Mitsuhiro (Japan)	University of California, Berkeley	Differential Geometry	5/85 - 2/86
Jarchow, Hans (Switzerland)	Kent State University	Functional Analysis	9/85 - 12/85
Jian, Zin-Ming (People's Republic of China)	Brown University	Numerical Analysis	9/85 - 8/86
Johansson, Klaus (West Germany)	Rice University	Topology	7/85 - 6/86
Karoubi, Max (France)	University of Western Ontario	Algebraic K -theory	3/86 - 6/86
Khanmy, Christian (Switzerland)	University of California, Berkeley	Trajectories of Differential Systems	8/85 - 9/85
Koras, Marius (Poland)	McGill University	Algebraic Group Actions	6/85 - 12/85
Koschorke, Ulrich (Germany)	University of California, Berkeley	Algebraic Topology	3/85 - 10/85
Kreis, Andreas S. (Switzerland)	Brown University	Mechanics	12/84 - 12/85
Kron, Alexander (Germany)	University of California, Berkeley	Logic	9/85 - 3/86
Lei, Gong-yan (People's Republic of China)	University of California, Berkeley	Numerical Analysis	8/84 - 9/85
Lin, Shao-Shiung (Taiwan)	University of California, Berkeley	Combustion Theory, Partial Differ- ential Equations	7/85 - 9/85

<u>Name and Home Country</u>	<u>Host Institution</u>	<u>Field of Special Interest</u>	<u>Period of Visit</u>
Lluis-Puebla, Emilio (Mexico)	University of Western Ontario	Algebraic K -theory	1/86 - 5/86
Looijenga, Eduard (The Netherlands)	University of North Carolina, Chapel Hill	Singularities, Algebraic Geometry	7/85 - 12/85
Luo, Xue-bo (People's Republic of China)	University of California, Berkeley	Partial Differential Equations	9/84 - 10/85
Marusic, Dragan (Yugoslavia)	University of California, Santa Cruz	Combinatorics	7/85 - 6/86
Mizutani, Tadayoshi (Japan)	University of California, Berkeley	Foliations	1/86 - 9/86
Muramatu, Tosinobu (Japan)	University of California, Berkeley	Functional Analysis	3/86 - 5/86
Nadkarni, M. G. (India)	McGill University	Ergodic Theory	9/85 - 12/85
O'Donovan, Donal P. (Ireland)	University of California, Berkeley	C^* Algebras	5/85 - 9/85
Okazawa, Noboru (Japan)	University of California, Berkeley	Operator Theory	8/85 - 8/86
Okonek, Christian (Germany)	University of California, Berkeley	Algebraic Geometry	10/85 - 10/86
Pach, Janos (Hungary)	SUNY at Stony Brook	Combinatorics	9/85 - 8/86
Patnaik, Surendranath (Algeria)	University of California, Berkeley	Topology	7/85 - 11/85
Pfalzgraf, Joachim (Germany)	University of California, Berkeley	Complex Analysis	12/85 - 12/86
Reidel, Norbert (Germany)	University of California, Berkeley	Operator Algebras	
Rothe, Franz (West Germany)	University of North Carolina, Chapel Hill	Partial Differential Equations	8/85 - 7/86
Saupe, Dietmar (West Germany)	University of California, Santa Cruz	Dynamical Systems	7/85 - 6/87
Schrohe, Eimar (Germany)	University of California, Berkeley	Functional Analysis	7/84 - 11/85
Semwogerere, Frederick (Uganda)	University of California, Berkeley	Functional Analysis, Theory of Bifurcation	8/85 - 8/86
Sheu, Shuenn-Jyi (Taiwan)	Brown University	Stochastic Control	8/85 - 11/85
Shyr, Huei-Jan (Taiwan)	University of Western Ontario	Automata, Formal Languages	7/85 - 9/85
Sims, Brailey (Australia)	Kent State University	Fixed Point Theory	9/85 - 5/86
Stettner, Lukasz (Poland)	Brown University	Stochastic Systems	1/86 - 7/86
Straume, Eldar (Norway)	University of California, Berkeley	Algebraic Topology, Analysis, Lie Theory	7/84 - 8/86
Tonge, Andrew (England)	Kent State University	Harmonic Analysis	9/85 - 5/86
Tsunoda, Shuichiro (Japan)	University of California, Berkeley	Algebraic Geometry, Open Algebraic Surfaces	7/85 - 9/86
Ueno, Kazushige (Japan)	University of California, Berkeley	Global Analysis	3/86 - 1/87
Wallace, David (Scotland)	University of Wisconsin-Madison	Algebra	8/85 - 1/86
Wang, Shengwang (People's Republic of China)	Central Michigan University	Operator Theory	9/85 - 5/86
Zhang, Li Xie (People's Republic of China)	Kent State University	Numerical Analysis	9/84 - 5/86

Backlog of Mathematics Research Journals

Backlog. Information on the backlog of papers for research journals, primarily those published in North America, is reported to the Providence Office by those editorial boards which elect to participate. The figures are an estimate of the number of printed pages which have been accepted, but are in excess of the number required to maintain copy editing and printing schedules.

Observed Waiting Time. The quartiles give a measure of normal dispersion. They do not include extremes which may be misleading. Waiting times are measured in months from receipt of manuscript in final form to publication of the issue. When a paper is revised, the waiting time between an editor's receipt

of the final revision and its publication may be much shorter than is the case otherwise, so these figures are low to that extent.

The observations are made from the latest issue published before the deadline for this issue of the *Notices* from journals that have actually been received by a subscriber in the Providence, Rhode Island, area; in some cases this may be two months later than publication abroad. If the waiting time as defined above is not given in the journal, if no new issue has been received since the last survey, or if the latest issue is for some reason obviously not typical, no times are given in this report and such cases are marked NA (not available or not applicable).

Journal	Number Issues per Year	Approximate Number Pages per Year	Backlog of Printed Pages		Editor's Estimated Time for Paper Submitted Currently to be Published (In Months)	Observed Waiting Time in Latest Published Issue (In Months)		
			5/31/85	12/15/84		Q ₁	M	Q ₃
Acta. Inform.	6	720	0	0	6	7	8	8
Aequationes Math.	6	640	485	137	11	10	13	17
Amer. J. Math.	6	1500	1250	2014	12	26	28	29
Ann. of Math.	6	1200	0	300	6	10	13	15
Ann. Probab.	4	1350	675	NR	18	9	12	13
Ann. Sci. Ecole Norm. Sup.	4	600	120	NR	12	NA	20	NA
Ann. Statist.	4	NR	NR	0	NR	7	8	10
Appl. Math. Optim.	3	288	0	150	6-12	6*	6*	14*
Applicable Anal.	NR	700	0	NR	6	8	11	12
Arch. Hist. Exact Scis.	12	1200	0	0	11-12	10	10	14
Arch. Rational Mech. Anal.	16	1600	NR	0	10-11	9	10	11
Bull. Austral. Math. Soc.	6	960	0	0	6.5	7	8	9
Canad. J. Math.	6	1152	1200	300	24	13	15	18
Canad. Math. Bull.	4	512	300	256	18	11	12	13
Comm. Algebra	12	2400	990	1239	9	8	12	13
Comm. Math. Phys.	20	3040	0	0	5	6	7	10
Comm. Partial Diff. Equations	12	1500	600	350	6-9	7	NA	10
Computing	8	768	0	0	7	11	12	14
Duke Math. J.	4	1100	0	0	8	8	10	13
Houston J. Math.	4	600	150	150	15	13	18	21
Illinois J. Math.	4	704	919	713	24	27	28	28
Indiana Univ. Math. J.	4	930	100	100	12	14	18	20
Internat. J. Math. Math. Sci.	4	832	0	200	4	8	12	21
Invent. Math.	12	2304	0	0	9	9	11	12
Israel J. Math.	12	1200	100	300	12	10	12	20
J. Algorithms	4	600	650	500	12	18	22	26
J. Amer. Statist. Assoc.	4	1200	0	150	0	8	8	9
J. Assoc. Comput. Mach.	4	1000	195	0	6	7	7	8
J. Austral. Math. Soc. Ser. A	6	844	800	800	20	21	22	25
J. Austral. Math. Soc. Ser. B	4	512	0	60	12	13	14	15
J. Comput. System Sci.	6	NR	NR	100	NR	8	9	12
J. Differential Geom.	4	1108	700	600	8	8	8	11
J. Math. Biol.	4	NR	NR	0	NR	7	9	10
J. Math. Phys.	12	3000	60	200	7-8	8†	9†	11†
J. Math. Sociol.	4	NR	NR	120	NR		NA	
J. Nigerian Math. Soc.	1	100	0	0	12		NA	
J. Operator Theory	4	800	600	NR	15	13	15	16
J. Symbolic Logic	4	1156	0	100	15	16	17	17

Journal	Number Issues per Year	Approximate		Backlog of Printed Pages		Editor's Estimated Time for Paper Submitted Currently to be Published (In Months)	Observed Waiting Time in Latest Published Issue (In Months)		
		Number Pages per Year	5/31/85	12/15/84	Q ₁		M	Q ₃	
Linear Algebra Appl.	12	3600	500	500	12-15	9	9	10	
Linear and Multilinear Algebra	6	540	NR	300	9	8	9	9	
Manuscripta Math.	15	1500	0	NR	5	4	5	6	
Math. Ann.	12	1920	0	0	7	7	9	12	
Math. Biosci.	10	1500	300	NR	6	5	6	9	
Math. Comp	4	1250	175	50	12	12	14	18	
Math. Oper. Res.	4	704	350	350	18	18	19	19	
Math. Programming	9	1080	100	120	15	6	7	13	
Math. Systems Theory	4	384	0	NR	6-24	11	13	14	
Math. Z.	12	1820	0	0	9	10	12	13	
Mem. Amer. Math. Soc.	6	2800	0	0	2	15	NA	18	
Michigan Math. J.	3	384	250	150	15	6	7	11	
Monatsh. Math.	8	704	0	0	7	7	8	8	
Numer. Funct. Anal. Optim.	6	NR	NR	150	NR	4	4	7	
Numer. Math.	8	1280	0	0	8	7	8	10	
Oper. Res.	6	NR	NR	NR	NR	19	21	24	
Pacific J. Math.	10	2500	NR	NR	NR	16	17	18	
Proc. Amer. Math. Soc.	12	2200	150	50	12	12	13	16	
Quart. Appl. Math.	4	512	128	128	15	17	18	21	
Resultate Math.	2	224	NR	140	12-14	10	12	18	
Rocky Mountain J. Math.	4	768	768	750	24	17	18	19	
Semigroup Forum	9	1152	0	0	6	5	5	7	
SIAM J. Algebraic Discrete Methods	4	766	100	269	12	13	15	17	
SIAM J. Appl. Math.	6	1050	150	0	10	8	9	11	
SIAM J. Comput.	4	1066	NR	394	16	14	17	19	
SIAM J. Control Optim.	6	975	NR	356	14	12	14	16	
SIAM J. Math. Anal.	6	1324	NR	958	18	17	19	21	
SIAM J. Numer. Anal.	6	1250	NR	356	11	12	12	13	
SIAM J. Sci. Statist. Comput.	4	1066	NR	449	16	15	16	17	
SIAM Rev.	4	600	0	0	10	7	8	11	
Stochastics	Varies	Varies	NR	NR	NR	8*	NA	18*	
Topology Appl.	NR	990	825	715	11	8	9	11	
Trans. Amer. Math. Soc.	12	5000	50	0	10	11	12	15	
Z. Wahrsch. Verw. Gebiete	12	1920	0	0	9-10	7	11	13	

NR means no response received.

NA means not available or not applicable.

* From date of acceptance (the only date given in this journal).

† From date received (dates of revision not given).

AMS Reports and Communications

Report of the Treasurer

The Treasurer this year again presents to the membership an abridged statement of the financial position of the Society, in semi-informal narrative style. A copy of the Treasurer's Report, as submitted to the Trustees and the Council, will be sent from the Providence Office to any member who requests it from the Treasurer. The Treasurer will be happy to answer any questions members may wish to put to him concerning the financial affairs of the Society.

I. A DESCRIPTION OF THE FINANCIAL POSITION OF THE SOCIETY AS OF DECEMBER 31, 1984

The Society had investments in accounts in the Rhode Island Hospital Trust National Bank	\$ 2,334,786
There was owing to it by subscribers, and others (less allowance for doubtful accounts)	389,416
It had prepaid expenses and deposits.	364,449
It had deferred prepublication costs	813,946
It had completed inventory of books and back volumes of journals	605,420
It had invested in the headquarters building, <i>Mathematical Reviews</i> editorial offices, computers, and other equipment	<u>3,943,980</u>
Making a total of current and fixed assets of	\$ 8,451,997
The Society also held investment securities and uninvested principal cash valued at	2,554,769
(Approximate market value December 31, 1984: \$2,606,986)	
Total assets, therefore, were	<u><u>\$11,006,766</u></u>

Offsetting these assets, the Society had

Accounts payable	\$ 521,031
Reserved unearned dues and subscriptions	5,854,525
Other miscellaneous liabilities	597,158
It had a mortgage on the headquarters building	893,860
A surplus in its publication funds	2,789,286
Its general fund reflected a deficit balance of	<u>(2,203,863)</u>
Thus, accounting for all the current funds.	\$ 8,451,997

The invested funds represent the following:

The Endowment Fund, largely the gifts of members	\$100,000	
Robert Henderson Endowment Fund	548,223	
Joseph Fels Ritt Memorial Fund	22,521	
The Library Proceeds Fund, derived from the sale of the Society's library in 1959	66,000	
Future operations fund	356,041	
The various prize funds	165,264	
Dues and publication reserve fund	148,671	
<i>Mathematical Reviews</i> subscription reserve fund	80,000	
Undistributed net gains on investment transactions	919,769	
Friends of Mathematics Fund	43,152	
Other funds, derived mainly from bequests to the Society by members, which Trustees were either required to invest or which they have invested at their option, the income being used for the general purposes of the Society	<u>105,128</u>	<u>2,554,769</u>
Total liabilities and fund reserves, therefore, were . . .		<u><u>\$11,006,766</u></u>

II. AN ACCOUNT OF THE FINANCIAL TRANSACTIONS OF THE SOCIETY
DURING THE FISCAL YEAR ENDED DECEMBER 31, 1984

The Society maintains its accounts in three funds. The General Fund includes transactions and balances relating to the general operations of the Society, membership dues and activities, support of special projects, meetings, information services, and sale of services.

The Publication Fund includes all transactions and balances relating primarily to the books, journals and back volumes of journals published by the Society.

The Special Fund includes transactions and balances relating to prize funds and various special projects, such as government supported institutes and symposia.

To meet its obligations, the Society received from

Sale of Society journals and back volumes	\$5,149,405	
Sale of other publications	1,603,642	
Dues and contributions of individual members	610,988	
Dues of institutional, corporate and associate members	295,855	
Government grants	424,811	
Sale of services	398,683	
Meetings	295,238	
Investment and trusts	220,614	
All other sources	<u>132,674</u>	
Total receipts		\$9,131,910

These funds were expended for

Publication of Society journals and back volumes	\$5,589,284	
Other publications	1,420,242	
Meetings	694,098	
Sale of services	427,206	
Membership activities	314,153	
Marketing	281,352	
All other	<u>299,171</u>	
Total expenses		<u>9,025,506</u>

Excess of Revenues over Expenses before Non-recurring items \$ 106,404

Non-recurring Items

Cumulative effect on prior years of change in method of accounting for completed books and back volumes of journals	\$ 602,000
Other	<u>52,044</u>

Total non-recurring items **654,044**

Increase in Fund Balances **\$ 760,448**

Respectfully submitted,

Franklin P. Peterson
Treasurer

Recent Appointments

Committee members' terms of office on standing committees expire on January 31 of the year after the year given in parentheses following their names, unless otherwise specified.

President Irving Kaplansky has appointed Stephen Lichtenbaum (1987) and Kenneth C. Millett (1987) to the *Committee on Research Fellowships*. Ivar Stakgold (1986) has been appointed chairman. Continuing members of the committee are J. William Helton (1986), Peter J. Kahn (1986), and Neil I. Koblitz (1986). Terms expire on June 30.

Hsiung Kuo (1986) has been appointed chairman of the *Committee on Summer Institutes* by President Irving Kaplansky. Continuing members of the Committee are Albert Baernstein II (1987), H. Blaine Lawson, Jr. (1987), and Judith D. Sally (1986). Terms expire February 28.

Jerrold Marsden (1986) has been appointed chairman of the AMS-IMS-SIAM *Committee on Joint Summer Research Conferences in the Mathematical Sciences*. Continuing members of the committee are Ronald L. Graham (1987), Malcolm R. Leadbetter (1986), Angus J. Macintyre (1987), John R. Martin (1987), James McKenna (1986), Tilla Klotz Milnor (1987), Evelyn Nelson (1987), and Katsumi Nomizu (1986). Terms expire on June 30.

A joint AMS-MAA *Committee on Arrangements for the New Orleans Meeting* (January 7-11, 1986) has been appointed by Presidents Irving Kaplansky AMS and Lynn A. Steen MAA. The committee members 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), Stephen Scariano, and Peggy Soileau.

Reports of Past Meetings

The April Meeting in Tucson

The eight hundred and eighteenth meeting of the American Mathematical Society was held at the University of Arizona in Tucson, Arizona on Friday and Saturday, April 12-13, 1985. The meeting was held in conjunction with a meeting of the Mathematical Association of America and the Sociedad Matemática Mexicana. There were 117 registrants of which 81 were members of the Society. William Velez of the University of Arizona served as the local organizer of the Meeting.

Invited Addresses. By invitation of the Committee to Select Hour Speakers for Far Western Sectional Meetings, there were two invited one-hour addresses.

GEORGE M. BERGMAN of the University of California spoke on *Representable functors among categories of algebras*. He was introduced by Robert B. Warfield, Jr.

GREGORY BRUMFIEL of Stanford University spoke on *Modern real algebra*. He was introduced by Alfred W. Hales.

Special Sessions. By invitation of the same committee, there were five special sessions of selected papers. The topics of these special sessions, the names of the organizers and the lists of speakers are as follows:

Abelian group theory, ROSS BEAUMONT, University of Washington. The speakers were Ulrich Albrecht, David M. Arnold, Doyle Cutler, Temple H. Fay, H. Housen, Roger Hunter, John Irwin, Patrick W. Keef, Mark Lane, Charles Megibben, Edwin P. Oxford, J. D. Reid, Alexander Soifer, C. Vinsonhaler, Robert B. Warfield, Jr., William Wickless and George V. Wilson.

The arithmetic of algebraic function fields of one variable, DANIEL J. MADDEN, University of Arizona. The speakers were Michael D. Fried, Gerhard Frey, David M. Goss, David R. Hayes, Michael I. Rosen, Robert Valentini and Horst H. Zimmer.

Galois module structure of algebraic number fields, ALBRECHT FROHLICH, King's College, University of London, England, and the University of Arizona. The speakers were Stephen U. Chase, Lindsay N. Childs, Ted Chinburg, Gary Cornell, Kurt Foster, Donald E. Maurer, Leon R. McCulloh, Olga Taussky-Todd, Martin Taylor, Stephen V. Ullom and Stephen B. Watt.

New ideas in nonlinear science, ALAN C. NEWELL, University of Arizona. The speakers were Gregory Baker, Marcus Cohen, J. Doyle Farmer, Diego Bricio Hernandez, F. C. Hoppensteadt, Christopher Jones and Maciej Wojtkowski.

There was one session of seven contributed ten-minute papers. It was chaired by John Brillhardt.

MAA Program. The MAA program included two hour addresses as follows: one by Constance Reid titled *Hilbert as a household word*, and another by Ivan Niven, retiring president of the MAA, titled *Some observations on mathematics and mathematicians*. There were also two MAA sessions of contributed papers.

Hugo Rossi

Salt Lake City, Utah

Associate Secretary

Officers and Committee Members of the Society

Terms of Officers expire on December 31 of the year given.

Terms of Committee Members expire on January 31 of the year after the year given in parentheses following their names unless otherwise specified.

BOARD OF TRUSTEES

Steve Armentrout (ex officio)	1986	Cathleen S. Morawets Franklin P. Peterson	1985 1986
Ramesh A. Gangolli	1989	(ex officio)	
Frederick W. Gehring	1987	Paul J. Sally, Jr.,	1988
Ronald L. Graham, chairman	1986	secretary	
Irving Kaplansky (ex officio)	1986		

Committees of the Board of Trustees

Agenda and Budget

Steve Armentrout	Irving Kaplansky
Ronald L. Graham, chairman	Franklin P. Peterson
Paul R. Halmos	Everett Pitcher

Appeals Committee on Discounted Subscriptions

R. M. Girouard, consultant	Morton Lowengrub, chairman
Melvin Hochster, consultant	Franklin P. Peterson
William J. LeVeque (ex officio)	Paul J. Sally, Jr.

Audit

Steve Armentrout	Cathleen S. Morawets
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Computer Operations and Facilities,

Visiting Committee on

Lee P. Neuwirth	1985	Peter J. Weinberger	1987
S. Tucker Taft	1986		

Corporate Relations

Ramesh A. Gangolli, chairman	Maria M. Klawe Oscar S. Rothaus
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Endowment

Andrew M. Gleason W. Ted Martin, chairman	Cathleen S. Morawets
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Investment

Steve Armentrout Ramesh A. Gangolli	Franklin P. Peterson, chairman
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Legal Aid

Steve Armentrout Morton L. Curtis, chairman	Todd Dupont Murray Gerstenhaber
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Liaison Committee

Irving Kaplansky, chairman	Franklin P. Peterson Everett Pitcher
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Long Range Planning

Hyman Bass Ronald L. Graham Melvin Hochster, chairman	Franklin P. Peterson Everett Pitcher
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Membership

Frederick W. Gehring, 1986 chairman	-----	1986
Jack K. Hale	1985	-----
		1986

The Publication Program

Steve Armentrout	1986	William J. LeVeque (ex officio)	
Murray Gerstenhaber, 1986 chairman		Everett Pitcher (ex officio)	
William E. Kirwan II	1985	Hugo Rossi	1985
		Elias M. Stein	1985

Salaries

Steve Armentrout	Ronald L. Graham
Andrew M. Gleason, chairman	Franklin P. Peterson

Staff and Services

Steve Armentrout, chairman	Franklin P. Peterson Paul J. Sally, Jr.
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Liaison Committee

Irving Kaplansky, chairman	Franklin P. Peterson Everett Pitcher
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COUNCIL

Officers (Members of the Council, ex officio)

President	Irving Kaplansky	1986
Ex-President	Julia B. Robinson	1985
Vice-Presidents	Linda Preiss Rothschild	1986
	Jacob T. Schwartz	1985
	Stephen Smale	1985
Secretary	Everett Pitcher	1986
Associate		
Secretaries	Frank T. Birtel	1986
	W. Wistar Comfort	1986
	Robert M. Fossum	1985
	Hugo Rossi	1985
Treasurer	Franklin P. Peterson	1986
Associate Treasurer	Steve Armentrout	1986

Executive Committee of the Council

Hyman Bass	1987	Everett Pitcher
Paul R. Halmos	1985	(ex officio)
Melvin Hochster	1986	Julia B. Robinson
Irving Kaplansky, (ex officio) chairman		(ex officio) Jean E. Taylor
		1988

Members-at-Large

Daniel A. Burns	1987	Carlos E. Kenig	1986
Michael G. Crandall	1986	Michael Shub	1985
Peter L. Duren	1985	Olga Tausky-Todd	1985
David Eisenbud	1986	Jean E. Taylor	1986
Susan J. Friedlander	1985	Audrey A. Terras	1987
Paul R. Halmos	1985	William P. Thurston	1986
Robin Hartshorne	1985	David A. Vogan, Jr.	1987
Melvin Hochster	1986	-----	1987
Joseph B. Keller	1987		

Publications and

Communications Committees

Editorial Committees

(Except for Associate Editors and the Editorial Board for Contemporary Mathematics, members of these Committees are members of the Council, ex officio)

American Journal of Mathematics, Society's Representatives

Spencer Bloch	1985	Richard B. Melrose	1986
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Bulletin (New Series)

Hyman Bass, chairman	1986	Calvin C. Moore	1987
	1985		
Meyer Jerison			

Associate Editors for Research Announcements

Spencer Bloch	1987	H. Blaine Lawson, Jr.	1987
Ronald L. Graham	1987	Richard B. Melrose	1987
Roger Howe	1986	Yiannis Moschovakis	1986
Wu-chung Hsiang	1987	Harold M. Stark	1987

Associate Editors for Research - Expository Articles

Felix E. Browder	1986	Irving Kaplansky	1985
Benedict H. Gross	1986	John W. Milnor	1985
Morris W. Hirsch	1987	Wilfried Schmid	1986
Victor Kac	1987	Guido L. Weiss	1987

Colloquium

Raoul H. Bott	1987	Louis Nirenberg,	1985
Barry Mazur	1986	chairman	

Mathematical Reviews

Robert G. Bartle	1985	Morton Lowengrub	1987
Melvin Hochster,	1986	chairman	

Mathematical Surveys and Monographs

M. Susan Montgomery	1987	R. O. Wells, Jr.,	1985
Gian-Carlo Rota	1986	chairman	

Associate Editor

Carl M. Pearcy

Editorial Board for Contemporary Mathematics

R. O. Wells, Jr.,		Johannes C. C. Nitsche	
managing editor			1986
Adriano M. Garsia	1985	Carl M. Pearcy	1987
James I. Lepowsky	1985	Irving Reiner	1986
Jan Mycielski	1987	Alan D. Weinstein	1987

Mathematics of Computation

Walter Gautschi,	1986	John E. Osborn	1986
chairman		Hugh C. Williams	1985
Donald Goldfarb	1987		

Associate Editors

James Bramble	1986	Philip Rabinowitz	1987
Bille C. Carlson	1986	Ridgway Scott	1986
Eugene Isaacson	1986	Daniel Shanks	1987
Heinz-Otto Kreiss	1987	Frank Stenger	1986
James N. Lyness	1986	Hans J. Stetter	1985
Morris Newman	1986	G. W. Stewart	1986
Frank W. J. Olver	1986	Vidar C. Thomee	1986
Stanley J. Osher	1986	Lars B. Wahlbin	1986
Beresford Parlett	1985	John W. Wrench, Jr.	1987

Proceedings

Richard R. Goldberg	1987	George R. Sell	1986
Irwin Kra	1987	Daniel W. Strocck	1987
Andrew M. Odlyzko	1985	J. Jerry Uhl, Jr.,	1985
Donald S. Passman	1988	chairman	

Associate Editors

Thomas H. Brylawski		Larry J. Goldstein	
Dennis Burke		Thomas J. Jech	
John B. Conway		Walter Littman	
Doug Curtis		Haynes R. Miller	
William J. Davis		Paul S. Muhly	
David G. Ebin		Bhama Srinivasan	
Bert E. Fristedt		William C. Waterhouse	

Transactions and Memoirs

Donald L. Burkholder	1986	Linda Preiss Rothschild	
William B. Johnson	1985		1986
Tilla Klots Milnor	1987	Lance W. Small	1986
Walter David Neumann		Joel A. Smoller	1987
	1985		

Associate Editors

Ronald L. Graham	1986	Kenneth Kunen	1987
Peter W. Jones	1987	R. O. Wells, Jr.	1986

Communications

(Only the Chairman of this Committee is a member, ex officio, of the Council.)

Monitor Problems in Communication

W. Wistar Comfort	1985	Robert W. Ritchie	1985
Nancy Gubman,		Judith D. Sally	1987
consultant		Lynn A. Steen	1986
William J. LeVeque		Floyd L. Williams	1987
(ex officio)			
Marian B. Pour-El,	1986		
chairman			

**Internal Organization of the
American Mathematical Society**

Standing Committees**Committee on Committees**

Michael G. Crandall	1986	Irving Kaplansky	1986
Charles W. Curtis,	1986	Everett Pitcher (ex officio)	
chairman		Julia B. Robinson	1986
Ronald A. Fintushel	1986	Lance W. Small	1986
William H. Jaco	1986	Jean E. Taylor	1986

Nominating Committee

Heini Halberstam	1985	Barry Simon	1985
Robert P. Langlands	1985	Harold M. Stark,	1985
Vera S. Pless	1986	chairman	
Mary Ellen Rudin	1986	R. O. Wells, Jr.	1986
Michael Shub	1986		

Centennial Committee

Felix E. Browder		Everett Pitcher, chairman
Harold M. Edwards		-----
Andrew M. Gleason		

Ad Hoc Committees**Centennial Program Committee**

Hyman Bass		John W. Milnor
Felix E. Browder, chairman		Cathleen S. Morawetz
Philip A. Griffiths		

1984 Election Tellers

Michael A. Buchner		Roger C. Entringer
--------------------	--	--------------------

Other Publications Committees**Standing Committees****Abstracts Editorial Committee**

Frank T. Birtel (ex officio)		Everett Pitcher, chairman
W. Wistar Comfort		(ex officio)
(ex officio)		Hugo Rossi (ex officio)
Robert M. Fossum		
(ex officio)		

Notices Editorial Committee

Paul F. Baum	1986	Mary Ellen Rudin	1988
Ralph P. Boas	1988	Steven H. Weintraub	1988
Raymond L. Johnson	1986	Daniel Zelinsky	1986
Jill P. Mesirov (ex officio)			
Everett Pitcher, chairman			
(ex officio)			

Associate Editors

Ronald L. Graham,		Hans Samelson,
Special Articles		Queries

Proceedings of Symposia in Applied Mathematics Editorial Committee

Richard E. Ewing	1986	-----	1987
William A. Massey	1985		

Ad Hoc Committee**Advisory Committee on****a Russian-English Dictionary**

Robert G. Bartle		Edwin Hewitt
James R. Bunch		Hans F. Weinberger,
Paul R. Halmos		chairman

Program and Meetings**Standing Committees****Program Committee for National Meetings**

Kenneth J. Barwise	1986	Neil J. A. Sloane	1987
F. Reese Harvey	1987	Karen Uhlenbeck,	1985
Barry Mazur	1985	chairman	
Everett Pitcher (ex officio)		William P. Ziemer	1986

Central Sectional Meetings (Select Hour Speakers for)

Eric D. Bedford,	1985	Peter P. Orlik	1986
chairman		Jeffrey B. Rauch	1986
Robert M. Fossum		Bhama Srinivasan	1985
(ex officio)			

Eastern Sectional Meetings (Select Hour Speakers for)

W. Wistar Comfort		Srinivasa S. R. Varadhan	
(ex officio)			
Clifford J. Earle, Jr.	1986	Floyd L. Williams,	1986
George R. Kempf	1985	chairman	1985

Far Western Sectional Meetings**(Select Hour Speakers for)**

Ramesh A. Gangolli,	1985	Hugo Rossi (ex officio)
chairman		Masamichi Takesaki
Adriano M. Garsia	1986	-----
		1986

Southeastern Sectional Meetings**(Select Hour Speakers for)**

Frank T. Birtel (ex officio)	Michael Schlessinger	1985
Kevin M. McCrimmon	Leonard L. Scott, Jr.	1985
James R. Retherford	chairman	1986

Agenda for Business Meetings

Everett Pitcher, chairman	David A. Sanchez	1985
Marian B. Pour-El	Guido L. Weiss	1985

Gibbs Lecturers for 1985 and 1986,**Committee to Select**

Jim Douglas, Jr.	Marion B. Pour-El,
Samuel Karlin	chairman

Status of the Profession*Standing Committees***Academic Freedom, Tenure, and****Employment Security**

Edward George Effros	Vera S. Pless	1987
Shoshichi Kobayashi	Halsey L. Royden,	1985
Charlotte Lin	chairman	1986
Robert R. Phelps	1986	

Employment and Educational Policy

Lida K. Barrett	1985	Gerald J. Janusz	1986
Stefan A. Burr	1986	Donald C. Rung,	1987
Philip C. Curtis, Jr.	1987	chairman	
Lisl Novak Gaal	1985		

Data Subcommittee

Lida K. Barrett	1985	James W. Maxwell	
Edward A. Connors	1987	(ex officio)	
Susan J. Devlin	1986	Donald E. McClure	1987
Lincoln K. Durst,		Donald C. Rung,	1986
consultant		chairman	
Arthur P. Mattuck	1985		

Employment Concerns Subcommittee

Charlotte Lin	1985	Barnet M. Weinstock,	1986
Audrey A. Terras	1986	chairman	
Robert J. Thompson	1985		

Short Course Subcommittee

Stefan A. Burr,	1986	Gerald J. Janusz	1987
chairman		Barbara L. Ososky	1985
Lisl Novak Gaal	1986	Philip D. Straffin, Jr.	1985

Human Rights of Mathematicians

Lenore Blum	1986	Leon A. Henkin	1985
Charles Herbert Clemens		Joshua A. Leslie	1986
	1987	John Nohel	1985
Chandler Davis,	1986	Seymour Schuster	1987
chairman			

Opportunities in Mathematics**for Disadvantaged Groups**

Manuel P. Berriosabal	1985	Gloria F. Gilmer,	1985
William G. Chinn	1987	chairman	
Amassa C. Fauntleroy	1987	Harold J. Stolberg	1987
Tepper L. Gill	1987		

Professional Ethics

Paul R. Halmos	1985	-----	1987
Anneli Lax	1985	-----	1987
Murray H. Protter,	1986		
chairman			

Research Fellowships (Terms expire on June 30)

J. William Helton	1986	Kenneth C. Millett	1987
Peter J. Kahn	1986	Ivar Stakgold,	1986
Neil I. Koblitz	1986	chairman	
Stephen Lichtenbaum	1987		

Science Policy

Hyman Bass	1987	Joseph J. Kohn	1985
Felix E. Browder,	1987	William J. LeVeque	
chairman		(ex officio)	
Ronald G. Douglas	1986	Cathleen S. Morawetz	1985
Frederick W. Gehring	1987	Julia B. Robinson	
Louis N. Howard	1986	(ex officio)	
Irving Kaplansky		Hugo Rossi	1985
(ex officio)		Guido L. Weiss	1985

Service to Mathematicians in Developing Countries

Raymond G. Ayoub,	James Eells
chairman	Donald M. Hill
James A. Donaldson	Marshall H. Stone

Translations from Chinese

Sun-Yung Alice Chang	Tai-Ping Liu
Tait-Yuen Lam, chairman	Franklin P. Peterson
Chia-Chiao Lin	

Prizes and Awards*Standing Committees***National Awards and Public Representation**

William Browder	1985	Everett Pitcher (ex officio)
Irving Kaplansky,	1987	Julia B. Robinson
chairman		1985

Steele Prizes (Terms expire on June 30)

Richard W. Beals	1987	Lawrence E. Payne	1987
Jerry L. Bona	1987	George B. Seligman	1986
Charles W. Curtis	1986	Patricia Lilaine Sipe	1986
Harold M. Edwards	1986	-----	1988
Frederick W. Gehring	1986	-----	1988

*Ad Hoc Committee***Veblen Prize, Committee to Select the Winner of the**

R. H. Bing	Shing-Tung Yau,
Richard K. Lashof	chairman

Institutes and Symposia*Standing Committee***Summer Institutes and Special Symposia**

(Terms expire on February 28)

Albert Baernstein II	1987	Judith D. Sally	1986
Hui-Hsiung Kuo,	1986	-----	1988
chairman			1988
H. Blaine Lawson, Jr.	1987		

*Ad Hoc Committee***1986 Summer Institute on Representations of****Finite Groups and Related Topics**

Jonathan L. Alperin,	Walter Feit
chairman	Paul Fong
Charles W. Curtis	

Joint Committees**AMS-ASA-IMS-MAA-NCTM-SIAM Committee on****Women in the Mathematical Sciences**

Nancy Angle (NCTM)	1985	Dianne P. O'Leary	1985
Raymond G. Ayoub	1986	(SIAM)	
(AMS)		Ingram Olkin (IMS)	
Susan J. Devlin (ASA)		Katherine L. Pedersen	1985
Marjorie G. Hahn (IMS)		(NCTM)	
Gloria C. Hewitt	1986	Linda Petzold (SIAM)	1986
(MAA)		Judith Roitman	1986
Julia Knight (AMS)	1986	(AMS)	
Carole B. LaCampagne		Alice T. Schafer	1986
(AMS, MAA),		(MAA)	
chairman	1986	Elizabeth L. Scott (IMS)	
Betty K. Lichtenberg	1987	----- (AMS)	1987
(NCTM)		----- (SIAM)	1987

AMS-ASL-IMS Committee on Translations from**Russian and Other Foreign Languages**

Boris M. Schein (AMS),
chairman
1985

AMS Subcommittee Members

Michael I. Brin	1987	Dmitry Khavinson	1987
Frank B. Cannonito	1985	Marian B. Pour-El	1985
David V. Chudnovsky	1986	Marina Ratner	1985
Igor Dolgachev	1987	Donald E. Sarason	1985
Richard Ericson	1987	Boris M. Schein,	1985
Jack K. Hale	1986	chairman	

ASL Subcommittee Members

Gregory L. Cherlin	1986	Vladimir Lifschitz	1987
James P. Jones	1986	Gregory Minc	1987

IMS Subcommittee Members

Miklós Csörgő Eugene Lukacs, chairman
 Eugene M. Klimko Lajos F. Takacs

AMS-IMS-SIAM Ad Hoc Executive Committee of The Evaluation Panel for NSF Postdoctoral Fellowships in the Mathematical Sciences

Mark Ablowitz (SIAM) William T. Trotter, Jr. (AMS)
 George C. Tiao (IMS)

AMS-IMS-SIAM Committee on Joint Summer Research Conferences in the Mathematical Sciences

(Terms expire on June 30)

Ronald L. Graham	1987	James McKenna	1986
Malcolm R. Leadbetter	1986	Tilla Klots Milnor	1987
Angus J. Macintyre	1987	Evelyn Nelson	1987
Jerrold E. Marsden,	1986	Katsumi Nomizu	1986
chairman	-----	-----	1986
John R. Martin	1987	-----	1987

AMS-IMS-SIAM Committee on Scientific Collaboration with Latin American Countries

Richard J. Griego (AMS), Richard A. Tapia (SIAM)
 chairman Cesareo Villegas (IMS)
 Juan Jorge Schäffer (AMS)

AMS-MAA Arrangements Committee for the New Orleans Meeting, January 7-11, 1986

Frank T. Birtel	Charles Rees
(ex officio)	Kenneth A. Ross
L. W. Jones	(ex officio)
William J. LeVeque	Stephen Scariano
(ex officio)	Peggy Soileau
John Liukkonen	
Michael Mislove,	
chairman	

AMS-MAA Arrangements Committee for the Laramie Meeting, August 12-15, 1985

Sandy H. Adams	Melfried Olson
Myron B. Allen	Kenneth A. Ross
Lois Kline	(ex officio)
William J. LeVeque	
(ex officio)	

AMS-MAA Joint Program Committee for the Laramie Meeting

Jeanne L. Agnew	Paul F. Baum
George E. Andrews	William P. Ziemer

AMS-MAA Joint Program Committee for the New Orleans Meeting

George E. Andrews	W. Gilbert Strang
Judith V. Grabiner	William C. Waterhouse
Neil J. A. Sloane,	
chairman	

AMS-MAA Joint Meetings Committee

William J. LeVeque,	Kenneth A. Ross
(ex officio) chairman	Alfred B. Willcox
Everett Pitcher	

AMS-MAA-NAM Joint Committee on Graduate Programs at Traditionally Black Institutions

C. B. Bell (AMS)	I. N. Herstein (MAA)
Lipman Bers (AMS)	Frank A. James (NAM)
R. Creighton Buck (MAA)	Ted Sykes (NAM)

AMS-MAA-SIAM Congressional Science Fellowship**Selection Panel (Terms expire on March 1)**

Richard D. Anderson	1984	Louise A. Raphael	1986
(MAA)		(AMS)	
T. Christine Stevens	1985	Marcia P. Sward	1987
(SIAM)		(CBMS)	
Thomas R. Kramer,	1984		
chairman			

AMS-MAA-SIAM Committee on Employment Opportunities (Terms expire on October 31)

Wilfred E. Barnes	1987	Calvin T. Long (MAA)	1986
(MAA)			
Richard E. Ewing	1986	John W. Petro (AMS)	1985
(SIAM)		Donald C. Rung	1987
Patrick Hagan (SIAM)	1985	(AMS)	

AMS-MAA-SIAM Joint Administrative Committee

I. Edward Block (SIAM)	Everett Pitcher (AMS),
Paul W. Davis (SIAM)	chairman
Leonard Gillman (MAA)	Kenneth A. Ross (MAA)
William J. LeVeque (AMS)	Alfred B. Willcox (MAA)
Franklin P. Peterson (AMS)	

AMS-MAA-SIAM Joint Policy Board for Mathematics

I. Edward Block (SIAM)	Kenneth A. Ross	1986
(ex officio)	(MAA)	
Gene H. Golub (SIAM)	Ivar Stakgold	1986
(ex officio)	(SIAM)	
Irving Kaplansky (AMS)	Lynn A. Steen (MAA)	
(ex officio)	(ex officio)	
William J. LeVeque (AMS)	Alfred B. Willcox (MAA)	
(ex officio)	(ex officio)	
Everett Pitcher	1986	
(AMS)		

Joint Policy Board for Mathematics Executive Secretary for National Affairs:

Kenneth M. Hoffman
 Cambridge Office
 Room 2-280, Massachusetts Institute of Technology
 Cambridge, MA 02139
 Telephone: 617-253-3214
 Washington Office
 Mathematical Association of America
 1529 Eighteenth Street, N.W., Washington, DC 20036
 Telephone: 202-387-5200

AMS-MAA-SIAM Joint Coordinating Committee on Public Understanding of Mathematics

Ronald L. Graham (AMS)	Lynn A. Steen (MAA)
Joseph B. Keller (SIAM)	

AMS-MAA-SIAM Joint Committee on the Status of the Profession

Lida K. Barrett (MAA)	Melvin Henriksen (AMS)
Wendell H. Fleming (SIAM)	Bernard L. Madison (MAA)
Louise Hay (AMS)	

AMS-SIAM Committee on Applied Mathematics

C. K. Chu	1985	Alan G. Konheim	1985
Constantine M. Dafermos	1986	George C. Papanicolaou,	1986
James M. Hyman	1987	chairman	
		Robert F. Warming	1987

AMS-SIAM Committee on**Mathematics in the Life Sciences**

Gail A. Carpenter	1986	Richard E. Plant,	1988
Kenneth L. Lange	1987	chairman	
Hans G. Othmer	1988	John Rinzel	1986
Alan S. Perelson	1987		

AMS-SIAM Committee to Screen Applicants for Graduate Study from the People's Republic of China

Chia-Chiao Lin	Mei-Chang Shen
Beresford N. Parlett	Karen Uhlenbeck
Franklin P. Peterson	

AMS-SIAM Committee to Select the Wiener Prize for 1985

Paul R. Garabedian,	Louis N. Howard
chairman	Gerald B. Whitham

Representatives**Advisory Board of the National Translations Center of the John Crerar Library**

Ralph P. Boas

Conference Board of the Mathematical Sciences

Irving Kaplansky 1986

Fulkerson Prize Committee

Alan J. Hoffman

Section A of the American Association for the Advancement of Science (Term expires on May 27)

Martin D. Davis 1986

U.S. National Committee on Theoretical and Applied Mechanics (Term expires on October 31)

Stuart S. Antman 1988

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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.

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POSITIONS AVAILABLE

BROWN UNIVERSITY

Professorship at the Associate level or above, with tenure, beginning July 1, 1986. Salary to be negotiated. Applicants should have outstanding records of research and strong commitment to teaching. Curriculum vitae and 3 letters of recommendation should be received by October 15, 1985. Equal Opportunity/Affirmative Action Employer. Address inquiries to John Wermer, Mathematics Department, Providence, RI 02912, Executive Officer.

UNIVERSITY OF AUCKLAND

New Zealand

MATHEMATICS AND STATISTICS DEPARTMENT

Applications are invited for a Lectureship in Mathematics, from persons who have postgraduate qualifications and proven research ability in any area of pure or Applied Mathematics, who can contribute to the Departments teaching and research programmes. Teaching potential will be carefully considered. Salary range \$NZ23,622 - 27,928. Closing date 31 August 1985. Conditions of Appointment and further details from Assistant Registrar (Academic Appointments), University of Auckland, Private Bag, Auckland, New Zealand.

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 Teichmüller 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.

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.

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.

POSITIONS AVAILABLE

THE AUSTRALIAN NATIONAL UNIVERSITY invites applications from suitably qualified women and men for appointment to the position of POSTDOCTORAL FELLOW/RESEARCH FELLOW/SENIOR RESEARCH FELLOW, AUTOMATED REASONING PROJECT, in the RESEARCH SCHOOL OF SOCIAL SCIENCES. The Project will be concerned with investigating the uses of non-classical logics in automated reasoning and is intended to substantially extend the research previously done in the Department of Philosophy, RSSS, into automated theorem proving for such logics. Special emphasis will be placed on investigating applications of this research, in particular to problems in number theory. As well as the usual research support, the Project expects to have its own dedicated computer. Applicants should be logicians or suitably qualified computer scientists, mathematicians or philosophers. It is expected that the appointments will be taken up after 1 April 1986. Applicants must write to the Registrar for further particulars. Other enquiries should be directed to the Deputy Coordinator of the Project, Dr. M. A. McRobbie (062) 49 2035 or (062) 49 2341. Closing date, 14 August 1985, Ref: SS 22.5.2. Salary will be in accordance with qualifications and experience within the range: Postdoctoral Fellow \$22,614–\$25,905 p.a.; Research Fellow \$26,236–\$34,467 p.a.; Senior Research Fellow \$36,649–\$43,715 p.a. Current exchange rate \$A1 = \$US.69. Appointment, unless otherwise stated, will be: Senior Research Fellow/Research Fellow normally up to three years with the possibility of extension to maximum of five years; Postdoctoral Fellow normally two years, with the possibility of extension to maximum of three years. Grants towards travel, assistance with housing, superannuation. Maternity leave is available. The University reserves the right not to make an appointment or to make an appointment by invitation at any time. Prospective applicants should write for further particulars quoting the reference number before submitting applications to Patricia M. White, Acting Registrar, GPO Box 4, Canberra, ACT, 2601 Australia.

THE UNIVERSITY IS AN EQUAL OPPORTUNITY EMPLOYER

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.

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

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*.

UCSB is an equal opportunity/affirmative action Employer.

DEPARTMENT OF MATHEMATICS ILLINOIS INSTITUTE OF TECHNOLOGY

Nominations and applications are invited for the position of chairman, Department of Mathematics. Qualifications include an earned doctorate, teaching and research experience as a university faculty member, preferably in an area of applied mathematics or statistics, leadership potential for departmental development and the ability to attract funded research. The starting date for this position is August 1986.

Applicants should submit a complete résumé. Applications, nominations and inquiries should be sent to Professor Kenneth Schug, Department of Chemistry, Illinois Institute of Technology, Chicago, IL 60610. Illinois Institute of Technology is an equal opportunity/affirmative action employer.

POSITIONS AVAILABLE

THE UNIVERSITY OF WESTERN ONTARIO DEPARTMENT OF MATHEMATICS

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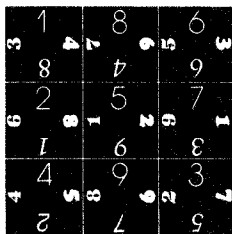
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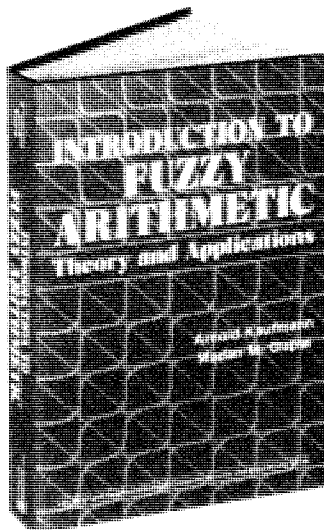
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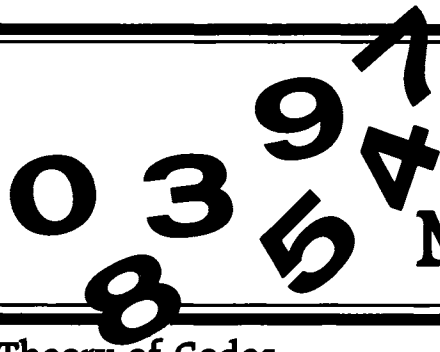


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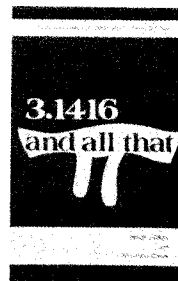
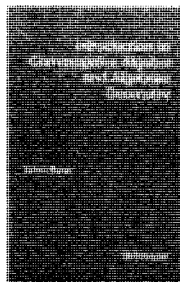
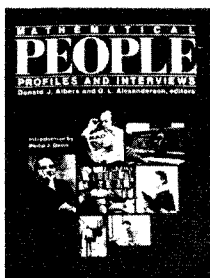
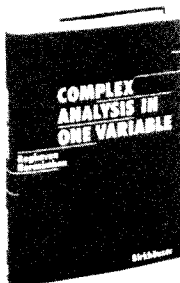
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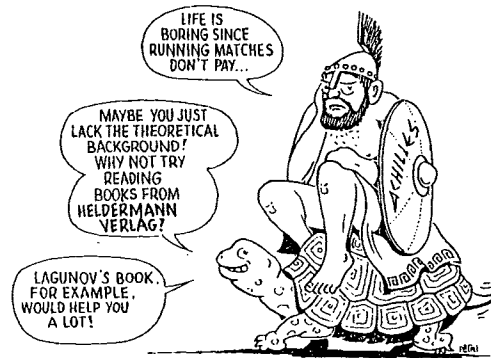
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During his early days as a mathematician, Errett Bishop made distinguished contributions in many branches of analysis—first in operator theory, then in the theory of polynomial approximation, and thence to his outstanding research in function algebras. This work in turn led him to his highly original approach to the theory of functions of several complex variables.

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The object of the present book is to present a view of Errett Bishop, who died suddenly in 1983 at the age of 54, as a human being, a colleague, and a mathematician. An eloquent statement of his philosophy is contained in his paper, "Schizophrenia in Contemporary Mathematics", which resulted from his AMS Colloquium Lectures in 1973 and which occupies about one-third of the book. In addition, there are memorial articles by S. Warschawski, J. Wermer, J. Kelley, H. Royden, I. Glicksberg, A. Nerode/G. Metakides/R. Constable, and Metakides/Nerode/R. A. Shore.

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