NOTICES OF THE AMERICAN MATHEMATICAL SOCIETY

Robert D. MacPherson
Receives Second NAS Award
in Mathematics page 325

Salt Lake City Meeting (April 9–10) page 339
Washington, D.C. Meeting (April 17–18) page 348

Vancouver, British Columbia Meeting
(August 15–19, 1993)
First Announcement page 366

APRIL 1993, VOLUME 40, NUMBER 4

Providence, Rhode Island, USA

ISSN 0002-9920

Calendar of AMS Meetings and Conferences

This calendar lists all meetings and conferences approved prior to the date this issue went to press. The summer and annual meetings are joint meetings of the Mathematical Association of America and the American Mathematical Society. **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, insofar as is possible. Abstracts should be submitted on special forms which are available in many departments of mathematics and from the headquarters office of the Society. Abstracts of papers to be presented at the meeting must be received at the headquarters of the Society in Providence, Rhode Island, on or before the deadline given below for the meeting. Note that the deadline for abstracts for consideration for presentation at special sessions is usually three weeks earlier than that specified below.

Meetings

Meeting #		Date	Place	Abstract Deadline	Program Issue
880	†	April 9–10, 1993	Salt Lake City, Utah	Expired	April
881	†	April 17–18, 1993	Washington, D.C.	Expired	April
882	†	May 20–23, 1993	DeKalb, Illinois	Expired	May-June
883	†	August 15–19, 1993 (96th Summer Meeting) (Joint Meeting with the Canadian Mathematical Society)	Vancouver, British Columbia	May 18	July-August
884	*	September 18–19, 1993	Syracuse, New York	May 18	September
885	*	October 1–3, 1993 (Joint Meeting with the Deutsche Mathematiker-Vereinigung e.V.)	Heidelberg, Germany	June 17††	September
886	*	October 22–23, 1993	College Station, Texas	August 4	October
887	*	November 6–7,1993	Claremont, California	August 4	October
888	*	December 1–4, 1993 (Joint Meeting with the Sociedad Matematica Mexicana)	Merida, Yucatan, Mexico	August 4	November
889	*	January 12–15, 1994 (100th Annual Meeting)	Cincinnati, Ohio	October 1	December
		March 18–19, 1994	Lexington, Kentucky		
		March 25–26, 1994	Manhattan, Kansas		
		April 9–10, 1994	Brooklyn, New York		
		June 16–18, 1994	Eugene, Oregon		
		August 15–17, 1994 (97th Summer Meeting)	Minneapolis, Minnesota		
		October 28–29, 1994	Stillwater, Oklahoma		
		November 11–13, 1994	Richmond, Virginia		
		March 24–25, 1995	Chicago, Illinois		
		November 3–4, 1995	Kent, Ohio		
		January 10–13, 1996 (102nd Annual Meeting)	Orlando, Florida		
		March 22–23, 1996	Iowa City, Iowa		

* Please refer to page 401 for listing of Special Sessions.
† Please refer to the Table of Contents for further information.
†† This date is later than previously published.

Conferences

June 7–18, 1993: AMS-SIAM Summer Seminar in Applied Mathematics on Tomography, Impedance Imaging, and Integral Geometry, Mount Holyoke College, South Hadley, Massachusetts.
June 23, 1993: Symposium on Some Mathematical Questions in Biology on Theories for the Evolution of Haploid-Diploid Life Cycles, Snowbird, Utah.
July 10–August 6, 1993: Joint Summer Research Conferences in the Mathematical Sciences, University of Washington, Seattle, Washington.
July 11–30, 1993: AMS Summer Institute on Stochastic Analysis, Cornell University, Ithaca, New York.
August 9–13, 1993: AMS Symposium on Mathematics of Computation 1943–1993: A Half-Century of Computational Mathematics, University of British Columbia, Vancouver, Canada.

Other Events Cosponsored by the Society

May 30–June 13,1993: First Caribbean Spring School of Theoretical Physics and Mathematics on Infinite Dimensional Geometry, Noncommutative Geometry, Operator Algebras, and Particle Physics, Pointe à Pitre, Guadeloupe. Cosponsored by the Société Mathématique de France.
July 11–15, 1993: Second World Congress on Neural Networks, Portland, Oregon.
October 15–17, 1993: Second International Conference on Ordinal Data Analysis, University of Massachusetts, Amherst. Cosponsored by the University of Massachusetts, Technische Hochschule Darmstadt, and the Classification Societies of North America and Germany.

Deadlines

	July-August Issue	September Issue	October Issue	November Issue
Classified Ads*	June 24, 1993	July 29, 1993	September 2, 1993	September 30, 1993
News Items	June 8, 1993	July 15, 1993	August 20, 1993	September 20, 1993
Meeting Announcements**	June 14, 1993	July 19, 1993	August 20, 1993	September 23, 1993

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

NOTICES OF THE AMERICAN MATHEMATICAL SOCIETY

ARTICLES

325 Robert D. MacPherson Receives Second NAS Award in Mathematics

Robert D. MacPherson was presented the second National Academy of Sciences Award in Mathematics on April 27, 1992, for "his role in the introduction and application of radically new approaches to the topology of singular spaces including characteristic classes, intersection homology, perverse sheaves, and stratified Morse theory".

327 Annual AMS-MAA Survey: Doctoral Degrees Conferred (*Supplementary List*)

A list of names and thesis titles for the 1991–1992 Ph.D. class is featured. The second report of the AMS-MAA Survey will appear in a future issue of the *Notices*.

FEATURE COLUMNS

329 Computers and Mathematics *Keith Devlin*

Two reviews constitute this month's column. First, Joel Davis, Tevian Dray, and André Weideman report their findings with the Student Edition of *MATLAB*; then Larry Riddle looks at *GyroGraphics*, version 4.

DEPARTMENTS

323 Letters to the Editor

328 Forum

335 News and Announcements

338 Funding Information for the Mathematical Sciences

339 Meetings and Conferences of the AMS
Salt Lake City, UT
April 9–10, 339
Washington, DC
April 17–18, 348
DeKalb, IL
May 20–23, 363
Vancouver, British Columbia
August 15–19, 366
Heidelberg, Germany
October 1–3, 400
Merida, Yucatan, Mexico
December 1–4, 400
Invited Addresses and Special Sessions, 401
1993 Symposium on Some Mathematical Questions in Biology, 405

406 Mathematical Sciences Meetings and Conferences

418 New Publications Offered by the AMS

422 AMS Reports and Communications
Recent Appointments, 422
Officers of the Society, 422
Reports of Council Meetings, 423, 425
Report of Business Meeting, 426

428 Backlog of Research Journals

431 Miscellaneous
Personal Items, 431
Deaths, 431

432 Classified Advertising

439 Forms

NOTICES
OF THE
AMERICAN MATHEMATICAL SOCIETY

EDITORIAL COMMITTEE
Sheldon Axler
Amassa C. Fauntleroy
Robert M. Fossum (Chairman)
Susan J. Friedlander (Forum Editor)
Carolyn S. Gordon
Carl R. Riehm
L. Ridgway Scott (Letters Editor)

MANAGING EDITOR
John S. Bradley

ASSOCIATE EDITORS
Jeffrey C. Lagarias, *Special Articles*

ASSOCIATE MANAGING EDITOR
Allyn Jackson

SUBSCRIPTION INFORMATION
Subscription prices for Volume 40 (1993) are $139 list; $111 institutional member; $83 individual member. (The subscription price for members is included in the annual dues.) A late charge of 10% of the subscription price will be imposed upon orders received from nonmembers after January 1 of the subscription year. Add for postage: Surface delivery outside the United States and India—$15; to India—$28; expedited delivery to destinations in North America—$32; elsewhere—$67. Subscriptions and orders for AMS publications should be addressed to the American Mathematical Society, P.O. Box 1571, Annex Station, Providence, RI 02901-1571. All orders must be prepaid.

ADVERTISING
Notices publishes situations wanted and classified advertising, and display advertising for publishers and academic or scientific organizations.

Copyright © 1993 by the American Mathematical Society. All rights reserved. Printed in the United States of America.

The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability. ♾ Most of this publication was typeset using the TEX typesetting system.

[*Notices of the American Mathematical Society* is published monthly except bimonthly in May, June, July, and August by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2213. Second class postage paid at Providence, RI and additional mailing offices. POSTMASTER: Send address change notices to *Notices of the American Mathematical Society*, Customer Service Department, American Mathematical Society, P. O. Box 6248, Providence, RI 02940-6248.] Publication here of the Society's street address, and the other information in brackets above, is a technical requirement of the U. S. Postal Service. All correspondence should be mailed to the Post Office Box, NOT the street address. Tel: 401-455-4000.

From the Executive Director . . .

ELECTRONIC PREPRINTS

The mathematics community has a highly-developed preprint culture. Even before easily accessible and inexpensive copying was available, mathematicians relied on the dissemination of preprints to make new results and techniques broadly known throughout the community. For at least a couple of decades, preprints have served as a primary means of information exchange within mathematics. Often preprints are distributed at the same time as the submission of a paper to a journal and appear within the network months (or even years) before the journal version. The journal version serves to provide the archived copy of record.

Electronic storage and delivery of information is creating a boom in the distribution of preprints. Electronic means are faster, less expensive, and more efficient, making any number of copies available with little more than the touch of a computer return key. Electronic bulletin boards, or electronic distribution and archival systems, are commonplace in mathematics. These systems bring a new democracy to the dissemination of information, with their widespread and open accessibility; however, they also bring a host of other issues. For the AMS, the questions are whether it has a role to play in this area and exactly what that role might be.

Electronic distribution services for preprints are not the same as electronic journals; the latter's most prevalent form today is simply an electronic delivery of the paper version. The currently accepted model of an electronic journal incorporates a peer review process and some level of an established editorial process. There is a limit to what can be expected of volunteer efforts in organizing refereeing and editing. Some strengths that the collective representation of the Society brings to establishing electronic journals are experience with volunteer editing and refereeing, continuity in the editorial process, and use of a common format and technology. Although electronic preprint services could also benefit from these capabilities and from centralization of the numerous sources of information, the role of the AMS in preprint dissemination is not clear. Advice within the Society has been toward caution in establishing mathematics preprint services, for a number of reasons.

The first voice of caution is not to do something that can be done equally well by volunteers. However, an alternate view is that there are benefits gained by centralizing a source for available information and providing a common format and technology. Also, there are arguments for the Society stimulating and supporting emerging efforts and new directions both in mathematics and in the delivery and retrieval of information.

Another concern is the possible blurring of the distinction between refereed and unrefereed scientific work. If a bulletin board is open, accepting any and all submissions, then there will inevitably be submissions that are not up to expected standards. If the Society places its imprimatur on a preprint service, does this give all postings on the board some credence as accepted science? Boards can be moderated; but would a moderated board, sanctioned by the Society, lend even more credence to results posted there and, particularly, blur the distinction between refereed and unrefereed results.

Ownership of material is another major concern. Dissemination of preprints has been commonplace and accepted; however, new technology provides unlimited dissemination, archiving, and retrieval capabilities. The source can be left with the author, as is the current situation with preprints, but early experience shows much higher use of those bulletin boards that have deposited and archived papers. There remains concern about copyright (ownership) and unlimited access to electronic versions of material.

The discussions within the Society have culminated in the formation of a volunteer committee on Electronic Products and Services, so that the Society can now move forward and bring leadership to this emerging area of communication of mathematics.

William Jaco

Letters to the Editor

Mathematics Funding

As a compulsive reader of the *New York Times*, the *Boston Globe*, the *Notices of the AMS*, and *Science*, I have been following with dread and horror the rout of the Good Guys (Small Science) by the Bad Guys (Big Science). The last straw for me was the story in the Dec. 28 issue of the *Times* in which it was asserted that someone in power in Washington has seriously suggested taking money from the pitifully small National Science Foundation (NSF) math budget in order to dig holes in the ground in key congressional districts, with the excuse that one more attempt will be made to detect gravitational waves, as predicted by the Einstein-Hilbert gravitational equations. Are we now in the position of the Sans Cullotes when Marie Antoinette told them to Eat Cake?

I also want to take this occasion to make a more realistic and serious proposal than Revolution. Clearly, a reason why the financial situation is so desperate is that the importance of the work of professional mathematicians for the advance of science and technology is still not comprehended by decision-makers in Washington. As someone who has screamed loudly about this for a long time, I must say that the situation at the academic research level has much improved in recent years. However, there is still a great gap between the small in-group expertise, which is best when the research problems are relatively clear-cut, and the much more amorphous and decentralized form, in which mathematics is encountered in a laboratory or scientific-engineering research setting, especially now that the advance of computer technology has so dramatically decentralized the way mathematical expertise impacts on scientific and engineering problem areas. Some in Washington (perhaps the same people who want to dig holes in key congressional districts?) seem to want to foster closer contact between academic science and industry by establishing more Super-Centers: In my opinion, at least as far as mathematics is concerned, exactly the opposite is needed!

To support this claim, I can cite my own decentralized research experiences and their bureaucratic genesis. I began with a stint at the Lincoln Laboratory of MIT from 1959–1961, when the space program was in the process of being initiated. I was hired in a random way, but found a fascinating research milieu which stimulated me to make research contributions to Control and Mechanics which have lasted and influenced the course of these disciplines. From 1961–1968 I was involved (at the Berkeley Rad Lab, Argonne National Laboratory, Cal Tech, SLAC, and UC Berkeley Physics Dept.) in the successful introduction of new mathematical tools and ways of thinking into elementary particle physics. Again, I was supported at a very local level by "working" scientists and engineers who realized on their own that new mathematical tools were needed, and had sufficient (but, by today's standards, relatively modest) resources to hire someone like me without making a Federal Case of it! In 1975–1990 I was involved with a NASA aircraft control research group which was making creative contributions to the advance of control theory and practice. Again, I was hired by two research engineers who realized themselves that the mathematics I knew would be useful in what they were trying to do. The funding mechanism was (partially) a program called "The NRC Research Associateships", which were expressly designed to acquaint academic types with the industrial problems in a localized way, and which I have heard are now drastically cut back.

I would propose a Program (perhaps a collaboration of the AMS, SIAM, and the NSF?) to foster the sort of localized creative research interchange I have experienced, instead of the empire-building SuperCenter mentality which we all know in our hearts is not the way serious mathematics and science is born. A scientist or engineer in industry or academia who might benefit from interaction with professional mathematicians could, through the Program, be put in touch with suitable mathematicians who would be willing to help in a very localized and sustained way and be funded modestly by the Program, perhaps with some share-funding. After a preliminary scouting of the mathematical landscape, Meetings could be held (again, at least partially funded by the Program) to bring in wider expertise. As a side benefit, as the mathematician's students and colleagues also collaborate on the research problems which are specific to the local situation, there might, over time, develop the sort of "market" in industry for well-trained mathematicians that is needed to ameliorate the unemployment which seems to have come upon us. The same idea could be adapted to the educational needs of the country: academics could be funded to set up special programs in schools, aid in improving mathematics courses for teachers, etc.

In any case, I believe that it would improve our public image (and morale) if we as a profession would take greater steps to bring to the attention of a wider world what contemporary mathematics has to offer for the advance of science and technology and impress on the powers-that-be that we have developed a resource of great potential benefit to the economy and educational structure!

Robert Hermann
Brookline, MA

(Received January 11, 1993)

Letters to the Editor

Letters submitted for publication in the *Notices* are reviewed by the Editorial Committee.

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

Letters should be typed and in legible form or they will be returned to the sender, possibly resulting in a delay of publication. All published letters must include the name of the author. Letters which have been, or may be, published elsewhere will be considered, but the Managing Editor of the *Notices* should be informed of this fact when the letter is submitted.

The committee reserves the right to edit letters.

Letters should be mailed to the Editor of the *Notices*, American Mathematical Society, P. O. Box 6248, Providence, RI 02940, or sent by e-mail to notices@math.ams.org, and will be acknowledged on receipt.

Ethnomathematics

The *Notices* article by U. D'Ambrosio (December 1992, 1183–1185) included the following assertion:

"If we go back to the Greeks, what is the origin of the word mathematics? Etymology tells us that *mathema* or *mathemata* means explanation or understanding, while *tics* comes from *techné*, which is the same root that gave us art and technique. It is coherent with early Greek writings to say that *Mathema tics* is the art or technique of explaining, understanding, in fact coping."

As he is speaking of a word we all know and love, readers might appreciate a more careful account of the etymology.

The ancient Greek word *mathemata* (singular *mathema*) means things learned or known; it was formed by combining the noun suffix "-mat-" with a verb root "mathe-" that means "learn" or "study". This word was then given the adjective suffix "-ic-", which means "related to" and is familiar even in English. Thus by etymology "mathematics" is material related to those things that can be truly learned and known. In particular, the last part of the word is formed in exactly the same way as "dramatic" from "drama" or "schematic" from "schema"; there is no connection with *techné* and no idea of "coping".

William C. Waterhouse
Pennsylvania State University
(Received January 8, 1993)

American Mathematical Society Translations, Series 2

Ordered Sets and Lattices II
Volume 152

This indispensable reference source contains a wealth of information on lattice theory. The book presents a survey of virtually everything published in the fields of partially ordered sets, semilattices, lattices, and Boolean algebras that was reviewed in *Referativnyí Zhurnal Matematika* from mid-1982 to the end of 1985. Of interest to mathematicians, as well as to philosophers and computer scientists in certain areas, this unique compendium is a must for any mathematical library.

1991 *Mathematics Subject Classification*: 06; 03, 08
ISBN 0-8218-7501-9, 247 pages (hardcover), November 1992
Individual member $77, List price $128, Institutional member $102
To order, please specify TRANS2/152NA

Singularity Theory and Some Problems of Functional Analysis
Volume 153
S. G. Gindikin, *Editor*

The papers in this volume include reviews of established areas as well as presentations of recent results in singularity theory. The authors have paid special attention to examples and discussion of results rather than burying the ideas in formalism, notation, and technical details. The aim is to introduce all mathematicians—as well as physicists, engineers, and other consumers of singularity theory—to the world of ideas and methods in this burgeoning area.

1991 *Mathematics Subject Classification*: 40, 51, 57, 58, 92; 12, 19, 28, 32, 35, 49, 60
ISBN 0-8218-7502-7, 199 pages (hardcover), November 1992
Individual member $61, List price $101, Institutional member $81
To order, please specify TRANS2/153NA

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

Robert D. MacPherson Receives Second NAS Award in Mathematics

Robert D. MacPherson has received the National Academy of Sciences Award in Mathematics, a prize of $5000 established by the AMS to commemorate the Society's centennial in 1988. Professor MacPherson was recognized for "his role in the introduction and application of radically new approaches to the topology of singular spaces including characteristic classes, intersection homology, perverse sheaves, and stratified Morse theory." The award was one of thirteen presented at the Academy's 129th meeting on April 27, 1992.

This is the second time the prize has been awarded; the first award went to Robert P. Langlands of the Institute for Advanced Study in 1988. The award is given every four years in recognition of excellence in the mathematical sciences as evidenced by work published within a ten-year period and has no other restrictions concerning age, citizenship, or branch of mathematical study.

The major sources of funds for the award are generous gifts to the Society from the late Morris Yachter and the late Sidney Henry Gould. Yachter was an applied mathematician and engineer and was an AMS member from 1957 until his death in 1990. Gould had a long history of association with the Society, serving as Executive Editor of *Mathematical Reviews* and as AMS Editor of Translations; he died in 1986.

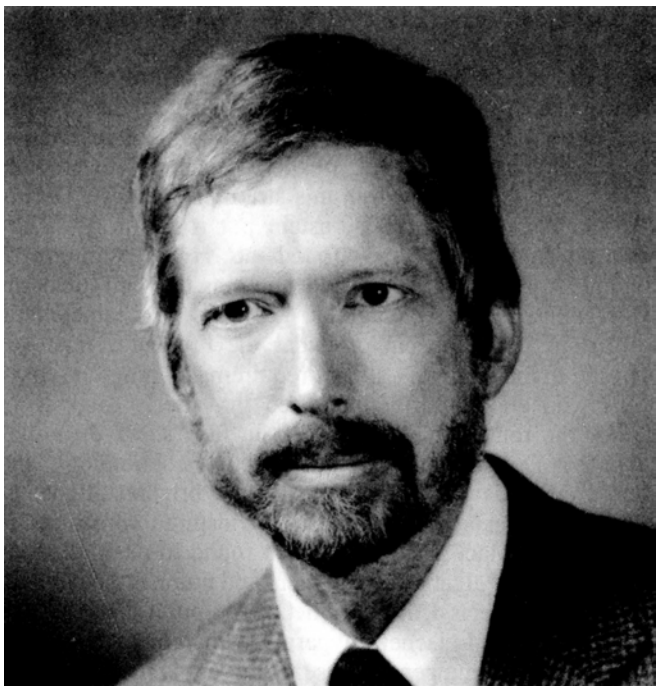
The committee choosing the 1992 awardee consisted of: William Browder (chair), Frederick W. Gehring, Richard G. Swan, and Daniel Gorenstein.

The Work of Robert D. MacPherson

The Managing Editor of *Notices* asked Raoul Bott of Harvard University to provide some comments on the work of Robert MacPherson. Professor Bott's response follows.

MacPherson was a graduate student at Harvard during the unruly years of the late 1960s, and it was my good fortune that he chose me as his thesis advisor. It soon became apparent that this at first rather shy young man had been blest with the gift of "seeing in all dimensions" to a quite unusual degree. My only task was to help him to communicate this vision to us less sighted ones. This gift is apparent in all of MacPherson's work, from his thesis on the characteristic classes of the singularities of maps, to his latest preprints, in collaboration with Fulton, on configuration spaces.

One of the most exciting instances in the pure mathematics of this century, as experienced by my generation, was surely the advent of sheaf theory in the 1940s and 1950s, which, in its various guises, forged links between topology, analysis, algebraic geometry, and number theory. Still, these new insights were clearly discernable only in the realm of nonsingular varieties and smooth manifolds. What was missing, and what to a large extent we now have, is an extension of this understanding into the much larger and, in so many cases, quite *unavoidable* domain of singular manifolds and stratified spaces.



Robert D. MacPherson

MacPherson has been one of the true pioneers of this step forward. His early work on singularities led him first to questions on characteristic numbers of singular spaces and then to one of his early achievements: the solution of a conjecture by Grothendieck and Deligne concerning characteristic classes of constructible sheaves. Soon thereafter, MacPherson started his very productive collaboration with

Baum and Fulton, and together they were able to formulate and prove a quite general statement of the Riemann-Roch theorem. But undoubtedly the centerpiece of the new understanding of stratified manifolds was the discovery of "intersection cohomology" by Goresky and MacPherson, which, according to the excellent survey article on this subject by Kleiman in *A Century of Mathematics in America Part* II, took place at the Institut des Hautes Etudes Scientifiques in the fall of 1974. Goresky was MacPherson's student at that time, and their wonderful collaboration has continued to this day.

At the center of our early understanding of the topology of manifolds stands the phenomenon of Poincaré duality. This hidden symmetry of the cohomology of a locally Euclidean space had already been discovered by Poincaré and is most easily formulated for compact orientable manifolds, where it asserts that: $H^n(M) \simeq H_{m-n}(M), m = \dim M$, or put differently: in complimentary dimensions, cohomology is in natural duality on such manifolds. In fact, one of the great driving forces of early sheaf theory was precisely the wish to produce a natural proof of this theorem, and to understand its implications in other more general situations, i.e., noncompact manifolds, local systems, etc. This symmetry was lost—one used to think irrevocably—once M acquired singularities.

The first great surprise of intersection cohomology was therefore that, by redefining the notion of chain and cycle for a stratified space, one could produce a new cohomology which agreed with the old notion in nonsingular instances, which did not depend on the stratification, and which satisfied Poincaré duality even on compact singular varieties. This in itself already achieved a goal set earlier by Dennis Sullivan—another of the gifted "seers" of this generation—to produce a "signature theorem" within this stratified category. During a recent conversation, J. Bernstein put it this way, "They (Goresky and MacPherson) found the '*right*' definition of cohomology." Bernstein was here applying the high standards of "*right*" exacted by algebraic geometry in characteristic p—that is, correct behavior under the Frobenius map—as opposed to the relatively simple requirements posed by those of us who are primarily interested in varieties over $\mathbb{R}$ or $\mathbb{C}$. For the remarkable fact is that in the "sheaf theoretic" guise that Deligne later gave intersection cohomology, and after prodigious work by many of the brightest lights of their generation, the $\mathbb{R}$-geometrically inspired constructs of Goresky and MacPherson were also found to meet all these requirements of algebraic geometers and number theorists. In particular, the "classical" Lefschetz fixed point theorem, and the two famous Lefschetz hyperplane theorems, were now also extended to the general case! But there is more: In some sense, wherever one could not get away from singularities, it turned out that the intersection cohomology behaved correctly. Over $\mathbb{R}$ it seems to yield the L^2 cohomology; with its aid, the Kazhdan-Lusztig conjectures in representation theory are solved; and it is also only in this context that the "Riemann-Hilbert problem" concerning the monodromies of differential equations finds its perfectly canonical formulation and solution.

Intersection cohomology, as well as the personal interactions of MacPherson with so many principals, has therefore played a decisive part in these cumulative achievements of the sheaf theory of the 1980s.

Of course, there is always a price to be paid for a deep understanding of so large and complicated an area of mathematics. It is paid in terms of the abstraction of the concepts and of the language. Thus, in this instance, the final clarity is only achieved in the realm of "perverse sheaves" or rather the derived category of complexes of such sheaves! But for the pilgrim of such a steep ascent there is vouchsafed, in the words of J. L. Verdier, a perfect category, a veritable "Paradise"!

MacPherson's interests really extend to all areas of mathematics, and his selfless devotion to our subject makes him an ideal and natural collaborator. The National Academy is to be congratulated for selecting him as their 1992 Prizewinner.

Biographical Sketch

Robert D. MacPherson was born in 1944 in Lakewood, Ohio. He received his B.A. from Swarthmore College in 1966 and his Ph.D. from Harvard University in 1970. He went to Brown University as a J. D. Tamarkin Instructor in 1972. By 1977 he had advanced from assistant professor to professor at Brown, and in 1985 he was named Florence Pirce Grant University Professor. In 1987 he moved to the Massachusetts Institute of Technology where he is currently chairman of the Pure Mathematics Committee.

Professor MacPherson has held numerous visiting positions at institutions all over the world, including the Institut des Hautes Etudes Scientifiques (IHES), Bûres-sur-Yvette (1974–1975, 1980–1981, Spring 1986); the Université de Paris VII (1976–1977); the Steklov Institute of Mathematics, Moscow (Fall 1980); the Consiglio Nazionale della Ricerche, Rome (Spring 1985); the Institute for Advanced Study, Princeton (Fall 1985); the University of Chicago (Fall 1991); and the Max-Planck Institut Für Mathematik, Bonn (Spring 1992).

Professor MacPherson presented the Hermann Weyl Lectures at the Institute for Advanced Study in Princeton in 1982 and the AMS Colloquium Lectures at the Joint Mathematics Meetings in San Francisco in January 1991. He delivered a plenary address at the International Congress of Mathematicians in 1983 in Warsaw. In addition, he presented the Unni Namboodiri Lectures at the University of Chicago in 1987 and the Hans Rademacher Lectures at the University of Pennsylvania in 1990.

Professor MacPherson was elected to the National Academy of Sciences and the American Academy of Arts and Sciences in 1992. He serves on the Advisory Committee for the Mathematical Sciences of the National Science Foundation. Well known for his concern for the Russian mathematical community, he is currently chair of the AMS Former Soviet Union Aid Fund Advisory Committee. He has donated his $5000 prize to the AMS fSU Aid Fund.

Doctoral Degrees Conferred

Supplementary List

1991–1992

The following list supplements the list of thesis titles published in the November 1992 issue of the *Notices*. Each entry contains the name of the recipient and the thesis title. The number in parentheses following the name of the university is the number of degrees granted by the department.

DISTRICT OF COLUMBIA

George Washington University (2)

OPERATIONS RESEARCH

Al-Mutairi, Dhaifalla Khalid, *Stochastic processes and their stochastic monotonicity properties in a layered defense system.*

Vopatek, Anne Louise, *Design of accelerated life tests: A Bayesian approach.*

IOWA

University of Iowa (1)

STATISTICS AND ACTUARIAL SCIENCE

Chang, Chee Jen, *Random coefficient Regression models in longitudinal studies.*

NEW YORK

Rensselaer Polytechnic Institute (4)

MATHEMATICAL SCIENCES

Borchers, Brian, *Improved branch and bound algorithms for integer programming.*

Fiedler, Stuart, *Model enhancement of stationary iterative methods.*

Kalocsai, Andre, *A study of asymptotic theories in nonlinear optics and hypersonic aerodynamics.*

Schurman, Iman, *Parabolic approximation models for acoustic and electromagnetic wave propagation.*

TEXAS

University of North Texas (4)

MATHEMATICS

Cossio, Jorge Ivan, *Multiple solutions for semilinear elliptic boundary value problems.*

Schlee, Glen Alan, *Borel sets with convex sections and extreme point selectors.*

Taylor, John, *Aspects of universality in function iteration.*

Wright, William Glen, *An algebraic characterization of stability groups.*

VIRGINIA

Virginia Polytechnic Institute and State University (1)

STATISTICS

Selander, Keith, *A function space approach to the generalized nonlinear model with applications to frequency domain spectral estimation.*

CANADA

University of Calgary (4)

MATHEMATICS AND STATISTICS

Boroczky, Karoly, *Intrinsic volumes of finite ball-packings.*

Li, Boyu, *The PT-order, cutsets and fixed points in posets.*

Misi, Titus S., *Random bivariate rays, statistical societies and Buffon's pi.*

Wang, Hong, *Packings, factors and factorizations of graphs.*

1990–1991

The following list supplements the list of thesis titles published in the November 1991 *Notices*, pages 1103–1121, the May/June 1992 *Notices*, pages 422–423, and the November 1992 *Notices*, page 1060.

GEORGIA

University of Georgia (1)

MATHEMATICS

Lin, Chin-Cheng, *H^p multipliers on the Heisenberg groups.*

NEW YORK

Rensselaer Polytechnic Institute (3)

MATHEMATICAL SCIENCES

McComb, Todd, *A study of two diverse problems in fluid dynamics in three parts.*

Orchard, Bradley, *Derivation and analysis of time-domain paraxial approximation for ocean acoustic wave propagation.*

Wang, Yun, *An adaptive local Hpr-refinement finite element method for parabolic partial differential equations.*

Erratum

Doctoral information for Robert Kelley and Catherine Samuelsen, Department of Mathematical Sciences, Rice University, was reported in the 1990–1991 list of doctoral degrees conferred. This information should have been reported in the list of doctoral degrees in 1991–1992.

Forum

The Forum section publishes short articles on issues that are of interest to the mathematical community. Articles should be between 1000 and 2500 words long. Readers are invited to submit articles for possible inclusion in Forum to:

Notices Forum Editor
American Mathematical Society
P.O. Box 6248
Providence, RI 02940

or electronically to notices@math.ams.org

Funding Mathematicians or Mathematics?

Ronald G. Douglas
SUNY at Stony Brook

Federal science funding is a topic much on the minds of Washington and the scientific community. The National Science Foundation and the National Institutes of Health strategic plans are outward manifestations of this concern, but, despite the plethora of editorials and articles, the topic is being largely ignored by the public as evidenced by its near omission from the recent political campaign. For the mathematical sciences community, however, current attention to this issue caps a decade of concern that began with the process leading to the David Report. However, much has changed in that decade, and unforeseen events of the last few years may prove to be more decisive than all the reports.

In discussing federal funding of the mathematical sciences, most people in the community choose to focus on the number of people supported, arguing that it is too small. The arguments that are presented, however, often remind me of the kind presented by students in their first rigorous mathematics course: a clear statement of what is to be proved, and a strong affirmation that it has been proved, but the assumptions being made are not articulated, and the steps of the argument often do not follow from one another. In particular, the arguments presented don't answer the obvious question: enough mathematicians are supported for what? The problem here is that we are on dangerous ground in attempting to justify mathematicians—that would be an entitlement program, and we can't compete with the needs of other groups on this basis. Moreover, although arguing for an entitlement would justify supporting every mathematician, the argument is moot since it will not succeed. Clearly the elderly, the homeless, the infirm, etc. are more deserving, or at least more numerous. No, we must argue for the support of the mathematical sciences. But even here we must be careful. Making the same case that can be made for poetry, classics, or art, to name a few, will likely result in federal funding for the mathematical sciences at the same level as for those subjects. And that is certainly not what most people want!

Rather, we must advance arguments that justify the federal funding of the mathematical sciences at a high level. But this requirement leads many mathematicians to water they don't want to drink. National needs that set the mathematical sciences apart from other disciplines relate either to scientific/technological infrastructure or applications. Both have been critical to past funding levels. The cold war, punctuated by the challenge of Sputnik, caused the public and Washington to see the maintenance of a high-level infrastructure as being critical to the national interest, and increased funding for the mathematical sciences was part of their response. As the arena for international confrontation shifted, so did the funding, and the mathematical sciences saw its share erode. However, much of the shift was to areas directly related to applications. In any case, recent events have shifted funding even more, with the current problems occupying national attention being economic competitiveness, health care, and the environment. The mathematical sciences can play an increasingly important role in meeting societal needs to confront these problems, especially since our educational role can be preeminent. If we want increased funding, this is the strategy that we must adopt.

Let me conclude with a few comments. Yes, I believe the mathematical sciences warrant more funding; and, yes, I believe they are important for their own sake. And yes, we should be saying this. However, that is not enough if we want results. I am not telling you how it should be, but how it is!

Computers and Mathematics

Edited by Keith Devlin

This month's column

Two reviews constitute this month's column. Firstly, Joel Davis, Tevian Dray, and André Weideman report their findings with the Student Edition of *MATLAB*; then Larry Riddle looks at *GyroGraphics* Version 4.

Editor's address:

Professor Keith Devlin
Department of Mathematics and Computer Science
Colby College
Waterville, Maine 04901

Correspondence by electronic mail is preferred, to:
kjdevlin@colby.edu.

Reviews of Mathematical Software

The Student Edition of *MATLAB*

Reviewed by Joel Davis*, Tevian Dray*, and André Weideman*

MATLAB is a mathematical software system based essentially on matrix manipulations. It combines a well-designed interpretive language with state-of-the-art algorithms from linear algebra, statistics, optimization, differential equations, and other areas. The net result is a powerful package that caters well to the needs of anyone doing numerical computation, such as a numerical analyst or an engineer. It is easier to use *MATLAB* and to become skilled in it than, say, *Mathematica* or *Maple*, but its scope is narrower since it cannot do any symbolic or multiple precision arithmetic.

* Joel Davis (joel@math.orst.edu) is an Associate Professor of Mathematics at Oregon State University. His research interests are in analysis, numerical analysis, and function design on computers. He is an experienced user of the MS-DOS implementation of *MATLAB*. Tevian Dray (tevian@math.orst.edu) is an Associate Professor of Mathematics at Oregon State University. He is an expert on the uses of algebraic computing in the field of general relativity. He had never used *MATLAB* prior to this review. André Weideman (weideman@math.orst.edu) is an Assistant Professor of Mathematics at Oregon State University. He is a numerical analyst, interested in spectral methods for differential and integral equations. He uses *MATLAB* extensively for his research.

The professional edition of *MATLAB* has established itself as a favorite tool in the numerical analysis community. For instance, the July 1992 issue of the *SIAM Journal on Matrix Analysis and Applications* [1] was devoted to numerical linear algebra, and more than a third of the papers credited *MATLAB* explicitly. It has now been joined by an inexpensive student edition, destined to become equally popular among students and teachers.

We reviewed The Student Edition of *MATLAB* 3.5 for both the Macintosh and MS-DOS implementations. This edition is sold by Prentice-Hall to registered students. It contains most of the features of the professional edition, the most notable difference being a restriction to matrices no bigger than 32×32. In addition, the MS-DOS implementation has only a limited ability to print graphics.

Before looking at the student edition, we asked why the professional edition was so successful in the field of numerical computation. We feel the primary reason is that it was developed by and for numerical analysts and it works and reasons like one of them. To quote a simple example: If A is a matrix and b a vector, the command `x=A\b` gives the solution of the linear system $Ax = b$, issuing an immediate warning when round-off error should be considered significant. That in itself is not remarkable, as other software packages do the same thing. However, not all competitors are sufficiently intelligent to interpret $Ax = b$ in the least-squares sense when A is not a square matrix. Also, no competitor makes it easier to assemble matrices and to perform intricate algorithms on them, computing eigenvalues or roots of polynomials along the way while displaying the results graphically—all done interactively and with just a few keystrokes. Computer codes involving matrices are often reduced by factors of four or more in length when translated into *MATLAB*, not to mention the time saved in developing and debugging new code.[1] Much of the current research in numerical analysis would not have been undertaken if it had to be done the old-fashioned way. This is summarized aptly by the authors of one particularly computationally intensive paper in [1]: "And none of this would have been any fun without *MATLAB*".

Most of the features that ensured the professional edition's

[1] One reason for this is the fact that many loops in languages such as C or FORTRAN are replaced by matrix products, for instance, the dot product of two vectors can be entered without any explicit summation.

success are present in the student edition. Graphs are easy, especially contour and surface plots in two dimensions—after all, the table of values to be graphed is just a matrix. Multiple line graphs on the same set of axes automatically get a different type of line so that they are easily distinguishable. *MATLAB* switches as necessary between real and complex arithmetic, and some functions, e.g., basic trigonometric functions, are defined for complex arguments (but see below). In the MS-DOS (and UNIX) implementation the arrow keys can be used to scroll back through previous commands, which is very nice for repeating and possibly changing earlier commands. One can easily perform spectral analysis or do signal processing involving Fourier transforms or filtering, and one can solve initial value problems for ordinary differential equations. Some or all of the variables used during a session can be saved for later use, and the session itself can be logged. There is an on-line help facility, not only for help regarding *MATLAB*'s built-in functions, but also for help regarding functions created by the user. An instructor can, with some effort, produce "movies" for use as classroom demonstrations. (An example of such a movie for row-echelon reduction is included in the demos.)

To give some examples of actual commands, `[V,D] = eig(A)` gives the eigenvectors and eigenvalues of the (previously entered) square matrix A, `[U,S,V]=svd(A)` gives the singular value decomposition of A, and `C=pinv(B)` gives the Moore-Penrose pseudoinverse of the (not necessarily square) matrix B. The matrix exponential of A is obtained by `E=expm(A)`, and its Cholesky-decomposition by `L=chol(A)`, with a warning issued if A is not positive definite. Using `polyfit`, one can fit data to polynomials, which after all are just vectors (of coefficients). In fact, one can multiply and divide polynomials (using the convolution operators `conv` and `deconv`), solve for their roots (`r=roots(p)`), and even reconstruct a polynomial from its roots (`p=poly(r)`). There is also a `ginput` command which allows values to be input directly from the graphics window using a mouse. Finally, there is a `flops` command which returns the number of floating point operations performed, a useful feature for comparing the efficiency of algorithms.

When one enters a symbol, say `F`, during a *MATLAB* session, *MATLAB* first looks for a variable called F, then it looks for a file `F.m`. Called **M-files**, these files can contain scripts and/or function definitions; many *MATLAB* commands are just calls to an M-file. This makes it particularly easy to customize *MATLAB* by writing one's own M-files, provided only that they are installed in a directory where *MATLAB* can find them. To do this one must typically specify *MATLAB*'s search path to find a personal directory or folder of M-files, and this is quite easy to do following the directions in the manual.[2] However, there is a common problem related to the use of M-files which is worth pointing out. A script called, say, `F.m` should not define a variable F, as this can lead to apparently inconsistent behavior, as subsequent calls to `F` will return the variable, not the script. One should also be careful to avoid duplicating the name of an existing M-file.

We have chosen two examples to illustrate the power and simplicity of *MATLAB* as it might be used in the classroom. The first of these, shown in Figure 1 (see next page), concerns the sensitivity of eigenvalues to perturbations, while the second, shown in Figure 2 (see next page), gives a well-known example of the difficulties inherent in polynomial interpolation. We also show the actual *MATLAB* commands (with comments) used to generate the pictures—count the keystrokes! We now briefly describe these two examples.

Sensitivity of Eigenvalues. The eigenvalues of certain matrices are highly sensitive to perturbations. An example of such a matrix is the super Jordan block A, which consists of 0s everywhere, except for the two diagonals immediately above the main one which have entry 1. Figure 1 shows what happens when such an A of size 32×32 is perturbed to $A + 10^{-4}E$, where E is a random matrix with elements taken from a normal distribution with mean 0 and variance 1. The eigenvalues of the unperturbed matrix are all 0s; those of the perturbed matrix move out into the complex plane—some of them by a distance greater than 1. Not only are the eigenvalues extremely sensitive to perturbation, but there seems to be an underlying geometry involved—the perturbed eigenvalues appear to be approximately located on a certain limaçon. For a discussion of this phenomenon we refer to [2]; for applications (where matrices become operators, and eigenvalues describe the stability of fluid flow) we refer to [3].

The Runge Phenomenon. It often comes as a surprise to undergraduate numerical analysis students that polynomial interpolation may not be pointwise convergent, even for infinitely differentiable functions. The prime example is due to Runge [4], in which $f(x) = 1/(1 + 25x^2)$ is interpolated in equidistant points over the interval $[-1, 1]$. Figure 2 shows the function $f(x)$ as the continuous line, and the interpolating polynomial of degree $n = 8$ as the dot-dash curve. Increasing n confirms the divergence near the endpoints of the interval.

We encountered very few problems with *MATLAB*, most of which were due to the stated restrictions of the student edition, such as the limitation to 32×32 matrices[3] and the limited ability to process, and hence print, graphics. The only way to print graphics in the MS-DOS implementation is via screen dumps, which can, however, be called from within *MATLAB* using the command `prtsc`. The Macintosh implementation also permits screen dumps using `shift-command-3`, which creates a MacPaint file. As with all Macintosh applications, the monitor must first be set to black and white. The documentation implies that `prtsc` dumps the screen on a pixel-by-pixel basis, resulting in hard copy with the resolution of the monitor, but this turned out to apply only to the MS-DOS implementation. On the Macintosh, both `prtsc` and `command-P` produced high-resolution graphics on

[2]For some reason, the Macintosh instructions explicitly discourage the use of this feature.

[3]The sombrero graphics example on page 115 of the manual fails because it requires a 33×33 matrix.

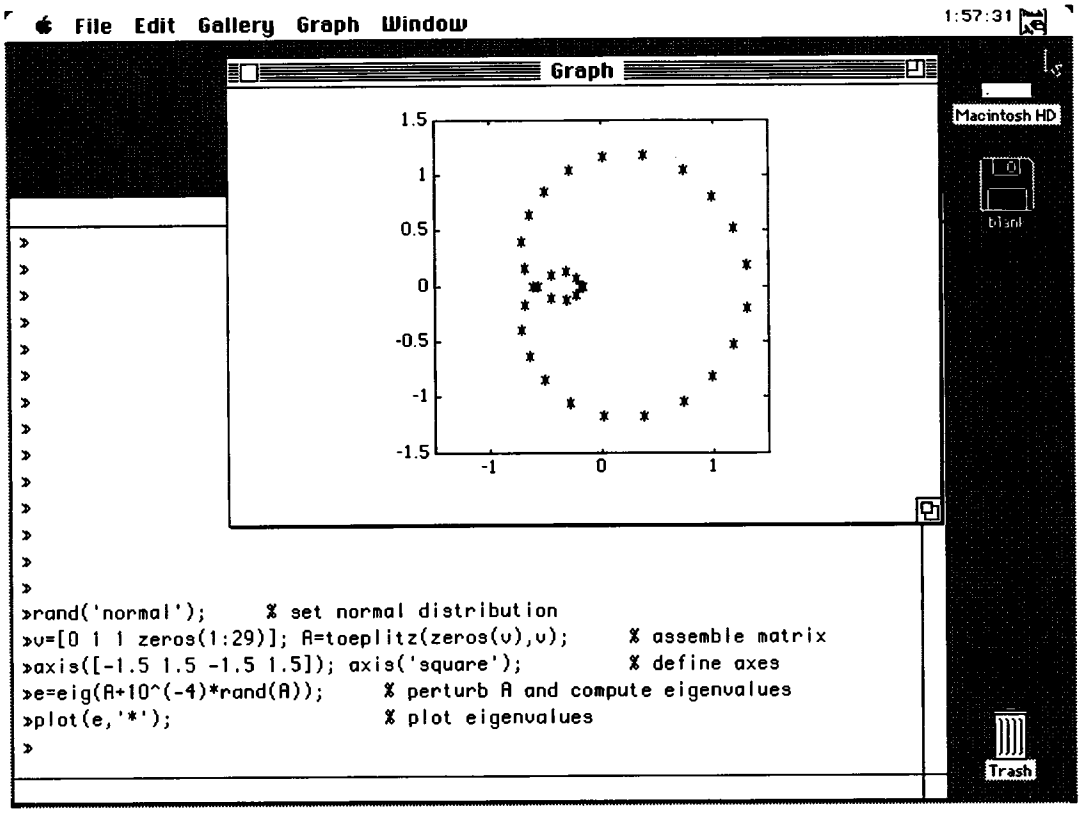


Figure 1

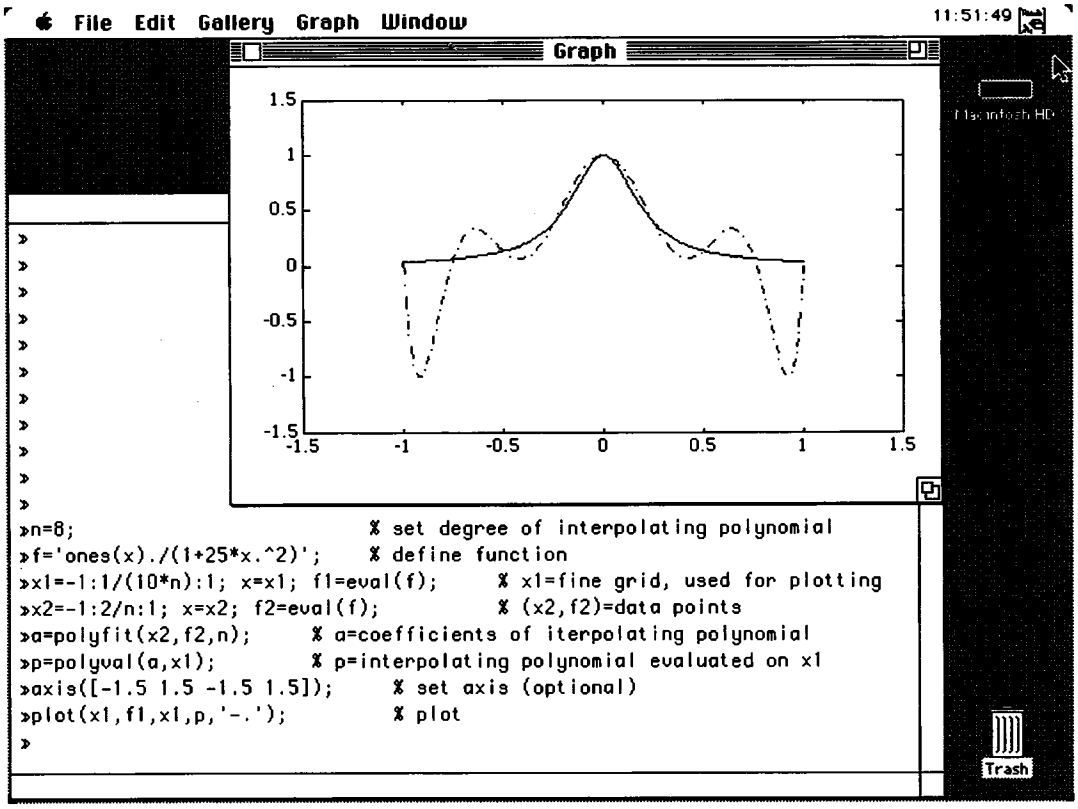


Figure 2

our LaserWriter. Furthermore, the Macintosh documentation states explicitly that holding down `command-F` while printing produces a PostScript file. This works with any Macintosh application but is normally not documented, and can, for instance, be used to e-mail Macintosh output (provided a suitable application, such as `SendPS` for the Macintosh or `macps` for UNIX, is available at the other end.) The Macintosh version also allows graphs to be saved in either EPSF or PICT format.

The only actual bug we found, present also in the UNIX implementation, was that some functions, such as the error and gamma functions, produce (with no warning!) the wrong value for complex arguments in apparent contradiction of our earlier praise regarding the superior treatment of complex variables.[4] We also note that roundoff error can be significant, for instance `sin(5419351)` is only accurate to 6 significant digits, although `format long` will happily give a 16-place "answer".[5]

We do have some minor gripes about the Macintosh implementation. The documentation is clearly inferior to that for MS-DOS, which caused us several problems when installing *MATLAB* on a Macintosh SE with very little space on its hard disk. Specifically, there is no mention of how big the Macintosh implementation is (418 Kb), and the instructions imply incorrectly that one cannot unpack the compressed source directly from the floppy disk. Furthermore, the compressed source consists of a single file, containing not only the necessary toolboxes but also two versions of the application (one for use with a coprocessor). We therefore had to unpack *MATLAB* on another machine with more space and then transfer it to our SE. In addition, unlike both the UNIX and MS-DOS implementations, one cannot use the arrow keys to scroll back through prior commands, although this is partially compensated by the usual Macintosh cut-and-paste ability. Finally, we were unable to obtain any files with the *MATLAB* icon; most files were Documents. So we were unable to start *MATLAB* except by double-clicking on the application itself, contrary to the instructions in the manual. Offsetting these very minor problems is the high-quality graphics output available with the Macintosh implementation.

MATLAB is an excellent piece of software. Not only is it indispensable for research involving numerical computations, but it has wide applicability to other areas as well, not the least of which is classroom use. As one professor put it, "Some students learn algorithmically what they don't learn abstractly." Many recent textbooks in fields such as linear algebra include *MATLAB* code and exercises, and here at Oregon State University *MATLAB* is used in courses in the departments of mathematics, statistics, electrical engineering, and chemical engineering. Such is *MATLAB*'s impact on the field that some textbooks even use a stylized version of its notation for describing algorithms, a prime example being Golub and Van Loan's *Matrix Computations* [5].

While the differences between the student and professional editions of *MATLAB* would bother the research numerical analyst, for most purposes, including classroom use, the limitations of the student edition should not be a problem. The Student Edition of *MATLAB* is a real bargain at $50; the professional edition costs several times that much. We recommend it highly.

[4]The new professional version (4.0) of *MATLAB* returns a warning when complex arguments are not allowed.

[5]This is an admittedly difficult problem, the point being that 16-place computations do not always give 16-place accuracy. For what it's worth, an HP 48 calculator gives the correct answer to 12 significant digits.

References

1. *SIAM Journal on Matrix Analysis and Applications*, **13** (1992).

2. L. Reichel and L. N. Trefethen, Eigenvalues and pseudo-eigenvalues of Toeplitz matrices, *Lin. Alg. Applic.* **162–164**, 153–185 (1992).

3. S. C. Reddy, P. J. Schmid, and D. S. Henningson, Pseudospectra of the Orr-Sommerfeld operator, *SIAM J. Appl. Math.* **53**, 15–47 (1993).

4. C. Runge, Über empirische Funcktionen und die Interpolation zwischen äquidistanten Ordinaten, *Zeitschrift für Mathematik und Physik* **46**, 224–243 (1901). (See also: James F. Epperson, On the Runge Example, *American Mathematical Monthly* **94**, 329–341 (1987).)

5. G. H. Golub and C. F. Van Loan, *Matrix Computations*, 2nd edition, The Johns Hopkins University Press, Baltimore, 1989.

GyroGraphics, Version 4

Reviewed by Larry Riddle*

GyroGraphics, version 4, is a set of programs for IBM-PC compatible computers that can be used to create and view animated 3D graphs of surfaces and space curves. Best results are obtained with at least an 80386 machine with 640K of RAM, a hard drive, math coprocessor, and VGA color graphics, but the animation will still run, though not as smoothly, on an 8088 compatible PC with any of the standard graphics adapters. Version 3 of *GyroGraphics* won the 1991 EDUCOM Award for Distinguished Mathematics Software. I have found the package to be an excellent addition to classroom demonstrations in calculus and linear algebra.

The key component of the *GyroGraphics* package is a program called AcroSpin by David Parker. AcroSpin is the underlying engine that reads an appropriately formatted file of data points and allows the interpreted image to be rotated, translated, and scaled interactively in real time. Most users will never need to deal directly with this program, however. Rather, they will use two other programs in the package, Gyro and GGMenu by Jerry Johnson, to create and manipulate the files needed by AcroSpin. Gyro is a menu-driven interface to AcroSpin with options for defining surfaces given in rectangular, cylindrical, or spherical coordinates, surfaces of revolutions around vertical or horizontal lines, parametric surfaces, space curves, and vector fields. There is considerable flexibility in defining the domain over which a surface will be drawn. For example, when graphing a surface in rectangular coordinates, one can specify a domain just as one would using

*Larry Riddle is an Associate Professor of Mathematics at Agnes Scott College, Decatur, GA. A particular interest of his is the pedagogical uses of computer technology in teaching mathematics. He can be reached by e-mail at riddle@mathcs.emory.edu.

limits of integration for a double integral, or even specify the domain in polar coordinates. Moreover, any independent surface variable can be plotted as a function of the other two. Tangent planes, Riemann sums, points, boxes, arbitrary vectors, and tangent and acceleration vectors may be added to the picture. Once Gyro has created the necessary data file and loaded it into AcroSpin, the user may manipulate the wire-frame object by using keyboard commands to rotate the graph, zoom in or out, or move it around the screen. There is no mouse support, however. Gyro saves each picture as a data file and also creates an associated text file describing the functions and domain. The program GGMenu provides a convenient menu interface allowing the user to quickly recall up to twenty-eight saved data files, along with their text description, for viewing in AcroSpin.

The surface options in Gyro allow up to two functions of the same type to be displayed in the same picture. However, since no hidden line removal is used by AcroSpin in creating the animation, surfaces that intersect anywhere except on the boundary of the domain may create a confusing picture. It is possible to create combinations of different types of surfaces and space curves with some advanced planning. For example, suppose one wanted to draw a curve lying on a surface. First one would create the data file for the surface. The next step would be to define the space curve, then, before creating its data file, change the color of the curve to a different one than that used for the surface. These two files must then be merged (using the DOS copy command, for example) before the new file can be viewed from within Gyro or GGMenu. While the process sounds complicated, the procedure actually works very smoothly to produce some beautiful and elaborate pictures, especially in version 4 of the program which uses the first letter of the file name in assigning names to the elements in the data file, thereby avoiding the problem in previous versions of duplicate names in the merged file. The merged file can be edited with any text editor if further modifications are necessary (such as eliminating duplicate axes or labels).

The use of visualization in the teaching of mathematics has become one of the cornerstones of the recent reform movement in calculus. *GyroGraphics* provides a quick and convenient way for students to visualize the shape and behavior of three-dimensional objects. Nevertheless, although creating the surfaces and curves is relatively easy, learning how to interpret the pictures must still be an integral part of the classroom experience before students can be expected to interact with the software in any meaningful way. This caveat aside, however, I have found that my students enjoy working with *GyroGraphics* and find it very helpful in making conjectures based upon graphical evidence that can then be confirmed analytically, or conversely, in supporting analytic work with computer graphics. For example, Figure 1 shows a series of three still pictures from the rotation of the helix given by $x(t) = \cos(t), y(t) = \sin(t)$, and $z(t) = t$. The first picture shows the projection of the helix onto the xy-plane, which is the default projection when a picture is initially displayed and a normal vector to the plane $x = y$. Upon rotating the graph until you are looking straight down this normal vector, you get the bottom picture in Figure 1, which is the projection of the helix onto the plane $x = y$. The curve, shown as a function in terms of z, appears to be a shifted sine or cosine curve. This conjecture can then be verified by using the standard formula for computing the projection of a point onto a plane.

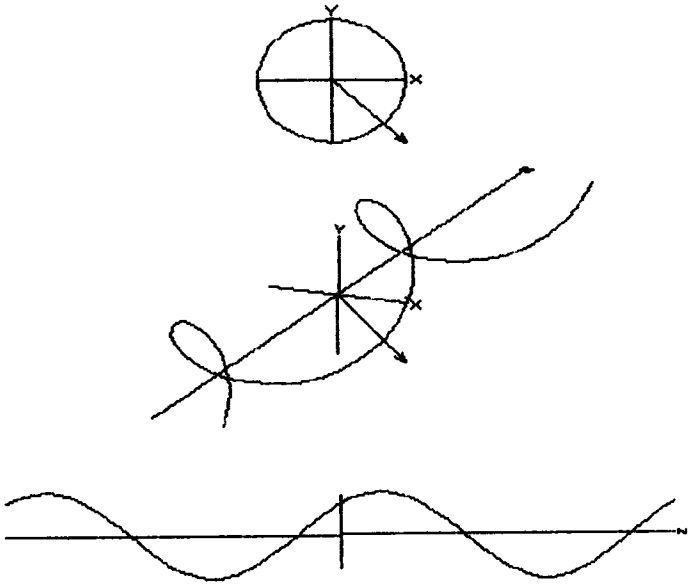


Figure 1

Consider next the problem of finding the absolute maximum and absolute minimum of the function $f(x, y) = y * \sqrt{x} - y^2 - x + 6y$ on the closed rectangle $0 \le x \le 9, 0 \le y \le 5$. Figure 2 shows the graph of this surface framed in a box.

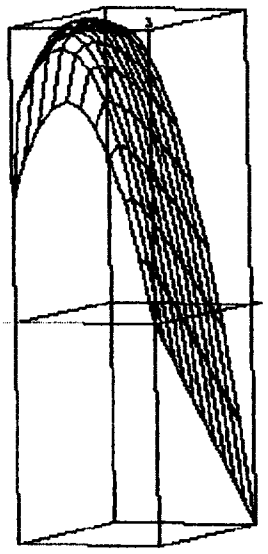


Figure 2

Each component of this picture—the axes, the labels, the surface, the domain rectangle, and the box—exists in a different "layer" that can be made visible or hidden. Rotating the surface makes it clear that the absolute maximum occurs at

an interior point and that the absolute minimum occurs at one of the corners of the bounding rectangle. Notice that the top of the box also acts as a tangent plane at the absolute maximum. With this information before them, the students can then be asked to find the location of the maximum. It is very easy to hide the box, add a tangent plane at the point suggested by the class, and then rotate the resulting picture to see that this plane is horizontal, thereby supporting the analytic work.

My students always find it interesting to see what some of those solids of revolutions that are so prevalent in calculus texts actually look like. Gyro provides options for rotating a function $y = f(x)$ around any horizontal or vertical line. When plotting such a surface of revolution defined by either one or two functions, you may add rectangles representing an upper or lower Riemann sum. Rotating these rectangles gives a visual demonstration of the disk or shell method for computing volumes. Figure 3 shows the surfaces generated

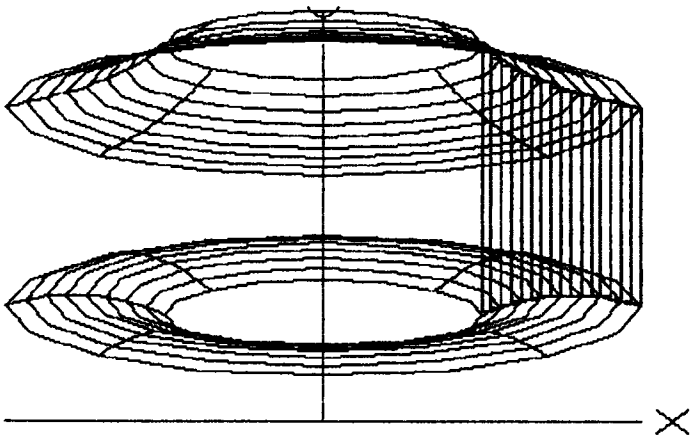


Figure 3

by rotating around the y-axis the graphs of $y = 2 + 1/x$ and $y = \sin(x)$ between $x = 1$ and $x = 2$, along with rectangles representing a lower Riemann sum. The layering feature in Gyro allows the user to view just the defining curves and rectangles, or just one of the top or bottom surfaces, or just the rectangles. For certain examples one may even add an actual simulation of the solid sliced into washers or shells (depending on the direction of rotation). This option may be invoked for only one function, however, and it is always the region between the function and the axis that is assumed to be revolved. Thus this option would not be available for the surface depicted in Figure 3.

The twenty-page manual accompanying *GyroGraphics* describes nine pedagogical uses of the program in calculus and linear algebra. Examples for two-dimensional applications include using rotations to simulate a tangent vector traveling along a sine curve to show the relationships between changing slope and concavity, and illustrating the concept of an inverse function by rotating the graph to interchange the X and Y labels. The program can be used in linear algebra to easily illustrate the geometry of vectors, normal vectors to planes, cross-products, and projections. An application to 3-dimensional l_p spaces in real analysis is even described for drawing the unit sphere given by $|x|^p + |y|^p + |z|^p = 1$ for $0 < p < \infty$.

The manual also does a good job of explaining the main features and menus of the programs. Each drawing option in the main menu has an additional on-line help screen that describes what that option does and suggests several examples. By choosing one of those examples, the user can automatically step through the menus for building the data file by repeatedly pressing the enter key while the program chooses the correct options and enters the necessary formulas and values. This provides an excellent way to learn the program while constructing some very interesting examples (such as a Möbius strip). AcroSpin has its own on-line help accessible once a graph has appeared that shows the keys for rotating, zooming, or translating the picture.

Gyro and GGMenu will run in a DOS window under Microsoft Windows 3.0 or 3.1. On some machines, however, this may cause a problem when trying to animate a picture. According to the Readme file accompanying the package, an apparent bug in Windows causes the screen to flash garbage in the background when AcroSpin attempts to use double buffering for the animation. The cure is to turn off the buffering by pressing the [B] key as soon as the picture appears on the screen. This must be done each time a picture is viewed.

GyroGraphics is available from CipherSystems, 717 Willow Drive, Stillwater, OK 74075, 405-377-4432, fax 405-377-6535. A single copy costs $89; quantity pricing and network licenses are also available.

News and Announcements

Gromov and Tits Receive Wolf Prize

The 1993 Wolf Prize in Mathematics will be awarded jointly to MIKHAEL GROMOV of the Institut des Hautes Etudes Scientifiques (IHES) and JACQUES TITS of the Collège de France. Gromov was cited "for his revolutionary contributions to global Riemannian and symplectic geometry, algebraic topology, geometric group theory, and the theory of partial differential equations." Tits was cited "for his pioneering and fundamental contributions to the theory of the structure of algebraic and other classes of groups and in particular for the theory of buildings."

Wolf Prizes have been awarded annually for outstanding achievements in agriculture, chemistry, mathematics, medicine, physics, and the arts. The prize is $100,000 for each category. To date, 143 laureates from eighteen countries have been honored. The 1993 Wolf Prizes will be presented on May 16, 1993 by the President of Israel at the Knesset building in Jerusalem. The Wolf Foundation was established by the late Ricardo Wolf, an inventor, diplomat, and philanthropist.

Mikhael Gromov has introduced a large number of very original concepts into the classical field of differential geometry that have led to the solution of a large number of important problems that had seemed unsolvable. The new invariants he introduced, which link structures in differential geometry with those of algebraic topology, have proved their value in Gromov's hands and in the hands of others. He succeeded, for example, in estimating the Betti numbers of Riemannian manifolds solely in terms of a lower bound on the sectional curvature. Much of his work makes use of concepts of the convergence of Riemannian manifolds. These daring ideas are also at the heart of his remarkable solution of the problem of groups of polynomial growth. This geometric approach, together with an idea of E. Rips, led him to the construction of the theory of hyperbolic groups, which has revolutionized the theory of discrete groups. He has also made profound contributions to the global theory of partial differential equations and to the theory of symplectic manifolds, constructing invariants which, for the first time, give a description of the degree of symplectic rigidity. His works are characterized by their incomparable depth and startling originality and will continue to be an inspiration for geometers for many years to come.

Gromov was born in 1943 in Boksitogorsk, Russia. He received his Ph.D. in 1969 and his D.Sc. in 1973 from the University of Leningrad. After holding positions at the University of Leningrad, the State University of New York at Stony Brook, and the University of Paris, he moved in 1982 to IHES, where he is a permanent fellow. Gromov received the Moscow Mathematical Society Prize (1971), the AMS Oswald Veblen Prize in Geometry (1971), and the Elie Cartan Prize of the French Academy of Sciences (1984). He is a foreign member of the U.S. National Academy of Sciences.

Jacques Tits has made many fundamental contributions to the theory of groups and their interactions with geometry. He has developed the theory of buildings as a central organizing principle and powerful tool for an astonishingly wide range of problems in group theory and geometry. This is a geometric approach to group theory which applies to finite groups, p-adic groups, and arithmetic groups, and has been instrumental in many of the most important advances in the last twenty years. Conversely, his work also uses group theory to make possible many profound contributions to geometry, both by Tits and others. Some of these contributions came in areas for which the theory was not originally designed, such as the theory of Riemannian spaces of rank exceeding 1. Tits' ideas are now an essential ingredient in the arsenal of every geometer. Tits has also made many other important contributions to Coxeter groups, Lie groups, and Kac-Moody algebras. The work of Tits has enriched mathematics enormously and has opened the path for numerous further developments.

Tits was born in 1930 in Brussels, Belgium and received his Ph.D. in 1950 from the University of Brussels. He was a professor at that institution and at the University of Bonn before moving to the Collège de France in 1973. Tits received the Henri Poincaré Prize in 1976. He has been elected to a number of scientific academies and has received numerous honorary doctorates from universities around the world.

NAS Prize to Holonyak

The National Academy of Sciences Award for the Industrial Application of Science was presented to NICK HOLONYAK, JR., professor of electrical and computer engineering at the University of Illinois at Urbana-Champaign. The $25,000 prize was established by IBM in honor of Ralph E. Gomory to

recognize original scientific work of intrinsic scientific importance and with significant, beneficial applications in industry. Holonyak was honored "for his profound impact on industry and on the daily lives of people around the world, through his prolific inventions in the area of semiconductor materials and devices including practical light-emitting diodes."

Fulbright Awards Announced

The J. William Fulbright Foreign Scholarship Board and the U.S. Information Agency have announced the names of over 900 recipients of Fulbright Awards. These awards provide support for lecturing, consulting, and research abroad in 1992–1993. The awardees in the mathematical sciences are listed below, together with their home affiliations and the countries in which they will use the awards.

DORIS C. APPLEBY, Marymount College (NY), Jordan; PAUL R. BOLSEN, University of Minnesota, Hungary; WILLIAM L. BRIGGS, University of Colorado at Denver, Ireland; VACLAY FABIAN, Michigan State University, Czech Republic and Slovakia; C. WARD HENSON, University of Illinois at Urbana-Champaign, Germany; VICTOR L. KLEE, University of Washington, Germany; RICHARD E. LADNER, University of Washington, New Zealand; LOREN D. MEEKER, University of New Hampshire, Brazil; CHARLES W. MULLINS, University of Central Arkansas, Ghana; BILLY E. RHOADES, Indiana University, Hungary; FRANK S. RIMLINGER, Fairfield University, Spain; MAXWELL A. ROSENLICHT, University of California at Berkeley, Ivory Coast; PUDUKKOTTAI K. SUBRAMANIAN, California State University at Los Angeles, India; and STANLEY WEARDEN, West Virginia University, Czech Republic and Slovakia.

Foundation "Matematika" Will Assist fSU Visitors

The Foundation "Matematika" is a nonprofit group of mathematicians in the former Soviet Union (fSU) who are working to assist Western mathematicians who wish to aid mathematics in the fSU. The president of the foundation is Ludvig Faddeev and the vice-president is Yakov Sinai. The foundation will help those who wish to visit the fSU make contact with mathematicians in the fSU. In addition, the foundation will assist in arranging for lectures at seminars and at meetings of the mathematical societies and other mathematical centers. Further information may be obtained by sending electronic mail to the foundation, fund@math.ac.msk.su. Postal mail may be sent to: Foundation "Matematika", Leninsky pr., 32a, Moscow 117334, Russia.

News from the Mathematical Sciences Institute (MSI)

Cornell University, the University of Puerto Rico, and *SUNY Stony Brook*

Please note that the August 2–6, 1993 workshop on Stochastic Analysis (organized by L. Gross) that was previously mentioned in the News and Announcements section of the March *Notices*, pages 244–245, has been cancelled.

New Analysis Journal

The Forum d'Analystes of Madras, India, announces the launching of a new periodical, the *Journal of Analysis*, devoted to analysis in the broad sense together with applications. The first volume, containing invited papers dedicated to the memory of C. T. Rajagopal, is scheduled to be released in March 1993. Submissions for later volumes may be sent to: Dr. R. Parvatham, Editor, *Journal of Analysis*, The Ramanujan Institute, University of Madras, Madras—600 005, India.

News from the Fields Institute for Research in the Mathematical Sciences

Activity in Dynamical Systems is continuing in May and June. Workshops and courses are being planned in: 5th Canadian Conference on General Relativity & Relativistic Astrophysics (May 13–15), organized by R. G. McLenaghan (University of Waterloo); Mathematical Ecology (May 26–29), organized by H. I. Freedman (University of Alberta) and J. Wu (Fields Institute/York University); Introduction to Lattice Gas Automata Methods (Course: June 3–4), and Symposium on Comparison Methods and Stability Theory (June 7–12), organized by A. Lawniczak (University of Guelph).

Further workshops and courses include: Riemannian Geometry, scheduled for the month of August (3–13), organized by M. Min-Oo (McMaster University), M. Wang (McMaster University) and M. Lovric (Fields Institute/McMaster University); Nonlinear Dynamics and Stochastic Mechanics (August 30–September 1), organized by N. Sri Namachchivaya (University of Illinois); Integration Algorithms for Classical Mechanics (October 14–17), organized by Jerry Marsden (University of California, Berkeley/Fields Institute) and Scott Tremaine (CITA).

Distinguished Lecture Series

Sir Michael F. Atiyah will present the next lecture in the Institute series on May 29, 1993, at 5:00 p.m. Sir Michael is President of the Royal Society, Director of the Isaac Newton Institute for Mathematical Sciences, and Master of Trinity College. He is a recipient of the Fields Medal.

The Fields Institute is pleased to announce that it has reached an agreement under which the American Mathematical Society will be its publisher. (See the news item immediately following this announcement for more information.)

For more information about these programs or the Fields Institute, please contact: Sandra Valeriote, Executive Assistant, The Fields Institute for Research in Mathematical Sciences, 185 Columbia St. W., Waterloo, Ontario, Canada, N2L 5Z5; Telephone: 519-725-0096; Fax: 519-725-2726; e-mail valeriote@fields.uwaterloo.ca.

AMS to Publish Fields Institute Series

The AMS is pleased to announce that it has reached an agreement to be the designated publisher for the Fields Institute for Research in Mathematical Sciences. The AMS will publish material growing out of the various activities at Fields, including the popular graduate course series, as well as conferences and workshops.

The Fields Institute formally opened about a year ago in Waterloo, Ontario. In that short time, it has established itself as an important center for mathematical activity in all areas. Attracting excellent speakers and participants from North America and abroad, Fields has developed a program that will result in high-quality publications having wide appeal. This agreement, together with a similar one signed recently with the Centre de Recherches Mathématiques in Montréal, and the long-standing publishing agreement the AMS has with the Canadian Mathematical Society, is an important step for the AMS in establishing stronger ties with the Canadian mathematical sciences community.

Be sure to watch the New Publications offered by the AMS section of the *Notices* for these new additions to the AMS library.

Erratum

Two clarifications have been made by the author of the obituary of D. H. Lehmer, which appeared in the January 1993 issue of the *Notices*, page 32. First, the review of Lehmer's *Selected Works* will appear in *Mathematics of Computation*, not in *Acta Arithmetica*. Second, *Acta* has published an obituary of Lehmer in addition to a complete biography of Lehmer's major publications and a list of his nineteen Ph.D. students.

American Mathematical Society

TRANSLATIONS

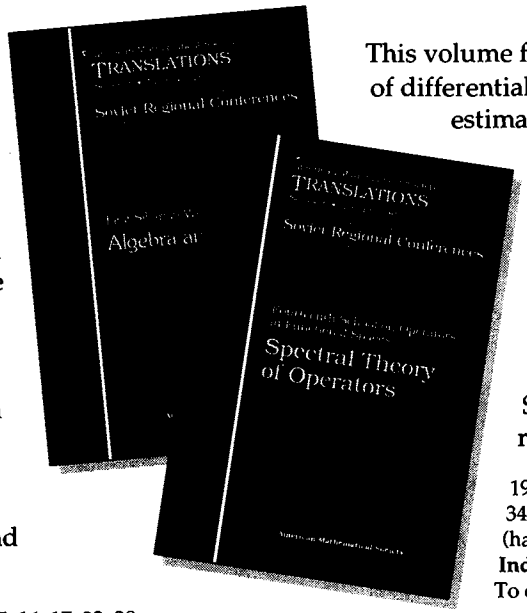
Series 2 • Volumes 148 & 150

Algebra and Analysis

A. D. Aleksandrov, O. V. Belegradek, I. A. Bokut', and Yu. L. Ershov, *Editors*

This collection consists of lectures delivered at the First Siberian Winter School, "Algebra and Analysis," held in March 1987 at a retreat near Kemerovo. The school was organized by Kemerovo State University and the Institute of Mathematics of the Siberian Branch of the Academy of Sciences of the USSR. The conference drew more than 100 participants from Novosibirsk, Kemerovo, Omsk, Moscow, St. Petersburg, and other cities. The papers concern current research on the interface of algebra and analysis.

1991 *Mathematics Subject Classification*: 05, 14, 15, 16, 17, 22, 28, 34, 51, 53, ISBN 0-8218-3700-1, 112 pages (hardcover), February 1991, **Indiv. mem. $40**, List $66, Inst. mem. $53
To order please specify TRANS2/148NA



Spectral Theory of Operators

S. G. Gindikin, *Editor*

This volume focuses on the spectral theory of differential operators. The emphasis is on estimates of the number of negative eigenvalues of elliptic differential operators and on the analysis of asymptotical distribution of eigenvalues. This collection provides an excellent overview of problems in the field, for Gindikin ranks among the leading Soviet specialists in this area of research.

1991 *Mathematics Subject Classification*: 34, 47; 58, ISBN 0-8218-7500-0, 176 pages (hardcover), March 1992
Indiv. mem. $67, List $112, Inst. mem. $90
To order please specify TRANS2/150NA

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

Funding Information for the Mathematical Sciences

NSF Grand Challenge Groups

The National Science Foundation (NSF) has opened a new competition for funding for Grand Challenge Application Groups. These group research grants will be made during fiscal year 1993 in connection with the U.S. High Performance Computing and Communications (HPCC) program. Seven Grand Challenge grants were made in fiscal year 1992.

Activities supported under this program are expected to achieve significant progress on (1) fundamental problems in science and engineering whose solution could be advanced by applying high-performance computing techniques and resources, and (2) enabling technologies which facilitate those advances. Funding will be provided for multidisciplinary groups of scientists, engineers, mathematicians, and computer scientists to apply emerging high-performance computing and communications systems to advance the solution of diverse science and engineering problems. The emphasis will be on support for groups requiring high-performance computing and communications capabilities where such focused, multidisciplinary support is generally unavailable or difficult to obtain. Projects will include aspects of design of models, algorithms, and software, as well as problem-solving environments, to fully realize the potential of high-performance computing and communications systems.

The deadline for preproposals will have passed by the time this issue of the *Notices* reaches its readers. The deadline for formal proposals is **June 16, 1993**. The full program announcement for this activity may be obtained on STIS, NSF's online information retrieval service. For an informational flyer about STIS, send an electronic message to stisfly@nsf.gov (Internet) or stisfly@nsf (Bitnet). Written inquiries about the Grand Challenges Groups may be sent to: HPCC/GCAG Coordinator, National Science Foundation, Room 417, 1800 G Street, NW, Washington, DC 20550. Within NSF's Division of Mathematical Sciences, the Computational Mathematics program has had extensive involvement in the HPCC initiative; contact Michael Steuerwalt (telephone 202-357-3691, msteuerw@nsf.gov (Internet), msteuerw@nsf (Bitnet)), or Alvin Thaler (tel: 202-357-3691, thaler@nsf.gov (Internet), thaler@nsf (Bitnet)).

In the last round of Grand Challenge grants, a number of mathematicians were involved. For more information, see "NSF 'Grand Challenge' Grants Awarded", News and Announcements, *Notices*, December 1992, page 1192.

SIAM Student Travel Awards

The Society for Industrial and Applied Mathematics (SIAM) will make several awards of $250 to support student travel to SIAM conferences during 1993. The awards are to be made from the SIAM Student Travel Fund, created in 1991 and maintained through book royalties donated by SIAM authors.

Any full-time student in good standing is eligible to receive an award. Top priority will be given to students presenting papers at the meetings, with second priority to students who are coauthors. Only students traveling more than 100 miles to the meetings are eligible for the awards.

Applications, including supporting letters, must be received at the SIAM office no later than one month before the first day of the meeting for which support is requested. The meetings for which applications could be made are:

- Conference on Mathematical and Numerical Aspects of Wave Propagation, June 7–10, 1993, in Newark, DE;
- Annual Meeting, July 12–16, 1993, in Philadelphia, PA;
- Conference on Simulation and Monte Carlo Methods, August 4–6, 1993, in San Francisco, CA;
- Third Conference on Linear Algebra in Signals, Systems, & Control, August 16–19, 1993, in Seattle, WA;
- Third Conference on Geometric Design; November 1–5, 1993, in Tempe, AZ.

For more information, contact Allison Bogardo or Donna DiLisi at: SIAM, 3600 University City Science Center, Philadelphia, PA 19104-2688; electronic mail siam@siam.org; telephone 215-382-9800; fax 215-386-7999.

Salt Lake City, Utah
University of Utah
April 9–10, 1993

Program

The eight-hundred-and-eightieth meeting of the American Mathematical Society (AMS) will be held on the campus of the University of Utah, Salt Lake City, Utah on Friday, April 9 and Saturday, April 10, 1993. This meeting is being held in conjunction with a meeting of the Mathematical Association of America (MAA). All sessions will be in the A. Ray Olpin University Union Building. The invited addresses will be in the Main Ballroom of the Union Building.

Invited Addresses

By invitation of the Western Section Program Committee, there will be four invited one-hour addresses. The speakers, their affiliations, the titles, and the scheduled times of presentation are:

Michael Christ, University of California, Los Angeles, *Analytic hypoellipticity, nonlinear eigenvalues, and nilpotent group representations*, 2:00 p.m., Saturday, April 10.

Kenneth M. Golden, University of Utah, *Percolation problems in materials science*, 2:00 p.m., Friday, April 9.

Robert M. Guralnick, University of Southern California, *Primitive permutation groups and coverings of curves*, 11:00 a.m., Friday, April 9.

Michael S. Waterman, University of Southern California, *Sequence comparison in molecular biology*, 11:00 a.m., Saturday, April 10.

Special Sessions and Contributed Papers

By invitation of the same committee, there will be six special sessions of selected twenty-minute papers. The topics of these sessions, and the names and affiliations of the organizers, are as follows:

Partial differential equations and several complex variables, **M. Salah Baouendi** and **Linda P. Rothschild**, University of California, San Diego.

Effective properties of inhomogeneous materials, **Andrej Cherkaev** and **Kenneth M. Golden**, University of Utah.

Hopf algebras and Hopf algebra actions, **Davida Fischman**, University of Southern California.

Singularities of geometric partial differential equations, **Libin Mou**, University of Southern California, and **Nat Smale**, University of Utah.

Commutative algebra and modules, **Paul Roberts**, University of Utah, **Roger A. Wiegand** and **Silvia M. Wiegand**, University of Nebraska at Lincoln.

Stochastic processes in population genetics, **Stewart N. Ethier**, University of Utah, and **Simon Tavare**, University of Southern California.

Abstracts for consideration for these sessions should have been submitted by the **January 6, 1993** deadline. This deadline was previously published in the Invited Speakers and Special Sessions section of the *Notices*.

There will also be sessions for contributed ten-minute papers. Abstracts should have been submitted by the **January 29, 1993** deadline previously published in the Calendar of AMS Meetings and Conferences. Late papers will not be accommodated.

Panel Discussion

The Joint Policy Board for Mathematics (JPBM) will sponsor a panel discussion on the rewards system in the mathematical sciences on Friday, from 5:00 p.m. to 6:30 p.m., in the Ballroom. Calvin C. Moore, Chair of the JPBM Committee on Professional Recognition and Rewards, will present an interim report of the committee. Other panelists will react to the report, and questions and comments will be taken from the audience.

Registration

The meeting registration desk will be located in the West Ballroom of the University Union Building and will be open from 8:00 a.m. to 5:00 p.m. on Friday, April 9, and 8:00 a.m. to noon on Saturday, April 10. The registration fees are $30 for members of the AMS, $45 for nonmembers, and $10 for emeritus members, students, or unemployed mathematicians, payable by cash, check, or Visa or MasterCard. There will be a special $5 one-day fee for MAA members on Friday only.

Accommodations

Rooms have been blocked for participants at the Doubletree Hotel, University Park Hotel, and the Quality Inn. The University Park Hotel is within walking distance of the campus, with the Doubletree and the Quality Inn located centrally in downtown Salt Lake City. All three hotels offer shuttle service to and from Salt Lake International Airport. Participants should make their own arrangements with the hotel of their choice and ask for the AMS conference rate. All rates are subject to applicable tax. **The AMS is not responsible for rate changes or the quality of the accommodations offered by these hotels/motels.**

University Park Hotel
480 Wakara Way, Salt Lake City, UT 84108
Telephone: 801-581-1000
Single or Double $65
The deadline for reservations was March 26, 1993.

Doubletree Inn
215 West South Temple , Salt Lake City, UT 84101
Telephone: 801-531-7500
Single or Double $57
The deadline for reservations was March 26, 1993.

Quality Inn City Center
154 West 600 South Temple, Salt Lake City, UT 84101
Telephone: 801-521-2930
Single or Double $45
The deadline for reservations was March 19, 1993.

Food Service

The University Union Building offers a reasonable variety of cafeteria-style food services on a cash basis. There are a very small number of restaurants located within walking distance of campus.

Parking

There is a visitor's parking lot located directly East of the University Union Building which charges $1.00 per hour. Parking permits for Friday can be purchased at the registration desk for approximately $2.25. There is ample free parking available on Saturdays.

Travel and Local Information

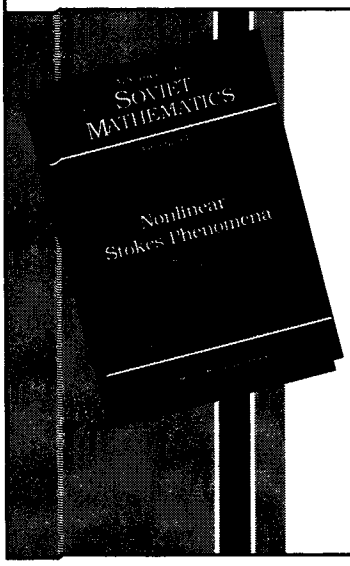
The nearest airport to the university is Salt Lake International Airport which is served by most major airlines. There is no convenient public transportation from the airport to the university, and a taxi is the only direct means of transportation. Most hotels provide shuttle service to and from the airport. There is ample public transportation from the downtown hotels to the university.

Salt Lake City is organized in a cartesian coordinate system, with the origin at the Church of the Latter Day Saints Temple in the middle of downtown. There are seven blocks to a mile (a block = 100 units in the coordinate system). The nearest corner of the university to the origin is at 100 South Street and 1340 East Street. The two major Interstates are I-15, which runs North-South roughly along 300 West Street, and I-80, which comes in from the East and merges with I-15 for several miles, then continues West along 100 North Street.

Weather and Local Attractions

In the first half of April the average high temperature is between 50°F and 60°F, and the average low temperature is 40°F. Rain and some snow is possible.

ADVANCES IN SOVIET MATHEMATICS



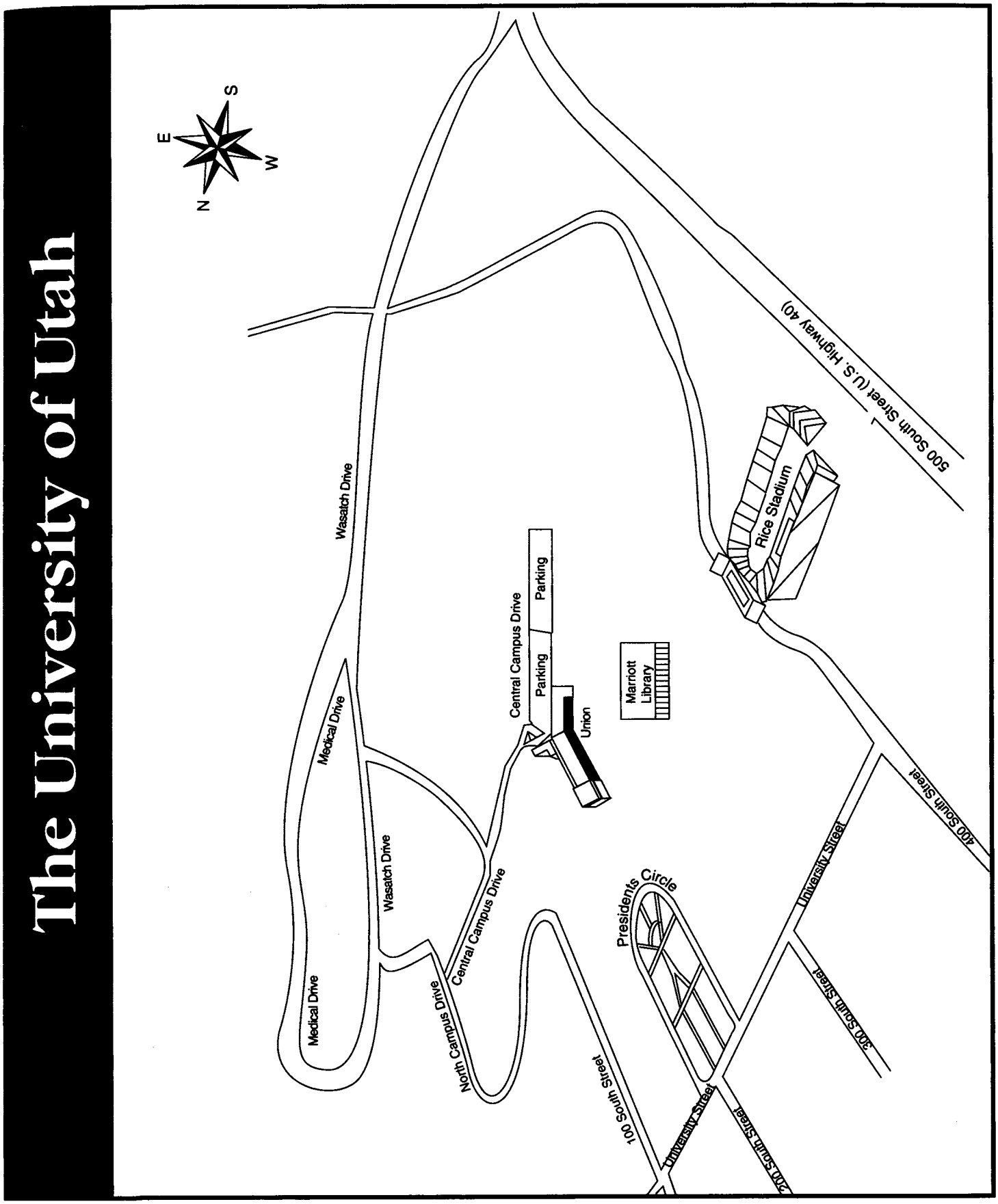
Nonlinear Stokes Phenomena

Yu. S. Il'yashenko, Editor
Volume 14

The nonlinear Stokes phenomenon occurs in the local theory of differential equations (or, more concisely, local dynamics) and finds application in singularity theory. This book contains a number of papers on this subject, including a survey that begins with Stokes' pioneering works on linear theory and discusses the work of Voronin.

1991 *Mathematics Subject Classification*: 32, 34, 35, 58; 43
ISBN 0-8218-4112-2, 287 pages (hardcover), February 1993
Individual member $70, List price $116, Institutional member $93
To order, please specify ADVSOV/14NA

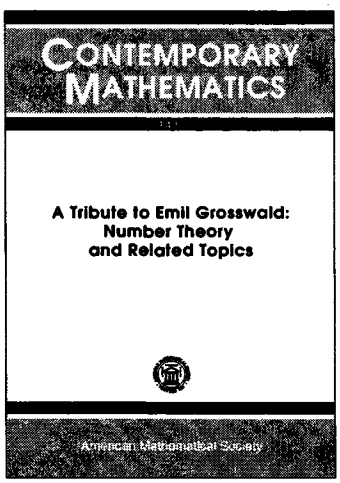
All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* **Order from:** American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard.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


The University of Utah
N
S
E
W
Wasatch Drive
Medical Drive
Medical Drive
Wasatch Drive
North Campus Drive
Central Campus Drive
Central Campus Drive
Parking
Parking
Union
Marriott Library
Rice Stadium
500 South Street (U.S. Highway 40)
Presidents Circle
University Street
400 South Street
300 South Street
100 South Street
University Street
200 South Street

Presenters of Papers

Numbers following the names indicate the speakers' positions on the program.
• AMS Invited Lecturer * AMS Special Session Speaker

* Aberbach, I. M., 46
* Abhyankar, S. S., 9
* Avramov, L. L., 47
* Baouendi, M. S., 97
* Barrett, D. E., 18
* Beattie, M., 5
* Bergen, J., 58
* Berlyand, L., 80
* Bhattacharya, K., 38
Bilyeu, R., 24
* Bruno, O. P., 8
* Chang, S.-T., 45
* Chen, J., 19
* Chen, W., 84
* Chen, Y., 20
* Cherkaev, A. V., 53
* Chin, W., 56
• Christ, M., 78
* Cordaro, P. D., 50
* Cutkosky, S. D., 11
* D'Angelo, J. P., 95
* Demeyer, F., 88
* Ding, S., 92
* Donnelly, P., 87
* Dutta, S. P., 61
* Ethier, S. N., 74
* Fannjiang, A., 82
* Gerstenhaber, M., 30
* Giaquinto, A., 32
* Gibiansky, L. V., 54
* Glassbrenner, D., 62
• Golden, K., 29
• Guralnick, R. M., 28
* Hamann, E., 10
* Hanges, N., 70
* Hardt, R., 41
* He, M., 76
* Heitmann, R. C., 90
* Herzog, J., 63
* Himonas, A. A., 17
* Hochster, M., 64
* Huneke, C., 44
* Ilmanen, T., 40
* Jacobowitz, H., 49
* Joyce, P., 75
* Kohn, J. J., 67
* Kozlov, S., 79
* Krone, S., 86
Kuttler, K., 23
* Larson, R. G., 4
* Lempert, L., 94
* Letzter, E. S., 33
* Levy, L. S., 91
Lewis, P., 25
* Lurie, K., 52
* Lyubeznik, G., 12
* Mazzeo, R., 21
* McNeal, J. D., 16
* Mendoza, G. A., 68
Michler, R. I., 22
* Milton, G. W., 7
* Montgomery, S., 57
* Murthy, M. P., 48
Muses, C., 27
* Musson, I. M., 31
* Nesi, V., 55
* Nichols, W. D., 34
* Olson, T., 37
* Osterburg, J., 59
* Papanicolaou, G., 6
* Pareigis, B., 1
Pohjanpelto, J., 26
* Pollack, D., 39
* Ponte-Castañeda, P., 36
* Qing, J., 42
* Radford, D. E., 3
* Reshetikhin, N., 35
* Richmond, B., 2
* Rosenberg, A., 93
* Rothschild, L. P., 51
* Rotthaus, C., 65
* Shaw, M.-C., 14
* Stanton, N. K., 66
* Tam, L.-F., 73
* Tartakoff, D. S., 96
* Tavaré, S., 85
* Toro, T., 72
* Towber, J., 60
* Treves, F., 15
* Wang, H.-J., 43
• Waterman, M. S., 77
* Wehr, J., 81
* Wei, S. W., 83
* Wickham, C., 89
* Xu, Y., 69
* Yang, P., 71
* Yuzvinsky, S., 13



Contemporary Mathematics, Volume 143

A Tribute to Emil Grosswald: Number Theory and Related Analysis

Mark Sheingorn and Marvin Knopp, *Editors*

With contributions by some of the leading contemporary researchers in number theory, modular functions, combinatorics, and related analysis, this book will be of interest to graduate students and specialists in these fields. The high quality of the articles and their close connection to current research trends make this volume a must for any mathematics library.

1991 *Mathematics Subject Classification*: 05, 11, 14, 33
ISBN 0-8218-5155-1, 612 pages (softcover), March 1993
Individual member $47, List price $79, Institutional member $63
To order, please specify CONM/143NA

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

Program of the Sessions

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

Abstracts of papers presented in the sessions at this meeting will be found in the April 1993 issue of *Abstracts of papers presented to the American Mathematical Society*, ordered according to the numbers in parentheses following the listings below.

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

Friday, April 9

Special Session on Hopf Algebras and Hopf Algebra Actions, I

8:30 a.m.–10:50 a.m.

8:30 a.m. (1) *Categories of Hopf modules and their reconstruction Hopf algebras.* Preliminary report.
Bodo Pareigis, University of Munich, Germany (880-16-15)

9:00 a.m. (2) *The Grothendieck group of a Hopf algebra.* Preliminary report.
Warren D. Nichols, Florida State University, and **Bettina Richmond***, Western Kentucky University (880-16-74)

9:30 a.m. (3) *Solutions to the quantum Yang-Baxter equation arising from pointed bialgebras.*
David E. Radford, University of Illinois, Chicago (880-16-81)

10:00 a.m. (4) *Braided bialgebras and completed-triangular bialgebras.*
Richard G. Larson*, University of Illinois, Chicago, and **Jacob Towber**, DePaul University (880-16-58)

10:30 a.m. (5) *Right crossed products and duality theorems.*
Margaret Beattie, Mount Allison University, New Brunswick (880-16-06)

Special Session on Effective Properties of Inhomogeneous Materials, I

8:30 a.m.–10:45 a.m.

8:30 a.m. (6) *Recent developments in the analysis of effective properties of inhomogeneous materials.*
George Papanicolaou, Courant Institute of Mathematical Sciences, New York University (880-60-91)

9:40 a.m. (7) *Correspondence between planar elasticity and two-dimensional complex conductivity.*
G. W. Milton*, Courant Institute of Mathematical Sciences, New York University, **A. V. Cherkaev**, University of Utah, and **A. B. Movchan**, University of Bath, England (880-73-77)

10:15 a.m. (8) *On the stiffness of materials containing a disordered array of microscopic holes or hard inclusions.*
Oscar P. Bruno*, Georgia Institute of Technology, and **Perry H. Leo**, University of Minnesota, Minneapolis (880-73-49) (Sponsored by Jeffrey S. Geronimo)

Special Session on Commutative Algebra and Modules, I

8:30 a.m.–10:50 a.m.

8:30 a.m. (9) *Polynomial maps and Zariski's main theorem.*
Shreeram S. Abhyankar, Purdue University, West Lafayette (880-14-05)

9:00 a.m. (10) *J. C., Maximal ideals and coincidences.*
Eloise Hamann, San Jose State University (880-13-13)

9:30 a.m. (11) *On the restriction of the Picard groups of a normal quasi-projective variety to a hypersurface section.*
S. D. Cutkosky, University of Missouri, Columbia (880-13-21)

10:00 a.m. (12) *Local cohomological dimension of algebraic varieties in characteristic $p > 0$ is algorithmically computable.*
Gennady Lyubeznik, University of Minnesota, Minneapolis (880-13-95)

10:30 a.m. (13) *The ring of glued polynomials on the union of hyperplanes.*
S. Yuzvinsky*, University of Oregon, and **C. O'Connor**, Shawnee State University (880-13-03)

Special Session on Partial Differential Equations and Several Complex Variables, I

8:30 a.m.–10:50 a.m.

8:30 a.m. (14) *Homotopy formulas in the tangential Cauchy-Riemann complex.*
Mei-Chi Shaw, University of Notre Dame (880-32-26)

9:00 a.m. (15) *Parametrices for a class of Schrödinger equations with variable coefficient.*
François Treves, Rutgers University, New Brunswick (880-35-51)

9:30 a.m. (16) *The Bergman projector of a convex domain.* Preliminary report.
Jeffery D. McNeal, Princeton University (880-32-88)

Friday, April 9 (cont'd)

10:00 a.m. (17) *Analytic hypoellipticity for the sum of squares of vector fields.*
A. Alexandrou Himonas, Institute for Advanced Study, Princeton University (880-35-34)

10:30 a.m. (18) *Mappings of nondegenerate locally polyhedral domains.*
David E. Barrett, University of Michigan, Ann Arbor (880-32-69)

Special Session on Singularities of Geometric Partial Differential Equations, I

9:00 a.m.–10:50 a.m.

9:00 a.m. (19) *Energy minimizing mappings between singular spaces.*
Jingyi Chen, University of California, Irvine (880-53-66) (Sponsored by Nat Smale)

9:30 a.m. (20) *Blow-up of heat flow of harmonic maps with a free boundary condition.*
Yunmei Chen*, University of Florida, and **Fang-Hua Lin**, Courant Institute of Mathematical Sciences, New York University (880-35-36)

10:00 a.m. (21) *Moduli spaces for complete metrics of constant positive scalar curvature.* Preliminary report.
Rafe Mazzeo*, University of Washington and Stanford University, and **Dan Pollack**, University of Texas, Austin (880-35-78)

10:30 a.m. Discussion

Session on Contributed Papers

9:00 a.m.–10:50 a.m.

9:00 a.m. (22) *Torsion of differentials of affine quasi-homogeneous hypersurfaces.*
Ruth Ingrid Michler, University of California, Berkeley (880-13-84)

9:20 a.m. (23) *A dynamic contact problem in thermal viscoelasticity.*
Kenneth Kuttler*, Michigan Technological University, and **Meir Shillor**, Oakland University (880-35-09)

9:40 a.m. (24) *Line integrals of monotone operators.* Preliminary report.
Russell Bilyeu, University of North Texas (880-46-01)

10:00 a.m. (25) *Unconditionally converging operators, V-sets, and vector measures.* Preliminary report.
Paul Lewis, University of North Texas (880-46-10)

10:20 a.m. (26) *Variational principles for differential equations with symmetries and conservation laws.*
Ian M. Anderson, Utah State University, and **Juha Pohjanpelto***, Oregon State University (880-49-92)

10:40 a.m. (27) *The center density of sphere packing in dimension zero.*
C. Muses, Mathematics & Morphology Research Center, Canada (880-51-48)

Invited Address

11:00 a.m.–11:50 a.m.

(28) *Primitive permutation groups and coverings of curves.*
Robert M. Guralnick, University of Southern California (880-20-04)

Invited Address

2:00 p.m.–2:50 p.m.

(29) *Percolation problems in materials science.*
Kenneth Golden, University of Utah (880-35-50)

Special Session on Hopf Algebras and Hopf Algebra Actions, II

3:00 p.m.–6:00 p.m.

3:00 p.m. (30) *Construction of quantum groups from Belavin-Drinfeld infinitesimals.*
Murray Gerstenhaber*, University of Pennsylvania, **Anthony Giaquinto**, University of Michigan, Ann Arbor, and **S. D. Schack**, State University of New York, Buffalo (880-16-46)

3:30 p.m. (31) *Multiparameter quantum enveloping algebras.*
William Chin, **Jacob Towber**, DePaul University, **Richard Larson**, University of Illinois, Chicago, and **Ian M. Musson***, University of Wisconsin, Milwaukee (880-16-42)

4:00 p.m. (32) *Nonstandard quantized enveloping algebras.*
Anthony Giaquinto, University of Michigan, Ann Arbor (880-16-73)

4:30 p.m. (33) *Prime spectra of skew polynomial rings.* Preliminary report.
Edward S. Letzter, Texas A & M University, College Station (880-16-47)

5:00 p.m. (34) *Hopf algebras of low dimension.* Preliminary report.
Warren D. Nichols*, Florida State University, and **Roselyn Williams**, Florida A & M University (880-16-87)

5:30 p.m. (35) *Quantum groups and q-difference equations.*
N. Reshetikhin, University of California, Berkeley (880-16-97) (Sponsored by Davida Fischman)

Special Session on Effective Properties of Inhomogeneous Materials, II

3:00 p.m.–5:00 p.m.

3:00 p.m. (36) *A comparison of methods for estimating the effective properties of nonlinear composites.*
P. Ponte-Castañeda, University of Pennsylvania (880-73-37) (Sponsored by Kenneth M. Golden)

3:35 p.m. (37) *Effective yield behavior of rigid/plastic composite materials.*
Tamara Olson, Brigham Young University (880-73-35)

4:30 p.m. (38) *Fine scale microstructure in Martensitic phase transformations.*
Kaushik Bhattacharya, Courant Institute of Mathematical Sciences, New York University (880-73-53)

Special Session on Singularities of Geometric Partial Differential Equations, II

3:00 p.m.–4:50 p.m.

3:00 p.m. (39) *Compactness results for the singular Yamabe problem.* Preliminary report.
Daniel Pollack, University of Texas, Austin (880-35-80)

3:30 p.m. (40) *Uniqueness in motion by mean curvature.*
Tom Ilmanen, University of Wisconsin, Madison (880-35-82)

4:00 p.m. (41) *Location of singularities of p-harmonic maps.*
Robert Hardt, Rice University (880-35-30)

4:30 p.m. (42) *Local behavior of solutions of heat equations for harmonic maps from surfaces near singular points.* Preliminary report.
Jie Qing, University of California, Los Angeles (880-53-60)

Special Session on Commutative Algebra and Modules, II

3:00 p.m.–5:50 p.m.

3:00 p.m. (43) *On the fitting ideals in free resolutions.*
Hsin-Ju Wang, Purdue University, West Lafayette (880-13-27)

3:30 p.m. (44) *Tensor products of modules over 1-dimensional local rings.* Preliminary report.
Craig Huneke* and **Roger Wiegand**, Purdue University, West Lafayette (880-13-14)

4:00 p.m. (45) *The asymptotic behavior of Hilbert-Kunz functions and their generalizations.* Preliminary report.
Shou-Te Chang, University of Michigan, Ann Arbor (880-13-44)

4:30 p.m. (46) *Reduction numbers, Rees algebras, and Pfaffian ideals.* Preliminary report.
Sam Huckaba, Florida State University, **Craig Huneke** and **Ian M. Aberbach***, Purdue University, West Lafayette (880-13-57)

5:00 p.m. (47) *Higher structures on infinite resolutions.*
Luchezar L. Avramov*, Purdue University, West Lafayette, **Vesselin N. Gasharov** and **Irena V. Peeva**, Brandeis University (880-13-72)

5:30 p.m. (48) *Zero cycles and projective modules.*
M. Pavaman Murthy, University of Chicago (880-13-93) (Sponsored by Roger A. Wiegand)

Special Session on Partial Differential Equations and Several Complex Variables, II

3:00 p.m.–4:50 p.m.

3:00 p.m. Discussion

3:30 p.m. (49) *Global Mizohata operators.*
Howard Jacobowitz, Rutgers University, Camden (880-35-12)

4:00 p.m. (50) *Hyperfuntion theory on hypoanalytic structures.* Preliminary report.
Paulo D. Cordaro, Institute for Advanced Study, Princeton University (880-35-33) (Sponsored by M. S. Baouendi)

4:30 p.m. (51) *Unique continuation and a Schwarz reflection principle for analytic sets.*
M. S. Baouendi and **Linda P. Rothschild***, University of California at San Diego, La Jolla (880-32-85)

Saturday, April 10

Special Session on Effective Properties of Inhomogeneous Materials, III

8:00 a.m.–10:45 a.m.

8:00 a.m. (52) *Relaxation of nonself-adjoint problems of optimal design.* Preliminary report.
Konstantin Lurie, Worcester Polytechnic Institute (880-49-68) (Sponsored by Kenneth M. Golden)

8:35 a.m. (53) *An approach to relation of optimal design problems.*
A. V. Cherkaev, University of Utah (880-49-67)

9:40 a.m. (54) *Bounds on the effective properties of composites: Translation method and its geometrical interpretation.*
Leonid V. Gibiansky, Courant Institute of Mathematical Sciences, New York University (880-73-75) (Sponsored by Kenneth M. Golden)

10:15 a.m. (55) *A set of materials which is stable under lamination.*
Vincenzo Nesi, University of L'Aquila, Italy (880-73-76)

Special Session on Hopf Algebras and Hopf Algebra Actions, III

8:30 a.m.–10:50 a.m.

8:30 a.m. (56) *Hopf algebras dual to the multiparameter deformation of the coordinate ring of n by n matrices.*
William Chin, DePaul University and University of Southern California (880-16-43)

9:00 a.m. (57) *Crossed products of Hopf algebras.*
Susan Montgomery*, University of Southern California, and **Hans-Jurgen Schneider**, University Munchen, Germany (880-16-08)

9:30 a.m. (58) *Chain conditions and Lie algebra actions.* Preliminary report.
Jeffrey Bergen, DePaul University (880-16-90)

10:00 a.m. (59) *The Connes spectrum under ore extension.*
James Osterburg* and **Xue Yao**, University of Cincinnati (880-16-16)

10:30 a.m. (60) *Braided bialgebras.*
Jack Towber, De Paul University (880-16-23) (Sponsored by Yuen F. Wong)

Saturday, April 10 (cont'd)

Special Session on Commutative Algebra and Modules, III

8:30 a.m.–10:50 a.m.

8:30 a.m. (61) *On the Canonical element conjecture.*
S. P. Dutta, University of Illinois, Urbana-Champaign (880-13-02)

9:00 a.m. (62) *Rings of invariants: The Cohen-Macaulay property and F-rationality.*
Donna Glassbrenner, University of Virginia (880-13-28) (Sponsored by Sylvia M. Wiegand)

9:30 a.m. (63) *On the Hilbert function of determinantal rings.*
J. Herzog*, and **A. Conca**, Purdue University, West Lafayette and University of Essen, Germany (880-13-55) (Sponsored by Sylvia M. Wiegand)

10:00 a.m. (64) *Tight closure and big Cohen-Macauley algebras.* Preliminary report.
Melvin Hochster, University of Michigan, Ann Arbor (880-13-24)

10:30 a.m. (65) *On a certain class of algebraically independent elements.* Preliminary report.
William Heinzer, Purdue University, West Lafayette, **Christel Rotthaus***, Michigan State University, and **Judith D. Sally**, Northwestern University (880-13-29)

Special Session on Partial Differential Equations and Several Complex Variables, III

8:30 a.m.–10:50 a.m.

8:30 a.m. (66) *Infinitesimal CR automorphisms of rigid hypersurfaces.*
Nancy K. Stanton, University of Notre Dame (880-32-32)

9:00 a.m. (67) *Global regularity on pseudo convex domains.*
Joseph J. Kohn, Princeton University (880-35-39)

9:30 a.m. (68) *Topological encoding of the symbol of transversally elliptic operators.* Preliminary report.
Gerardo A. Mendoza, Temple University (880-35-63)

10:00 a.m. (69) *Problems in extending analytic varieties.*
Yeren Xu, Temple University, Philadelphia (880-32-52)

10:30 a.m. (70) *First integrals for compact involutive structures.*
Nicholas Hanges, Herbert H. Lehman College, City University of New York (880-35-18)

Special Session on Singularities of Geometric Partial Differential Equations, III

9:00 a.m.–10:50 a.m.

9:00 a.m. (71) *Conformally invariant energy functionals.* Preliminary report.
Libin Mou and **Paul Yang***, University of California, Los Angeles (880-35-79)

9:30 a.m. Discussion

10:00 a.m. (72) *Functions whose graphs are Lipschitz manifolds.* Preliminary report.
Tatiana Toro, Institute for Advanced Study, Princeton University (880-28-65)

10:30 a.m. (73) *Harmonic functions and the structure of complete manifolds.*
Peter Li and **Luen-Fai Tam***, University of California, Irvine (880-53-94)

Special Session on Stochastic Processes in Population Genetics, I

9:30 a.m.–10:50 a.m.

9:30 a.m. (74) *Neutral allelic genealogy.* Preliminary report.
S. N. Ethier*, University of Utah, and **Tokuzo Shiga**, Tokyo Institue of Technology, Japan (880-92-70) (Sponsored by Stephen M. Krone)

10:00 a.m. (75) *Parameter estimation for multi-class selection models.*
Paul Joyce*, University of Idaho, and **Simon Tavare**, University of Southern California (880-60-20)

10:30 a.m. (76) *Approximations of population genetic models as measure-valued processes.*
Ming He, University of Utah (880-60-71)

Invited Address

11:00 a.m.–11:50 a.m.

(77) *Sequence comparisons in molecular biology.*
Michael S. Waterman, University of Southern California (880-92-40)

Invited Address

2:00 p.m.–2:50 p.m.

(78) *Analytic hypoellipticity, nonlinear eigenvalues, and nilpotent group representations.*
Michael Christ, University of California, Los Angeles (880-35-45)

Special Session on Effective Properties of Inhomogeneous Materials, IV

3:00 p.m.–5:45 p.m.

3:00 p.m. (79) *Homogenization of multiscaled media.*
Serguei Kozlov, University of Provence, Marseilles, France (880-35-41)

3:35 p.m. (80) *A "streched checkerboard" model of an orthotropic elastic composite of two vastly different materials.*
Leonid Berlyand*, Pennsylvania State University, University Park, and **Oleg Gendelman**, Russian Academy of Sciences, Moscow (880-35-56) (Sponsored by Kenneth M. Golden)

4:40 p.m. (81) *Conductance fluctuations in random media.* Preliminary report.
Jan Wehr, University of Arizona (880-82-89)

5:15 p.m. *Convection enhanced diffusion.*
(82) **Albert Fannjiang***, University of California, Los Angeles, and **George Papanicolaou**, Courant Institute of Mathematical Sciences, New York University (880-76-59)

Special Session on Singularities of Geometric Partial Differential Equations, IV

3:00 p.m.–4:50 p.m.

3:00 p.m. *Curvature and singularity.*
(83) **S. Walter Wei**, University of Oklahoma (880-53-17)

3:30 p.m. *Classification of the solutions of a singular elliptic P.D.E.*
(84) **Wenxiong Chen***, Southwest Missouri State University, and **Congming Li**, University of Colorado, Boulder (880-35-61)

4:00 p.m. Discussion

Special Session on Stochastic Processes in Population Genetics, II

3:00 p.m.–4:20 p.m.

3:00 p.m. *Inference for the coalescent.*
(85) **R. C. Griffiths**, Monash University, Australia, and **S. Tavaré***, University of Southern California (880-60-07) (Sponsored by Michael S. Waterman)

3:30 p.m. *A relation between Fleming-Viot processes and measure-valued branching diffusions.* Preliminary report.
(86) **Stephen Krone*** and **S. N. Ethier**, University of Utah (880-60-62)

4:00 p.m. *The coalescent, ladder models and hypervariable loci.*
(87) **P. Donnelly*** and **A. Roe**, Queen Mary & Westfield College, England (880-60-11) (Sponsored by Michael S. Waterman)

Special Session on Commutative Algebra and Modules, IV

3:00 p.m.–5:50 p.m.

3:00 p.m. *Reflexive modules over normal domains.*
(88) **Frank Demeyer*** and **Kim Regnier**, Colorado State University (880-13-22)

3:30 p.m. *Local duality for Matlis reflexive modules.* Preliminary
(89) report.
Richard Belshoff and **Cameron Wickham***, Southwest Missouri State University (880-13-64)

4:00 p.m. *Characterization of completions of unique factorization*
(90) *domains.*
Raymond C. Heitmann, University of Texas, Austin (880-13-31)

4:30 p.m. *Krull-Schmidt theorems in dimension 1.* Preliminary
(91) report.
Lawrence S. Levy*, University of Wisconsin, Madison, and **Charles J. Odenthal**, University of Toledo (880-16-54)

5:00 p.m. *On weak liftings of modules.* Preliminary report.
(92) **Songqing Ding**, Texas Tech University (880-13-38)

5:30 p.m. *Noncommutative algebra and algebraic geometry.*
(93) **Alexander Rosenberg**, University of Utah (880-13-83) (Sponsored by Paul C. Roberts)

Special Session on Partial Differential Equations and Several Complex Variables, IV

3:00 p.m.–4:50 p.m.

3:00 p.m. *Loop surfaces as complex manifolds.*
(94) **László Lempert**, Purdue University, West Lafayette (880-32-19)

3:30 p.m. *Degrees for proper holomorphic mappings between balls.* Preliminary report.
(95) **John P. D'Angelo**, University of Illinois, Urbana-Champaign (880-32-25)

4:00 p.m. *Global analyticity for $\Box_b$ on three dimensional CR*
(96) *manifolds.*
David S. Tartakoff*, University of Illinois, Chicago, and **Makhlouf Derridj**, University of Paris-Sud, France (880-32-96)

4:30 p.m. *Geometry of analytic discs attached to real*
(97) *submanifolds of complex space.* Preliminary report.
M. S. Baouendi, University of California at San Diego, La Jolla (880-32-86)

Lance W. Small
Associate Secretary
La Jolla, California

Washington, D.C.
Howard University
April 17–18, 1993

Program

The eight-hundred-and-eighty-first meeting of the American Mathematical Society (AMS) will be held at Howard University in Washington, D.C., on Saturday and Sunday, April 17 and 18, 1993. Additional related events will be held on Friday evening, April 16. Invited addresses will be held in the Biology Greenhouse Auditorium located in Just Hall. All other sessions will be held in the auditoria in Just Hall, Downing Hall, and Locke Hall on Saturday and in Douglass Hall on Sunday.

Invited Addresses

By invitation of the Eastern Section Program Committee, there will be four invited one-hour addresses. The speakers, their affiliations, the titles of their talks, and the scheduled times of presentation are:

Fan Chung, Bell Communications Research, *Graphs in representation theory*, 11:00 a.m., Saturday, April 17.

Leopold Flatto, AT&T Bell Labs, *Geodesic flows and continued fractions*, 1:30 p.m., Sunday, April 18.

Joel Spruck, Johns Hopkins University, *On the existence theorems for convex hypersurfaces of constant Gauss curvature in hyperbolic space*, 11:00 a.m., Sunday, April 18.

A. Zamolodchikov, Rutgers University, *Studying two dimensional quantum field theory—Up the down staircase*, 1:30 p.m., Saturday, April 17.

Special Sessions and Contributed Papers

By invitation of the same committee, there will be thirteen special sessions of selected twenty-minute papers. The topics of these sessions, and the names and affiliations of the organizers, are as follows:

Geodesic flows, hyperbolic geometry, and symbolic dynamics, **Roy L. Adler**, Thomas J. Watson Research Center, IBM, and **Leopold Flatto**;

Dilation and interpolation: operator theoretic methods, **Joseph Ball**, Virginia Polytechnic Institute and State University, and **Cora Sadosky**, Howard University;

Wavelets in sampling theory and signal processing, **John J. Benedetto**, University of Maryland, and **Rodney Kerby**, Howard University;

Geometric methods in combinatorics, **Joseph E. Bonin**, George Washington University;

Graph theory, **Nathaniel Dean**, Bellcore;

Mathematics of two-dimensional quantum field theory, **Edward Frenkel**, Harvard University;

Undergraduate research in applied mathematics, **Anant P. Godbole**, Michigan Technical University, and **Gary J. Sherman**, Rose-Hulman Institute of Technology;

Undergraduate research in pure mathematics, **Anant P. Godbole** and **Gary J. Sherman**;

Pure and applied recursion theory, **Valentina Harizanov**, George Washington University, and **Jim Owings**, University of Maryland, College Park;

Ergodic theory, dynamical systems, and applications, **Kevin Hockett** and **E. Arthur Robinson**, George Washington University;

History of mathematics, **Victor J. Katz**, University of the District of Columbia;

Low dimensional topology, **Yongwu Rong**, George Washington University;

Nonlinear elliptic problems in geometry and physics, **Joel Spruck**.

Abstracts for consideration for these sessions should have been submitted by the **January 6, 1993** deadline. This deadline was previously published in the Invited Speakers and Special Sessions section of the *Notices*.

There will also be sessions for contributed ten-minute papers. Abstracts should have been submitted by the **January 29, 1993** deadline previously published in the Calendar of AMS Meetings and Conferences. Late papers will not be accommodated.

Panel Discussion

The Joint Policy Board for Mathematics (JPBM) will sponsor a panel discussion on the rewards system in the mathematical sciences on Saturday, from 5:15 p.m. to 6:30 p.m. Richard Herman, Chair of the JPBM, will present an interim report of the JPBM Committee on Professional Recognition and Rewards.

Council

The AMS Council will meet at 7:00 p.m. on Saturday, April 17, 1993, in the Founders Ballroom at the Howard University Inn located at 2225 Georgia Avenue, N.W., Washington, D.C. 20001, on the Howard University campus.

Registration

The meeting registration desk will be located in the lobby by the auditorium in Just Hall and will be open from 8:00 a.m. to 5:00 p.m. on Saturday, April 17, and 8:00 a.m. to noon on Sunday, April 18. The registration fees are $30 for members of the AMS, $45 for nonmembers, and $10 for emeritus members, students, or unemployed mathematicians, payable by cash, check, or Visa or MasterCard.

Accommodations

A block of rooms is being held at the Howard University Inn. Participants should call 202-462-5400 and identify themselves as being with the 881st AMS meeting. **The deadline for reservations was March 16, 1993** to insure availability and the group discount rates. The rates are $72 single, $82 double, $92 triple, and $102 quadruple. There is an 11% sales tax and $1.50 occupancy fee per room per night.

Although rooms have not been blocked at the following locations, they are included for your information. Rates are subject to change and any applicable tax. The Silver Spring Holiday Inn is 20 minutes by car and 30 minutes by public transportation to the campus; all others are 10 to 20 minutes from campus. Participants should make their own arrangements with the hotel of their choice. **The AMS is not responsible for rate changes or the quality of the accommodations offered by these hotels/motels.**

Holiday Inn
8777 Georgia Avenue, Silver Spring, MD 20910
Telephone: 301-589-0800
Single $69 Double $79

Comfort Inn
500 H Street, N.W., Washington, D.C. 20001
Telephone: 202-289-5959
Single or Double $59

Capital Hilton
1001 16th Street, N.W., Washington, D.C. 20036
Telephone: 202-393-1000
Single or Double $125–$150

Holiday Inn
1155 14th Street, N.W., Washington, D.C. 20005
Telephone: 202-737-1200
Single or Double $89

Quality Hotel, Capitol Hill
415 New Jersey Avenue, N.W., Washington, D.C. 20001
Telephone: 202-638-1616
Single or Double $59–$99

Food Service

Several fast food restaurants are located on Georgia Avenue near the university, and the Howard Inn has a coffee shop and Joplin's Restaurant. Entrees at Joplin's range in price from $15 to $20. In addition, the student cafeteria in the Blackburn Center will be open.

Parking and Local Travel Arrangements

Parking is permitted and free of charge on Saturday and Sunday in several lots near campus. Most convenient for registration is the lot on the southeast corner of Fourth and Bryant Streets. The Howard University-Shaw Metro stop on the Green Line of the subway system is five blocks south of the campus on Seventh Street, N.W.

Travel and Local Information

Washington, D.C. is served by Amtrak and by three major airports: National Airport, Washington/Dulles Airport, and Baltimore/Washington International (BWI) Airport. Taxis are available at all airports, but are quite expensive. (Fares from National, Dulles, and BWI are approximately $8, $35, and $40 respectively.)

National Airport is by far the most convenient airport for those using public transportation. There is a Metro station at the airport which is on the Blue and Yellow Lines. Take the Yellow Line to Gallery Place and transfer to the Green Line on the same platform. Then refer to the local travel section above.

Shuttle vans are available for $7 from Dulles airport to the West Falls Church station on the Metro Orange Line. Take the Orange Line to L'Enfant Plaza and transfer to the Green Line. Then refer to the local travel section above.

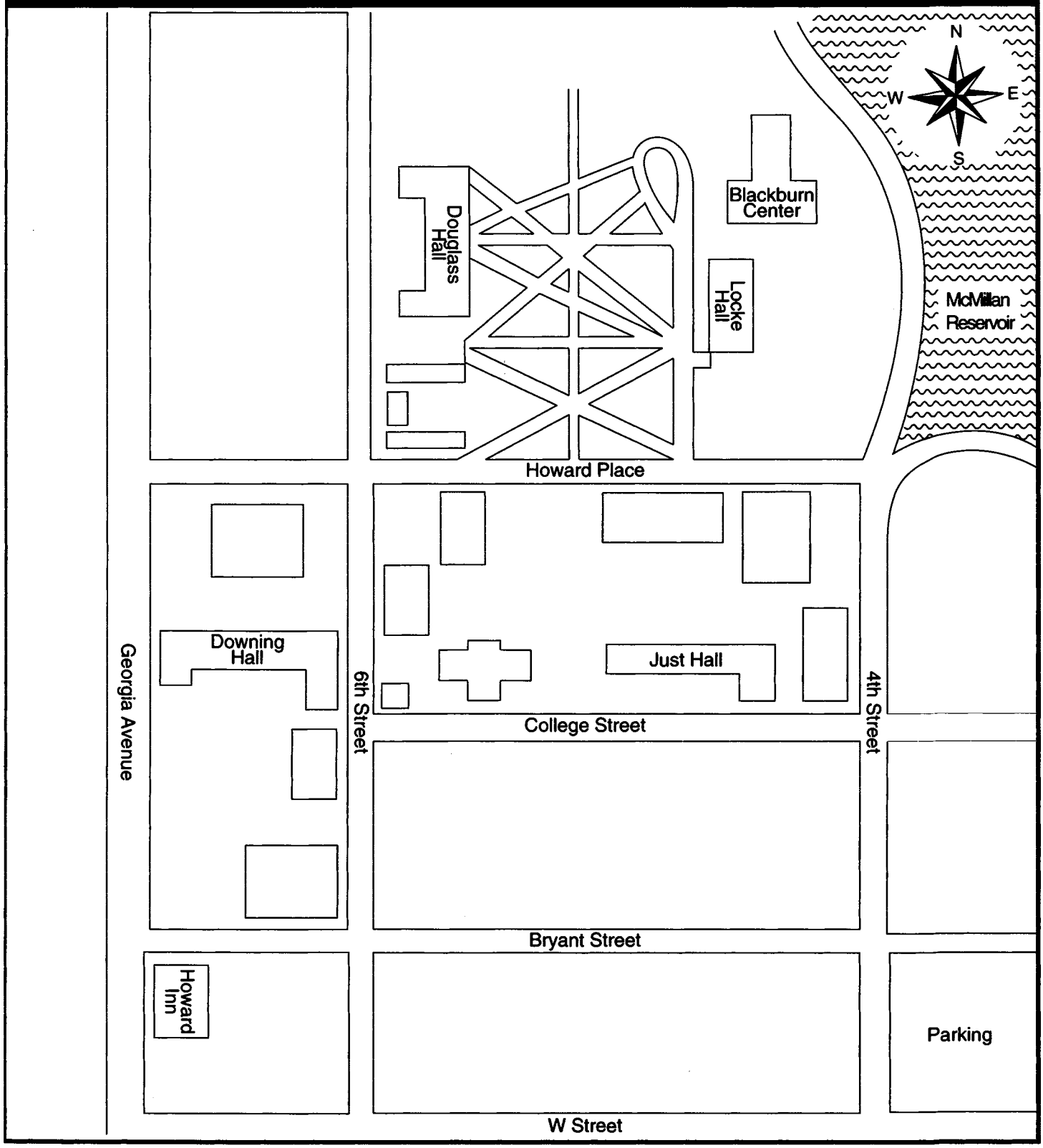
There is a free shuttle from BWI Airport to an Amtrak station. The ticket from there to Union Station is $10 one-way and $17 round trip. From there take the Metro Red Line to Gallery Place and transfer on the lower level to the Green Line. Then refer to the local travel section above.

Weather and Local Attractions

Washington is very likely to be lovely in mid-April. The cherry blossoms will no longer be in bloom, but many other flowers and blossoms will be plentiful. Average rainfall for the month of April is three inches. The average daily temperature in April is 53°F.

Washington has numerous museums including the Smithsonian Institution's Museum of American History (the one most people call "the Smithsonian"), the National Air and Space Museum, the Museum of Natural History, and the National Museum of Art. All of these museums are on the Mall which is the parkland stretching from the Capitol to the Lincoln Memorial (with the Washington Monument halfway between) and all are easily accessible by Metro. In addition, of course, Washington is the seat of the federal government, and one can visit the Capitol, the White House, the Supreme Court, and the many monuments.

Howard University



Presenters of Papers

Numbers following the names indicate the speakers' positions on the program.
• AMS Invited Lecturer * AMS Special Session Speaker

Adomian, G., 149
*Akbulut, S., 51
*Akkari, S., 31
*Aldroubi, A., 64
*Alligood, K., 45
*Almgren, F., 14
*Baginski, F., 123
*Ball, J. A., 60
Bandt, C., 145
*Bauer, D., 21
*Benedetto, J. J., 4
*Bennett, M. K., 137
*Bernhard, J. A., 172
*Berry, T. V., 74
*Bolt, M., 195
*Bostrom, A. K., 75
Boucherif, A., 146
*Bouwknegt, P., 215
Brandt, H. E., 153
*Brislawn, C., 190
*Brown, M., 203
*Burr, S. A., 71
*Calinger, R., 104
*Campbell, S., 169
*Carter, J. S., 140
*Casey, S. D., 189
*Cenzer, D., 127
*Chen, G., 24
*Cherednik, I., 101
*Cholak, P., 26
*Christner, G. B., 180
•Chung, F. R., 57
*Clancey, K., 61
*Cohn, H., 154
*Cooper, W. L., 197
*Cox, C. L., 73
*Cozzens, M. B., 192
*Crossley, J. N., 220
*Curtis, C. L., 97
*Dekster, B., 139
*del Junco, A., 80
*Domke, G., 68
*Dong, R.-T., 210
*Dreibelbis, D. L., 78
*Drucker, T., 53
*Dunfield, N., 170
*Ellis, D. B., 130
*Ellis, R. L., 19
*Evans, L. C., 11
Faith, C., 115
*Fasanelli, F., 217
*Faudree, R. J., 23
*Fejer, P. A., 221
*Fieldsteel, A., 133
•Flatto, L., 184
*Frazier, M., 161
*Gage, M. E., 12
*Getzler, E., 100
Gill, T. L., 151
Godbole, A. P., 42
*Goodson, G. R., 205
*Gordon, C., 94
*Gordon, G., 90
*Gould, R. J., 164
Govil, N. K., 106
*Gröchenig, K., 3
Grant, C. G., 109
*Green, J., 103
*Guan, B., 121
*Guan, P., 122
*Haas, A., 155
*Haddad, K. N., 83
Hakim, J., 41
*Hall, G., 131
*Heil, C., 66
Herbera, D., 114
*Hildebrandt, D., 173
*Hinman, P. G., 27
Hiremath, G. R., 111
*Hoffman, D., 207
*Holland, K. L., 138
*Holmes, P., 82
*Hoste, J., 93
*Houdre, C., 62
*Hudgins, L. H., 67
*Hunt, F., 81
*Inman, F., 171
*Isaksen, D., 200
*Jacobson, M. S., 20
*Janssen, J. C., 163
*Jawerth, B., 159
*Jockusch, C., 128
*Kac, V., 174
*Kalliongis, J., 144
*Kammeyer, J. W., 44
*Katz, V. J., 179
*Kazhdan, D., 175
Kent, D. C., 110
*Kierstead, H. A., 126
*Kirk, P., 143
*Kitchens, B., 134
*Klassen, E. P., 96
*Knight, J. F., 117
*Kontostathis, K., 222
*Kung, J. P., 89
*Kurtz, S. A., 118
*Kusner, R., 209
*Kutin, S., 7
*Lagarias, J. C., 156
*Lalley, S. P., 157
*Landau, H. J., 15
*Lawrence, J., 136
*Lee, R., 166
*Lempp, S., 120
*Lerman, M., 119
*Lesniak, L. M., 22
*Levi, M., 79
Lewis, E., 36
*Li, W., 49
*Li, Y., 86
*Lian, B., 98
*Lin, E. B., 6
*Lin, X.-S., 141
*Lipman, M. J., 69
*Lomonaco, S. J., Jr., 213
*Loo, S. P., 70
*Mahoney, C. R., 191
*Martin, G., 125
*Matsuo, A., 176
*Mauer, A. J., 201
*McCoy, B. M., 55
*Mehta, P. P., 76
Mihram, G. A., 35
*Miller, W. P., 33
*Morris, W. D., Jr., 135
*Moschovakis, Y. N., 28
*Mosteig, E., 10
Movahedi-Lankarani, H., 112
*Murenzi, R., 160
*Nakanishi, T., 56
*Nash-Williams, C. S., 194
*Nashed, M. Z., 65
Natarajan, P., 43
*Nerode, A., 116
Nimershiem, B. E., 113
*Norton, A., 46
Ouzomgi, S. I., 150
*Owings, J., 25
*Oxley, J., 30
*Parshall, K. V., 105
*Picciotto, S., 9
*Pinzon, L. E., 167
Prather, C., 107
*Przytycki, J. H., 212
*Quinn, F., 142
*Radin, C., 47
*Rajpal, S., 32
*Reid, T., 92
*Rickey, V. F., 178
*Roberts, D. L., 54
*Roberts, F., 193
*Robertson, I. B., 196
*Rodman, L., 59
*Rosema, K., 72
*Rosenblum, M., 182
*Rosenstein, G. M., 218
*Rovnyak, J., 181
*Sacks, G. E., 29
*Sadosky, C., 17
Sadowsky, J., 37
*Sagan, B. E., 88
*Sandler, H., 187
*Sauer, T., 206
Schafer, R. D., 40
*Scheinerman, E. R., 162
*Schmidt, T. A., 186
*Schoenberg, F., 198
*Schot, S. H., 52
*Schoutens, K., 214
*Schwarz, A. S., 99
*Scofield, P. D., 177
*Servatius, B., 34
*Shore, R. A., 129
*Silva, C. E., 204
*Silver, D. S., 48
Singh, S. P., 152
*Smolinsky, L., 211
*Solomyak, B., 188
*Spitkovsky, I. M., 16
•Spruck, J., 183
*Steinbach, D., 185
*Sutherland, S., 132
*Swetz, F., 102
*Szenes, A., 216
*Talvacchia, J., 124
*Tattersall, J. J., 219
*Taylor, J. E., 13
*Thompson, S., 199
*Traldi, L., 91
*Vanderkam, J., 8
*Vetterli, M., 63
*Wald, K., 77
*Wallstrom, G. L., 168
*Walnut, D. F., 158
*Walter, G. G., 1
Wang, P., 147
*Weinreich, D., 202
*Whitaker, N., 85
Williams, D. A., 148
*Woerdeman, H. J., 18
Wolsson, K., 39
*Wright, G., 50
*Wu, Y.-Q., 95
Yang, C.-C., 108
*Yang, Y., 84
Yu, J.-T., 38
•Zamolodchikov, A., 58
*Zayed, A. I., 5
*Zhang, C.-Q., 165
*Zhang, D., 208
*Zhang, Z., 2
*Zou, H., 87

Program of the Sessions

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

Abstracts of papers presented in the sessions at this meeting will be found in the April 1993 issue of *Abstracts of papers presented to the American Mathematical Society*, ordered according to the numbers in parentheses following the listings below.

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

Saturday, April 17

Special Session on Wavelets in Sampling Theory and Signal Processing, I

8:00 a.m.–10:50 a.m.

8:00 a.m. *A class of band limited cardinal wavelets.*
(1) **G. G. Walter*** and **Y. M. Liu**, University of Wisconsin, Milwaukee (881-41-24)

8:30 a.m. *Adaptive decompositions with time-frequency atoms.*
(2) **Stephane Mallat** and **Zhifeng Zhang***, Courant Institute of Mathematical Sciences, New York University (881-94-15) (Sponsored by John J. Benedetto)

9:00 a.m. *Acceleration of the frame algorithm.*
(3) **Karlheinz Gröchenig**, University of Connecticut, Storrs (881-42-16)

9:30 a.m. *Irregular sampling and a wavelet auditory model.*
(4) Preliminary report.
John J. Benedetto, University of Maryland, College Park (881-42-61)

10:00 a.m. *On the extension of the Zak transform.*
(5) **Ahmed I. Zayed*** and **Piotr Mikusinski**, University of Central Florida (881-42-188)

10:30 a.m. *Some remarks on wavelet transforms and sampling.*
(6) **E. Bing Lin***, **Tomasz Bielecki**, **Jie Chen** and **Stephen S.T. Yau**, University of Illinois, Chicago (881-42-54)

Special Session on Undergraduate Research in Applied Mathematics, I

8:00 a.m.–10:50 a.m.

8:00 a.m. Orientation

8:30 a.m. Discussion

Special Session on Undergraduate Research in Pure Mathematics, I

8:00 a.m.–10:50 a.m.

8:00 a.m. Orientation

9:00 a.m. *On the shellability of the poset of p-subgroups of a finite group.*
(7) **Samuel Kutin***, Old Westbury, New York, and **Murad Özaydın**, University of Oklahoma (881-20-109) (Sponsored by Anant P. Godbole)

9:30 a.m. *Counting nilpotent pairs.*
(8) **Jeffrey Vanderkam***, Durham, North Carolina, **Jason Fulman**, Harvard University, and **Mike Galloy**, Rose-Hulman Institute of Technology (881-20-93) (Sponsored by Anant P. Godbole)

10:00 a.m. *A formula for the distribution character of representations of $SL(2, R)$, using Cayley transform.*
(9) **Sally Picciotto**, Yale University (881-22-108) (Sponsored by Anant P. Godbole)

10:30 a.m. *Asymptotic cones of elliptic orbits in sp_4(R).*
(10) **Linie Chang**, Duke University, **Michael Kleber**, Harvard University, and **Edward Mosteig***, University of Michigan, Ann Arbor (881-22-112) (Sponsored by Anant P. Godbole)

Special Session on Nonlinear Elliptic Problems in Geometry and Physics, I

8:20 a.m.–10:50 a.m.

8:20 a.m. *The level set method for nonlinear PDE.* Preliminary
(11) report.
Lawrence C. Evans, University of California, Berkeley (881-35-119)

9:00 a.m. *Evolving plane curves by curvature in relative*
(12) *geometries, II.*
Michael E. Gage* and **Yi Li**, University of Rochester (881-53-77)

9:40 a.m. *Flat flow is motion by crystalline curvature for curves*
(13) *with crystalline energies.*
Fred Almgren, Princeton University, and **Jean E. Taylor***, Rutgers University, New Brunswick (881-35-78)

10:20 a.m. *Flat curvature flow and crystal growth.* Preliminary
(14) report.
Jean E. Taylor, Rutgers University, New Brunswick, **Frederick Almgren*** and **Lihe Wang**, Princeton University (881-35-115)

Special Session on Dilation and Interpolation: Operator Theoretic Methods, I

8:30 a.m.–10:50 a.m.

8:30 a.m. (15) *Prediction and the Nehari problem.* Preliminary report. **I. Gohberg**, Tel Aviv University, Israel, and **H. J. Landau***, AT&T Bell Laboratories, Murray Hill, New Jersey (881-47-201)

9:00 a.m. (16) *Positive extensions of almost periodic functions.* **Ilya M. Spitkovsky*** and **Hugo J. Woerdeman**, College of William & Mary (881-30-70)

9:30 a.m. (17) *A Nehari theorem in the bidisk.* **Mischa Cotlar**, Universidad Central de Venezuela, Venezuela, and **Cora Sadosky***, Howard University (881-32-200)

10:00 a.m. (18) *Linearly constrained interpolation in nest algebras.* **Mihály Bakonyi**, Georgia State University, and **Hugo J. Woerdeman***, College of William & Mary (881-47-05)

10:30 a.m. (19) *Extensions with positive real part. A new version of the abstract band method.* **Robert L. Ellis**, University of Maryland, College Park (881-47-145)

Special Session on Graph Theory, I

8:30 a.m.–10:50 a.m.

8:30 a.m. (20) *On a problem of Posa and Seymour.* **Ralph Faudree**, Memphis State University, **Ronald Gould**, Emory University, and **Michael S. Jacobson***, University of Louisville (881-05-85)

9:00 a.m. (21) *Toughness and triangle-free graphs.* **D. Bauer***, Stevens Institute of Technology, **J. van den Heuvel**, University of Twente, Netherlands, and **E. Schmeichel**, San Jose State University (881-05-156)

9:30 a.m. (22) *Degree conditions and cycle extendability.* **R. J. Faudree**, Memphis State University, **R. J. Gould**, Emory University, **M. S. Jacobson**, University of Louisville, and **L. M. Lesniak***, Drew University (881-05-137)

10:00 a.m. (23) *Monochromatic spanning trees in 2-colored graphs.* Preliminary report. **R. J. Faudree***, Memphis State University, **R. J. Gould**, Emory University, **M. S. Jacobson**, University of Louisville, and **L. M. Lesniak**, Drew University (881-05-207)

10:30 a.m. (24) *Mixed Ramsey numbers: Total chromatic number and stars.* **Guantao Chen**, North Dakota State University, Fargo (881-05-158)

Special Session on Pure and Applied Recursion Theory, I

8:30 a.m.–10:50 a.m.

8:30 a.m. (25) *Cantor singleton.* **Georgia Martin** and **James Owings***, University of Maryland, College Park (881-03-37)

9:00 a.m. (26) *On the Cantor-Bendixon rank of recursively enumerable sets.* Preliminary report. **Peter Cholak***, University of Michigan, Ann Arbor, and **Rod Downey**, Victoria University of Wellington, New Zealand (881-03-10)

9:30 a.m. (27) *Iterated relative recursive enumerability.* Preliminary report. **Peter A. Cholak** and **Peter G. Hinman***, University of Michigan, Ann Arbor (881-03-59)

10:00 a.m. (28) *Non-deterministic recursion.* **Yiannis N. Moschovakis**, University of California, Los Angeles (881-03-216)

10:30 a.m. (29) *Logic on an E-closed set.* Preliminary report. **Gerald E. Sacks**, Harvard University and Massachusetts Institute of Technology (881-03-17) (Sponsored by Raoul H. Bott)

Special Session on Geometric Methods in Combinatorics, I

8:30 a.m.–10:50 a.m.

8:30 a.m. (30) *On sign-representable matroids.* **James Oxley***, Louisiana State University, Baton Rouge, and **Geoff Whittle**, Victoria University of Wellington, New Zealand (881-05-204)

9:00 a.m. (31) *Random packing of matroid bases.* **Safwan Akkari**, Indiana University-Purdue University, Ft. Wayne (881-05-127)

9:30 a.m. (32) *Quaternary paving matroids.* **Sanjay Rajpal**, Dartmouth College (881-05-198)

10:00 a.m. (33) *Recent progress on matroid reconstruction.* Preliminary report. **William P. Miller**, George Washington University (881-05-144)

10:30 a.m. (34) *Rigidity matroids.* **Brigitte Servatius**, Worcester Polytechnic Institute (881-05-187)

Session on Contributed Papers, I

8:30 a.m.–10:40 a.m.

8:30 a.m. (35) *On ethnomathematics: An enquiry on comparative truth.* Preliminary report. **Danielle Mihram**, University of California, Los Angeles, and **G. Arthur Mihram***, Princeton, New Jersey (881-03-203)

8:45 a.m. (36) *Infinite covering systems of congruences which don't exist.* **Ethan Lewis**, University of Pennsylvania (881-11-13)

9:00 a.m. (37) *Resolving false computations in multiple item residue number systems.* Preliminary report. **John Sadowsky**, Johns Hopkins University (881-11-74)

9:15 a.m. (38) *Product formula for minimal polynomials.* **Jie-Tai Yu**, Cornell University (881-12-06)

9:30 a.m. (39) *The relationship of generalized sub-Wronskians of $\phi : E^m \to E^n$ to linear dependence and curvature.* **Kenneth Wolsson**, Fairleigh Dickinson University, Teaneck (881-15-139)

Saturday, April 17 (cont'd)

9:45 a.m. (40) *Simple noncommutative Jordan algebras satisfying* $([x,y],y,y)=0$.
R. D. Schafer, Massachusetts Institute of Technology (881-17-131)

10:00 a.m. (41) *p-adic spherical distributions.*
Jeffrey Hakim, American University (881-22-214)

10:15 a.m. (42) *A non-monotone coupling and a Poisson approxiamtion.*
Patrick D. Burghardt, University of Wisconsin, Madison, **Anant P. Godbole***, Michigan Technological University, and **Amy B. Prengaman**, Health Care Investment Analysts, Maryland (881-60-80)

10:30 a.m. (43) *Automata and response pattern of individuals.*
Ponnammal Natarajan, Anna University, India (881-92-30)

Special Session on Ergodic Theory, Dynamical Systems and Applications, I

9:00 a.m.–10:50 a.m.

9:00 a.m. (44) *Restricted orbit equivalence for ergodic $\mathbf{Z}^d$-actions.* Preliminary report.
Janet Whalen Kammeyer*, United States Naval Academy, and **Daniel J. Rudolph**, University of Maryland, College Park (881-28-41)

9:30 a.m. (45) *Rotation intervals for diffeomorphisms of the plane.*
Kathleen Alligood, George Mason University (881-58-42)

10:00 a.m. (46) *Quasiconformal extensions, Zygmund conformal structures and wandering domains.* Preliminary report.
Alec Norton*, University of Texas, Austin, and **Dennis Sullivan**, Graduate School and University Center, City University of New York (881-58-44)

10:30 a.m. (47) *Aperiodic tiling and substitution dynamics.*
Charles Radin, University of Texas, Austin (881-52-03)

Special Session on Low Dimensional Topology, I

9:00 a.m.–10:50 a.m.

9:00 a.m. (48) *Entropy invariants for knots.*
Daniel S. Silver, University of South Alabama (881-57-66)

9:30 a.m. (49) *Connected sums, Floer homology and spectral sequence.* Preliminary report.
Weiping Li, Yale University (881-57-14)

10:00 a.m. (50) *Mapping class groups, quantum invariants and quadratic forms.*
Gretchen Wright, Columbia University (881-57-67)

10:30 a.m. (51) *Some mod 3 relations between Donaldson polynomial invariants.*
Selman Akbulut, Michigan State University (881-57-208)

Special Session on History of Mathematics, I

9:30 a.m.–10:50 a.m.

9:30 a.m. (52) *Eighty years of Sommerfeld's radiation condition.*
Steven H. Schot, American University (881-01-07)

10:00 a.m. (53) *Euclid and his Victorian defender.*
Thomas Drucker, Modern Logic, Pennsylvania (881-01-163)

10:30 a.m. (54) *Root extraction in the American curriculum.* Preliminary report.
David L. Roberts, Johns Hopkins University, Baltimore (881-01-23) (Sponsored by Victor J. Katz)

Special Session on Mathematics of Two-dimensional Quantum Field Theory, I

9:40 a.m.–10:50 a.m.

9:40 a.m. (55) *Fermionic sum representations for branching functions of affine lie algebras.*
Timothy R. Klassen, Rutgers University, Piscataway, **Rinat Kedem**, **Barry M. McCoy*** and **Ezer Melzer**, State University of New York, Stony Brook (881-81-182) (Sponsored by Edward Frenkel)

10:20 a.m. (56) *Characters, dilogarithm and TBA: The case of parafermion CFT.*
Tomoki Nakanishi, Harvard University (881-81-180) (Sponsored by Edward Frenkel)

Invited Address

11:00 a.m.–11:50 a.m.

(57) *Graphs in representation theory.*
Fan R. K. Chung, Bellcore, New Jersey (881-05-155)

Invited Address

1:30 p.m.–2:20 p.m.

(58) *Studying two dimensional quantum field theory–Up the down staircase.*
A. Zamolodchikov, Rutgers University, New Brunswick (881-99-223)

Special Session on Dilation and Interpolation: Operator Theoretic Methods, II

2:40 p.m.–4:00 p.m.

2:40 p.m. (59) *Interpolation of real rational matrix functions.*
J. A. Ball, Virginia Polytechnic Institute and State University, **I. Gohberg**, Tel Aviv University, Israel, and **L. Rodman***, College of William and Mary (881-15-140)

3:10 p.m. (60) *Zero-pole interpolation for matrix meromorphic functions on an algbraic curve with determinantal representation.*
Joseph A. Ball, Virginia Polytechnic Institute and State University (881-47-159)

3:40 p.m. (61) *Zero-pole subspace interpolation and complex vector bundles.*
Kevin Clancey, University of Georgia (881-30-128)

Special Session on Wavelets in Sampling Theory and Signal Processing, II

2:40 p.m.–5:30 p.m.

2:40 p.m. (62) *Wavelet-frames and nonparametric statistical estimation: Irregular samples and noises.* Preliminary report.
Christian Houdre, Stanford University (881-62-194)

3:10 p.m. (63) *Time-varying orthogonal best bases.*
Martin Vetterli*, **Cormac Herley** and **Kannan Ramchandran**, Columbia University (881-42-213) (Sponsored by John J. Benedetto)

3:40 p.m. (64) *Discrete spline filters for multiresolutions and wavelets of l_2.*
Akram Aldroubi*, **Murray Eden** and **Michael Unser**, National Institute of Health, Maryland (881-42-149)

4:10 p.m. (65) *Reproducing kernal Hilbert spaces from sampling theorems.*
M. Zuhair Nashed*, University of Delaware, and **Gilbert G. Walter**, University of Wisconsin, Milwaukee (881-42-189)

4:40 p.m. (66) *Continuity of the joint spectral radius: Application to wavelets.*
Christopher Heil, Massachusetts Institute of Technology (881-39-81)

5:10 p.m. (67) *Wavelet transforms and spectral estimations.*
Lonnie H. Hudgins, Northrop Electronics Systems Division, California (881-94-32)

Special Session on Graph Theory, II

2:40 p.m.–4:30 p.m.

2:40 p.m. (68) *How the rank of a graph is effected by vertex/edge addition or deletion.*
Jean Bevis, Kevin Blount, George Davis, Gayla Domke* and **Valeria Miller**, Georgia State University (881-05-171)

3:10 p.m. (69) *The latest on sphere-of-influence graphs.*
Marc J. Lipman, Office of Naval Research, Virginia (881-05-205) (Sponsored by Nathaniel Dean)

3:40 p.m. (70) *On Rado numbers.*
Stefan A. Burr, City College, City University of New York, and **S. P. Loo***, West Virginia University (881-05-132)

4:10 p.m. (71) *Either a graph or its complement contains a spanning broom.*
Stefan A. Burr, City College, City University of New York (881-05-218)

Special Session on Undergraduate Research in Applied Mathematics, II

2:40 p.m.–4:00 p.m.

2:40 p.m. (72) *The inverse problem for arbitrary networks.*
Kevin Rosema, University of Washington (881-94-86) (Sponsored by Anant P. Godbole)

3:10 p.m. (73) *Flow dependent networks.*
Christopher L. Cox, Northwestern University (881-94-110) (Sponsored by Anant P. Godbole)

3:40 p.m. (74) *Computing Grobner bases on the MasPar $MP-1$.*
Thomas Vincent Berry, Winston-Salem, North Carolina (881-68-102) (Sponsored by Anant P. Godbole)

Special Session on Undergraduate Research in Pure Mathematics, II

2:40 p.m.–4:30 p.m.

2:40 p.m. (75) *Algebraic and topologic structure results for the space of infinite matrices.*
Mitch Anderson and **Alistair K. Bostrom***, University of Hawaii, Hilo (881-15-48)

3:10 p.m. (76) *Permutation invariant norms on R^n.*
Paras P. Mehta, Harvard University (881-15-92) (Sponsored by Anant P. Godbole)

3:40 p.m. (77) *Poisson approximation and the area of a random polygon.*
Kevin Wald, New York, New York (881-60-106) (Sponsored by Anant P. Godbole)

4:10 p.m. (78) *A counterexample to the conjecture on the coefficients of normalized univalient funtions which map the unit disk into itself.*
Daniel Lewis Dreibelbis, University of Virginia (881-30-107) (Sponsored by Anant P. Godbole)

Special Session on Ergodic Theory, Dynamical Systems and Applications, II

2:40 p.m.–5:00 p.m.

2:40 p.m. (79) *Hidden linearity in relaxation oscillations.*
Mark Levi, Rensselaer Polytechnic Institute (881-58-122)

3:10 p.m. (80) *Natural factors of measure-preserving maps.*
Andres del Junco*, University of Toronto, **Mariusz Lemanczyk** and **Mieczyslaw Mentzen**, Nicholas Copernicus University, Poland (881-28-153)

3:40 p.m. (81) *Approximating the invariant measures of finite dimensional maps.*
Fern Hunt, National Institute of Standards & Technology, Maryland (881-58-08)

4:10 p.m. (82) *Wavelet projections of an evolution equation.*
Juan Elezgaray, CNRS, France, **Gal Berkooz** and **Philip Holmes***, Cornell University (881-58-36)

4:40 p.m. (83) *IP cluster points and recurrent sequences.*
Kamel N. Haddad*, California State University, Bakersfield, and **Aimee Johnson**, Tufts University (881-54-114)

Saturday, April 17 (cont'd)

Special Session on Nonlinear Elliptic Problems in Geometry and Physics, II

2:40 p.m.–5:10 p.m.

2:40 p.m. (84) *The self-dual cosmological equations.* Preliminary report.
Yisong Yang, Carnegie Mellon University (881-35-25)

3:20 p.m. (85) *Statistical equilibrium solutions for the Euler equations.*
Nathaniel Whitaker* and **Bruce Turkington**, University of Massachusetts, Amherst (881-35-116)

4:00 p.m. (86) *On the positive solutions of Matukuma equation.*
Yi Li, University of Rochester (881-34-52)

4:40 p.m. (87) *Local behavior and classification of positive solutions of semilinear elliptic equations with supercritical Sobolev growth.*
Henghui Zou, Northwestern University (881-35-76)

Special Session on Geometric Methods in Combinatorics, II

2:40 p.m.–5:00 p.m.

2:40 p.m. (88) *Connnecting characteristic and chromatic polynomials.* Preliminary report.
Andreas Blass, University of Michigan, Ann Arbor, and **Bruce E. Sagan***, Michigan State University (881-52-136)

3:10 p.m. (89) *Sign-coherent identities for characteristic polynomials of matroids.*
Joseph P. S. Kung, University of North Texas (881-05-49)

3:40 p.m. (90) *Greedoids and the Tutte polynomial.*
Gary Gordon, Lafayette College (881-05-147)

4:10 p.m. (91) *An algorithmic view of Crapo's β-invariant.*
Lorenzo Traldi, Lafayette College (881-05-126)

4:40 p.m. (92) *Ramsey numbers for matroids.*
Talmage Reid, University of Mississippi (881-05-01)

Special Session on Low Dimensional Topology, II

2:40 p.m.–5:00 p.m.

2:40 p.m. (93) *Infinite framed link diagrams of open 3-manifolds.* Preliminary report.
Jim Hoste, Pitzer College (881-57-195)

3:10 p.m. (94) *Dehn surgery on knots in the 3-sphere.*
Cameron Gordon* and **John Luecke**, University of Texas, Austin (881-57-210)

3:40 p.m. (95) *Tangle sums producing simple tangles.*
Ying-Qing Wu, University of Texas, Austin (881-57-55) (Sponsored by Yongwu Rong)

4:10 p.m. (96) *Spectral flow and analyticity for operators on manifolds with boundary.* Preliminary report.
Eric P. Klassen*, Florida State University, and **Paul A. Kirk**, Indiana University, Bloomington (881-57-217)

4:40 p.m. (97) *Casson's invariant for closed 3-manifolds with even first Betti number.* Preliminary report.
Cynthia L. Curtis, Princeton University (881-57-196)

Special Session on Mathematics of Two-dimensional Quantum Field Theory, II

2:45 p.m.–5:35 p.m.

2:45 p.m. (98) *On the BRST-algebraic structure in string theory.*
Bong Lian*, University of Toronto, and **Gregg Zuckerman**, Yale University (881-17-177) (Sponsored by Edward Frenkel)

3:25 p.m. (99) *Batalin-Vilkovisky algebras in quantum field theory.*
Albert S. Schwarz, University of California, Davis (881-81-183) (Sponsored by Edward Frenkel)

4:25 p.m. (100) *Batalin-Vilkovisky algebras and two-dimensional topological field theory.*
Ezra Getzler, Massachusetts Institute of Technology (881-55-174)

5:05 p.m. (101) *The Macdonald constant term conjecture.*
Ivan Cherednik, University of North Carolina, Chapel Hill (881-17-173) (Sponsored by Edward Frenkel)

Special Session on History of Mathematics, II

2:45 p.m.–4:55 p.m.

2:45 p.m. (102) *The volume of a sphere in ancient China.*
Frank Swetz, Pennsylvania State University (881-01-118) (Sponsored by Victor J. Katz)

3:25 p.m. (103) *The algebra of logic: What Boole really started.* Preliminary report.
Judy Green, Marymount University (881-01-157)

4:05 p.m. (104) *Leonhard Euler: The Berlin years–A preliminary study.*
Ronald Calinger, Catholic University of America (881-01-143) (Sponsored by Victor J. Katz)

4:35 p.m. (105) *The American Mathematical Endeavor: 1776-1876.*
Karen V. H. Parshall, University of Virginia (881-01-125)

Session on Contributed Papers, II

2:45 p.m.–5:10 p.m.

2:45 p.m. (106) *Inequalities concerning the L^p norm of a polynomial and its derivative.*
Robert B. Gardner, Louisiana State University, Shreveport, and **Narendra K. Govil***, Auburn University, Auburn (881-30-150)

3:00 p.m. (107) *Sampling vs. interpolation for entire functions.*
Carl Prather, Virginia Polytechnic Institute and State University (881-30-170)

3:15 p.m. (108) *Factorization of A(z) + B(w) under composition.*
Lee A. Rubel, University of Illinois, Urbana-Champaign, and **Chung-Chun Yang***, Hong Kong University of Science & Technology, Hong Kong (881-32-04)

3:30 p.m. (109) *Metrics for singular analytic spaces.*
C. G. Grant*, United States Naval Academy, and **P. Milman**, University of Toronto (881-32-151)

3:45 p.m. (110) *Precauchy spaces.* Preliminary report. **D. C. Kent*** and **Nandita Rath**, Washington State University (881-54-123)

4:00 p.m. (111) *Metrizability in isocompact wM spaces.* Preliminary report. **G. R. Hiremath**, Talladega College (881-54-202)

4:15 p.m. (112) *The topology of quasibundles.* **H. Movahedi-Lankarani***, Pennsylvania State University, Altoona, and **R. Wells**, Pennsylvania State University, University Park (881-55-130)

4:30 p.m. (113) *Flat 3-manifolds appear as cusps of hyperbolic 4-manifolds.* **Barbara E. Nimershiem**, Franklin & Marshall College (881-57-75)

4:45 p.m. (114) *The Ore condition for polynomial rings.* **Ferrran Cedó**, University Autonoma de Barcelona, Spain, and **Delors Herbera***, Rutgers University, New Brunswick (881-16-221)

5:00 p.m. (115) *Maximal module theorems.* **Carl Faith**, Rutgers University, New Brunswick (881-16-222)

Special Session on Pure and Applied Recursion Theory, II

3:00 p.m.–5:20 p.m.

3:00 p.m. (116) *Game extraction of programs from specifications.* **Anil Nerode***, **Jeffrey B. Remmel** and **Alex Yakhnis**, Cornell University (881-03-73)

3:30 p.m. (117) *Mixed systems.* **C. J. Ash**, Monash University, Australia, and **J. F. Knight***, University of Notre Dame (881-03-19)

4:00 p.m. (118) *The structural approach to the P vs. NP problem.* **Stuart A. Kurtz**, University of Chicago (881-03-72)

4:30 p.m. (119) *Priority arguments using iterated trees of strategies, II.* **Steffen Lempp**, University of Wisconsin, Madison, and **Manuel Lerman***, University of Connecticut, Storrs (881-03-40)

5:00 p.m. (120) *Priority arguments using iterated trees of strategies.* **Steffen Lempp***, University of Wisconsin, Madison, and **Manuel Lerman**, University of Connecticut, Storrs (881-03-39)

Sunday, April 18

Special Session on Nonlinear Elliptic Problems in Geometry and Physics, III

8:20 a.m.–10:50 a.m.

8:20 a.m. (121) *The Dirichlet problem for a class of fully nonlinear elliptic equations.* **Bo Guan**, Indiana University, Bloomington (881-35-117)

9:00 a.m. (122) *On Weyl problem with nonnegative Gauss curvature.* Preliminary report. **Pengfei Guan***, McMaster University,, and **Yanyan Li**, Rutgers University, New Brunswick (881-58-28)

9:40 a.m. (123) *Numerical solutions of boundary value problems for K-surfaces.* Preliminary report. **Frank Baginski***, George Washington University, and **Nate Whitaker**, University of Massachusetts, Amherst (881-35-79)

10:20 a.m. (124) *A non-minimal solution of the Yang-Mills-Higgs equation with positive coupling constant.* **Janet Talvacchia**, Swarthmore College (881-35-220)

Special Session on Pure and Applied Recursion Theory, III

8:30 a.m.–10:50 a.m.

8:30 a.m. (125) *(α, β)-selective sets.* Preliminary report. **Georgia Martin**, University of Maryland, College Park (881-03-12)

9:00 a.m. (126) *From recursive to on-line coloring of graphs.* Preliminary report. **Henry A. Kierstead**, Arizona State University (881-03-56)

9:30 a.m. (127) *Pure and applied Π^0_1 classes.* **Douglas Cenzer**, University of Florida (881-03-47)

10:00 a.m. (128) *A cohesive degree which is not high.* Preliminary report. **Carl Jockusch***, University of Illinois, Urbana-Champaign, and **Frank Stephan**, University of Karlsruhe, Germany (881-03-71)

10:30 a.m. (129) *Jumps of minimal degrees below $0'$.* **Rod Downey**, Victoria University of Wellington, New Zealand, **Steffen Lempp**, University of Wisconsin, Madison, and **Richard A. Shore***, Cornell University (881-03-09)

Special Session on Ergodic Theory, Dynamical Systems and Applications, III

8:30 a.m.–10:50 a.m.

8:30 a.m. (130) *Suspensions, inheritance, and flows on homogeneous spaces.* **David B. Ellis**, Beloit College (881-54-34)

9:00 a.m. (131) *Central configurations in the 1+n body problem.* Preliminary report. **Glen Hall**, Boston University (881-70-160)

9:30 a.m. (132) *On the dynamics of some polynomial root-finding algorithms.* Preliminary report. **Scott Sutherland**, State University of New York, Stony Brook (881-58-35)

10:00 a.m. (133) *Residual properties of α-flows.* Preliminary report. **Andres del Junco**, University of Toronto,, **Adam Fieldsteel***, Wesleyan University, and **Kye-Won Park**, Ajou University, (881-28-113)

10:30 a.m. (134) *Entropy on noncompact spaces.* Preliminary report. **Bruce Kitchens**, IBM T. J. Watson Research Center, Yorktown Heights, New York (881-28-38)

Sunday, April 18 (cont'd)

Special Session on Geometric Methods in Combinatorics, III

8:30 a.m.–10:50 a.m.

8:30 a.m. (135) *A poset of pseudoline arrangements.*
Walter D. Morris, Jr., George Mason University (881-90-22) (Sponsored by Joseph E. Bonin)

9:00 a.m. (136) *Gram's relation inside out.*
Jim Lawrence, George Mason University (881-52-206)

9:30 a.m. (137) *Lattices and geometry.* Preliminary report.
M. K. Bennett, University of Massachusetts, Amherst (881-06-18)

10:00 a.m. (138) *Applications of combinatorial geometries in model theory.* Preliminary report.
Kitty L. Holland, Simon Fraser University (881-03-197)

10:30 a.m. (139) *The Borsuk conjecture holds for convex bodies with a belt of regular points.*
Boris Dekster, Mount Allison University (881-52-11)

Special Session on Low Dimensional Topology, III

8:30 a.m.–10:50 a.m.

8:30 a.m. (140) *A diagrammatic theory of knotted surfaces.*
J. Scott Carter*, University of South Alabama, and **Masahico Saito**, University of Texas, Austin (881-57-60)

9:00 a.m. (141) *The formal Knizhnik-Zamolodchikov connection and a universal knot invariant.* Preliminary report.
Xiao-Song Lin, Columbia University (881-57-62) (Sponsored by Yongwu Rong)

9:30 a.m. (142) *A topological quantum theory approach to the Andrews-Curtis conjecture.*
Frank Quinn, Virginia Polytechnic Institute and State University (881-57-68)

10:00 a.m. (143) *Computing spectral flow via cup products.* Preliminary report.
Paul Kirk*, Florida State University, and **Eric Klassen**, Indiana University, Bloomington (881-57-211)

10:30 a.m. (144) *Infinite generation of* $\Pi_1(Diff(M))$.
John Kalliongis*, Saint Louis University, and **Darryl McCullough**, University of Oklahoma (881-57-53)

Session on Contributed Papers, III

8:30 a.m.–10:40 a.m.

8:30 a.m. (145) *The tangential structure of fractal measures.*
Christoph Bandt, Ernst-Moritz-Arndt University, Germany (881-28-215)

8:45 a.m. (146) *Discontinuous differential equations.* Preliminary report.
Abdelkader Boucherif*, Georgia Institute of Technology, and **Ghouti Boukli-Hacene**, University of Tlemcen, Algeria (881-34-166) (Sponsored by Johnny L. Henderson)

9:00 a.m. (147) *On a degenerate isotropic material.*
Ping Wang, Pennsylvania State University, Schuykill (881-35-164) (Sponsored by Joseph H. Clements)

9:15 a.m. (148) *The linear shallow water theory: A mathematical justification.*
James A. Donaldson and **Daniel A. Williams***, Howard University (881-35-165)

9:30 a.m. (149) *Solutions of physical problems by decomposition.*
George Adomian, General Analytics Incorporated, Georgia (881-35-191)

9:45 a.m. (150) *Continuity of point derivations in Banach function algebras.*
S. I. Ouzomgi, Pennsylvania State University, University Park (881-46-152)

10:00 a.m. (151) *A new class of Banach spaces.*
Tepper L. Gill* and **W. W. Zachary**, Howard University (881-46-185)

10:15 a.m. (152) *An extension of a fixed point theorem.* Preliminary report.
S. P. Singh, Memorial University of Newfoundland, Canada (881-47-124)

10:30 a.m. (153) *Torsion relations in the spacetime tangent bundle.*
Howard E. Brandt, Army Research Laboratory, Maryland (881-53-133)

Special Session on Geodesic Flows, Hyperbolic Geometry, and Symbolic Dynamics, I

9:00 a.m.–10:50 a.m.

9:00 a.m. (154) *Markoff geodesics as matrices.* Preliminary report.
Harvey Cohn, City College, City University of New York (881-11-02)

9:30 a.m. (155) *Invariant measures for general Gauss transforms.*
Andrew Haas, University of Connecticut, Storrs (881-11-199)

10:00 a.m. (156) *The continuous diophantine approximation mapping of Szekeres.*
Jeffrey C. Lagarias*, AT&T Bell Laboratories, Murray Hill, New Jersey, and **Andrew D. Pollington**, Brigham Young University (881-11-142)

10:30 a.m. (157) *A rigidity theorem for surfaces of variable negative curvature.*
Steven P. Lalley, Purdue University, West Lafayette (881-53-186)

Special Session on Wavelets in Sampling Theory and Signal Processing, III

9:00 a.m.–10:50 a.m.

9:00 a.m. (158) *Sampling and the multisensor deconvolution problem.*
David F. Walnut, George Mason University (881-42-120)

9:30 a.m. (159) *Wavelets on closed sets and applications.*
Björn Jawerth, University of South Carolina, Columbia (881-42-212)

10:00 a.m. (160) *Scale-angle representation: Application to frequency extraction and sampling.*
J-P. Antoine, **P. Carrette**, University Catholique de Louvain, Belgium, and **R. Murenzi***, Clark Atlanta University (881-62-168)

10:30 a.m. (161) *An almost orthogonal radical wavelet expansion for radical distributions.*
Jay Epperson, University of New Mexico, and **Michael Frazier***, Michigan State University (881-41-146)

Special Session on Graph Theory, III

9:00 a.m.–10:50 a.m.

9:00 a.m. (162) *Rectilinear crossing number of a complete graph and Sylvester's "Four-point Problem" of geometric probabilty.*
Edward R. Scheinerman*, Johns Hopkins University, and **Herbert S. Wilf**, University of Pennsylvania (881-05-57)

9:30 a.m. (163) *The Dinitz problem solved for rectangles.*
Jeannette C. M. Janssen, Lehigh University (881-05-148)

10:00 a.m. (164) *On p-intersection representations.*
Nancy Eaton, University of Rhode Island, **Ronald J. Gould*** and **Vojtech Rodl**, Emory University (881-05-138)

10:30 a.m. (165) *Nowhere-zero 4-flows of solvable Cayley graphs.*
B. Alspach, Simon Fraser University, **Y-P. Liu**, Nanjing Normal, People's Republic of China, and **C-Q Zhang***, West Virginia University (881-05-31)

Special Session on Undergraduate Research in Applied Mathematics, III

9:00 a.m.–10:50 a.m.

9:00 a.m. (166) *Consistency in cooperative game theory.*
Roger Lee, Cambridge, Massachusetts (881-90-103) (Sponsored by Anant P. Godbole)

9:30 a.m. (167) *Reasonable allocations for PFF and CFF games.*
Luz E. Pinzon, Rutgers University, New Brunswick (881-90-94) (Sponsored by Anant P. Godbole)

10:00 a.m. (168) *Compound Poisson approximations for word patterns.*
Garrick Lee Wallstrom*, Abington, Massachusetts, and **Allison Michelle Skolnick**, East Brunswick, New Jersey (881-60-96) (Sponsored by Anant P. Godbole)

10:30 a.m. (169) *Statistical tests for Markov-dependence.*
Sharyn Campbell, Youngstown, Ohio (881-62-111) (Sponsored by Anant P. Godbole)

Special Session on Undergraduate Research in Pure Mathematics, III

9:00 a.m.–10:50 a.m.

9:00 a.m. (170) *Some results in Euclidean plane geometry.*
Nathan Dunfield, Corvallis, Oregon (881-51-91) (Sponsored by Anant P. Godbole)

9:30 a.m. (171) *Factorization in $K[x^2, x^3]$.*
Faith Inman, University of North Carolina, Greensboro (881-16-90) (Sponsored by Anant P. Godbole)

10:00 a.m. (172) *Unknotting numbers and minimal knot diagrams.*
James A. Bernhard, Princeton University (881-55-105) (Sponsored by Anant P. Godbole)

10:30 a.m. (173) *Mapping class groups of compact 2-manifolds.*
Dean Hildebrandt, Harvard University (881-55-89) (Sponsored by Anant P. Godbole)

Special Session on Mathematics of Two-dimensional Quantum Field Theory, III

9:00 a.m.–10:50 a.m.

9:00 a.m. (174) *Irreducible representations of affine superalgebras and number theory.*
Victor Kac*, Massachusetts Institute of Technology, and **Minoru Wakimoto**, Mie University, Japan (881-17-175)

9:40 a.m. (175) *Representations of Kac-Moody algebras and quantum groups.*
David Kazhdan*, Harvard University, and **George Lusztig**, Massachusetts Institute of Technology (881-17-178)

10:20 a.m. (176) *A q-deformation of Wakimoto representation and the quantum Knizhnik-Zamolodchikov equation.*
Atsushi Matsuo, Nagoya University, Japan (881-81-176) (Sponsored by Edward Frenkel)

Special Session on History of Mathematics, III

9:00 a.m.–10:50 a.m.

9:00 a.m. (177) *Calculus after the calculus.*
Paul D. Scofield, Washington & Lee University (881-01-167)

9:40 a.m. (178) *Saint Vincent and the logarithm.* Preliminary report.
V. Frederick Rickey, Bowling Green State University (881-01-190)

10:15 a.m. (179) *Pascal's triangle and the solution of polynolmial equations.* Preliminary report.
Victor J. Katz, University of the District of Columbia (881-01-162)

Special Session on Dilation and Interpolation: Operator Theoretic Methods, III

9:30 a.m.–10:50 a.m.

9:30 a.m. (180) *A Krein space extension of the Carathéodory-Fejér problem.* Preliminary report.
Gene B. Christner, University of Virginia (881-47-50)

10:00 a.m. (181) *Julia operators and coefficient problems.*
James Rovnyak, University of Virginia (881-47-51)

10:30 a.m. (182) *Operator theory and the Bose-like oscillator.*
Marvin Rosenblum, University of Virginia (881-47-161)

Sunday, April 18 (cont'd)

Invited Address

11:00 a.m.–11:50 a.m.

(183) *On the existence of convex hypersurfaces of constant Gauss curvature in hyperbolic space.*
Joel Spruck, Johns Hopkins University (881-53-219)

Invited Address

1:30 p.m.–2:20 p.m.

(184) *Geodesic flows and continued fractions.*
Leopold Flatto, AT&T Bell Laboratories, Murray Hill, New Jersey (881-58-129)

Special Session on Geodesic Flows, Hyperbolic Geometry, and Symbolic Dynamics, II

2:40 p.m.–4:30 p.m.

2:40 p.m. (185) *Fricke groups and continued fractions.* Preliminary report.
David Steinbach, Mathematical Sciences Research Institute, California (881-41-192) (Sponsored by Roy L. Adler)

3:10 p.m. (186) *Symbolic dynamics and flow on the Hecke surfaces.*
Thomas A. Schmidt, Widener University (881-58-83)

3:40 p.m. (187) *Intersections of closed geodesics on hyperbolic surfaces.*
Thea Pignataro, City College, City University of New York, and **Hanna Sandler***, American University (881-51-69)

4:10 p.m. (188) *β-Transformations and zeros for a class of power series.*
Boris Solomyak, University of Washington (881-58-46)

Special Session on Wavelets in Sampling Theory and Signal Processing, IV

2:40 p.m.–3:30 p.m.

2:40 p.m. (189) *Deconvolution, splines, Shannon sampling, and wavelets.*
Stephen D. Casey, American University (881-42-193)

3:10 p.m. (190) *Some algebraic obstructions to the existence of compactly supported symmetric wavelets.*
Chris Brislawn, Los Alamos National Laboratory (881-41-20)

Special Session on Graph Theory, IV

2:40 p.m.–4:30 p.m.

2:40 p.m. (191) *Maximal and forbidden unit distance graphs in the plane.*
Carolyn R. Mahoney*, California State University, San Marcos, and **Kiran B. Chilakamarri**, Central State University (881-05-169)

3:10 p.m. (192) *Extreme values of the edge-neighbor-connectivity.*
Margaret B. Cozzens*, National Science Foundation, Washington, DC, and **Shu-Shih Yang Wu**, Northeastern University (881-05-184)

3:40 p.m. (193) *Sturdy networks.*
Barry Piazza, University of Southern Mississippi, **Fred Roberts***, Rutgers University, New Brunswick, and **Sam Stueckle**, Northeastern University (881-05-135)

4:10 p.m. (194) *Strongly connected mixed graphs and connected detachments of graphs.*
C. St. J. A. Nash-Williams, University of Reading, England (881-05-134)

Special Session on Undergraduate Research in Applied Mathematics, IV

2:40 p.m.–4:30 p.m.

2:40 p.m. (195) *Exotic curves on the Genus-2 handlebody.*
Michael Bolt, Grand Rapids, Michigan (881-53-100) (Sponsored by Anant P. Godbole)

3:10 p.m. (196) *Counting critical points of polynomials.*
Ian B. Robertson, OCMR 1394, Oberlin, Ohio (881-26-95) (Sponsored by Anant P. Godbole)

3:40 p.m. (197) *An investigation of lifting modulo p as a method for computing Grobner bases.*
William L. Cooper*, Philadelphia, Pennsylvania, and **Janine Ladick**, Louisville, Kentucky (881-12-87) (Sponsored by Anant P. Godbole)

4:10 p.m. (198) *Computational methods for the Igusa local Zeta function.*
Frederic Schoenberg, Brown University (881-11-88) (Sponsored by Anant P. Godbole)

Special Session on Undergraduate Research in Pure Mathematics, IV

2:40 p.m.–5:00 p.m.

2:40 p.m. (199) *Upper bounds for covering numbers.*
Sandra Thompson*, Minneapolis, Minnesota, and **Eric Vigoda**, Rochester, New York (881-05-104) (Sponsored by Anant P. Godbole)

3:10 p.m. (200) *Randomly C_4-decomposable graphs.*
Daniel Isaksen, Berkeley, California (881-05-98) (Sponsored by Anant P. Godbole)

3:40 p.m. (201) *Which Cayley graphs of prime power order are isomorphic?.*
Andrew J. Mauer, Williams College (881-05-99) (Sponsored by Anant P. Godbole)

4:10 p.m. (202) *Structural characteristics of $V_n(G)$.*
David Weinreich, Emory University (881-05-97) (Sponsored by Anant P. Godbole)

4:40 p.m. (203) *Characterization of singular graphs.* **Maryanne Brown**, Newton, Massachusetts (881-05-101) (Sponsored by Anant P. Godbole)

Special Session on Ergodic Theory, Dynamical Systems and Applications, IV

2:40 p.m.–4:00 p.m.

2:40 p.m. (204) *Factors of Cartesian products of nonsingular Chacon maps.* **A. del Junco**, University of Toronto, and **Cesar E. Silva***, Williams College (881-28-141)

3:10 p.m. (205) *Remarks on ergodic transformations isomorphic to their inverses.* Preliminary report. **Geoffrey R. Goodson***, Towson State University, and **Daniel J. Rudolph**, University of Maryland, College Park (881-28-33)

3:40 p.m. (206) *Shadowing and global error of differential equations calculations.* **Tim Sauer**, George Masón University (881-58-43)

Special Session on Nonlinear Elliptic Problems in Geometry and Physics, IV

2:40 p.m.–5:10 p.m.

2:40 p.m. (207) *Adding handles to the helicoid.* **David Hoffman***, University of Massachusetts, Amherst, **Hermann Karcher**, University of Bonn, Germany, and **Fusheng Wei**, Texas A & M University, College Station (881-53-29)

3:20 p.m. (208) *The Dirichlet energy of mappings on spheres.* Preliminary report. **D. Zhang**, Johns Hopkins University (881-53-82) (Sponsored by Joel Spruck)

4:00 p.m. (209) *Regular homotopy classes of minimal surfaces.* Preliminary report. **Rob Kusner***, Institute for Advanced Study, and **Nick Schmitt**, University of Massachusetts, Amherst (881-53-27)

4:40 p.m. (210) *Nodal sets on Riemannian manifolds.* Preliminary report. **Rui-Tao Dong**, Johns Hopkins University (881-53-121) (Sponsored by Joel Spruck)

Special Session on Low Dimensional Topology, IV

2:40 p.m.–4:00 p.m.

2:40 p.m. (211) *A subgroup of the mapping class group compatible with surgery.* **Lawrence Smolinsky**, Louisiana State University, Baton Rouge (881-57-65)

3:10 p.m. (212) *A simple proof of the Traczyk Yokota criteria for periodic knots.* **Józef H. Przytycki**, Odense University, (881-57-45)

3:40 p.m. (213) *Minimal energy electrostatic knots.* **Samuel J. Lomonaco, Jr.**, University of Maryland Baltimore County (881-78-21)

Special Session on Mathematics of Two-dimensional Quantum Field Theory, IV

2:45 p.m.–4:35 p.m.

2:45 p.m. (214) *Introduction to W-algebras.* **Kareljan Schoutens**, Joseph Henry Laboratories, Princeton University (881-81-179) (Sponsored by Edward Frenkel)

3:25 p.m. (215) *Semi-infinite cohomology of W-algebras.* **Peter Bouwknegt**, University of Southern California (881-81-172) (Sponsored by Edward Frenkel)

4:05 p.m. (216) *Dilogarithm identities, q-difference equations, and the Virasoro algebra.* **Edward Frenkel**, Harvard University, and **Andras Szenes***, Massachusetts Institute of Technology (881-17-181)

Special Session on History of Mathematics, IV

2:45 p.m.–4:20 p.m.

2:45 p.m. (217) *Biographical remarks on the life and work of Joaquin Basilio Diaz.* **Florence Fasanelli**, Mathematical Association of America (881-01-84)

3:20 p.m. (218) *Calculus for a new century: Granville, Smith and Longley.* Preliminary report. **George M. Rosenstein**, Franklin & Marshall College (881-01-26)

3:50 p.m. (219) *Thomas Jefferson's contributions to mathematics.* **J. J. Tattersall**, Providence College (881-01-63)

Special Session on Pure and Applied Recursion Theory, IV

3:00 p.m.–4:20 p.m.

3:00 p.m. (220) *Using second order logic.* Preliminary report. **John N. Crossley**, Monash University, Australia (881-03-154)

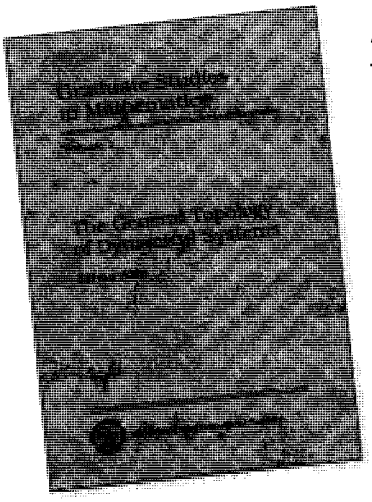
3:30 p.m. (221) *The two quantifier theory of the recursively enumerable weak truth-table degrees in decidable.* Preliminary report. **Klaus Ambos-Spies**, University of Heidelberg, Germany, **Peter A. Fejer***, University of Massachusetts, Boston, **Steffen Lempp**, University of Wisconsin, Madison, and **Manuel Lerman**, University of Connecticut, Storrs (881-03-58)

4:00 p.m. (222) *Recent progress in priority theory.* **K. Kontostathis**, Villanova University (881-03-64)

Lesley M. Sibner
Associate Secretary
Brooklyn, New York

Introducing...

Graduate Studies in Mathematics



The Series...

Graduate Studies in Mathematics is the first graduate text series to be published by the AMS. This exciting new series incorporates the same high quality and distinguished authorship as other AMS publications at an affordable price for the graduate student. This series is useful to professors looking for graduate-level textbooks for class use and to librarians wishing to recommend suitable books to graduate students.

Volume 1

The General Topology of Dynamical Systems

Ethan Akin

- is an essential text for students studying dynamical systems and numerical analysis;
- contains straightforward proofs (guided by hints) for less-experienced readers;
- has over 60 exercises and 50 supplemental exercises;
- builds a natural foundation for all aspects of dynamical systems theory, using both old and new research;
- is a valuable reference tool for students and researchers alike.

60-day examination copy available

1991 *Mathematics Subject Classification*: 58, 34; **ISBN 0-8218-3800-8**, 261 pages (hardcover), 1993
List price $50, Individual mem. $30, Institutional mem. $40. To order, please specify **GSM/1NA**

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

DeKalb, Illinois
Northern Illinois University
May 20–23, 1993

Second Announcement

The eight-hundred-and-eighty-second meeting of the American Mathematical Society (AMS) will be held at Northern Illinois University, DeKalb, Illinois, from Thursday, May 20, through Sunday, May 23, 1993. Special sessions and sessions for contributed papers will be held in DuSable Hall and Cole Hall, and invited addresses will be in the auditoria in Cole Hall.

Invited Addresses

By invitation of the Central Section Program Committee, there will be three invited addresses. The speakers, their affiliations, and the titles of their talks where available are:

Susan J. Friedlander, University of Illinois at Chicago, *Instabilities in fluid motion.*

Russell D. Lyons, Indiana University, *title to be announced.*

Clark Robinson, Northwestern University, *title to be announced.*

Special Sessions

By invitation of the same committee, there will be eleven special sessions of selected twenty-minute papers. The topics of these sessions, and the names and affiliations of the organizers, are as follows:

Advances in linear algebra: theory, computation, application, **Gregory S. Ammar**, Northern Illinois University.

Number theory, **Michael A. Filaseta**, University of South Carolina, and **Carl Pomerance**, University of Georgia.

Mathematical topics in fluid dynamics, **Susan J. Friedlander**.

Combinatorics, **Zoltan Furedi**, University of Illinois, Urbana.

Analytic number theory, **Andrew J. Granville**, Isaac Newton Institute for the Mathematical Sciences.

Beautiful graph theory, **Frank Harary**, New Mexico State University.

Stochastic processes, **Mohsen Pourahmadi**, Northern Illinois University.

History of mathematics, **Jeanne LaDuke**, DePaul University.

Function theory, **Linda R. Sons**, Northern Illinois University.

Probabilistic methods, **Joel H. Spencer**, New York University, Courant Institute of Mathematical Sciences.

Discrete groups, **Peter Waterman**, Northern Illinois University.

Abstracts for consideration for these sessions should have been submitted by the **February 3, 1993** deadline. This deadline was previously published in the Invited Speakers and Special Sessions section of the *Notices*.

The sessions on *Function theory*, *Number theory*, *Combinatorics*, *Analytic number theory*, *Beautiful graph theory*, and *Probabilistic methods* have been coordinated to coincide with the Paul Erdős Birthday Celebration being organized by Northern Illinois University.

Contributed Papers

There will also be sessions for contributed ten-minute papers. Abstracts should have been submitted by the **February 26, 1993** deadline previously published in the Calendar of AMS Meetings and Conferences. Late papers will not be accommodated.

Registration

The meeting registration desk will be located in the third floor west corner foyer of DuSable Hall and will be open from 8:00 a.m. until 5:00 p.m. on Thursday, May 20; Friday, May 21; Saturday, May 22; and from 8:00 a.m. until noon on Sunday, May 23. The registration fees are $30 for members of the AMS, $45 for nonmembers, and $10 for emeritus members, students, or unemployed mathematicians, payable by cash, check, or Visa or MasterCard.

Events of Other Organizations

Northern Illinois University is celebrating the birthday of Paul Erdős in conjunction with the meeting. They have arranged for a one-hour mathematical address by Paul Erdős and for a banquet in his honor (see next page). The Erdős lecture will be at 4:15 p.m., Thursday, May 20, in Room 100 of Cole Hall. As noted above, a number of the Special Sessions at this meeting are coordinated with the Erdős Birthday Celebration.

For further information contact John Selfridge of Northern Illinois University.

Social Event

A banquet honoring Paul Erdős is planned for Thursday, May 20. A cash bar reception from 6:30 p.m. to 7:30 p.m will be followed by dinner at 7:30 p.m. The buffet dinner includes choice of salads, hand-carved roast baron of beef, baked chicken, mixed vegetables, rice, rolls with butter, apple pie, and beverage. Tickets including tax and gratuity are $25 for each mathematician and $20 for each of their guests. **Tickets must be ordered by May 6, 1993.** Mail orders, including your name, affiliation, and a check payable to Northern Illinois University, should be sent to Math Conference Banquet, College of Continuing Education, Northern Illinois University, DeKalb, IL 60115. Credit card orders can be charged to Visa, MasterCard, or Discover by calling 815-753-0277.

Accommodations

A block of sixty-three rooms has been reserved in the **Holmes Student Center Guest Rooms**. This air-conditioned facility is located on campus and is a five-minute walk to DuSable Hall. The rate for a single room is $37.74 per night. The rate for a double room is $43.29 per night. The rate for a triple room is $48.84 per night. All rates include tax. To make a reservation call 815-753-1444 (FAX 815-753-5099). Participants must indicate they are attending the AMS meeting.

Although rooms have not been blocked at the following locations, information is included for your convenience. Rates are subject to change and include tax. Participants should make their own arrangements with the hotel of their choice and ask for the AMS conference rate. **The AMS is not responsible for rate changes or the quality of the accommodations offered by these hotels/motels.**

Days Inn in DeKalb (15-minute walk to DuSable Hall)
1212 W. Lincoln Highway, DeKalb, IL 60115
Telephone: 815-758-2603
Single or Double $49.95

Ho Jo Inn (15-minute walk to DuSable Hall)
1321 W. Lincoln Highway, DeKalb, IL 60115
Telephone: 815-756-7620
Single $38.85 Double $43.29

Motel 6 (15-minute walk to DuSable Hall)
1116 W. Lincoln Highway, DeKalb, IL 60115
Telephone: 815-756-3398
Single $24.36 Double $31.02

Oxford Inn (10 minutes by car from campus)
State Route 23 (at Oakland), DeKalb, IL 60115
Telephone: 815-756-3552
Single $51.06 Double $57.72

Best Western Concord Inn (20 minutes by car from campus)
Highway 251 and I-88, Rochelle, IL 61068
Telephone: 815-562-5551
Single $55.11 Double $62.20

Super 8 Motel (20 minutes by car from campus)
601 Highway 38, Rochelle, IL 61068
Telephone: 815-562-2468
Single $38.40 Double $46.95

Food Service

There are several restaurants and fast food establishments within walking distance of campus. A list of local restaurants will be available at the Registration Desk.

Parking

Free parking is available in Parking Lots S and 38 located west of DuSable Hall. Leave a note on your windshield indicating that you are attending the AMS meeting. Enter lots S and 38 from Annie Glidden Road. Parking is likely to be at a premium on campus at this time because of several construction projects. Do not use other parking lots without first obtaining a visitor's permit from Campus Parking Services.

Travel and Local Information

Northern Illinois University is located in DeKalb, Illinois, 65 miles west of Chicago on the East-West Tollway (I-88) and 35 miles southeast of Rockford on Route 38. The campus is one-and-one-half miles north of I-88 on Annie Glidden Road which is the second DeKalb exit if traveling on I-88 from the east and the first DeKalb exit if approaching from the west.

The DeKalb Limousine Service provides transportation to and from either O'Hare or Midway International Airports. A one-way trip to or from O'Hare costs $35 per person and to or from Midway the cost is $45 per person. These rides are cheaper when the limousine is shared. Prior reservations are required. Call 800-892-2988 or 815-758-0631. Visa, MasterCard and American Express are accepted.

Weather and Local Attractions

The weather in northern Illinois in mid-May is unpredictable. Temperatures might be as high as the high 70s or as low as the mid-50s (Fahrenheit). It is recommended that participants bring clothes appropriate to either extreme, as well as for the possibility of rain.

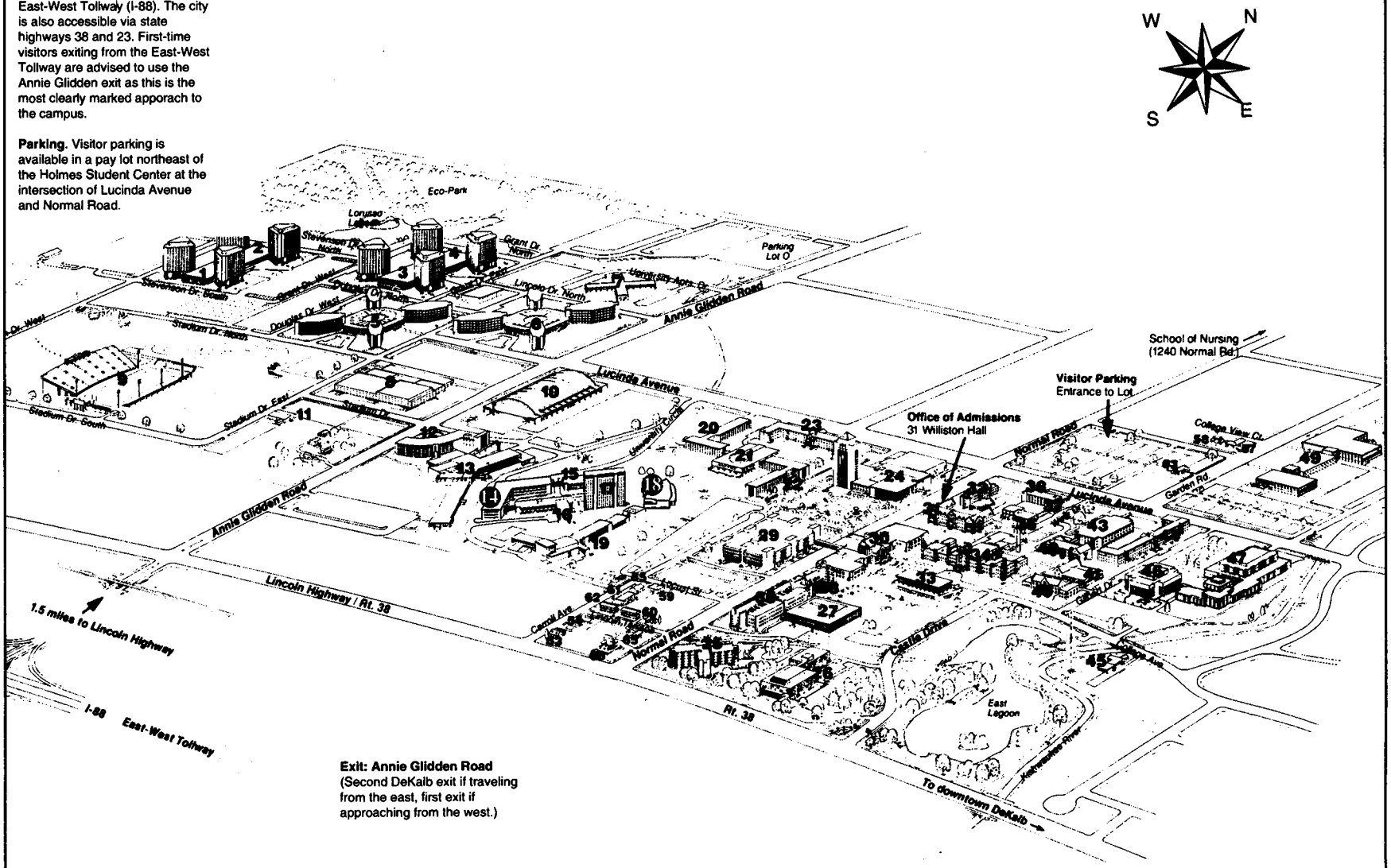
Andy R. Magid
Associate Secretary
Norman, Oklahoma

Northern Illinois University

Directions to NIU. NIU's main campus in DeKalb, Illinois is located one mile north of the East-West Tollway (I-88). The city is also accessible via state highways 38 and 23. First-time visitors exiting from the East-West Tollway are advised to use the Annie Glidden exit as this is the most clearly marked apporach to the campus.

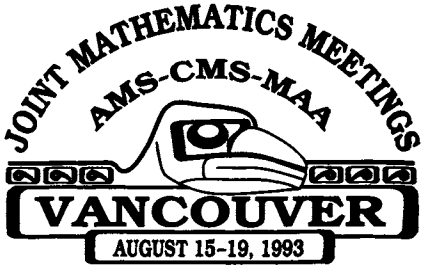
Parking. Visitor parking is available in a pay lot northeast of the Holmes Student Center at the intersection of Lucinda Avenue and Normal Road.

Academic Buildings
18 Cole Hall
14 DuSable Hall

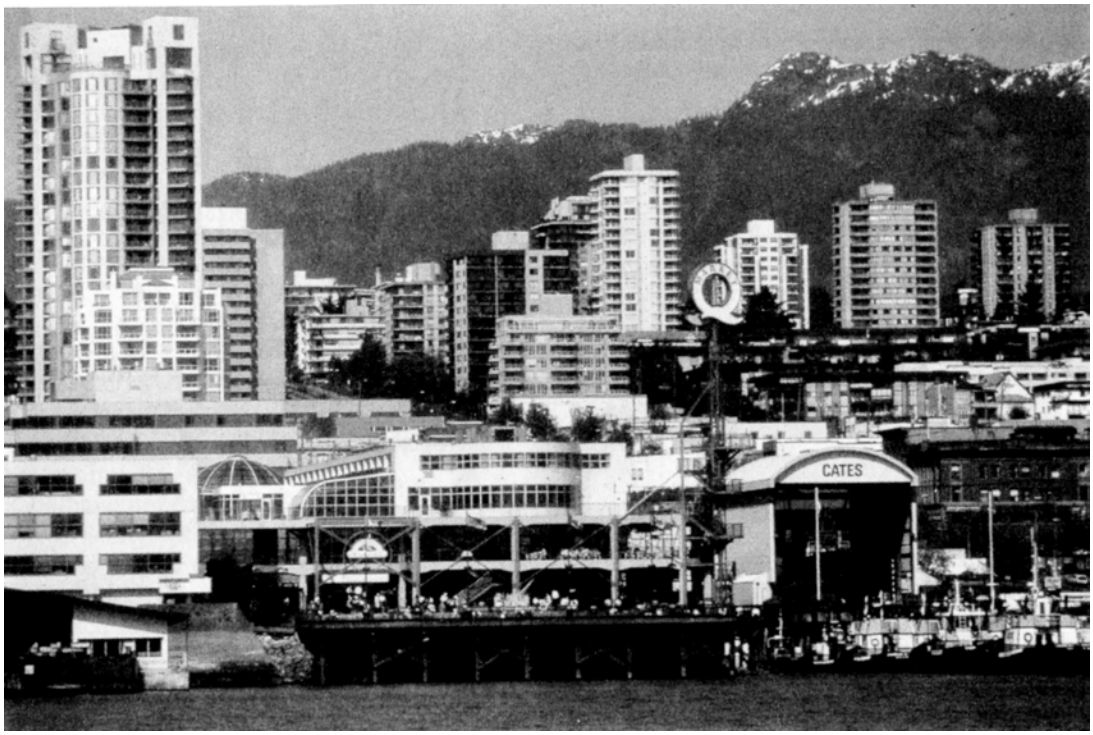


Exit: Annie Glidden Road
(Second DeKalb exit if traveling from the east, first exit if approaching from the west.)

International Joint Mathematics Meetings Vancouver, British Columbia, Canada August 15–19, 1993



First announcement



Lonsdale Quay, North Vancouver. Photo courtesy of the Ministry of Tourism, British Columbia

WHERE TO FIND IT!

(a guide to this meeting announcement)

	Page		*Page*
How to Preregister	377	Summer Meeting of the MAA	371
How to Get a Room	378	Other Organizations	374
Joint AMS-CMS Sessions	367	Other Events of Interest	374
Joint CMS-MAA Sessions	368	Miscellaneous Information	381
Sessions for Students	370	Timetable	388
Summer Meeting of the AMS	370	Maps	380, 385
Summer Meeting of the CMS	371	All Forms	at the back of this issue

International Joint Mathematics Meetings

In the interest of furthering the exchange of mathematics worldwide, the AMS and MAA have accepted an invitation to join forces with the Canadian Mathematical Society to bring you one of the strongest mathematics programs ever assembled. All sessions and events will take place on the campus of the University of British Columbia in Vancouver. There will be conflict-free plenary talks each morning, and the program has a full five days designed to include something for everyone: special sessions, panels, education sessions, contributed paper sessions, and an enriching program for students. The University of British Columbia provides a scenically beautiful and appropriate venue for this first joint gathering of these U.S. and Canadian organizations.

Vancouver is truly a vacation-oriented region, and we encourage the families of participants to attend and take advantage of everything the area has to offer. Special family rates have been negotiated with the dormitories at UBC, and several whole- and half-day trips have been arranged so that you may sample Canadian hospitality, entertainment, and discovery.

Attention Students!

Students should refer to the **Sessions for Students** section on page 370 for those sessions presented especially for them. In an attempt to make this announcement less overwhelming, other sessions that are thought to be of particular interest to students have been flagged with this symbol ☞. Of course there may be several more, like some of the joint invited addresses, so students should take time to peruse the entire announcement to find other items of personal interest.

IMPORTANT DEADLINES

AMS-CMS Special Session Abstracts	**Expired**
AMS Abstracts	
For Consideration for Special Sessions	**April 27**
Of Contributed Papers	**May 18**
MAA Abstracts of Contributed Papers	**May 7**
ORDINARY Preregistration	**June 11**
Hotel Accommodations (MMSB)	**June 11**
Tickets through Preregistration	**June 11**
MAA Minicourse Preregistration (MAA)	**June 11**
Hotel Changes and Cancellations (MMSB)	**July 1**
Gage Residence Accommodations (UBC)	**July 12**
Motions for AMS Business Meeting	**July 16**
CMS General Meeting Notices of Motion	**July 19**
FINAL Preregistration (no hotel or tickets)	**July 19**
Cancellations for all Banquets and Tours (50% refund)	**August 2**
Gage Residence Accommodation Cancellations (less CDN$15 fee) (UBC)	**48 hours before arrival**
Preregistration Cancellations (50% refund)	**August 11**

Welcome Address

All participants are invited to the official commencement of this first joint meeting of the AMS, CMS, and MAA at the welcoming address on Sunday at 9:15 a.m.

Opening Banquet

On Sunday evening, the AMS, CMS, and MAA are honored to host a banquet where each organization's prizes will be awarded. All participants are invited to attend this festive event. Details on the banquet, including how to purchase tickets, can be found in the section on Social Events.

The Scientific Program

The August 1993 International Joint Mathematics Meetings, including the 95th Summer Meeting of the AMS, the Canadian Mathematical Society Summer Meeting 1993, the 71st Summer Meeting of the Mathematical Association of America, and the 1993 summer meetings of the Association for Women in Mathematics and Pi Mu Epsilon (ΠΜΕ), will be held August 15–19 (Sunday–Thursday), 1993, at the University of British Columbia, Vancouver, Canada. All sessions will take place on the campus of the university.

Joint AMS-CMS Sessions

By invitation of the AMS-CMS Joint Program Committee (Spencer Bloch, David W. Boyd, Carl Herz [Chair], Dusa McDuff, Victor P. Snaith, and Nancy K. Stanton), five speakers will address the AMS and CMS. The names of the speakers, their affiliations, the titles (where available), dates, and times of their talks follow:

Jill C. Pipher, Brown University, title to be announced, Sunday, 10:55 a.m.;

Curt McMullen, University of California, Berkeley, *Frontiers in complex dynamics*, Monday, 11:05 a.m.;

H. Blaine Lawson, State University of New York, Stony Brook, *Algebraic cycles and topology*, Tuesday, 11:05 a.m.;

Robert E. Gompf, University of Texas, Austin, *4-manifolds and symplectic topology*, Wednesday, 11:05 a.m.;

Louis Nirenberg, Courant Institute of Mathematical Sciences, New York University, title to be announced, Thursday, 10:55 a.m.

Also by invitation of the AMS-CMS Program Committee there will be Special Sessions of selected twenty-minute papers. The topics, the names and affiliations of the mathematicians arranging them, and the tentative days and times they will meet are:

3- and 4-manifolds, **David M. Austin**, University of British Columbia, Sunday and Monday at 2:30 p.m.;

Variational methods in partial differential equations, **Nassif Ghoussoub**, University of British Columbia, Tuesday and Wednesday at 2:30 p.m., and Thursday at 9:00 a.m. and 3:00 p.m.;

Conformal dynamics, **Linda Keen**, Herbert H. Lehman College, CUNY, Sunday, Monday, and Tuesday at 2:30 p.m.;

Algebraic cycles, **James L. Lewis**, University of Alberta, and **Barry Mazur**, Harvard University, Sunday and Monday at 2:30 p.m.;

Number theory, **Rajiv Gupta**, University of British Columbia, and **Ram M. Murty**, McGill University, Tuesday and Wednesday at 3:00 p.m., and Thursday at 9:00 a.m.;

Harmonic analysis techniques in partial differential equations, **Gregory Verchota**, Syracuse University, Sunday and Monday at 2:30 p.m.

The AMS and CMS are grateful to the Natural Sciences and Engineering Research Council (NSERC) of the Government of Canada for its generous support of these sessions.

Speakers in these sessions should have followed the instructions for submission of abstracts to CMS as instructed by their organizers.

Contributed Papers: There will be sessions for contributed papers on Sunday, Monday, Tuesday, Wednesday, and Thursday afternoons, and Thursday morning. Anyone contributing should also examine the list of AMS Special Sessions to see if his or her paper may be considered appropriate for one of them, and then submit by the April 27 deadline.

Abstracts for AMS-CMS contributed papers and AMS Special Sessions should be prepared on the standard AMS form available from the AMS office in Providence or in departments of mathematics and should be sent to the Abstracts Coordinator, Meetings Department, American Mathematical Society, P. O. Box 6887, Providence, Rhode Island 02940, **so as to arrive by the abstract deadline of May 18, 1993.** A charge of $16 is imposed for retyping abstracts that are not in camera-ready form. **Late papers cannot be accepted.**

Participants planning to submit abstracts for AMS ten-minute contributed papers by the May 18 deadline should be sure to indicate on the abstract any special scheduling requests.

Electronic Submission of Abstracts: This service is available only to those submitting papers for AMS-CMS contributed paper sessions or AMS Special Sessions who use the TEX typesetting system. Requests to obtain the package of files may be sent by e-mail to **abs-request@math.ams.org** on the Internet. Users may also obtain the package on IBM or Macintosh diskettes available free of charge by writing to the Abstracts Coordinator at the address given above. **All** users should be sure to specify whether they want plain TEX, AMS-TEX, or the LATEX package. Again, late papers cannot be accommodated.

Joint CMS-MAA Sessions

By invitation of the CMS-MAA Program Committee (Alan Cooper, Shirley A. Hill, Kenneth A. Ross (Chair), Peter D. Taylor, Alan C. Tucker, and Robert E. Woodrow), four speakers will address the CMS and MAA on some history or development of mathematics. The names of the speakers, their affiliations, the titles (where available), dates, and times of their talks follow:

Jonathan M. Borwein, Simon Fraser University, *Means, iterations, and experimentally induced identities*, Sunday, 9:35 a.m.;

Uri Treisman, University of Texas, Austin, title to be announced, Monday, 2:30 p.m.;

Deborah Hughes Hallett, Harvard University, *The goals of curriculum reform: students, technology, and mathematics*, Tuesday, 8:30 a.m.;

Gilles Brassard, Université de Montréal, *Quantum cryptography*, Wednesday, 8:30 a.m.

Also by invitation of the CMS-MAA Program Committee, the following sessions will take place:

Contributed Papers: Contributed papers are being organized on five topics for presentation at the meeting. The topics, organizers, their affiliations, and the probable days they will meet are given below. The procedures and deadlines are given following the list of sessions. In particular, note that proposals should be sent directly to the organizer whose name is followed by an asterisk (*).

- *History of mathematics*, Monday and Tuesday afternoons.

V. Frederick Rickey*
Department of Mathematics and Statistics
Bowling Green State University
Bowling Green, OH 43403-0221
telephone: 419-372-7452
e-mail: rickey@andy.bgsu.edu

James J. Tattersall, Providence College

Papers on the history of any area of the mathematical sciences, including those dealing with the pedagogy of mathematics, are invited.

- *Interacting with elementary school kids*, Wednesday afternoon and Thursday morning.

Willard A. Parker*
Department of Mathematics
Kansas State University
Manhattan, KS 66506-2602
telephone: 913-532-6750
e-mail: parker@math.ksu.edu

Teaching mathematics to elementary school children sounds like a challenge, but it is one many mathematicians have been meeting in one form or another. Mathematicians have become involved with elementary school children in a variety of ways, including special one-time presentations in elementary school classrooms and in other settings, extended work with classes or with a selected group of students, participation in special events such as math days and math competitions, and communication with elementary classrooms via electronic media. This session invites papers describing experiences of mathematicians working with elementary school children as well as practical suggestions for how mathematicians may become involved in such activities.

- *Less is more*, Tuesday and Wednesday afternoons.

Peter D. Taylor*
Department of Mathematics and Statistics
Queen's University
Kingston, Ontario K7L 3N6 Canada
telephone: 613-545-2434
fax: 613-545-2964
e-mail: taylorp@qucdn.queensu.ca

John Poland, Carleton University

We are so busy running around trying to cover all the material that our students "just have to know", and they are overburdened and frustrated because they never seem to have enough time to do anything really properly, even if they knew how, which they don't. With the cost crunch we all seem to be spinning faster and faster, and WHERE WILL IT ALL END?!

Submissions are encouraged from anyone who has had real success in getting their colleagues to agree to substantially cut down the amount of material in a course/program, thus freeing classroom time to talk/interact/explore/learn!

☞ • *Mathematics and industry interface*, Sunday and Monday afternoons.

Brian Alspach*
Department of Mathematics and Statistics
Simon Fraser University
Burnaby, B.C. V5A 1S6 Canada
telephone: 604-291-4815
fax: 604-291-4947
e-mail: alspach@cs.fsu.ca

This will be a session dealing with the interface between mathematics and industry, with emphasis on those topics that will interest students and assist them in making career decisions. For example, co-op education, industry recruiting, industrial perspectives, special joint university-industry programs, and so on, would be suitable topics. Presentations by students with industrial experience are welcome.

• *Research in undergraduate teaching*, Monday and Tuesday afternoons.

John Selden*
Vanderbilt University
mailing address: 1015 Melrose Drive
Cookeville, TN 38501
telephone: 615-526-1007
e-mail: js9484@tntech.edu

This session is sponsored by the Joint AMS-MAA Committee on Research in Undergraduate Mathematics Education, Ed Dubinsky (Chair). The organizing committee also includes Ed Dubinsky and Steve Monk. Presentations are invited that describe research on the teaching and learning of any aspect of undergraduate mathematics. Descriptions of courses taught must be in the context of investigations into such questions as how mathematics is learned, methods of teaching, effectiveness of the approach, and similar issues.

Presentations are normally limited to ten minutes, although selected contributors may be given up to twenty minutes. Individuals wishing to submit papers for any of these sessions should submit a **one-page summary** of the paper, including the name(s) and address(es) of the author(s) directly **to the organizer whose address is given.** The purpose of this summary is to enable the organizer(s) to evaluate the appropriateness of the paper for the session, so this summary should be as detailed and informative as possible within the one-page limitation. This summary must reach the organizer by **April 27**. Summaries should NOT be sent to the MAA office in Washington.

The organizer will acknowledge receipt of the summary. If the paper is accepted for presentation, the organizer will send the author(s) a standardized abstract form to be used to prepare a brief abstract, which will be published in the journal *Abstracts* (copies will be available in the registration area).

Completed abstract forms must be returned to the organizer promptly and **no later than May 7. Do not send the abstracts to the AMS, and do not submit them electronically.** Abstracts not received by that date will not be published. An abstract form may be obtained in advance from either the AMS office in Providence or the MAA Washington office, and the abstract may be submitted along with the summary.

Rooms where CMS-MAA contributed paper sessions will be held are equipped with an overhead projector and screen. Please see the **Miscellaneous Information** section of this announcement for additional information on audio-visual equipment.

The following **panel discussions** will also take place:

How to Help Your Majors Get into Graduate School: This panel discussion, sponsored by the MAA Committee on the Participation of Women, is scheduled to take place from 3:45 p.m. to 4:45 p.m. on Tuesday.

What is an interactive text? Four examples: This panel discussion is sponsored by the MAA Committee on Computers in Mathematics Education (CCIME) (L. Carl Leinbach, Chair) and is organized by **J. S. Devitt**, University of Saskatchewan. Panelists include **William J. Davis**, Ohio State University, **Gerald J. Porter**, University of Pennsylvania, **Robert J. Lopez**, Rose-Hulman Institute of Technology, and **Jim Swift**, Institute of Academic Technology, University of North Carolina. The panel is scheduled from 3:15 to 5:45 p.m. on Wednesday.

Models for Cooperative Learning for Undergraduate Mathematics Classes: This panel, scheduled from 9:00 a.m. to 10:40 a.m. on Thursday, is a presentation of several possible modes of cooperative learning for college classes that have some basis in sound research. The organizers are **G. Joseph Wimbish** and **Keith E. Schwingdorf**, Purdue University, North Central.

Other Joint Sessions

By invitation of the AMS, CMS, MAA, and the National Association of Mathematicians, **Aderemi O. Kuku**, University of Ibadan, Nigeria, and President of the African Mathematical Union, will give an address on Monday at 8:30 a.m., on *Mathematical research and education in Africa—problems and prospects.*

Sessions for Students

The AMS, CMS, MAA, and ΠΜΕ are rolling out the red carpet to welcome students, who should also refer to the sessions marked by ☞. All students who attend are expected to register for the Joint Mathematics Meetings and to pay the normal student registration fee. Faculty members, bring your students! Students, bring your faculty members!

CMS-MAA Student Lecture: Richard K. Guy, University of Calgary, will speak on *The unity of combinatorics* at 2:10 p.m. on Wednesday.

MAA-Mu Alpha Theta (MAΘ) **Lecture:** This is the second in this series of summer lectures sponsored jointly by the MAA and the high school honorary society, MAΘ. This year's lecture will be given by **Richard Rhoad**, New Trier Township High School, on *American high school mathematics—now and in the future*, at 2:30 p.m. on Tuesday. The speaker was selected by the MAA-MAΘ Lecture Committee, consisting of Judith E. Broadwin, Leonard Gillman, Katherine P. Layton (Chair), and Paul See.

Student Workshop: *Using Maple to do mathematics* is scheduled from 8:30 a.m. to 10:30 a.m. on Thursday.

MAA Student Paper Sessions: These are scheduled on Tuesday, Wednesday, and Thursday afternoons.

The MAA Student Chapter Faculty Advisors' Breakfast will be held on Tuesday morning.

The **ΠΜΕ J. Sutherland Frame Lecture** will be delivered on Wednesday at 8:30 p.m. by **George Andrews**, Pennsylvania State University, on *Ramanujan for students.*

ΠΜΕ will hold sessions for contributed papers on Tuesday, Wednesday, and Thursday afternoons.

The ΠΜΕ Council will meet from noon to 1:00 p.m. on Tuesday, August 17.

Information on the ΠΜΕ banquet can be found in the **Social Events** section of this announcement.

A reception for students will be cosponsored by ΠΜΕ and MAA on Monday, August 16, at 6:15 p.m., where there will be a make-your-own sundae party.

ΠΜΕ prepares their own program for their sessions; copies will be available at the Registration Desk.

A **student hospitality/information center** will be open Sunday through Thursday from 8:00 a.m. to 6:00 p.m. This center will provide a place where students can meet and greet one another. You never know who may drop in!

95th Summer Meeting of the AMS

August 15–19, 1993

Colloquium Lectures: A series of three Colloquium Lectures, *On the regularity properties of Gauge Fields in Minkowski space-time*, will be given by **Sergiu Klainerman**, Princeton University. The lectures will be given at 9:50 a.m. on Monday, Tuesday, and Wednesday.

Progress in Mathematics Lectures: This series of lectures provides a forum for the exposition of mathematical topics that have come into prominence in the past five years. The members of the Progress in Mathematics Selection Committee for these lectures are Hyman Bass, Michael Crandall, John Friedlander, Peter Li, Haynes Miller (Chair), and James Serrin.

The names and affiliations of the speakers and their titles are as follows:

Armand Borel, Institute for Advanced Study, *Values of indefinite quadratic forms at integral points and flows on spaces of lattices*, Wednesday at 1:15 p.m.;

Avner Friedman, University of Minnesota, Minneapolis, *PDE based models arising from industrial problems*, Thursday at 1:15 p.m.

Special Sessions: By invitation of the AMS Program Committee for National Meetings (Spencer Bloch, Hermann Flaschka, H. W. Lenstra, Dusa McDuff, Nancy K. Stanton [Chair], and Mary F. Wheeler), 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, and the tentative days and times they will meet are:

Problems in number theory in memory of E. G. Straus, **Joseph Arkin** and **David C. Arney**, United States Military Academy, and **Mathukumalli V. Subbarao**, University of Alberta, Sunday, Monday, and Tuesday at 2:30 p.m.;

Geometric methods in mathematical physics, **John K. Beem**, University of Missouri, Columbia, and **Krishan L. Duggal**, University of Windsor, Wednesday at 2:30 p.m. and Thursday at 8:30 a.m. and 2:30 p.m.;

Topological methods in group theory, **Alan B. Brownstein**, Rutgers University, and **Ronnie Lee**, Yale University, Wednesday at 2:30 p.m. and Thursday at 8:30 a.m. and 2:30 p.m.;

Discrete geometry and convexity, **Jacob E. Goodman**, CUNY, Sunday, Monday, and Tuesday at 2:30 p.m.;

Symplectic geometry, **Mark J. Gotay**, University of Hawaii, Sunday, Monday, and Thursday at 2:30 p.m.;

Exponential families in mathematical statistics, **Gerard G. Letac**, Université de Toulouse III, Sunday, Monday, and Tuesday at 2:30 p.m.;

Algebraic and geometric methods in control theory, **En-Bing Lin**, University of Illinois at Chicago, Sunday, Monday, and Tuesday at 2:30 p.m.;

Random knotting and linking, **Kenneth C. Millett**, University of California, Santa Barbara, Wednesday at 2:30 p.m., and Thursday at 8:30 a.m. and 2:30 p.m.

Most of the papers to be presented at these Special Sessions will be by invitation; however, anyone contributing an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these sessions should indicate this clearly on the abstract, **and should submit it by April 27, 1993, three weeks earlier than the normal deadline for contributed papers**, in order that it be considered for inclusion.

See the instructions for AMS abstracts submission given at the end of the **AMS-CMS Joint Sessions** section.

Other AMS Events

Council Meeting: The Council of the Society will meet at 2:00 p.m. on Friday, August 13.

Business Meeting: The Business Meeting of the Society will take place at 12:15 p.m. on Monday. The Secretary notes the following resolution of the Council: Each person who attends a Business Meeting of the Society shall be willing and able to identify himself as a member of the Society. In further explanation, it is noted that *each person who is to vote at a meeting is thereby identifying himself as and claiming to be a member of the American Mathematical Society.*

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

(a) doing nothing;

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

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

(d) recommending referral to a committee; and

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

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

The committee consists of M. Salah Baouendi, Robert M. Fossum (Chair), and Carol L. Walker.

In order that a motion for the Business Meeting of August 16, 1993, receive the service offered by the committee in the most effective manner, it should be in the hands of the Secretary by July 16, 1993.

CMS Summer Meeting 1993

August 15–19, 1993

Jeffery-Williams Lecture: The Jeffery-Williams Lectureship was inaugurated in 1968 to recognize mathematicians who have made outstanding contributions to mathematical research and is presented in conjunction with the Society's Summer Meeting. This year the Jeffery-Williams Lecture will be delivered by **James G. Arthur**, University of Toronto, on *Trace formulas and automorphic representations*, on Tuesday, August 17 at 7:00 p.m.

There will be a reception immediately preceding the lecture. Please see the **Social Events** section for details.

Other CMS Events

Board of Directors' Meeting: The Boards of Directors' Meeting will take place on Saturday, August 14, at 2:30 p.m.

James G. Arthur, CMS Jeffery-Williams Lecture

General Meeting: The General Meeting of the Society will take place on Monday, August 16 from 5:30 p.m. to 6:30 p.m. All members are invited to attend.

Committee Meetings: Most standing and ad-hoc committees will hold meetings in Vancouver. Members are encouraged to contact committee members regarding any items for inclusion in committee agendas. Room assignments for all CMS committee meetings will be made by the Administrative Coordinator in Ottawa.

Notices of Motion: In accordance with the existing by-laws, notices of motion must be received at the Executive Office at least four weeks before the meeting at which this notice of motion is to be considered. Notices of motion should include the mover and seconder and should be sent to the CMS Secretary, Executive Office, 577 King Edward, Suite 109, POB 450, Station A, Ottawa, Ontario, Canada K1N 6N5. In order to be considered at the General Meeting, all notices of motion must be received in Ottawa before July 19, 1993.

71st Summer Meeting of the MAA

August 15–19, 1993

☞ **Hedrick Lectures:** The 40th Earle Raymond Hedrick Lectures will be given by **Sir Michael Atiyah** of Trinity College, Cambridge, England. These lectures are scheduled at 1:25 p.m. on Sunday, Monday, and Tuesday, August 15–17. The title of the lecture series is *Recent developments in geometry and physics: 4-dimensions*. The first lecture will be on history, the second will focus on 3-dimensions, and the third will focus on 4-dimensions. The members of the Committee on Earle Raymond Hedrick Lectures who arranged

for this series include Andrew M. Gleason (Chair), Richard K. Guy, and Barbara Osofsky.

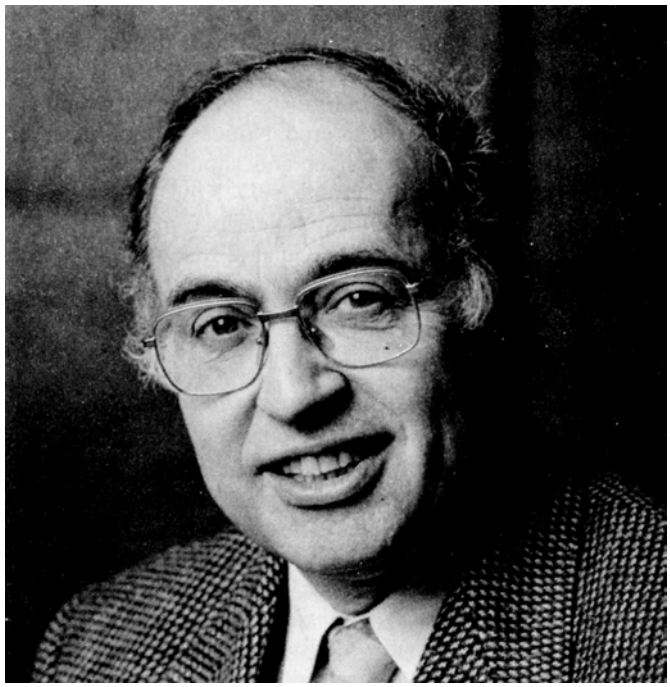
☞ **Minicourses:** Sign up now for one of the following Minicourses! The names and affiliations of the organizer(s), the topics, the dates and times of their meetings, and the enrollment limitations of each are indicated.

Minicourse #1: *The Fibonacci and Catalan numbers*, **Ralph P. Grimaldi**, Department of Mathematics, Rose-Hulman Institute of Technology. Part A: Sunday, 2:30 p.m.–4:30 p.m.; Part B: Monday, 2:30 p.m.–4:30 p.m. Enrollment limit: 80; registration fee: US$36.

In an introductory course in discrete or combinatorial mathematics one encounters the Fibonacci numbers—and sometimes the Catalan numbers. This Minicourse will review and then extend the first encounter as it examines some of the properties these numbers exhibit as well as applications where these sequences arise. A survey of applications dealing with chemistry, physics, computer science, linear algebra, set theory, graph theory, and number theory will show why these sequences are of interest and importance.

Minicourse #2: *Teaching applied mathematics via Maple*, **Robert J. Lopez**, Rose-Hulman Institute of Technology. Part A: Sunday, 2:30 p.m.–4:30 p.m.; Part B: Monday, 2:30 p.m.–4:30 p.m. Enrollment limit: 30; registration fee: US$45.

Computer algebra systems support a new approach to teaching classical applied mathematics, one that uses a "just-in-time" delivery of information and skills. This perspective is presented via examples taken from the list: Laplace transforms interactively, resonance by example, Fourier approximation to oscillator, Bessel and Legendre equations, fractionating columns, vector calculus, linear systems of ODEs, series solution of an ODE at an irregular singular point, the Calculus of Variations, car-following models.



Sir Michael Atiyah, MAA Hedrick Lecturer

Minicourse #3: *Environmental modeling via the qualitative, visual, and computational*, **B. A. Fusaro**, Salisbury State University. Part A: Sunday, 4:45 p.m.–6:45 p.m.; Part B: Tuesday, 2:30 p.m.–4:30 p.m. Enrollment limit: 30; registration fee: US$45.

This Minicourse can be used as the basis for a six-week module in a general education course or it can serve as an introduction to an emerging field. The core notion is a five-stage modeling process. Beginning with a verbal description of direct observation of an environmental situation, the first stage constructs a diagrammatic energy model. Then a qualitative graph is made of an energy variable versus time. The third stage develops a *flow equation* (a differential equation in disguise). An approximate solution of this equation is then found via an Execution Trace (if only calculators are on hand) or simple BASIC code. The fifth stage uses the numbers obtained to plot a graph of energy versus time.

Minicourse #4: *Implementing the Harvard calculus curriculum*, **Wayne Raskind**, University of Southern California. Part A: Sunday, 4:45 p.m.–6:45 p.m.; Part B: Tuesday, 2:30 p.m.–4:30 p.m. Enrollment limit: 40; registration fee: US$45.

This Minicourse will familiarize the participants with the philosophy and the materials being developed under the Harvard Calculus Reform Project. It will describe the philosophy behind the project and its implementation at a variety of institutions. The project is based on the *Rule of Three* in which most topics are presented geometrically, numerically, and symbolically to enhance student understanding of the concepts of calculus. Participants will be provided sample materials to examine, try out, and take home to incorporate into their own classes.

Minicourse #5: *Teaching finite mathematics to a large class of arts and education students*, **J. Chris Fisher**, University of Regina. Part A: Monday, 2:30 p.m.–4:30 p.m.; Part B: Tuesday, 2:30 p.m.–4:30 p.m. Enrollment limit: 40; registration fee: US$45.

My approach to large classes of nonscience students: hand out a list of several hundred problems and take all exam questions from that list. These problems include many that require insight and ingenuity. For the Minicourse I shall describe my course, exchange problems with the participants, and discuss a couple of topics in detail that are not readily found in mathematics books: (a) chronology (featuring modular arithmetic to solve problems arising from the Christian, Jewish, and Moslem calendars); and (b) equal temperament (featuring Farey series to explaining the 12-tone scale). Each participant should send a favorite problem or two to the organizer so that these may be added to the handouts.

☞ ***Minicourse #6***: *Combinatorial design theory*, **Eric Mendelsohn**, University of Toronto. Part A: Wednesday, 2:00 p.m.–4:00 p.m.; Part B, Thursday, 8:30 a.m.–10:30 a.m. Enrollment limit: 80; registration fee: US$36.

The aim of this course is to open the world of design theory so that participants may go on to explore it by themselves.

Combinatorial design theory is a field with ancient roots. However, the combinatorial explosion of results in the last twenty years has left most of this field unknown except to experts. There are applications in fields ranging from algebraic geometry to computer architecture. The modest aims of this course are to expand upon the 12-page introduction to *Contemporary Design Theory–A Collection of Surveys*, J. Dinitz and D. Stinson, John Wiley and Sons, ISBN 0-471-53141-3 (1992), so that remaining chapters or other surveys in design theory will be accessible.

☞ ***Minicourse #7***: *Lagrange multipliers*, **Edward J. Barbeau, Jr.**, University College, Toronto. Part A: Wednesday, 2:00 p.m.–4:00 p.m.; Part B: Thursday, 8:30 a.m.–10:30 a.m. Enrollment limit: 40; registration fee: US$36.

The optimization technique of Lagrange Multipliers is often superficially and pragmatically covered in an advanced calculus course. We will explore the conceptual basis of multipliers, considering such matters as geometry, duality, convexity, and penalty functions. How are multipliers conceived in different contexts? Following a review of Lagrange's work, we will examine their appearance in physics and economics and look at developments over the last forty years after the Kuhn-Tucker theorem made it a branch of functional analysis. Participants should be familiar with standard applications of Lagrange Multipliers and with the material of an undergraduate course in modern analysis that includes linear functionals.

Minicourse #8: *Earth algebra*: *College algebra with applications to environmental issues*, **Christopher Schaufele** and **Nancy E. Zumoff**, Kennesaw State College. Part A: Wednesday, 2:00 p.m.–4:00 p.m.; Part B: Thursday, 2:00 p.m.–4:00 p.m. Enrollment limit: 80; registration fee: US$36.

This Minicourse is a presentation of the content and methodology of a freshman mathematics course developed by the presenters. *Earth Algebra* uses elementary equations to build models which can be used to study environmental problems. The course is focused on greenhouse gas emission and global warming; brief modules are being developed which can be used independently. The Minicourse provides an overview, and participants will work through two of the modules. Graphing calculators are required.

☞ ***Minicourse #9***: *Round-robin tournaments*: *an introduction*, **John W. Moon**, University of Alberta. Part A: Wednesday, 4:15 p.m.–6:15 p.m.; Part B: Thursday, 2:00 p.m.–4:00 p.m. Enrollment: 40; registration fee: US$45.

A round-robin tournament T_n consists of n *nodes* $1, 2, \ldots, n$ such that each pair of nodes i and j is joined by exactly one of the *arcs* $\overrightarrow{ij}$ or $\overrightarrow{ji}$. Our object is to discuss certain structural properties of tournaments and to consider various applications to the method of paired comparisons, voting schemes and choice functions, and dominance relations in sociometric groups. A copy of the author's monograph *Topics on Tournaments* will be distributed to participants.

☞ ***Minicourse #10***: *Iteration*, **Ronald J. Lancaster**, St. Mildred's-Lightbourne School. Part A: Wednesday, 4:15 p.m.–6:15 p.m.; Part B: Thursday, 4:15 p.m.–6:15 p.m. Enrollment limit: 36; registration fee: US$36.

This Minicourse will take an iterative look at solving equations and systems of equations, shuffling playing cards, Rubik's Cubes, number theory problems, financial mathematics, and transformations. TI-85 and TI-81 graphics calculators will be provided and instructions on how to use them will also be given. There will be something here for everyone, and the style of the course will be "hands-on". This Minicourse will be of particular value to college teachers who are interested in doing workshops for high school students.

Minicourse #11: *Learning abstract algebra by programming in ISETL*, **Ed Dubinsky**, Purdue University, **Uri Leron**, Technion-IIT, and **Rina Zazkis**, Simon Fraser University. Part A: Wednesday, 4:15 p.m.–6:15 p.m.; Part B: Thursday, 8:30 a.m.–10:30 a.m.; Part C: Thursday, 4:15 p.m.–6:15 p.m. Enrollment limit: 30; registration fee: US$45.

The organizers believe that undergraduates' difficulty in learning abstract algebra has less to do with the complexity of the theorems than with the abstract nature of the mathematical objects involved. Programming in a mathematical language can help by getting students to construct those objects on the computer, allowing mathematical operators to be, for them, activities about meaningful objects. The Minicourse is a hands-on experience in doing this with *ISETL*. No previous programming background is necessary.

Participants interested in attending should complete the MAA Minicourse Preregistration Form found at the back of this issue and **send it directly to the MAA office** so as to arrive **by June 11**. Please note that **prepayment is required** and can be made by check payable to MAA (Canadian checks must be marked "in U.S. funds") or Visa or MasterCard. After the deadline, potential participants are encouraged to call the MAA headquarters at 800-331-1622 or 202-387-5200 to check on availability.

MAA Minicourses are open only to persons who register for the International Joint Mathematics Meetings and pay the regular registration fee. If the only reason for registering for the meetings is to gain admission to an MAA Minicourse, **this must be indicated by checking the appropriate box on the MAA Minicourse Preregistration Form.** Then, if the Minicourse is fully subscribed, a full refund can be made of the joint meetings preregistration fee. Otherwise, the meetings preregistration will be processed and the 50% refund rule will apply. If you must cancel your Minicourse preregistration, please make clear your intention as to meetings preregistration. If no instruction is given, the meetings registration will also be cancelled. Preregistration forms for the International Joint Mathematics Meetings should be mailed to Providence or Ottawa, while **MAA Minicourse forms should be sent to the MAA office in Washington prior to the deadline of June 11.**

Other MAA Sessions

Teaching Award Presentations: Seven outstanding teachers received the first MAA Awards for Distinguished College or University Teaching of Mathematics at the San Antonio

meeting in January 1993. Four of them made wonderful presentations in San Antonio on "the secrets of their success". The other three winners of this prestigious award, **V. Frederick Rickey**, Bowling Green State University; **Doris W. Schattschneider**, Moravian College; and **Philip D. Straffin, Jr.**, Beloit College, will make similar presentations in Vancouver on Sunday from 2:30 p.m. to 3:50 p.m.

SUMMA Workshop: *Intervention projects for minority precollege students* is scheduled from 4:00 p.m. to 6:00 p.m. on Sunday and will be directed by **William A. Hawkins**, Director of SUMMA (Strengthening Underrepresented Minority Mathematics Achievement).

☞ **Regular-faced polyhedra: an introduction:** This 47-minute video, scheduled for 8:45 p.m. on Tuesday, is a study of various families of regular-faced polyhedra with many animations and a model of the Yog Sothoth. This showing is organized by **Lorraine Foster**, California State University, Northridge.

☞ **1993 Micro-inequities Skits:** From 8:45 p.m. to 10:45 p.m. on Tuesday, the Committee on the Participation of Women is presenting its seventh program of skits about the incidents reported by mathematicians that reveal the current relationship between the sexes within our community. Individually, many of these are funny in retrospect, but cumulatively they chip away at women's professional strength like drops of water on a rock. The acting is by mathematicians. There will be a brief opportunity for response between the skits. Formal discussion groups, led by specially prepared mathematicians, will follow the set of skits. Suggestions for skit material and volunteers for acting are welcomed by the committee Chair, Carol B. Lacampagne, U.S. Department of Education.

Quantitative Literacy Open Meeting: From 2:10 p.m. to 3:40 p.m. on Wednesday individuals will have an opportunity to discuss informally with members of the CUPM Subcommittee on Quantitative Literacy (Linda R. Sons, Chair) their questions, ideas, and problems regarding a quantitative literacy program at their institution. The committee is prepared to explain its views on what quantitative literacy is and why and how it should be fostered in colleges and universities.

Retired Mathematicians: Might the Washington office of the MAA, possibly working with the sections, promote events that would enrich the professional lives of retired mathematicians? To determine whether there is interest, a brainstorming session is scheduled from 9:30 a.m. to 10:30 a.m. on Thursday and is organized by **Andrew Sterrett**, Assistant Director of Programs for the MAA.

Other MAA Events

Business Meeting: The MAA Business Meeting is scheduled on Wednesday at 12:15 p.m. This meeting is open to all members of the Association. Note that MAA prizes, which traditionally have been awarded at this meeting, will be given at the Opening Banquet on Sunday. Please see more details in the **Social Events** section.

Board of Governors: The MAA Board of Governors will meet from 8:30 a.m. to 4:00 p.m. on Saturday, August 14. This meeting is open to all members of the Association.

Section Officers: There will be a Section Officers' meeting on Sunday from 4:00 p.m. to 6:00 p.m.

Activities of Other Organizations

The **Association for Women in Mathematics** (AWM) and the CMS Committee on Women in Mathematics are cosponsoring a panel discussion on *Affirmative action* on Monday, from 3:15 p.m. to 4:30 p.m.

The Fourth Annual Alice T. Schafer Mathematics Prize for excellence in undergraduate mathematics will be presented at the AWM Prize Session and Membership Meeting beginning at 4:35 p.m. on Monday, August 16.

An open reception is planned from 9:30 p.m. to 11:00 p.m. on Monday. See the **Social Events** section for details.

Blumenthal Award and Address: The AMS is honored to have this meeting selected as the venue at which the quadrennial Leonard M. and Eleanor Blumenthal Award for the Advancement of Research in Pure Mathematics will be given. The terms of the award stipulate that a distinguished panel chooses the awardee on the basis of an outstanding Ph.D. thesis. Immediately after the prize is announced, the awardee will address the audience on the subject of the prizewinning work. The award is scheduled to be given on Sunday at 4:00 p.m.

The **Joint Policy Board for Mathematics** (JPBM) will hold a public policy address on Tuesday evening at 8:15 p.m. This event is cosponsored by the AMS Committee on Science Policy (Frank W. Warner, III, Chair), the CMS, and the MAA Science Policy Committee (T. Christine Stevens, Chair). **John Gibbons**, Assistant to the President for Science and Technology, has been invited to speak.

The **National Science Foundation** (NSF) will be represented at a booth in the exhibit area. NSF staff members will be available to provide counsel and information on NSF programs of interest to mathematicians. The booth will be open the same days and hours as the exhibits. Times that staff will be available will be posted at the booth.

Please see the details of the **IIME** sessions in the **Sessions for Students** section of this announcement.

Other Events of Interest

Book Sales and Exhibits

Information Booths: All meeting participants are invited to visit the three organizations' membership information booths during the meetings. A representative will be available at each organization's booth to answer questions about membership, publication and other programs. Complimentary coffee will be available at the AMS and CMS booths.

Book Sales: Books published by the AMS, CMS, and MAA will be sold at discounted prices somewhat below the cost for the same books purchased by mail. **These discounts**

will be available only to registered participants wearing the official meetings badge. Visa and MasterCard will be accepted for book sale purchases at the meetings. The book sales will be open the same days and hours as the commercial exhibits.

Exhibits: The book and educational media exhibits are open from 1:00 p.m. to 5:00 p.m. on Sunday, 9:00 a.m. to 5:00 p.m. Monday through Wednesday, and 9 a.m. to noon on Thursday. Participants are encouraged to visit the exhibits to see what's new.

As part of Canada's *Science and Technology Week*, the CMS invites universities, colleges, schools, and community associations to sponsor and participate in activities designed to promote a greater interest in and better understanding of science and its importance. The CMS sponsors an activity titled **Math in the Malls**, where organizers plan various activities inviting passersby of all ages to participate in mathematics events that are fun and captivating. Participants are invited to the Math in the Malls booth in the exhibit area for a special exhibit presented by **Ed Williams**, Memorial University of Newfoundland, and **Malgorzata Dubiel**, Simon Fraser University.

The AMS, CMS, and MAA are grateful to the participating exhibitors who have agreed to sponsor a Coffee Hut in the exhibit area. Look for it in the afternoons.

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

Social Events

It is strongly recommended that tickets for these events be purchased through preregistration, since only a very limited number of tickets will be available for sale on-site. Tickets purchased through preregistration will be mailed with your badge and program from Providence. Should participants wish to pick up their ticket(s) at the meeting at the same time as their badge and program, they must indicate this on the Preregistration/Hotel form. To get a 50% refund, **returned tickets must be received by the Mathematics Meetings Service Bureau by August 2.** After that date no refunds can be made. Special meals are available upon request at all banquets, including vegetarian and kosher, but this must be indicated on the Preregistration/Hotel Form in advance.

Lounges available for socializing: Participants should note that the Gallery Lounge and The Pit in the Student Union Building are open until late evening for the sharing of snacks and beverages and working out that elusive theorem with their peers.

Opening Banquet: The special feature of this banquet will be the awarding of AMS, CMS, and MAA prizes. Recipients of three Leroy P. Steele Prizes (AMS): one for writing a truly fundamental paper, one for a work or sequence of works that has been shown to be of lasting value, and one for an outstanding career; the Jeffery-Williams Lectureship (CMS); the Merten M. Hasse Prize, and various awards for outstanding journal articles, namely the Carl B. Allendoerfer, Lester R. Ford, and George Pólya Awards (MAA) will be announced at this banquet. Attendees will have the opportunity to meet with each of them on Sunday, August 15 at 7:00 p.m. The banquet will be preceded by a cash bar reception at 6:15 p.m. on the patio outside the west windows of the Totem Park Ballroom.

Dinner will be served at 7:00 p.m. in the Totem Park Ballroom. The menu consists of Pacific shrimp cocktail; chicken breast stuffed with Camembert cheese and topped with orange sauce; green beans almondine; parmesan broiled tomatoes; rice pilaf; French crusty rolls and butter; sacher torte with raspberry coulis; and coffee and tea. Vegetarian meals are available upon request. Tickets are US$27 (CDN$33) per person, including gratuity and all taxes. Since this event occurs the evening of the first day of the meetings and **seating is very limited**, very few, if any, tickets will be available for purchase on-site, so be sure to purchase your ticket when you preregister.

Children's Reception: A reception for children of participants attending the Opening Banquet will be held concurrently in the Unit Lounge in the Totem Park Complex from 6:30 p.m. to 9:30 p.m. on Sunday. It is anticipated that amateur entertainment will be provided. Licensed personnel will provide child care. The cost for this event is US$5 (CDN$6) per child and participants must reserve places for their children in advance on the Preregistration/Hotel form. Children must be over three years of age.

Jeffery-Williams Reception: This complimentary wine and cheese reception, open to all participants, will take place on Tuesday, August 17, from 6:00 p.m. to 6:45 p.m. (Please see the CMS program section for more information on the Jeffery-Williams Lecture.)

Salmon Barbecue: Participants will have an opportunity to taste world-famous Pacific salmon at a cookout to be held on Monday, August 16, from 7:00 p.m. to 9:30 p.m. There will be a cash bar where participants can relax and mingle with their colleagues and guests.

The menu will include barbecued whole Pacific salmon with lemon wedges and tartar sauce; wild rice casserole; three sisters vegetables (a medley of corn, green beans, and squash); garden green salad; platters of sliced tomato and cucumbers; marinated carrots; onions and green pepper salad; red cabbage and apple salad; fresh seasonal vegetables with dip; marinated new potato salad; Waldorf salad; traditional bannock; platters of fresh melon; Okanagan apple and hazelnut crisp; Canadian cheddar cheese; mocha java coffee; orange pekoe tea, and lemonade. Vegetarian and kosher meals are available through advance request. Tickets are US$27 (CDN$33), including all taxes and gratuity. Tickets for children ten and under are 1/2 price.

This event will take place at the Museum of Anthropology, and admission is included as part of the evening. There may be special exhibitions in addition to the research collection. See art and artifacts from around the world and marvel at the great

achievements of the First Peoples of the Northwest Coast. Wander through the Masterpiece Gallery with its dramatic views and exquisitely carved works in gold, silver, argillite, and wood. Guides will be present throughout the evening.

AWM Reception: The mouth-watering salmon barbecue and the museum are not enough to make a completely enjoyable evening on Tuesday! The AWM will top off the night with one of their spectacular parties. Held at the historic Cecil Green Park House on campus, all participants are invited for camaraderie, music, and refreshments.

MAA 25-Year Member Banquet: The MAA is planning its sixteenth annual banquet on Wednesday for those individuals who have been members of the Association for twenty-five years or more. There will be a cash bar reception from 6:30 p.m. to 7:30 p.m. on the south patio of the Long House Great Hall. Dinner will be served at 7:30 p.m. in the Long House Great Hall. The menu includes garden green salad with chopped papaya, sliced almonds, Spanish onion and raspberry vinaigrette; sole paupiette with lobster sauce; honey-glazed squash; medley of cauliflower, carrots, and snow peas; multigrain rolls with butter; fresh apple flan with cinnamon whipped cream; coffee and tea. Tickets are US$26 (CDN$31.50) each including all taxes and gratuity. Vegetarian and kosher meals are available through advance request.

ΠΜΕ Banquet: This popular annual event will take place on Wednesday, August 18, at 6:30 p.m., at Trekkers Restaurant. The menu includes Italian lasagne, garlic bread, garden green salad with herb vinaigrette, relish trays, fresh fruit platters, dessert, coffee and tea, served buffet style. Tickets are US$12 (CDN$14.50) including gratuity and all applicable taxes. Tickets for ΠΜΕ members are US$8 (CDN$10). Vegetarian meals are available through advance request.

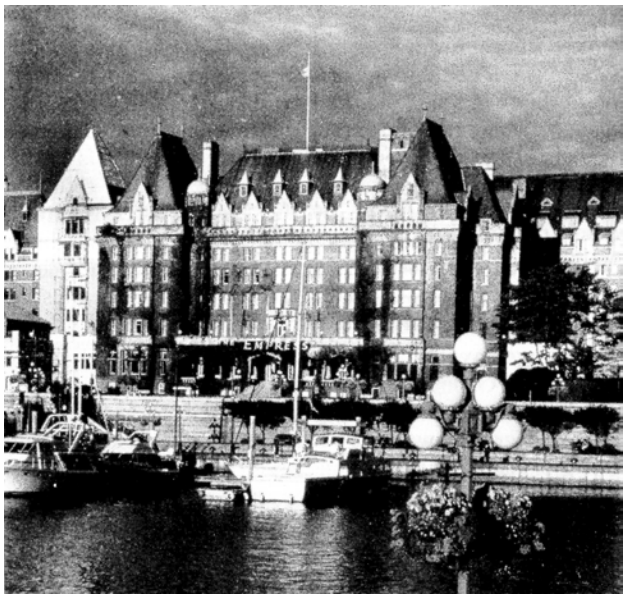
Tours

Because of its many attractions and marvelous climate, Vancouver is a premier vacation destination. The following tours have been recommended as typical of the area in the summer. These tours are available exclusively to mathematicians and their families (with the exception of the Steam Train/Boat Tour). Tickets should be purchased through preregistration as seats are limited and many tours may sell out early. Please indicate preference for tour(s) on the Preregistration/Hotel Form and include applicable payments. NOTE: Should these tours not meet the minimum, they will be canceled and full refunds issued. All tours will take place as scheduled, rain or shine, and no refunds will be made because of weather. No food is included in the prices of the tickets listed below. Unless where noted, childrens' fares apply to those aged twelve and under.

City Tour: (3.5 hours) Vancouver and its environs are truly captivating! A motorcoach will leave from the UBC campus after lunch and take you to see the 1,000 acre Stanley Park, exotic Chinatown, historic Gastown (where Victoria had its humble beginnings), and Queen Elizabeth Park Sunken Gardens. You will also go through the city center shopping district, the prestigious Shaughnessy residential area, the financial district, English Bay Beach Drive, and see a panoramic view of the city from Little Mountain. This tour is offered on Sunday and Tuesday afternoons at US$24 (CDN$29) per adult and US$14 (CDN$17) per child.

North Shore Tour: (4 hours) Nature lovers and anyone who appreciates the grandeur Mother Nature has to offer shouldn't miss this tour. A motorcoach will leave the UBC campus after lunch. Awaiting you is the Grouse Mountain Superskyride with panoramic views of the lower mainland. A trip across the swaying 750-foot long, 250-foot high Capilano Suspension Bridge is an adventure you won't forget! Also included are logging shows, *Our Spirit Soars* and *The Best of Times* film presentations in the Theatre in the Sky, Peak Chair Rides, a visit to the Capilano salmon hatchery, and the quaint shops at Lonsdale Quay. The tour ends with a voyage across Vancouver's harbor on the unique SeaBus. This tour is offered on Monday and Wednesday afternoons at US$36 (CDN$43.50) per adult and US$21 (CDN$25.50) per child.

Victoria Tour: This all-day tour (12 hours) leaves the UBC campus early in the morning by bus to connect with the ferry to Victoria Island, home of the capital of British Columbia. After a 90-minute ferry ride through the Gulf Islands (keep an eye out for a playful seal or two), participants will take in the limitless colors and fragrances of the world-renowned Butchard Gardens and continue on to see the University of Victoria, the Royal Victoria Yacht Club, and Beacon Hill Park. A Victoria city tour, as well as the uplands, Oak Bay residential areas, and scenic Beach are included, and time on your own to explore the attractions of Victoria's inner



Empress Hotel, Victoria. Photo courtesy of the Ministry of Tourism, British Columbia.

harbor. This tour is offered on Friday, August 20, at US$61.50 (CDN$75) per adult and US$33 (CDN$40) per child.

Whistler Tour: A motorcoach will depart from the UBC campus for the resort town and alpine village of Whistler, with its many sports activities, shops, bistros, and galleries. On the way enjoy spectacular views of Howe Sound. See Shannon Falls in the Squamish Forest Reserve. Don't forget to bring your camera! This all-day tour (9.5 hours) is offered on Saturday, August 14, at US$36 (CDN$44) per adult and US$17.50 (CDN$21) per child.

Steam Train/Boat Tour: ALL ABOARD for a whistle-blowing, clickety-clacking, good old time!! Let the authentic steam train Royal Hudson take you back to another era. Wind through the British Columbian wilderness along Howe Sound to take in seascapes, snow-capped peaks, rock cliffs, waterfalls, forests, tunnels, and trestles. You'll stop at the quaint logging town of Squamish in the Garibaldi Mountains at midday to browse in shops, picnic in the park, or visit nearby Shannon Falls (the truly adventurous can opt for a glacier tour by air at extra cost). Pack a picnic, take advantage of the buffet on board the return trip at CDN$12.50, or purchase lunch in Squamish. Your return trip will be aboard the M.V. Brittania where you will observe the scenery from a decidedly different perspective from the waters of Howe Sound. This all-day tour is offered on Friday, August 20, at US$50.50 (CDN$61.50) per adult; US$43.50 (CDN$53) for seniors (60+)/youths (ages twelve to eighteen); and US$19 (CDN$23) for children, ages five to eleven.

These tours have been chosen as the best sampling the Vancouver area has to offer and give you the opportunity to enjoy them with your colleagues. Many other activities are available, such as deep-sea or salmon fishing, kayaking, bicycle touring, sailing expeditions, and tours of historic mansions and botanical and classical Chinese gardens. For children a visit to Science World, offering hands-on exploration and an OMNIMAX theater, is a must. Information on other tours, including self-guided tours of areas like Granville Island, will be available at the Local Information section of the Registration Desk at the meeting. To arrange for pre- and postconference tours, please contact your travel agent. Those desiring more information on recreation within the area should call the British Columbia Bureau of Tourism at 604-683-2000.

How to Preregister

The importance of preregistration cannot be overemphasized. Those who preregister pay fees considerably lower than those who register at the meeting (on-site registration fees will be 30% higher than the preregistration fees listed below). There are two separate preregistration deadlines, each with its own advantages and benefits. **The same deadlines apply to all participants, regardless of choice of payment bureau.**

ORDINARY Preregistration (and hotel accommodation)	June 11
FINAL Preregistration (no hotel or tickets)	July 19

Canadian and U.S. Payment Bureaus

Participants choosing to pay in Canadian funds must send their preregistration forms to the **CMS Executive Office** in Ottawa. Participants choosing to pay in U.S. funds must send their preregistration forms to the **Mathematics Meetings Service Bureau** (MMSB) in Providence.

Please note that the same deadlines apply to all participants, regardless of choice of payment bureau.

Tickets purchased through preregistration will be mailed with your badge and program **from Providence**, regardless of choice of payment bureau. Should participants wish to pick up their ticket(s), badge, and program at the meeting, they must indicate this on the Preregistration/Hotel Form.

Cancellations and/or changes to hotel reservations made through the MMSB, preregistration, or tickets must be sent to Providence regardless of where the original payment was sent.

On-site registration can be made using Canadian currency only!

Ordinary Preregistration: Those who preregister by the **ordinary** deadline of **June 11** may make hotel reservations at special rates offered only through the MMSB. They will receive formal acknowledgments prior to the meetings, as well as their badges, programs, and appropriate tickets by mail two to three weeks before the meeting (unless the appropriate box signaling the contrary was checked on the Preregistration/Hotel Form). **All material will be sent from the AMS office in Providence.**

There will be a special Registration Assistance desk at the meeting to assist individuals who either do not receive this mailing or who have a problem with their registration. Please note that a **CDN$3 replacement fee** will be charged for programs and badges that are mailed, but are not brought by participants to Vancouver.

Final Preregistration: Those who preregister by the **final** deadline of **July 19** must pick up their badge and program at the meeting. Unfortunately, it is not possible to provide final preregistrants with hotel accommodations or tickets to special events in advance. **Please note that the July 19 deadline is firm and any forms received after that date will be returned!**

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

If you wish to be included in a **list of individuals sorted by mathematical interest**, please provide the one *Mathematical Reviews* classification number of your major area of interest

on the Preregistration/Hotel Form. (A list of these numbers appears on the back of the AMS and MAA abstract forms.) The master copy of this list will be posted on the meetings' bulletin board near the registration area.

Preregistration Fees: The AMS-MAA Joint Meetings Committee, with additional guidance from the Canadian Mathematical Society for this meeting, is responsible for maintaining a sound fiscal position for these meetings and keeping the deficits at a reasonable level, while still providing the very best meeting facilities and services to the participants. Registration fees only partially cover the expenses of holding meetings. While fees for this meeting are somewhat higher than usual, participants will note that this ground-breaking international meeting is five days long (two days longer than a Mathfest, and one day longer than the usual Joint Mathematics Meetings). A complimentary coffee break will be served each morning in the Woodward Instructional Services Center (IRC). Also, there is a complimentary reception on Tuesday evening.

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

International Joint Mathematics Meetings

	US$	CDN$
Member of AMS, CMS, MAA, and IIME	$135	$165
Emeritus Member of AMS, MAA, and Retired CMS	35	43
Nonmembers	210	256
Student/Unemployed	35	43
Librarian/High School Teacher	30	37
High School Student	2	2

MAA Minicourses

Minicourses #1, 6, 7, 8, 10	$ 36
#2, 3, 4, 5, 9, 11	45

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

Preregistration forms accompanied by insufficient payment either will be returned, therefore delaying the processing of any hotel housing request, or a US$5 (CDN$6) charge will be assessed if an invoice must be prepared to collect the delinquent amount. Overpayments of less than US$2 (CDN$2.50) will not be refunded.

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

The **unemployed** status refers to any person currently unemployed, actively seeking employment, and 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 or on account of long-term disability from his or her latest position. This rate is also extended to any CMS member who has retired from his or her position.

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

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

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

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

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

Electronic Preregistration: This service is available for preregistration, and hotel accommodation if desired, by requesting information via e-mail from **meet@math.ams.org**. Residence Hall accommodations cannot be requested via e-mail. Requests will be acknowledged within 24 hours with the electronic form and instructions on how to complete it. **VISA or MasterCard is the ONLY method of payment which will be accepted for electronic preregistration**, and charges to credit cards will be made in U.S. funds. These forms will be treated in the same manner as forms received through U.S. mail. Receipt of the completed form and payment will be acknowledged by the MMSB. Participants are advised to bring a copy of this acknowledgment with them to Vancouver. The same deadlines apply as for preregistration by mail.

How to Get a Room

In view of the distance from the city of Vancouver to UBC, the extensive scientific program and numerous evening social events (all of which are taking place on the UBC campus), participants may find it more convenient to choose university residence accommodation. The Walter Gage Residence at UBC is of a very high quality and is recommended for those who do not wish to make the trip back and forth to the city center every day.

Participants should be aware that all payments for housing must be made in Canadian currency, and balances paid through credit cards will be reflected as such.

The Canadian government imposes a 7% Goods and Services Tax (GST) on most goods and services. Meetings' participants visiting Canada for the International Joint

Mathematics Meetings may file for a refund for some GST expenditures. GST charged on residence accommodations or hotels is refundable, while charges on food, beverages, entertainment, tours, and taxis are not. Participants must fill out the GST rebate form (available at the front desk of Gage as well as duty free shops and the airport), and attach all pertinent receipts, verifying the amount spent. The form is filed when leaving the country (or, you have up to one year to file). Revenue Canada auditors will inspect your documents to make decisions on the eligibility of expenses and send out a check within six to eight weeks. **Participants should be sure to save all receipts.**

In the interests of keeping registration fees down, UBC and the Holiday Inn have agreed to collect an extra CDN$5 per night to help defray the cost of meeting room rental.

How to Obtain University Residence Accommodations

All reservation requests for university accommodations will be handled by the University of British Columbia (UBC). It is essential that the UBC Accommodation Form (found at the back of this issue) be completed fully and clearly and mailed or faxed (604-822-1001) to the UBC Reservations Office, along with payment where appropriate, by **July 12**. Telephone requests cannot be accepted. Housing payments for residence accommodations sent to Providence or Ottawa **cannot** be forwarded to the UBC Reservations Office on your behalf, but must be returned, thereby delaying your reservation request.

Participants may occupy residence hall rooms at UBC during the period August 14 to August 21. A limited number of rooms may be available either before or after these dates on a space-available basis. Participants are advised to make reservation requests early. A limited number of rooms on campus will be available for those participants who do not preregister but plan on attending the meetings and registering on-site.

All check-ins and room assignments will be done beginning at 2:00 p.m. daily at the reception desk in the Walter Gage Complex. This is located in the northeast corner of the UBC campus and accessed from Wesbrook Mall at Gate 2. Reservations **for suites only** must be guaranteed by payment of a one-night deposit; the balance is due upon check-in. No deposit is required for rooms with shared baths. All payments to UBC for housing must be made in Canadian currency, CDN$ traveler's checks, Visa or MasterCard. Personal checks are not accepted. A one-night cancellation charge applies if cancellation is not received in writing 48 hours prior to the check-in date. **Refunds of deposits will incur a CDN$15 administration charge.**

Walter Gage Complex combines three 17-story towers and two adjacent lowrise buildings. The towers offer apartment-style accommodations in which you share the washroom and pleasant living area with five of your colleagues and enjoy the panoramic view of the ocean and the mountains. Every floor is divided into four apartments, each containing six single bedrooms, one large shared washroom (bathroom), a lounge area with refrigerator, and a balcony. Some private suites are available in the lowrise buildings, each building having three floors. The private single suite includes a private washroom and bed-sitting area. The double-occupancy suite includes a private washroom, living room, and bedroom. Deluxe suites are ideal for families up to a maximum occupancy of four persons. All suites are equipped with sinks and refrigerators. The number of suites is limited and single bedrooms or adjacent single bedrooms will be provided when requests for suites cannot be satisfied.

Smoking is permitted only in the participant's private bedroom. As all other areas are considered public, smoking is not permitted anywhere else (including the lounge area, bathrooms, hallways, etc.). Alcohol is permitted in the private bedrooms of participants over 19 years of age.

Rooms in the Totem Park Complex will be substituted when rooms in the Walter Gage Residence are no longer available. This complex, located on the southwest corner of the UBC campus, consists of six separate houses providing both single and double accommodations, and a central common building where the front desk is located. Each floor contains shared washroom facilities, pay telephones, and a lounge with a color television and refrigerator.

Clean towels, bedroom freshening, and washroom cleanup will be provided on a daily basis. Bed linen will be changed every four days. Refreshments, snacks, cigarettes, and newspapers are available in the lobby of each complex. A limited number of irons and alarm clocks is available for your use from the reception desk. Coin-operated washers and dryers are located in the housing complex. Participants are advised to bring their own alarm clocks and clothes hangers in addition to essential items such as toothpaste, etc.

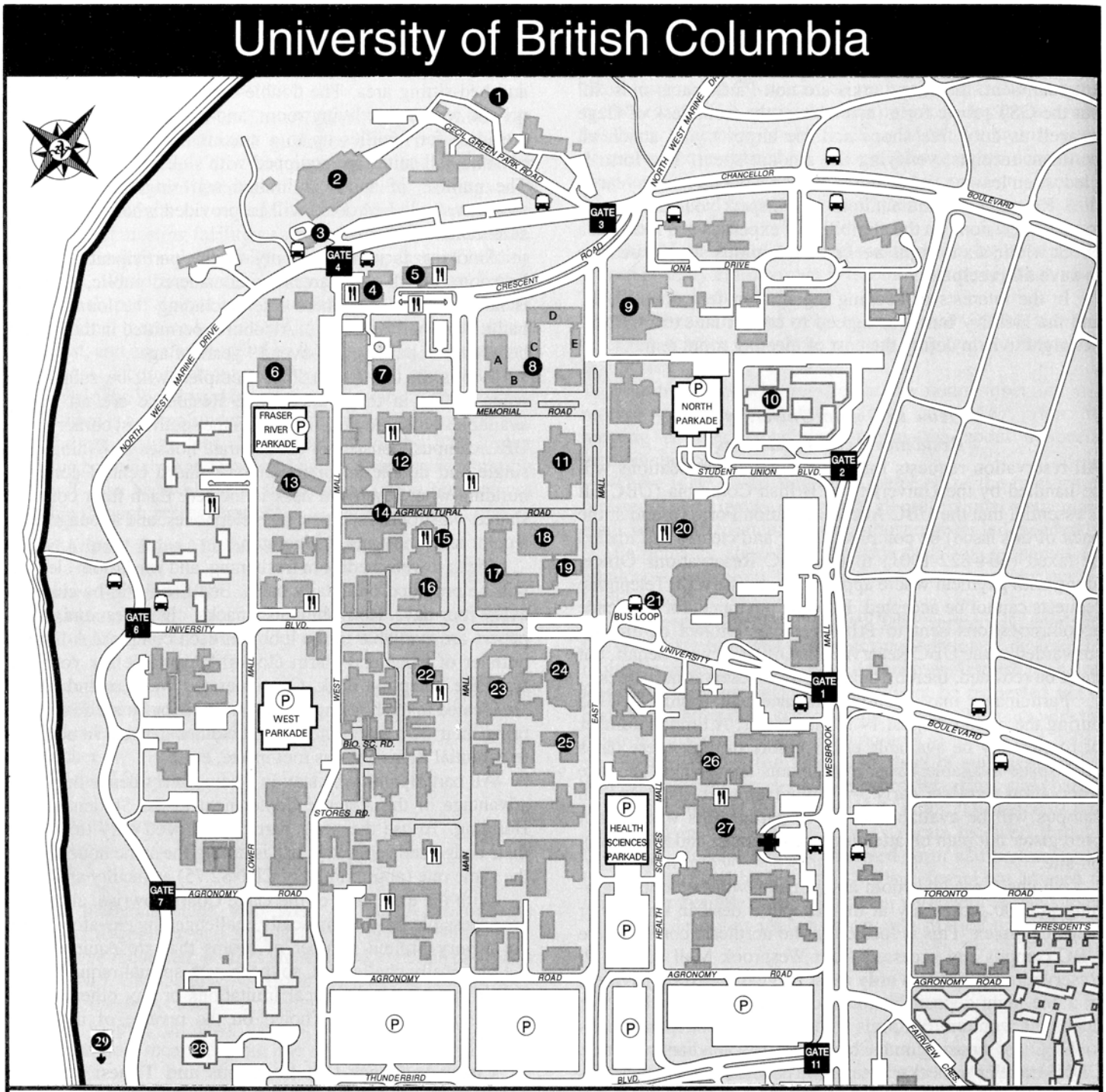
All participants who stay in a campus residence may take advantage of the Aquatic Center next to the Student Union Building. To use the pool, participants need only to present their badge and room key; use is during the same hours and at the same rate (approximately CDN$2.75) as faculty and staff.

With the exception of the Gage Court Lowrise, all rooms are accessible for the physically challenged by elevator. There are a very limited number of rooms that are equipped for the physically challenged, so those with special requirements should book early. Physical limitations or any other special requirements should be noted on the reverse of the UBC Accommodation Form.

Check-In/Check-Out Locations and Times: Check-in time is 2:00 p.m. Check-out time is before 11:00 a.m. Luggage storage is available for late departures.

Room and Board Rates: The following rates apply for residence accommodations at UBC (quoted in Canadian dollars):

Single room with shared washroom	$34
Rooms with private baths:	
Single room (single bed)	$55
Suite (double bed)	$73
Deluxe suite (twin beds, etc.)	$85



6. Asian Centre
23. Biological Sciences
24. Bookstore
29. Botanical Gardens
21. Bus Loop
8. Buchanan Bldg
1. Cecil Green Park House
17. Chemistry
5. Faculty Club
13. First Nations House of Learning
10. Gage Residence (housing registration)
4. Graduate Student Centre
19. Hebb Theatre
18. Hennings Bldg
16. Henry Angus Bldg
26. Woodward Instructional Resources Centre (IRC)
9. Law Theatre
11. Main Library
12. Mathematics Bldg
14. Microcomputer Lab
2. Museum of Anthropology
7. Music Bldg
3. Parking and Security
25. School of Family and Nutritional Sciences
22. Scarfe Bldg
20. Student Union Bldg (meeting registration)
27. UBC Hospital Emergency Service & First Aid
28. Totem Park Dining Room
15. Trekkers Cafeteria

VISITOR PARKING Ⓟ FIRST AID ✚ BUS STOP 🚌 CAFETERIAS 🍴

How to Obtain Hotel Accommodations

As an alternative to university housing, the MMSB lists the following hotels/motels with group rates. All hotels are located in downtown Vancouver and are approximately five to twelve miles from the university. Participants are urged to plan their transportation accordingly.

Participants must make their own arrangements with the following hotels by **July 15** (unless a different deadline is indicated) and should identify themselves as being with the International Joint Mathematics Meetings to take advantage of group rates. Rates are subject to change after these deadlines. Those who preregister by the ordinary deadline of June 11 may opt to make reservations at the Holiday Inn through the MMSB. To do so, please complete the hotel portion of the Preregistration/Hotel Form.

Group rates quoted are in Canadian funds and are subject to a 10% Provincial Rooms Tax and a 7% GST. The GST on the hotel room will be returned to nonresidents of Canada if rebate procedures are followed.

Holiday Inn Vancouver Centre - Headquarters Hotel
711 West Broadway
Vancouver, B. C., Canada V5Z 3Y2
Telephone: 604-879-0511
Single $110 Double $120
Reservation deadline: **June 11** (through MMSB)
Reservation deadline: **July 8** (directly)

Hotel Vancouver
900 West Georgia Street
Vancouver, B. C., Canada V6C 2W6
Telephone: 604-662-1907
Single or Double $145

Hyatt Regency Vancouver
655 Burrard Street
Vancouver, B. C., Canada V6C 2R7
Telephone: 604-683-1234
Single $140 Double $160

Sheraton Inn Plaza 500
500 West 12th Avenue
Vancouver, B. C., Canada V5Z 1M2
Telephone: 604-873-1811
Single $105 Double $110

Ramada Vancouver Centre
898 West Broadway
Vancouver, B. C., Canada V5Z 1J8
Telephone: 800-663-5403
Single or Double $105

Quality Inn
1335 Howe Street
Vancouver, B. C., Canada V6Z 2R7
Telephone: 604-682-0229
Single or Double $96

Campus Food Service

Full-course meals can be purchased in the SUB Cafeteria in the Student Union Building from 7:00 a.m. to 7:00 p.m. daily. A widely varied menu includes an extensive salad and fruit bar, a deli custom sandwich counter, vegetarian entrees, an in-house bakeshop, and, of course, the world famous UBC Cinnamon Bun. Other smaller cafeterias open on a limited basis in the Student Union Building are the Pit Pub, Gallery Lounge, and Tortellini's Restaurant. Across campus are Trekkers, The Barn, and the Ponderosa Cafeteria. Others are located in the University Village, a five-minute walk from the Walter Gage Complex.

Miscellaneous Information

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

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

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

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

Banking/currency exchange: Payments for all goods and services on campus must be made in Canadian currency or by credit card where indicated; some commercial establishments may accept U.S. currency or travelers' checks at a less favorable rate than banks. The Bank of Montreal, located in the basement of the Student Union Building, provides currency exchange from 9:00 a.m. to 3:30 p.m., Monday through Thursday, and 9:00 a.m. to 5:00 p.m. on Friday. An automatic teller machine (MasterCard, Interac, Circuit, and Cirrus networks) is also located here. A Canadian Imperial Bank of Commerce branch is located in the University Village and is open from 9:30 a.m. to 5:00 p.m., Monday through Friday. This bank also has an automatic teller (Visa, Interac, and Plus networks). These banks are closed on Saturday and Sunday, although some city banks may be open on Saturday. Currency exchange may also be made at Vancouver International Airport from 5:45 a.m. to 11:00 p.m. daily.

Camping and RV Facilities: There are several campgrounds, most with RV facilities, in the general area. Participants should contact the individual campground for rates. Advance reservations are strongly advised.

Burnaby Cariboo RV Park, 8765 Cariboo Place, Burnaby, B.C. V3N 4T2, 604-420-1722.

Capilano RV Park, 295 Tanahauk Avenue, North Vancouver, B.C. V7P 1C5, 604-982-4722.

KOA Vancouver/Surrey, 14601 40th Avenue, Surrey, B.C. V4P 2J9.

Richmond RV Park and Campground, 6200 River Road, Richmond, B.C. V6Y 2A2.

Tynehead RV Campground, 16275 102nd Avenue, Surrey, B.C. V4N 2K7, 604-589-1161.

Park Canada RV Innis Campground, 4799 Highway Number 17, Delta, B.C. V4M VT2.

Dogwood Campground of BC, 15151 112th Avenue, Surrey, B.C. V3R 6G8, 604-583-5585.

Car Rental: Avis has been named the official car rental company for the meeting. Special rates are available in either Vancouver or Seattle (driving time to the UBC campus from Seattle is approximately three hours). To rent a car at the special rates for this meeting, call 1-800-331-1600 and use the meeting number Y595303, if the rental city is Vancouver; if renting out of Seattle, use the meeting number B571010. These rates are applicable one week prior to and one week after the meetings and include unlimited mileage. Rates need not be guaranteed by reservation; however reservations are strongly advised. Rates are in Canadian dollars, with rates available in Seattle in U.S. dollars.

	Daily	**Weekly**
Car Class	**1–4 days**	**5–7 days**
A Subcompact	$37 (US$37)	$205 (US$123)
B Compact	$37 (US$40)	$205 (US$139)
C Intermediate	$39 (US$42)	$213 (US$165)
D Fullsize 2-door	$41 (US$45)	$223 (US$185)
E Fullsize 4-door	$41 (US$47)	$223 (US$192)
H Luxury	$52 (US$48)	$310 (US$209)
V Minivan	$46 (US$59)	$260 (US$209)

Applicable charges for taxes, optional refueling service, PAI (Personal Accident Insurance), PEC (Personal Effects Coverage), and LIS (Liability Insurance protection for third party) are extra. Optional LDW (Liability Damage Waiver) may be purchased if renting in Vancouver at CDN$12.95 per day, or for US$12 per day if renting from Seattle. Rentals are subject to Avis age, driver's license, and credit requirements as well as car availability at the time of rental. Cars must be returned to the rental location or additional charges apply. Weekend rentals are available between Thursday at 4:00 p.m. and Monday at 4:00 p.m.

Children's Activities: A parent-child lounge will be furnished with casual furniture, a crib, a changing area, and a VCR and monitor for viewing videotapes. The tapes, appropriate for children, can be checked out at the Telephone Message section of the registration desk. Any child using this lounge must be accompanied by a parent (not simply an adult) who must be responsible for supervision of the child. This lounge will be unattended and parents assume all responsibility for their children. This lounge will be open only during the hours of registration, and all persons must leave the lounge at the close of registration each day.

Please refer to the section on **Social Events** for information on the Children's Reception on Sunday evening.

Citizenship Requirement: U.S. citizens must bring proof of citizenship with them. This is defined as a birth certificate, passport, or voter registration card. Other foreign participants should check with the nearest Canadian embassy for documentation applicable for their country.

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

Electricity: Throughout Canada electricity is 120V, 60Hz.

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

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. There is no charge for this service. Please note that no printed lists of employers or applicants who fill out forms will be published.

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

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

If a person or group wishes to display information of a mathematical nature promoting a product or program for sale, they may do so in the book sale area at the Joint Books, Journals, and Promotional Materials exhibit for a fee of US$35 (CDN$43) per item.

If a person or group would like to display material in the book sale area separate from the Joint Books table, the proponent must reimburse the meeting for any extra furnishings requested (tables, chairs, easels, etc.) **in addition to payment per item**. (This latter display is also subject to space availability.)

The administration of these tables is in the hands of the Exhibits Coordinator. The following rules and procedures apply.

1. Announcements submitted by participants should ordinarily be limited to a single sheet no more than 8½" × 14".
2. A copy of any announcement proposed for either table

is to be sent to the Exhibits Coordinator, Canadian Mathematical Society, 577 King Edward, Suite 109, POB 450, Station A, Ottawa, Ontario, Canada K1N 6N5, to arrive at least one week before the first day of the scientific sessions.

3. The judgment on the suitability of an announcement for display rests with the Joint Meetings Committee. It will make its judgments on a case-by-case basis to establish precedents.
4. Announcements of events competing in time or place with the scheduled scientific program will not be accepted.
5. Copies of an accepted announcement for either table are to be provided by the proponent. Announcements are not to be distributed in any other way at the meetings (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, both tables will be swept clean. Therefore, a proponent who wishes the return of extra copies should remove them before the close of registration.

Insurance: Liability insurance is the responsibility of each individual delegate. Visitors are not covered by the Canadian Medical Health Insurance Plan. Participants should have their own coverage.

Mail: All mail and telegrams for persons attending the meeting should be addressed as follows: Participant's name, International Joint Mathematics Meetings, UBC Conference Centre, 5961 Student Union Boulevard, Vancouver, British Columbia, Canada, V6T 2C9. Those received will be posted on the message board near the registration area. Mail not picked up will be forwarded after the meeting to the mailing address given on the participant's registration record.

Parking: Limited free parking is available for participants staying in the Walter Gage Residence. Ample paid parking is provided in visitor parking lots and parkades on campus for CDN$1.20 each hour or portion thereof, CDN$10 maximum per day (Monday through Friday). Fifteen-minute loading/unloading permits can be obtained at any kiosk free of charge. Overnight parking of recreational vehicles is not permitted on campus.

AMS Petition Table: At the request of the AMS Committee on Human Rights of Mathematicians, a table will be made available in the registration area at which petitions on behalf of named individual mathematicians suffering from human rights violations may be displayed and signed by meetings 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 AMS 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 days in advance of the meetings to the Director of Meetings in Providence (telephone 401-455-4137). 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 that is not a petition (e.g., advertisements, résumés) will be removed by the staff. **At the end of registration on Saturday, any material on the table will be discarded**; individuals placing petitions on the table should be sure to remove them prior to the close of registration.

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

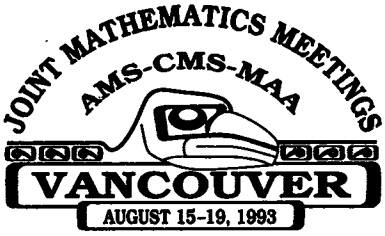
Telephone Messages: A telephone message center will be located in the registration area to receive incoming calls for participants. **The center will be open from August 14 through August 18 during the hours that the registration desk is open.** Messages will be taken and posted on the meetings' message board. In the case of a bona fide emergency every attempt will be made to contact the participant as soon as possible; otherwise, each participant must take responsibility for checking the message board. Once the Joint Meetings Registration Desk has closed for the day there is no mechanism for contacting participants other than calling them directly at their hotel or campus residence. The telephone number of the message center is 604-822-9502. Messages for participants staying in the Walter Gage Complex may be left at the Complex's front desk at 604-822-1020. It will be open 24 hours per day.

Travel

AIR CANADA and UNITED AIRLINES have been selected as the official airlines for the meeting for their generally convenient schedules to Vancouver. Participants should refer to the full page advertisement on the next page for procedures on how to take advantage of specially negotiated rates available only for this meeting.

Participants traveling from U.S. cities may find it more economical to fly into Sea Tac or Bellingham Airport, then take the Quick Shuttle to Vancouver (approximately three and one-half to four hours), and then bus or taxi to the university. As an example, the current round trip shuttle fare from Sea Tac to Vancouver is US$51 (CDN$60) for an adult. There are discounted fares for seniors and children. Participants should call 604-244-3744 for details on all fares and schedule information.

Travel from the airport: A taxi from Vancouver International Airport to UBC costs approximately CDN$24 (US$18), a limousine (maximum 7 persons) costs CDN$26 (US$20) plus tax. A shuttle bus (CDN$8.25, US$7) leaves the airport every 30 minutes for downtown Vancouver hotels. City buses #4 and #10 connect UBC directly with downtown Vancouver. To use public transport, the current fare is CDN$1.50; exact change is required. When boarding the bus at Vancouver



SPECIAL AIRFARES!

AIR CANADA and UNITED AIRLINES have been selected as the official airlines for the International Joint Mathematics Meetings to be held in Vancouver, B.C., Canada, August 15–19, 1993. The following benefits are available exclusively to mathematicians and their families attending the meetings:

For **AIR CANADA**:

- Savings of up to 50% for travel within North America, subject to applicable fare restrictions, and a minimum 15% savings on the regular Executive and Hospitality Class fares. To qualify, there is a minimum three-day advance purchase requirement, as well as a one-night minimum stay, and a fifteen-day maximum stay.

- Savings of 35% to 40% off full fare economy class, subject to availability, with a minimum seven-day advance purchase, a minimum stay of two nights, and a fifteen-day maximum stay.

You may call **1-800-361-7585** from anywhere in Canada and the United States to contact Air Canada directly, or call any licensed travel agent. Instruct the ticket agent to enter **CV930890** in the tour code box of your ticket in order to qualify for the applicable discount.

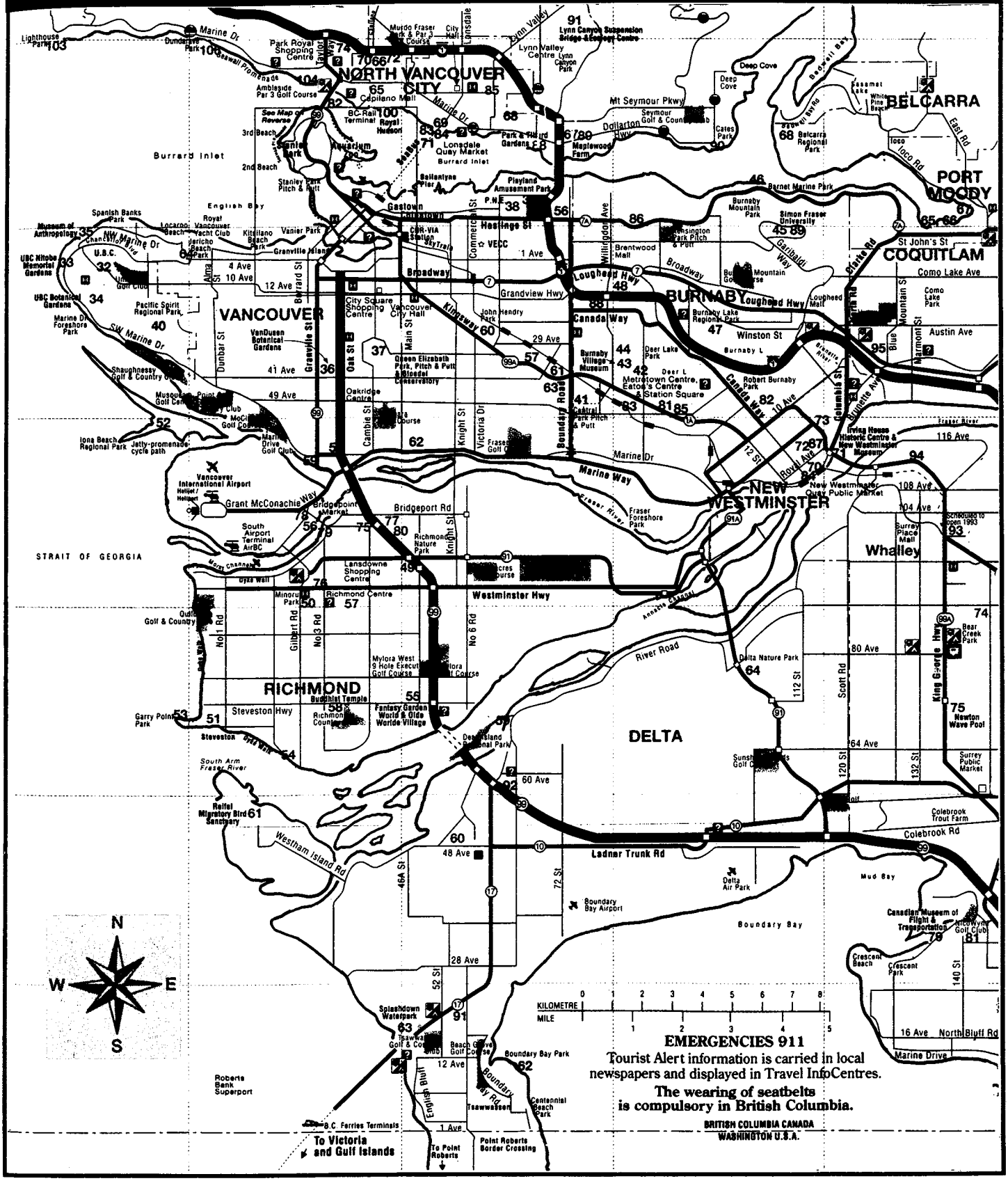
For **UNITED AIRLINES**:

- Savings of 5% off any applicable fare to Seattle or Vancouver.

- Savings of 10% off United's YUA fare to Seattle or Vancouver.

Please call United's Meeting Desk at **1-800-521-4041** and cite the tour code number **540CH** to take advantage of these special rates. Participants may also make reservations through any licensed travel agent; please be sure your travel agent calls United's Meeting Desk for ticketing instructions.

Vancouver area



Airport, request a "transfer" from the driver. Take the bus to Granville Street and 41st Ave. and transfer to the #41 to UBC.

Automobile approaches to UBC Walter Gage Residence, 5959 Student Union Boulevard:

From Vancouver International Airport: Follow Grant McConachie Way over the Arthur Laing Bridge, take the Granville Street exit ramp, continue north on Granville Street to West 70th Avenue, turn left onto West 70th Avenue which becomes Southwest Marine Drive, continue on Southwest Marine Drive to the UBC campus (10–15 minutes), turn right onto 16th Avenue, turn left onto Wesbrook Mall (Gate 10), turn left onto Student Union Boulevard (Gate 2), turn right immediately into the Walter Gage Complex.

From Washington State: Drive north on U.S. Interstate 5 (through Seattle, Bellingham). Interstate 5 becomes Highway 99 at the Canada/U.S. border. Take Highway 99 through the George Massey Tunnel and over the Oak Street Bridge, continue north on Oak Street to West 49th Avenue, turn left onto West 49th Avenue which becomes Southwest Marine Drive; follow the directions mentioned above from Southwest Marine Drive.

From Central British Columbia: Drive west on Trans-Canada Highway 1 (through Hope, Abbotsford), continue on Trans-Canada over the Port Mann Bridge, follow the highway to the Grandview exit west, continue west as Grandview Highway becomes West 12th Avenue, West 12th Avenue become West 10th Avenue at MacDonald Street, West 10th Avenue becomes University Boulevard at Blanca. Follow University Boulevard to the UBC campus, turn right onto Wesbrook Mall (Gate 1), turn left onto Student Union Boulevard (Gate 2), turn right immediately into the Walter Gage Complex.

On the UBC campus, bus passes can be purchased at the Student Union Building Ticket Office. Day passes are available for CDN$4 (usable only from 9:30 a.m. onwards). Multiple passes are also available.

Weather: During August, day-time temperatures are usually in the range 20°C (68°F)–25°C (77°F). Occasional rain should be expected. For evenings, sweaters or jackets may be needed.

Local Arrangements Committee

The members of the Local Arrangements Committee are Monique L. Bouchard (ex-officio), David Boyd, Afton Cayford (Cochair), Alan Cooper, William H. Jaco (ex-officio), Katherine Heinrich, David Leeming, Dale Rolfson, Kenneth A. Ross (ex-officio), Dennis Sjerve (Cochair), and Marcia P. Sward (ex-officio).

The AMS and MAA are especially grateful for the free spirit of collaboration and the diligence of the CMS staff and the Local Arrangements Committee.

Corollary Conferences

1993 CRM-UBC Summer School on Mathematical Biology

July 19–August 13, 1993

This summer school held by the Centre de Recherches mathétiques (CRM) of l'Université de Montréal will be jointly sponsored by CRM and UBC, and held on the UBC campus in Vancouver. The school is under the scientific direction of Robert M. Miura, (UBC).

There will be courses on a number of different themes in mathematical biology, with lectures by C. W. Clark (UBC), A. Dobson (Princeton), L. Keshet (UBC), S. Levin (Princeton), D. A. Ludwig (UBC), M. Mangel (UC, Davis), J. Milton (Chicago), R. M. Miura, S. Pimm (Tennessee), J. Rinzel (NIH), L. A. Segel (Weizmann), and J. J. Tyson (Virginia Tech). The lectures are intended for an audience of graduate students, and, in keeping with this objective, only graduate students and postdoctoral fellows are invited to attend. Note: prior experience in mathematical biology is not an absolute prerequisite.

Funding is being provided by CRM via NSERC, le Fonds FCAR du Québec, and l'Université de Montréal. Additional funding is being provided by the Deans of Graduate Studies of Western Canadian Universities; the Mathematical Sciences Research Institute, Berkeley, California; and the Deans of Graduate Studies and Science and the Department of Mathematics at UBC.

Application forms can be obtained from Louis Pelletier, CRM Summer School, Université de Montréal, C.P. 6128, succ. "A", Montréal, Québec H3C 3J7, Canada, fax: 514-343-2254, e-mail: pelletl@ere.umontreal.ca.

1993 CMS Annual Seminar

Mathematical Quantum Theory

August 4–8, 10–14, 1993

This is a Canadian Mathematical Society annual seminar supported by the NSERC and the Centre de Recherches Mathématiques of the Université de Montréal and will be held at the University of British Columbia, Vancouver, B.C., Canada.

This meeting is designed to be a research level summer school concentrating on two related areas of contemporary mathematical physics. The subject for the first session (August 4–8) is mathematical quantum field theory and many-body theory, while the second session (August 10–14) will deal with Schrödinger operators. Each session will feature a series of minicourses of approximately four hours each. The minicourse lecturers will be D. Brydges, J. Feldman, J. Fröhlich, K. Gawedzki, and V. Rivasseau in the first session; and S. Agmon, W. Hunziker, I.M. Sigal, and B. Simon in the second session. In addition, about thirty speakers have been invited to give one hour lectures. Short contributions will be accommodated as time permits.

For more information please contact R. Froese, Department of Mathematics, University of British Columbia, Vancouver, B.C. V6T 1Z2, e-mail: rfroese@unixg.ubc.ca.

Symposium on Mathematics of Computation
August 9–13, 1993

Under the auspices of the AMS and in celebration of the 50th anniversary of the journal *Mathematics of Computation*, an international symposium will take place at the University of British Columbia, Vancouver, Canada, August 9–13, 1993. The symposium will be held immediately prior to the joint AMS/MAA/CMS summer meeting. As part of the symposium, there will be a two-session minisymposium on computational number theory dedicated to the memory of D. H. Lehmer. Invited speakers will be presenting survey and state-of-the-art lectures in plenary sessions. There will also be poster sessions and 15-minute contributed paper sessions. It is anticipated that the symposium will be partially supported by grants from U.S. federal agencies.

Abstracts and requests for information regarding the scientific program should be addressed to Walter Gautschi, Department of Computer Sciences, Purdue University, West Lafayette, IN 47907. The abstract deadline is April 1, 1993. Requests for registration and housing information should be sent to Mathematics Meetings Service Bureau, PO Box 6887, Providence, RI 02940-6887, or by e-mail: jlm@math.ams.org.

CONTEMPORARY MATHEMATICS

The Madison Symposium on Complex Analysis

Edgar Lee Stout and Alexander Nagel, Editors

Volume 137

This volume contains the proceedings of a Symposium on Complex Analysis, held at the University of Wisconsin at Madison in June 1991 on the occasion of the retirement of Walter Rudin. Among the main subjects covered are applications of complex analysis to operator theory, polynomial convexity, holomorphic mappings, boundary behavior of holomorphic functions, function theory on the unit disk and ball, and some aspects of the theory of partial differential equations related to complex analysis. Containing papers by some of the world's leading experts in these subjects, this book reports on current directions in complex analysis and presents an excellent mixture of the analytic and geometric aspects of the theory.

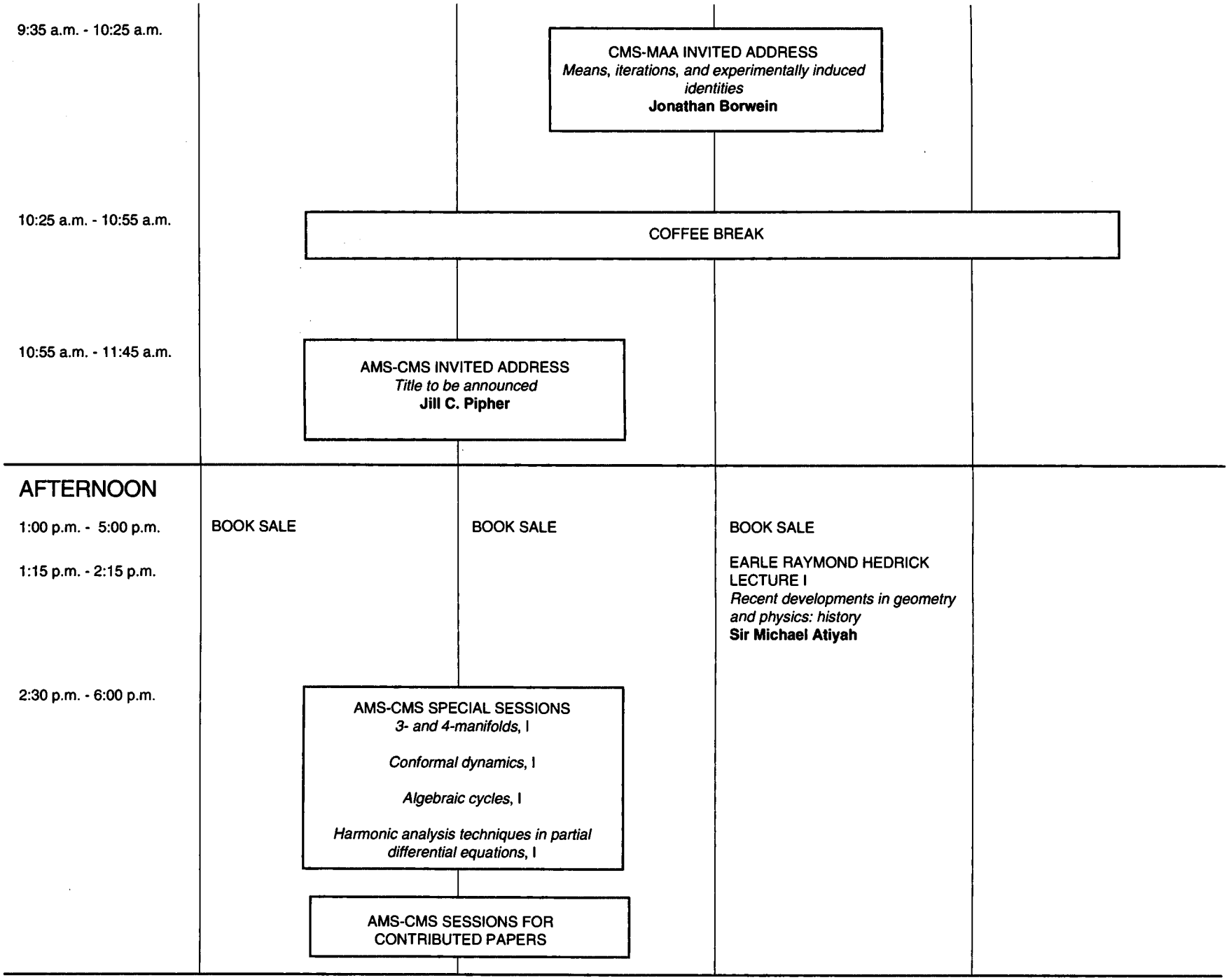
1991 *Mathematics Subject Classification*: 30, 32; 42, 47
ISBN 0-8218-5147-0, 478 pages (softcover), October 1992.
Individual member $29, List price $49, Institutional member $39
To order, please specify CONM/137NA

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

Timetable

(Pacific Daylight Time)

	American Mathematical Society	Canadian Mathematical Society	Mathematical Association of America	Other Organizations
Friday, August 13				
AFTERNOON				
2:00 p.m. - 6:30 p.m.	COUNCIL MEETING			
Saturday, August 14				
MORNING				
8:30 a.m. - 4:00 p.m.			BOARD OF GOVERNORS' MEETING	
AFTERNOON				
2:30 p.m. - 6:30 p.m.		BOARD OF DIRECTORS' MEETING		
3:00 p.m. - 6:30 p.m.	REGISTRATION FOR JOINT MEETINGS			
Sunday, August 15				
MORNING				
8:00 a.m. - 4:00 p.m.	REGISTRATION FOR JOINT MEETINGS			
9:15 a.m. - 9:25 a.m.	WELCOME ADDRESS			


9:35 a.m. - 10:25 a.m.
CMS-MAA INVITED ADDRESS
Means, iterations, and experimentally induced identities
Jonathan Borwein
10:25 a.m. - 10:55 a.m.
COFFEE BREAK
10:55 a.m. - 11:45 a.m.
AMS-CMS INVITED ADDRESS
Title to be announced
Jill C. Pipher
AFTERNOON
1:00 p.m. - 5:00 p.m.
BOOK SALE
BOOK SALE
BOOK SALE
1:15 p.m. - 2:15 p.m.
EARLE RAYMOND HEDRICK LECTURE I
Recent developments in geometry and physics: history
Sir Michael Atiyah
2:30 p.m. - 6:00 p.m.
AMS-CMS SPECIAL SESSIONS
3- and 4-manifolds, I
Conformal dynamics, I
Algebraic cycles, I
Harmonic analysis techniques in partial differential equations, I
AMS-CMS SESSIONS FOR CONTRIBUTED PAPERS

Sunday, August 15, (cont'd)

AFTERNOON (cont'd)

American Mathematical Society

2:30 p.m. - 6:00 p.m.

SPECIAL SESSIONS

Problems in number theory in memory of E. G. Straus, I

Discrete geometry and convexity, I

Symplectic geometry, I

Exponential families in mathematical statistics, I

Algebraic and geometric methods in control theory, I

Canadian Mathematical Society

2:30 p.m. - 6:30 p.m.

CMS-MAA CONTRIBUTED PAPER SESSION

Mathematics and industry interface, I

Mathematical Association of America

2:30 p.m. - 4:30 p.m.

MINICOURSE #1 (PART A)

The Fibonacci and Catalan numbers

MINICOURSE #2 (PART A)

Teaching applied mathematics via Maple

2:20 p.m. - 3:50 p.m.

TEACHING AWARDS PRESENTATIONS

4:00 p.m. - 4:50 p.m.

4:00 p.m. - 6:00 p.m.

SUMMA WORKSHOP

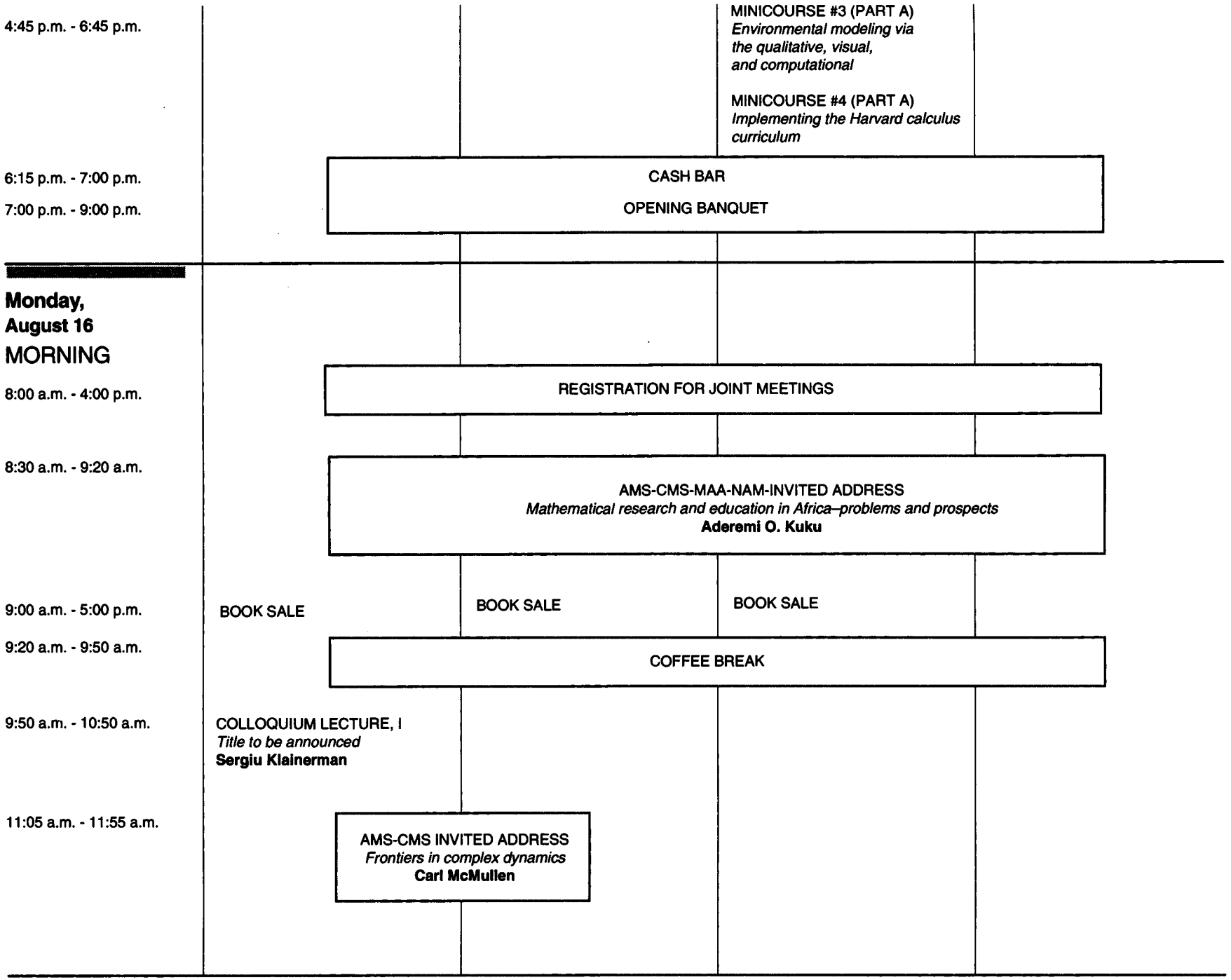
Intervention projects for minority precollege students

SECTION OFFICERS' MEETING

Other Organizations

4:00 p.m. - 4:50 p.m.

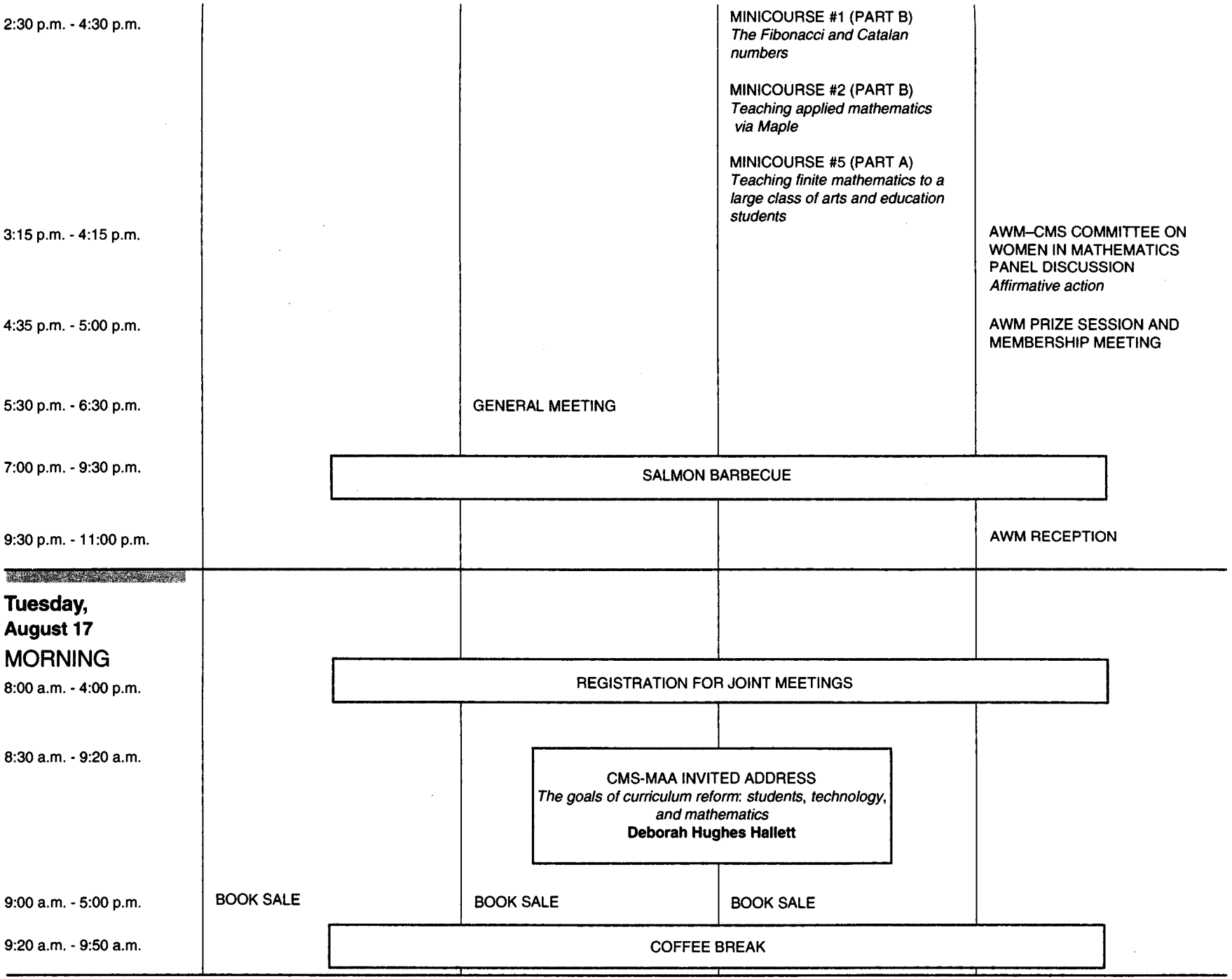
LEONARD M. AND ELEANOR B. BLUMENTHAL AWARD FOR THE ADVANCEMENT OF RESEARCH IN PURE MATHEMATICS


4:45 p.m. - 6:45 p.m.
MINICOURSE #3 (PART A)
Environmental modeling via the qualitative, visual, and computational
MINICOURSE #4 (PART A)
Implementing the Harvard calculus curriculum
6:15 p.m. - 7:00 p.m.
CASH BAR
7:00 p.m. - 9:00 p.m.
OPENING BANQUET
Monday, August 16
MORNING
8:00 a.m. - 4:00 p.m.
REGISTRATION FOR JOINT MEETINGS
8:30 a.m. - 9:20 a.m.
AMS-CMS-MAA-NAM-INVITED ADDRESS
Mathematical research and education in Africa–problems and prospects
Aderemi O. Kuku
9:00 a.m. - 5:00 p.m.
BOOK SALE
BOOK SALE
BOOK SALE
9:20 a.m. - 9:50 a.m.
COFFEE BREAK
9:50 a.m. - 10:50 a.m.
COLLOQUIUM LECTURE, I
Title to be announced
Sergiu Klainerman
11:05 a.m. - 11:55 a.m.
AMS-CMS INVITED ADDRESS
Frontiers in complex dynamics
Carl McMullen

Monday, August 16 (cont'd)

AFTERNOON

	American Mathematical Society	Canadian Mathematical Society	Mathematical Association of America	Other Organizations
12:15 p.m. - 12:45 p.m.	BUSINESS MEETING			
1:25 p.m. - 2:15 p.m.			EARLE RAYMOND HEDRICK LECTURE, II *Recent developments in geometry and physics: 3-dimensions* **Sir Michael Atiyah**	
2:30 p.m. - 3:20 p.m.			CMS-MAA INVITED ADDRESS *Title to be announced* **Uri Treisman**	
2:30 p.m. - 5:00 p.m.	AMS-CMS SPECIAL SESSIONS *3- and 4-manifolds*, II *Conformal dynamics*, II *Algebraic cycles*, II *Harmonic analysis techniques in partial differential equations*, II		CMS-MAA CONTRIBUTED PAPER SESSIONS *History of mathematics*, I *Mathematics and industry interface*, II *Research in undergraduate teaching*, I	
	AMS-CMS SESSIONS FOR CONTRIBUTED PAPERS			
	SPECIAL SESSIONS *Problems in number theory in memory of E. G. Strauss*, II *Discrete groups*, II *Symplectic geometry*, II *Exponential families in mathematical statistics*, II *Algebraic and geometric methods in control theory*, II			


2:30 p.m. - 4:30 p.m.
MINICOURSE #1 (PART B)
The Fibonacci and Catalan numbers
MINICOURSE #2 (PART B)
Teaching applied mathematics via Maple
MINICOURSE #5 (PART A)
Teaching finite mathematics to a large class of arts and education students
3:15 p.m. - 4:15 p.m.
AWM–CMS COMMITTEE ON WOMEN IN MATHEMATICS PANEL DISCUSSION
Affirmative action
4:35 p.m. - 5:00 p.m.
AWM PRIZE SESSION AND MEMBERSHIP MEETING
5:30 p.m. - 6:30 p.m.
GENERAL MEETING
7:00 p.m. - 9:30 p.m.
SALMON BARBECUE
9:30 p.m. - 11:00 p.m.
AWM RECEPTION
Tuesday, August 17
MORNING
8:00 a.m. - 4:00 p.m.
REGISTRATION FOR JOINT MEETINGS
8:30 a.m. - 9:20 a.m.
CMS-MAA INVITED ADDRESS
The goals of curriculum reform: students, technology, and mathematics
Deborah Hughes Hallett
9:00 a.m. - 5:00 p.m.
BOOK SALE
BOOK SALE
BOOK SALE
9:20 a.m. - 9:50 a.m.
COFFEE BREAK

Tuesday, August 17, (cont'd)

	American Mathematical Society	Canadian Mathematical Society	Mathematical Association of America	Other Organizations
MORNING (cont'd)				
9:50 a.m. - 10:50 a.m.	COLLOQUIUM LECTURE, II *Title to be announced* **Sergiu Klainerman**			
11:05 a.m. 11:55 a.m.	AMS -CMS INVITED ADDRESS *Title to be announced* **H. Blaine Lawson**			
AFTERNOON				
1:25 p.m. - 2:15 p.m.			EARLE RAYMOND HEDRICK LECTURE, III *Recent developments in geometry and physics: 4-dimensions* **Sir Michael Atiyah**	
2:30 p.m. - 3:20 p.m.				MAA-MU ALPHA THETA LECTURE *On American high school mathematics—now and in the future* **Richard Rhoad**
2:30 p.m. - 6:00 p.m.	AMS-CMS SPECIAL SESSIONS *Variational methods in partial differential equations*, I *Conformal dynamics*, III		CMS-MAA CONTRIBUTED PAPER SESSIONS *History of mathematics*, II *Less is more*, I *Research in undergraduate teaching*, II	
	AMS-CMS SESSIONS FOR CONTRIBUTED PAPERS			
	SPECIAL SESSIONS *Problems in number theory in memory of E. G. Strauss*, III *Discrete geometry and convexity*, III *Exponential families in mathematical statistics*, III *Algebraic and geometric methods in control theory*, III			
3:00 p.m. - 6:00 p.m.	AMS-CMS SPECIAL SESSION *Number theory*, I			

2:30 p.m. - 4:30 p.m.

MINICOURSE #3 (PART B)
Environmental modeling via the qualitative, visual, and computational

MINICOURSE #5 (PART B)
Teaching finite mathematics to a large class of arts and education students

3:30 p.m. - 6:00 p.m.

STUDENT PAPER SESSIONS

PI MU EPSILON CONTRIBUTED PAPER SESSIONS

3:45 p.m. - 4:45 p.m.

CMS-MAA COMMITTEE ON THE PARTICIPATION OF WOMEN PANEL DISCUSSION
How to help your majors get into graduate school

6:00 p.m. - 6:45 p.m.

JEFFERY WILLIAMS RECEPTION

7:00 p.m. - 8:00 p.m.

JEFFERY-WILLIAMS LECTURE
Trace formulas and automorphic representaions
James G. Arthur

8:15 p.m. - 9:15 p.m.

JPBM–AMS COMMITTEE ON SCIENCE POLICY–MAA SCIENCE POLICY COMMITTEE POLICY ADDRESS
Speaker and title to be announced

8:45 p.m. - 9:45 p.m.

VIDEO PRESENTATION
Regular-faced polyhedra: an introduction

8:45 p.m. - 10:45 p.m.

COMMITTEE ON THE PARTICIPATION OF WOMEN SPECIAL PRESENTATION
1993 Micro-inequities skits

Wednesday, August 18

MORNING

8:00 a.m. - 4:00 p.m.

REGISTRATION FOR JOINT MEETINGS

8:30 a.m. - 9:20 a.m.

CMS-MAA INVITED ADDRESS
Quantum cryptography
Gilles Brassard

9:00 a.m. - 5:00 p.m.

BOOK SALE

BOOK SALE

BOOK SALE

9:20 a.m. - 9:50 a.m.

COFFEE BREAK

Wednesday, August 18 (cont'd)

	American Mathematical Society	Canadian Mathematical Society	Mathematical Association of America	Other Organizations
MORNING (cont'd)				
9:50 a.m. - 10:50 a.m.	COLLOQUIUM LECTURE, III *Title to be announced* **Sergiu Klainerman**			
11:05 a.m - 11:55 a.m.	AMS-CMS INVITED ADDRESS *4-manifolds and symplectic topology* **Robert E. Gompf**			
AFTERNOON				
12:15 p.m. - 12:45 p.m.			BUSINESS MEETING	
1:15 p.m. - 2:45 p.m.	PROGRESS IN MATHEMATICS LECTURE *Values of indefinite quadratic forms at integral points and flows on spaces of lattices* **Armand Borel**			
2:00 p.m. - 4:00 p.m.			MINICOURSE #6 (PART A) *Combinatorial design theory* MINICOURSE #7 (PART A) *Lagrange multipliers* MINICOURSE #8 (PART A) *Earth algebra: College algebra with applications to environmental issues*	
2:10 p.m. - 6:00 p.m.	AMS-CMS SPECIAL SESSION *Variational methods in partial differential equations*, II AMS-CMS SESSIONS FOR CONTRIBUTED PAPERS		CMS-MAA CONTRIBUTED PAPERS SESSION *Interacting with elementary school kids*, I *Less is more*, II	

2:10 p.m. - 3:00 p.m.

CMS-MAA STUDENT LECTURE
The unity of combinatorics
Richard K. Guy

2:10 p.m - 6:00 p.m.

SPECIAL SESSIONS
Geometric methods in mathematical physics, I

Topological methods in group theory, I

Random knotting and linking, I

3:00 p.m. - 6:00 p.m.

AMS-CMS SPECIAL SESSION
Number theory, II

3:15 p.m. - 6:00 p.m.

STUDENT PAPER SESSIONS

PME CONTRIBUTED PAPER SESSIONS

4:15 p.m. - 6:15 p.m.

MINICOURSE #9 (PART A)
Round-robin tournaments: an introduction

MINICOURSE #10 (PART A)
Iteration

MINICOURSE #11 (PART A)
Learning abstract algebra by programming in ISETL

EVENING

6:30 p.m. - 8:15 p.m.

PME BANQUET

8:30 p.m. - 9:30 p.m.

PME J. SUTHERLAND FRAME LECTURE
Ramanujan for students
George Andrews

Thursday, August 19

MORNING

8:00 a.m. - 1:00 p.m.

REGISTRATION FOR JOINT MEETINGS

Thursday, August 19 (cont'd)

	American Mathematical Society	Canadian Mathematical Society	Mathematical Association of America	Other Organizations
MORNING (cont'd)				
8:30 a.m. - 10:30 a.m.			MINICOURSE #6 (PART B) *Combinatorial design theory* MINICOURSE #7 (PART B) *Lagrange multipliers*	
8:30 a.m. - 10:40 a.m.	AMS-CMS SPECIAL SESSIONS *Variational methods in partial differential equations*, II *Number theory*, III		CMS-MAA CONTRIBUTED PAPER SESSION *Interacting with elementary school kids*, II	
	AMS-CMS SESSIONS FOR CONTRIBUTED PAPERS			
	SPECIAL SESSIONS *Geometric measures in mathematical physics*, II *Topological methods in group theory*, II *Random knotting and linking*, II			
9:00 a.m. - noon	BOOK SALE	BOOK SALE	BOOK SALE	
10:55 a.m. - 11:45 a.m.	AMS-CMS INVITED ADDRESS *Title to be announced* **Louis Nirenberg**			
AFTERNOON				
1:15 p.m. - 2:45 p.m.	PROGRESS IN MATHEMATICS LECTURE, II *PDE based models arising from industrial problems* **Avner Friedman**			

2:00 p.m. - 4:00 p.m.

MINICOURSE #9 (PART B)
Round-robin tournaments: an introduction

MINICOURSE #11(PART B)
Learning abstract algebra by programming in ISETL

2:10 p.m. - 6:00 p.m.

AMS-CMS SESSIONS FOR CONTRIBUTED PAPERS

STUDENT PAPER SESSIONS

PME CONTRIBUTED PAPER SESSIONS

SPECIAL SESSIONS
Geometric methods in mathematical physics, III

Topological methods in group theory, III

Symplectic geometry, III

Random knotting and linking, III

3:00 p.m. - 6:00 p.m.

AMS-CMS SPECIAL SESSION
Variational methods in partial differential equations, IV

4:15 p.m. - 6:15 p.m.

MINICOURSE #10 (PART B)
Iteration

MINICOURSE #11 (PART C)
Learning abstract algebra by programming in ISETL

International Joint Mathematics Meeting
Heidelberg, Germany
October 1–3, 1993

Preliminary announcement

The AMS and the Mathematiker-Vereinigung e.V. have agreed to hold a joint meeting October 1–3, 1993. The scientific program will include up to six Invited Addresses and several Special Sessions. The Program Committee responsible for planning the program is coordinated by AMS Secretary Robert M. Fossum and includes Klaus D. Bierstedt, Joachim Cuntz, Albrecht E. Dold, Norbert Schappacher, and Friedrich Tomi from DMV; and Dale H. Husemoller and Bernd Ulrich from AMS. Please consult the Invited Addresses/Special Sessions section of this issue of the *Notices* for the most current list of speakers and organizers. More will be announced at a later date.

The abstract deadline is **June 17** for contributed papers and special sessions, and **May 27** for consideration of contributed papers for special sessions. The first announcement will be in the May/June *Notices*.

International Joint Mathematics Meeting
Merida, Yucatan, Mexico
December 1–4, 1993

Preliminary announcement

The AMS and the Sociedad Matematica Mexicana (SMM) have agreed to hold a joint meeting in December in Merida, Yucatan, Mexico. The meeting is scheduled for December 1–4, 1993. The scientific program will include up to six Invited Addresses and several Special Sessions. The Program Committee responsible for planning the program is coordinated by AMS Secretary Robert M. Fossum and includes L. Gorostiza, J. G. Gómez, and Jorge Ize from SMM; and Idun Rieten, Mary Ellen Rudin, and William Velez from AMS. Proposals for Special Sessions are welcome and should be submitted to Robert Fossum, who will forward them to the Program Committee for consideration. The SMM will be celebrating its 50th Anniversary during this year.

The abstract deadline is **August 4** for contributed papers and special sessions, and **July 14** for consideration of contributed papers for special sessions. The first announcement will be in the May/June *Notices*.

Invited Addresses and Special Sessions

Invited Addresses at AMS Meetings

The individuals listed below have accepted invitations to address the Society at the times and places indicated. For some meetings, the list of speakers is incomplete. Please check the table of contents for full announcements or programs of meetings happening in the near future. Invited addresses at Sectional Meetings are selected by the Section Program Committee, usually twelve to eighteen months in advance of a meeting. Members wishing to nominate candidates for invited addresses should send the relevant information to the Associate Secretary for the Section who will forward it to the Section Program Committee.

Syracuse, NY, September 1993

Tadeusz Iwaniec
Charles A. McGibbon
James M. Renegar
Alvany Rocha

Heidelberg, Germany, October 1993

Gerd Faltings
Helmut H. W. Hofer
Michael J. Hopkins
Vaughan F. R. Jones

College Station, TX, October 1993

Steven P. Lalley
Gilles Pisier
Theodore A. Slaman
Stephan A. Stolz

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.

September 1993 Meeting in Syracuse, New York
Eastern Section
Associate Secretary: Lesley M. Sibner
Deadline for organizers: Expired
Deadline for consideration: April 27, 1993

Douglas R. Anderson, *Geometric topology*
Robert Bruner and Charles A. McGibbon, *Algebraic topology*
Steven P. Diaz and Anthony V. Geramita, *Commutative algebra and algebraic geometry*
Allan Greenleaf and Robert S. Strichartz, *Harmonic analysis*
Wu-Teh Hsiang, *Differential geometry and global analysis*
Mark Kleiner and Dan Zacharia, *Representations of finite dimensional algebras*
Juan J. Manfredi, *Nonlinear potential theory*
Terry R. McConnell, *Topics in probability*
Paul Pedersen and James M. Renegar, *Computational problems involving polynomials*
Alvany Rocha, *Lie theoretic methods in mathematical physics*

October 1993 Meeting in Heidelberg, Germany
(Joint Meeting with the Deutsche Mathematiker-Vereinigung e.V.)
Associate Secretary: Robert M. Fossum
Deadline for organizers: Expired
Deadline for consideration: May 27, 1993
(This deadline is later than previously published.)

Joachim Cuntz, *Operator algebras*
Klas Diederich and John Erik Fornaess, *Complex analysis*
George K. Francis, *Geometry*
Hans-Werner Henn, *Homotopy theory*

October 1993 Meeting in College Station, Texas
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: Expired
Deadline for consideration: July 14, 1993

Josefina Alvarez, *Harmonic analysis and its applications*
Harold P. Boas, Al Boggess, and Emil J. Straube, *Several complex variables*
Randall K. Campbell-Wright, Carl C. Cowen, and Barbara D. MacCluer, *Composition operators on spaces of analytic functions*
Alfonso Castro, Joseph A. Iaia, John W. Neuberger, and Henry A. Warchall, *Nonlinear partial differential equations*
Goong Chen and Jianxin Zhou, *Control systems governed by partial differential equations*
Tim D. Cochran, Lorenzo A. Sadun, and Philip B. Yasskin, *Texas geometry and topology*
William E. Fitzgibbon and J. J. Morgan, *Reaction diffusion systems*
David R. Larson, *Non self adjoint operator algebras*

Edward S. Letzter, *Representation theory and geometry of noncommutative algebras*
John C. Meakin, Amitai Regev, Mark V. Sapir, and Samuel M. Vovsi, *Identities and varieties of algebraic structures*
Efton L. Park, *Noncommutative differential geometry*
Gilles Pisier and Thomas Schlumprecht, *The geometry of Banach spaces and operator spaces*
Sung Yell Song and Paul M. Terwilliger, *Algebraic combinatorics*

November 1993 Meeting in Claremont, California
Western Section
Associate Secretary: Lance W. Small
Deadline for organizers: Expired
Deadline for consideration: July 14, 1993

December 1993 Meeting in Merida, Mexico
(Joint Meeting with the Sociedad Matematica Mexicana)
Associate Secretary: Robert M. Fossum
Deadline for organizers: May 1, 1993
Deadline for consideration: July 14, 1993

January 1994 Meeting in Cincinnati, Ohio
Associate Secretary: Robert J. Daverman
Deadline for organizers: April 5, 1993
Deadline for consideration: September 23, 1993

March 1994 Meeting in Lexington, Kentucky
Southeastern Section
Associate Secretary: Robert J. Daverman
Deadline for organizers: June 18, 1993
Deadline for consideration: To be announced

March 1994 Meeting in Manhattan, Kansas
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: June 25, 1993
Deadline for consideration: To be announced
Andrew G. Bennett and Charles N. Moore, *Harmonic analysis and probability*
Andrew L. Chermak and Albert L. Delgado, *Groups and geometries*
Louis Crane and David N. Yetter, *Quantum topology*
Lev Kapitanski and Lige Li, *Nonlinear topics and critical phenomena in partial differential equations*
Zongzhu Lin and David B. Surowski, *Representations of algebraic groups and quantum groups*
Gabriel Nagy and Vladimir V. Peller, *Operator theory*
Joseph M. Rosenblatt, *Convergence problems in ergodic theory*
Misha Vishnik, *Dynamical systems and fluid dynamics*
Hunan Yang and Qisu Zou, *Computational mathematics and numerical analysis*

April 1994 Meeting in Brooklyn, New York
Eastern Section
Associate Secretary: Lesley M. Sibner
Deadline for organizers: July 9, 1993
Deadline for consideration: To be announced

June 1994 Meeting in Eugene, Oregon
Western Section
Associate Secretary: Lance W. Small
Deadline for organizers: September 7, 1993
Deadline for consideration: To be announced

August 1994 Meeting in Minneapolis, Minnesota
Associate Secretary: Lesley M. Sibner
Deadline for organizers: November 15, 1993
Deadline for consideration: To be announced

October 1994 Meeting in Stillwater, Oklahoma
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: January 28, 1994
Deadline for consideration: To be announced

November 1994 Meeting in Richmond, Virginia
Southeastern Section
Associate Secretary: Robert J. Daverman
Deadline for organizers: February 11, 1994
Deadline for consideration: To be announced

March 1995 Meeting in Chicago, Illinois
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: June 24, 1994
Deadline for consideration: To be announced

November 1995 Meeting in Kent, Ohio
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: February 4, 1995
Deadline for consideration: To be announced

January 1996 Meeting in Orlando, Florida
Associate Secretary: Lance W. Small
Deadline for organizers: April 12, 1995
Deadline for consideration: To be announced

March 1996 Meeting in Iowa City, Iowa
Central Section
Associate Secretary: Andy R. Magid
Deadline for organizers: June 22, 1995
Deadline for consideration: To be announced
Daniel D. Anderson, *Commutative ring theory*

Information for Organizers

Special Sessions at Annual and Summer Meetings are held under the supervision of the Program Committee for National Meetings (PCNM). They are administered by the Associate Secretary in charge of that meeting with staff assistance from the Meetings Department in the Society office in Providence.

According to the "Rules for Special Sessions" of the Society, Special Sessions are selected by the PCNM from a list of proposed Special Sessions in essentially the same manner as individuals are selected to give Invited Addresses. The number of Special Sessions at a Summer or Annual

Meeting is limited. The algorithm that determines the number of Special Sessions allowed at a given meeting, while simple, is not repeated here, but can be found in "Rules for Special Sessions" on page 614 in the April 1988 issue of the *Notices*.

Each person selected to give an Invited Address is invited to generate a Special Session, either by personally organizing one or by having a Special Session organized by others. Proposals to organize a Special Session are sometimes requested either by the PCNM or by the Associate Secretary. Other proposals to organize a Special Session may be submitted to the Associate Secretary in charge of that meeting (who is an *ex-officio* member of the committee and whose address may be found below). These proposals must be in the hands of the PCNM at least nine months prior to the meeting at which the Special Session is to be held in order that the committee may consider all the proposals for Special Sessions simultaneously. Proposals that are sent to the Providence office of the Society, to the *Notices*, or directed to anyone other than the Associate Secretary will have to be forwarded and may not be received in time to be considered for acceptance.

It should be noted that Special Sessions must be announced in the *Notices* in such a timely fashion that any member of the Society who so wishes may submit an abstract for consideration for presentation in the Special Session before the deadline for such consideration. This deadline is usually three weeks before the deadline for abstracts for the meeting in question.

Special Sessions are very effective at Sectional Meetings and can usually be accommodated. The processing of proposals for Special Sessions for Sectional Meetings is handled in essentially the same manner as for Annual and Summer Meetings by the Section Program Committee. Again, no Special Session at a Sectional Meeting may be approved so late that its announcement appears past the deadline after which members can no longer send abstracts for consideration for presentation in that Special Session.

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*.

More precise details concerning proposals for and organizing of Special Sessions may be found in the "Rules for Special Sessions" or may be obtained from any Associate Secretary.

Proposals for Special Sessions to the Associate Secretaries

The programs of Sectional Meetings are arranged by the Associate Secretary for the section in question:

Western Section

Lance W. Small, Associate Secretary
Department of Mathematics
University of California, San Diego
La Jolla, CA 92093
Electronic mail: g_small@math.ams.org
(Telephone 619-534-3590)

Central Section

Andy R. Magid, Associate Secretary
Department of Mathematics
University of Oklahoma
601 Elm PHSC 423
Norman, OK 73019
Electronic mail: g_magid@math.ams.org
(Telephone 405-325-6711)

Eastern Section

Lesley M. Sibner, Associate Secretary
Department of Mathematics
Polytech University of New York
Brooklyn, NY 11201-2990
Electronic mail: g_sibner@math.ams.org
(Telephone 718-260-3505)

Southeastern Section

Robert J. Daverman, Associate Secretary
Department of Mathematics
University of Tennessee
Knoxville, TN 37996-1300
Electronic mail: g_daverman@math.ams.org
(Telephone 615-974-6577)

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.

Proposals for Special Sessions at the December 1-4, 1993 meeting in Merida, Mexico, only, should be sent to Robert M. Fossum at the Department of Mathematics, University of Illinois, Urbana, Il 61801, Telephone: 217-244-1741, e-mail: rmf@math.ams.org.

Information for Speakers

A great many of the papers presented in Special Sessions at meetings of the Society are invited papers, but any member of the Society who wishes to do so may submit an abstract for consideration for presentation in a Special Session, provided it is received in Providence prior to the special early deadline announced above and in the announcements of the meeting at which the Special Session has been scheduled. Contributors should know that there is a limitation in size of a single Special Session, so that it is sometimes true that all places are filled by invitation. Papers not accepted for a Special Session are considered as ten-minute contributed papers.

Abstracts of papers submitted for consideration for presentation at a Special Session must be received by the Providence office (Abstracts Coordinator, Meetings Department, American Mathematical Society, P. O. Box 6887, 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.

Electronic submission of abstracts is available to those who use the TEX typesetting system. Requests to receive the electronic package of files via e-mail should be sent to **abs-request@math.ams.org**. Users may also obtain the package on IBM or Macintosh diskettes, available free of charge by writing to: Electronic Abstracts, American Mathematical Society, Meetings Department, P.O. Box 6887, Providence, RI 02940, USA. When requesting the abstracts package, users should be sure to specify whether they want the

plain TEX, AMS-TEX, or the LATEX package. Requests for general information concerning abstracts may be sent to **abs-misc@math.ams.org**.

Number of Papers Presented

Joint Authorship

Although an individual may present only one ten-minute contributed paper at a meeting, any combination of joint authorship may be accepted, provided no individual speaks more than once. An author can speak by invitation in more than one Special Session at the same meeting.

An individual may contribute only one abstract by title in any one issue of *Abstracts*, but joint authors are treated as a separate category. Thus, in addition to abstracts from two individual authors, one joint abstract by them may also be accepted for an issue.

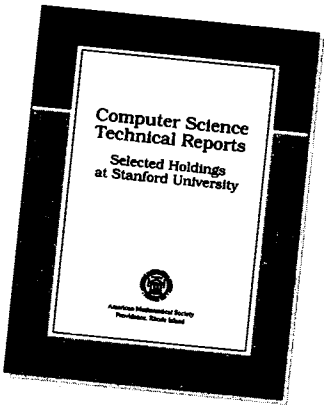
Site Selection for Sectional Meetings

Sectional Meeting sites are recommended by the Associate Secretary for the Section and approved by the Committee of Associate Secretaries and Secretary. Recommendations are usually made eighteen to twenty-four months in advance. Host departments supply local information, ten to twelve rooms with overhead projectors for contributed paper sessions and Special Sessions, an auditorium with twin overhead projectors for invited addresses, and registration clerks. The Society partially reimburses for the rental of facilities and equipment, and for staffing the registration desk. Most host departments volunteer; to do so, or for more information, contact the Associate Secretary for the Section.

Important New Reference Source!

30 Years **Computer Science Technical Reports: Selected Holdings at Stanford University**

Technical reports have functioned as the preprint literature for the field of computer science. Over the past thirty years, Stanford University has collected these reports on a regular basis from approximately 100 computer science departments and research groups worldwide. This publication is a listing of 36,364 reports in the Stanford collection. The reports are listed in order by institution name and, within the institution listings, by report number. In addition, there is a list of institution names and codes and an author index. This publication is useful to researchers in mathematics and computer science, as well as to librarians and others needing access to this kind of bibliographic information. *Computer Science Technical Reports* is also available through the AMS online database, MathSci®. Contact AMS Database Services for more details.



1991 *Mathematics Subject Classification*: 00, 68
ISBN 0-8218-0009-4, 1160 pages (softcover), October 1992
List price $198. To order, please specify CSTRPT/NA

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

1993 Symposium on Some Mathematical Questions in Biology

Theories for the evolution of haploid-diploid life cycles

Snowbird, Utah, June 23

The twenty-seventh annual Symposium on Some Mathematical Questions in Biology, focusing on *Theories for the evolution of haploid-diploid life cycles*, will be held during the annual meeting of the Society for the Study of Evolution, June 19–23, 1993, in Snowbird, Utah. The symposium is sponsored by the American Mathematical Society, the Society for Industrial and Applied Mathematics (SIAM), and the Society for Mathematical Biology (SMB).

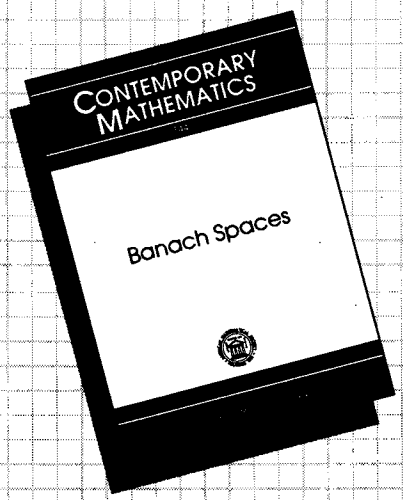
The AMS-SIAM-SMB Committee on Mathematics in the Life Sciences serves as the Organizing Committee for the symposium. The committee members are Jack D. Cowan, James W. Curren, Marcus W. Feldman, Eric S. Lander, Marc Mangel (Chair), and James D. Murray. **Mark Kirkpatrick**, University of Texas, serves as the organizer.

The session will be on Wednesday morning, June 23. The speakers and their topics are: **Graham Bell** (McGill University), *The comparative biology of the alternation of generations*; **James Crow** (University of Wisconsin) and **Alex Kondrashov** (University of Oregon), *The evolution of haploid-diploid life cycles under deleterious mutation*; **Cheryl Jenkins** (University of Texas), *Ecological selection and deleterious mutation in the evolution of life cycles*; **Richard Michod** (University of Arizona), *Genetic repair and life cycle evolution*; **Sarah Otto** (Berkeley), *Genetic prerequisites and consequences of life cycle evolution*; and **Veronique Perrot** (Universität Basel), *Experimental tests of theories for the evolution of haploid-diploid life cycles.*

Proceedings of the symposium will be published by the AMS in the series *Lectures on Mathematics in the Life Sciences.*

The SMB has funds for partial support of graduate students attending the symposium from the Landahl travel grants. Those interested in requesting support should contact John Rinzel, Mathematical Research Branch, NIDDK, Bldg. 31, Room 4B-54, NIH, Bethesda, MD 20892, by May 10, 1993. The application should include a one-page research summary, a letter from a faculty sponsor, a summary of requested funding, and a statement of any past Landahl awards.

For further information on the symposium, contact the Symposium Conference Coordinator, AMS, P.O. Box 6887, Providence, RI 02940, or dls@math.ams.org by e-mail.



CONTEMPORARY MATHEMATICS

Banach Spaces

Bor-Luh Lin and William B. Johnson, Editors

Volume 144

This volume contains the proceedings of the International Workshop on Banach Space Theory, held at the Universidad de Los Andes in Merida, Venezuela, in January 1992. These refereed papers contain the newest results in Banach space theory, real or complex function spaces, and nonlinear functional analysis. There are several excellent survey papers, including ones on homogeneous Banach spaces and applications of probability inequalities, in addition to an important research paper on the distortion problem. This volume is notable for the breadth of the mathematics presented.

1991 *Mathematics Subject Classification*: 46
ISBN 0-8218-5157-8, 201 pages (softcover), March 1993
Individual member $25, List price $42, Institutional member $34
To order, please specify CONM/144NA

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

Mathematical Sciences Meetings and Conferences

THIS SECTION contains announcements of meetings and conferences of interest to some segment of the mathematical public, including *ad hoc*, local, or regional meetings, and meetings or symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. A complete listing of meetings of the Society, and of meetings sponsored by the Society, will be found inside the front cover.

AN ANNOUNCEMENT will be published in the *Notices* if it contains a call for papers, and specifies the place, date, subject (when applicable), and the speakers; a second announcement will be published only if there are changes or necessary additional information. Once an announcement has appeared, the event will be briefly noted in each issue until it has been held and a reference will be given in parentheses to the month, year, and page of the issue in which the complete information appeared. Asterisks (*) mark those announcements containing new or revised information.

IN GENERAL, announcements of meetings and conferences held in North America carry only date, title of meeting, place of meeting, names of speakers (or sometimes a general statement on the program), deadlines for abstracts or contributed papers, and source of further information. Meetings held outside the North American area may carry more detailed information. In any case, if there is any application deadline with respect to participation in the meeting, this fact should be noted. All communications on meetings and conferences in the mathematical sciences should be sent to the Editor of the *Notices*, care of the American Mathematical Society in Providence, or electronically to notices@math.ams.org.

DEADLINES for entries in this section are listed on the inside front cover of each issue. In order to allow participants to arrange their travel plans, organizers of meetings are urged to submit information for these listings early enough to allow them to appear in more than one issue of the *Notices* prior to the meeting in question. To achieve this, listings should be received in Providence SIX MONTHS prior to the scheduled date of the meeting.

EFFECTIVE with the 1990 volume of the *Notices*, the complete list of Mathematical Sciences Meetings and Conferences will be published only in the September issue. In all other issues, only meetings and conferences for the twelve-month period following the month of that issue will appear. As new information is received for meetings and conferences that will occur later than the twelve-month period, it will be announced at the end of the listing in the next possible issue. That information will not be repeated until the date of the meeting or conference falls within the twelve-month period.

1993

1993–1994. **Mittag-Leffler Institute's Academic Program for 1993–1994: Topology and Algebraic K-theory**, Djursholm, Sweden. (Dec. 1992, p. 1274)

Spring 1993. **IMACS Symposium on Mathematical Modelling**, Wiener Neustadt, Germany. (Jan. 1992, p. 54)

1993. **Second IMACS International Conference on Computational Physics**, Univ. of Colorado, Boulder, CO. (Jan. 1992, p. 55)

April 1993

4–7. **First International Conference on Mathematical Linguistics**, Barcelona, Spain. (Sep. 1992, p. 772)

4–9. **Copper Mountain Conference on Multigrid Methods**, Copper Mountain, Colorado. (Nov. 1992, p. 1116)

4–10. **Topics in Pseudo-Differential Operators**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

5–7. **Predictability and Nonlinear Modelling in Natural Sciences and Economics**, Wageningen, The Netherlands. (Jan. 1993, p. 55)

5–8. **British Applied Mathematics Colloquium (35th British Theoretical Mechanics Colloquium)**, Glasgow, UK. (Jan. 1993, p. 55)

5–9. **IMA Tutorial: Design and Analysis of Adaptive Systems**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Nov. 1991, p. 1172)

5–9. **Théorie des Opérateurs**, CIRM, Marseille, France. (Jan. 1993, p. 55)

6–8. **NASECODE IX: The Ninth International Conference on the Numerical Analysis of Semiconductor Devices and Integrated Circuits**, Copper Mountain, Colorado. (Jan. 1993, p. 55)

7–10. **The Ninth Conference on the Mathematical Foundations of Programming Semantics**, New Orleans, LA. (Nov. 1992, p. 1116)

8–10. **Clifford Algebras in Analysis**, University of Arkansas, Fayetteville, AR. (Sep. 1992, p. 772)

9–10. **Western Section**, University of Utah, Salt Lake City, Utah.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

9–11. **The Second Boise Extravaganza in Set Theory (BEST)**, Boise State Univ., Boise, Idaho. (Dec. 1992, p. 1277)

11–17. **Arbeitsgemeinschaft mit Aktuellem Thema**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

12–16. **IMA Workshop on Adaptive Control, Filtering, and Signal Processing**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Nov. 1991, p. 1172)

12–16. **Second IMACS International Symposium on Mathematical and Intelligent Models in System Simulation**, Brussels, Belgium. (Feb. 1993, p. 179)

12–16. **GAMM-Jahrestagung 1993**, Dresden, Germany. (Sep. 1992, p. 772)

12–17. **Tenth Easter Conference on Model Theory**, Wendisch-Rietz (near Berlin), Germany. (Jan. 1993, p. 55)

14–16. **Seventh SEFI European Seminar on Mathematics in Engineering Education**, Eindhoven University of Technology, The Netherlands. (Feb. 1992, p. 149)

14–16. **The Mathematics of Food Production, Processing, and Presentation**, Belfast, Great Britain. (Sep. 1992, p. 772)

14–17. **Dynamics of Complex Systems in Biosciences**, Marseille, France. (Jan. 1993, p. 56)

14–23. **International Conference in Abstract Analysis**, Kruger National Park, Republic of South Africa. (Oct. 1992, p. 948)

15–22. **Symposium on Analytic and Geometric Aspects of Hyperbolic Geometry: Research Level Workshop**, University of Warwick, Coventry, UK. (Dec. 1992, p. 1277)

16. **Fifth Annual Conference on Biomathematics**, State University of New York at Stony Brook. (Mar. 1993, p. 276)

16–17. **Conference on Graduate Programs in the Applied Mathematical Sciences II**, Clemson University, Clemson, SC. (Feb. 1993, p. 179)

17. **Fortieth Anniversary Algebra Day**, Carleton University, Ottawa, Canada. (Feb. 1993, p. 179)

17–18. **Eastern Section**, Howard University, Washington, DC.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

18. **Tutorial on Introduction to Paral-**

lel Computation, Houston, TX. (Dec. 1992, p. 1277)

18–24. **The Arithmetik of Fields**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

18–24. **Mathematische Grundlagen und Numerische Verfahren bei Transsonischen Strömungen**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

19–20. **IMA Minisymposium on Fuzzy Control**, University of Minnesota, Minneapolis, MN. (Nov. 1992, p. 1117)

19–21. **SIAM Conference on Mathematical and Computational Issues in the Geosciences**, Houston, TX. (Jul./Aug. 1992, p. 631)

19–23. **Cartes Cellulaires sur les Surfaces de Riemann (Théorie des "Dessins D'Enfants"**, Marseille, France. (Jan. 1993, p. 56)

23. **Applied Probability day at Columbia University**, New York City, NY. (Feb. 1993, p. 180)

25–May 1. **Low Dimensional Dynamics**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

26–28. **Methodes Spectrales et Elements Spectraux**, Clamart, France. (Jan. 1993, p. 56)

26–29. **NCGA '93 Computer Graphics Solutions: Applications for Implementation**, Philadelphia, PA. (Nov. 1992, p. 1117)

26–29. **The Mathematics of Finite Elements and Applications VIII, MAFELAP 1993**, Uxbridge, UK. (Jan. 1993, p. 56)

27–29. **NSF/DoD's National SBIR Conferences**, Minneapolis, MN. (Sep. 1992, p. 772)

30–May 2. **Third Midwestern Geometry Conference**, University of Missouri, Columbia, MO. (Dec. 1992, p. 1277)

May 1993

2–4. **Workshop on Operator Algebras**, Institute for Advanced Studies in Mathematics, Technion, Haifa, Israel. (Oct. 1992, p. 948)

2–7. **Algebraic Geometry Workshop on the Occasion of the 65th Birthday of F. Hirzebruch**, Emmy Noether Institute, Bar-Ilan Univ., Ramat Gan, Israel. (Dec. 1992, p. 1277)

2–8. **Design and Experiments: Optimality, Construction and Applications**, Oberwolfach, Federal Republic of Germany. (Jan. 1993, p. 56)

2–8. **Austrian Conference on Discrete Geometry and Related Topics**, (near Neuhofen), Austria. (Mar. 1993, p. 276)

3–7. **IMA Tutorial: Verification Issues in Discrete Event Systems, as well as Performance and Control**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Nov. 1991, p. 1172)

3–7. **Problemes aux Limites & Equations Integrales dans des Domaines Non Reguliers (Boundary Value Problems and Integral Equations in Nonsmooth Domains)**, CIRM, Marseille, France. (Feb. 1993, p. 180)

3–14. **Workshop on Qualitative Aspects and Applications of Nonlinear Evolution Equations**, Trieste, Italy. (Jan. 1993, p. 56)

4–8. **The Third International Colloquium on Cognitive Science (ICCS-93)**, Donostia-San Sebastian, Spain. (Nov. 1992, p. 1117)

6–12. **Spring School on Potential Theory and Analysis**, Paseky, Czechoslovakia. (Jan. 1993, p. 56)

* 7–9. **Workshop on Hodge Theory and Singularities**, University of California at Riverside.

ORGANIZERS: M.-C. Chang, M. Green, Z. Ran, J. Steenbrink.
PROGRAM AND SUPPORT: A small amount of support will be available, mostly for living expenses. Women, minorities, and new researchers are especially invited to apply. The mathematical community is cordially invited to attend. May is a month of concentration in Hodge theory and singularities at MSRI, and a number of participants are expected from there.
INFORMATION: M. Green, Dept. of Math., UCLA, Los Angeles, CA 90024; mlg@math.ucla.edu or ziv@ucrmath.ucr.edu; or contact M. Green at 310-825-4701.

* 8. **New York Graph Theory Day Twenty-five**, Pace University, New York, NY.

SPONSOR: Mathematics Section, New York Academy of Sciences.
ORGANIZING COMMITTEE: A. Colbourn, M.L. Gargano, J.W. Kennedy, M. Kotler, L.V. Quintas, C. Wolf, C. Zahn.
INVITED SPEAKERS: D.E. Goldberg (U. of Illinois, Champaign): Genetic algorithms; R. Steinberg (AT&T Bell Labs.): The state of the three color problem.
INFORMATION: GTD 25, Math. Dept., Pace University, New York, NY 10038; 212-346-1280; e-mail: quintas@pacevm.bitnet.

* 8–9. **Southern California Analysis and Partial Differential Equations Seminar (SCAPDE)**, University of California, San Diego.

INVITED SPEAKERS: R. Carmona (UC Irvine), J. Garnett (UCLA), J. Kazdan (U. of Pennsylvania), R. Mazzeo (Stanford and U. of Washington), P. Rabinowitz (U. of Wisconsin), J. Taylor (Rutgers).
INFORMATION: S. Baouendi (sbaouendi@ucsd.edu) or L. Rothschild (lrothschild@ucsd.edu), Dept. of Math.-0112, UCSD, La Jolla, CA 92093-0112.

* 8–9. **Topics in Algebra and Topology: A Conference in Honor of Peter Hilton**, Centre de Recherches Mathématiques, Université de Montréal.

ORGANIZING COMMITTEE: F. Clarke (Director, CRM), G. Mislin (Zurich), L. Pelletier (Coordinator, CRM), N. Schlomiuk (U. de Montréal).
INVITED SPEAKERS: C. Casacuberta (Barcelona), B. Eckmann (ETH, Zurich), R. Geoghegan (SUNY Binghamton), I. James (Oxford), G. Mislin (Zurich), F. Peterson (MIT), D. Sjerve (UBC), U. Stammbach (Zurich).
INFORMATION: L. Pelletier, 514-343-2197; e-mail: pelletl@ere.umontreal.ca.

9–14. **Conference in Harmonic Analysis to Honor Guido Weiss**, Universidad Autonoma de Madrid, Madrid, Spain. (Mar. 1993, p. 277)

9–15. **Reelle Algebraische Geometrie**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

9–17. **Jerusalem Combinatorics '93**, Hebrew University of Jerusalem, Israel. (Jul./Aug. 1992, p. 631)

10–12. **IMACS Symposium on Signal Processing and Neural Networks–SPANN '93**, Université du Québec at Montréal, Canada. (Jan. 1992, p. 56)

10–14. **IMA Workshop on Discrete Event Systems, Manufacturing Systems, and Communication Networks**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Nov. 1991, p. 1172)

10–14. **The Tenth International Symposium on Applied Algebra, Algebraic Algorithms, and Error Correcting Codes**, San Juan de Puerto Rico. (Oct. 1992, p. 948)

10–14. **Geometrie et Topologie des Sous-Varietes**, CIRM, Marseille, France. (Nov. 1992, p. 1117)

10–14. **International Geometric Colloquium**, Moscow. (Jan. 1993, p. 56)

12–14. **Detonique**, Rocquencourt, France. (Jan. 1993, p. 56)

13–15. **The Twelfth Pacific Coast Resource Modeling Conference**, Tucson, AZ. (Jan. 1993, p. 56)

13–16. **ASL Spring Meeting in Conjunction with a Meeting of the Society for Exact Philosophy**, York University, Toronto, Canada. (Nov. 1992, p. 1117)

14–16. **Knots and Quantum Gravity**, University of California, Riverside, CA. (Feb. 1993, p. 180)

* 15–25. **School of Analysis and Topology**, Katsyvely, Crimea, Ukraine.

CHAIRMAN: Yu. Zelinskii, Kiev.
CONFERENCE TOPICS: Complex analysis, convex analysis, integral geometry, multivalued mappings, general and algebraic topology.
INFORMATION: Yu. Zelinskii, Institute of Math., Tereshchenkovskaja Str., 3, 252601, Kiev-4, Ukraine; fax: (044) 225 20 10; e-mail: mathem@sovamsu.sovusa.com.

16–22. **Mathematical Problems in Viscoelastic Flows**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

17–19. **Third International Conference on Expert Systems for Numerical Computing**, Purdue University, West Lafayette, IN. (Dec. 1992, p. 1278)

17–21. **Algebre et Applications**, Marseille, France. (Feb. 1993, p. 180)

18–21. **Eighth Annual Conference on Structure in Complexity Theory**, San Diego, CA. (Oct. 1992, p. 948)

18–21. **Workshop in Function Theory and Algebraic Differential Equations**, University of Illinois, Urbana, IL. (Mar. 1993, p. 277)

20–21. **DIMACS Quadratic Assignment Problem Workshop**, DIMACS Center, Rutgers University, New Brunswick, NJ. (Mar. 1993, p. 277)

20–22. **International Symposium on Ordinary Differential Equations and Applications**, Western Michigan University, Kalamazoo, MI. (Nov. 1992, p. 1117)

20–22. **International Conference on Approximation, Probability, and Related Fields**, University of California, Santa Barbara. (Dec. 1992, p. 1278)

20–23. **International Conference on Approximation Probability and Related Fields**, University of California, Santa Barbara, CA. (May/Jun. 1991, p. 477)

20–23. **Central Section**, Northern Illinois University, DeKalb, IL.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

23–29. **Differentialgeometrie im Grossen**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

24–27. **COMPEURO '93**, Paris-Evry, France. (Jul./Aug. 1992, p. 631)

24–27. **Eurocrypt '93: A Workshop on the Theory and Applications of Cryptographic Techniques**, Lofthus, Norway. (Nov. 1992, p. 1118)

24–28. **Matroides et Matroides Orientes**, CIRM, Marseille, France. (Nov. 1992, p. 1118)

24–28 **Ergodic Theory and Its Connections with Harmonic Analysis**, Alexandria, Egypt. (Feb. 1993, p. 181)

24–28. **Théorie des Nombres et Automates**, CIRM, Marseille, France. (Jan. 1993, p. 57)

*24–29. **Second Gokova Geometry/Topology Conference: A Meeting in Low Dimensional Topology**, Gokova, Turkey.

SPONSOR: TUBITAK (The Scientific and Technical Research Council of Turkey).
INVITED SPEAKERS: *Tentative*: F. Cohen, R. Cohen, R. Fenn, R. Fintushel, R. Gompf, I. Hambelton, W. Li, G. Masbaum, G. Mikhalkin, J. Morgan, T. Mrowka, D. Ruberman, R. Stern, J. Weitsman.
INFORMATION: Turgut Onder, Dept. of Math., Middle East Technical University, Ankara, Turkey; mattrgt%trmetu.bitnet@pucc.princeton.edu; or S. Akbulut: akbulut@math.msu.edu.

26–29. **First International Conference on Dynamic Systems and Applications**, Morehouse College, Atlanta, GA. (Oct. 1992, p. 948)

26–29. **G.J. Butler Workshop in Mathematical Ecology**, Fields Institute for Research in Mathematical Sciences, Waterloo, Ontario. (Mar. 1993, p. 277)

27–28. **Fifteenth Symposium on Mathematical Programming with Data Perturbations**, George Washington University, Washington, DC. (Jan. 1993, p. 57)

28–30. **Algebraic Geometry-Interactions between Commutative Algebra and Algebraic Geometry**, Columbia, MO. (Mar. 1993, p. 277)

30–June 1. **Canadian Society for the History and Philosophy of Mathematics**, Carleton University, Ottawa, Ontario, Canada. (Sep. 1992, p. 772)

30–June 2. **Fourteenth Annual Meeting of the Canadian Applied Mathematics Society/Societe Canadienne de Mathematiques Applique**, York University, North York, Ontario. (Jan. 1993, p. 57)

30–June 4. **NSF Calculus Reform Workshop: Core Approach to Calculus.** (Feb. 1993, p. 181)

30–June 5. **Funktionalanalysis und Nichtlineare Partielle Differentialgleichungen**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

30–June 13. **First Caribbean Spring School of Theoretical Physics and Mathematics on Infinite Dimensional Geometry, Noncommutative Geometry, Operator Algebras, and Particle Physics**, Guadeloupe (French West Indies). (Nov. 1992, p. 1118)

31–June 4. **Workshop on Nonnegative Matrices, Applications, and Generalizations**, Technion, Haifa, Israel. (Nov. 1992, p. 1118)

June 1993

June 1993. **Fourth IMACS International Symposium on Computational Acoustics**, Cambridge, England. (Jan. 1992, p. 56)

June 1993. **GAMM/IFIP - Workshop on Stochastic Optimization: Numerical Methods and Technical Applications**, Neubiberg/München, Germany. (Sep. 1992, p. 773)

June 1993. **Summer Workshop: Calculus, Computers, Concepts, and Cooperative Learning**, Purdue University, West Lafayette, IN. (Nov. 1992, p. 1118)

1–4. **Rigidite et Deformation pour les Systemes Hyperboliques**, CIRM, Marseille, France. (Nov. 1992, p. 1118)

1–5. **CBMS-NSF Conference on Applications of the Representation Theory of Quantum Affine Lie Algebras to Solvable Lattice Models**, North Carolina State University, Raleigh, NC. (Jan. 1993, p. 57)

*1–5. **Energy Systems Modeling**, Salisbury State University, Salisbury, MD.

PURPOSE: To introduce college teachers to modeling.
LECTURER: H.T. Odum, U. of Florida.
INFORMATION: B.A. Fusaro, Dept. of Math. & C.S., Salisbury State University, Salisbury, MD 21801; 410-543-6470 or 6471; fax: 410-548-5597.

2–4. **The Lars Onsager Symposium. Coupled Transport Processes and Phase Transitions**, Trondheim, Norway. (Dec. 1992, p. 1278)

2–4. **DIMACS Workshop on Parallel Algorithms for Unstructured and Dynamic Problems**, Rutgers University, Piscataway, NJ. (Feb. 1993, p. 181)

2–5. **Ninth Biennial Conference of the Association of Christians in the Mathematical Sciences**, Westmont College, Santa Barbara, CA. (Sep. 1992, p. 773)

3–6. **Symposium on Comparison Methods and Stability Theory**, The Fields Institute, Waterloo, Ontario. (Mar. 1993, p. 278)

3–9. **Fifteenth Nevanlinna Colloquium**, Ann Arbor, MI. (Jan. 1993, p. 57)

*4–7. **Sixth Meeting of European Women in Mathematics**, Warsaw, Poland. (Please note additional information to Jan. 1993, p. 58)

PROGRAM: The European Women in Maths group has been running since 1986 with the aims of encouraging women in mathematics, supporting women in mathematical research, providing a biennial conference, fostering international scientific communication among women in mathematics, and promoting equal opportunity and treatment of women and men in the mathematical community. The program will include: (i) expository mathematical lectures; (ii) talks and discussions on the theme "creativity"; (iii) meeting and talk to Warsaw students of mathematics; (iv) general discussion on the situation of women mathematicians in different countries (especially in East and Central Europe); (v) organization and business for EWM. The expository talks will be open to the general mathematical public.
INVITED SPEAKERS: *Tentative*: Z. Adamowiczw (Warsaw), V. Balladini (Lyon), I. Kersten (Bielefeld), H. Bacelar-Nicolau (Lisboa), D. Przeworska-Rolewicz (Warsaw), C. Geijsel (Amsterdam), M. Gray (Washington).

6–9. **Annual Meeting of the Statistical Society of Canada**, Wolfville, Nova Scotia, Canada. (Feb. 1992, p. 149)

6–12. **Analysis auf Kompakten Varietäten**,

Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

7–10. **SIAM Conference on Mathematical and Numerical Aspects of Wave Propagation Phenomena**, University of Delaware, Newark, DE. (Jul./Aug. 1992, p. 631)

7–10. **The Eighth Haifa Matrix Theory Conference**, Technion, Haifa, Israel. (Nov. 1992, p. 1119)

7–11. **IMA Tutorial: Mathematical Theory which Has become an Integral Part of Modern Financial Economics**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Nov. 1991, p. 1172)

7–11. **Colloque International en l'Honneur de G. Freiman. La Methode Additive Inverse et ses Applications**, CIRM, Marseille, France. (Nov. 1992, p. 1119)

7–11. **Art and Mathematics Conference (AM93)**, State University of New York, Albany, NY. (Dec. 1992, p. 1279)

*7–12. **International Conference in Honour of Bernard Malgrange**, Grenoble, France. (Please note updated information to Nov. 1992, p. 1119)

CONFERENCE TOPICS: Complex analysis and geometry, singularities, differential equations and D-modules.
INVITED SPEAKERS: S. Baouendi, D. Barlet, D. Cerveau, J. Ecalle, L. Ehrenpreis, V. Guillemin, L. Hormander, M. Kashiwara, T. Kawai, S. Lojasiewicz, J. Mather, Z. Mebkhout, R. Narasimhan, F. Pham, C. Sabbah, Y.T. Siu, A. Voros.
INFORMATION: J. Gasqui, Secretariat du Colloque, Malgrange, Institut Fourier, B.P. 74, 38402 St. Martin d'Heres cedex (France); e-mail: com@grenet.fr; fax (33) 76 51 44 78.

7–12. **Methodes Geometriques et Topologiques en Physique Theorique**, Lyon, France. (Jan. 1993, p. 58)

7–12. **Workshop on Pattern Formation and Lattice-Gas Automata**, The Fields Institute, Waterloo, Ontario. (Feb. 1993, p. 182)

7–12. **Seminar on Stochastic Analysis, Random Fields, and Applications**, Ascona, Switzerland. (Feb. 1993, p. 182)

7–13. **Workshop on Pattern Formation and Cellular Automata**, Fields Institute for Research in Mathematical Sciences, Waterloo, Ontario. (Apr. 1992, p. 352)

7–18. **AMS-SIAM Summer Seminar in Applied Mathematics: The Mathematics of Tomography, Impedance Imaging, and Integral Geometry**, Mount Holyoke College, South Hadley, MA.

INFORMATION: D. Salter, AMS, P.O. Box 6887, Providence, RI 02940.

13–18. **The Householder Symposium XII Meeting on Numerical Algebra**, UCLA Conference Center, Lake Arrowhead, CA. (Dec. 1992, p. 1279)

13–18. **NSF Calculus Reform Workshop: Calculus in a Real and Complex World.** (Feb. 1993, p. 182)

13–18. **NSF Calculus Reform Workshop: Ithaca College Program.** (Feb. 1993, p. 182)

13–18. **NSF Calculus Reform Workshop: Harvard Consortium Program.** (Feb. 1993, p. 182)

*13–18. **SIMS 1993 AIDS Conference**, Berlin, Germany.

PROGRAM: The 1993 SIMS (Societal Inst. of the Math. Sciences) Research Application Conference (RAC-93) will address quantitative methods for studying AIDS. RAC-93 will address methods for projections of AIDS cases, mathematical models for the AIDS epidemic, natural history of HIV infections, and intervention studies and clinical trials. Particular attention will be given to issues associated with intravenous drug users.
PROGRAM CHAIRS: P.R. Bacchetti, Dept. of Epidemiology and Biostatistics, U. of California, SFO; K. Dietz, Dept. of Medical Biometry, U. of Tuebingen; M. Pagano, Dept. of Biostatistics, Harvard School of Public Health.
INFORMATION: Contact SIMS at 203-966-1008 or fax 203-972-6069.

13–19. **Differential-Algebraic Equations: Theory and Applications in Technical Simulation**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

14–17. **The Fifth Asian Logic Conference**, National University of Singapore, Singapore. (May/Jun. 1992, p. 496)

14–17. **IMACS Symposium on Symbolic Computation**, Lille, France. (Feb. 1993, p. 182)

14–18. **IMA Workshop on Mathematical Finance**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Nov. 1991, p. 1172)

14–18. **Linear Logic Workshop**, Mathematical Sciences Institute, Cornell University, Ithaca, NY. (May/Jun. 1992, p. 496)

14–18. **Homologie des Algebres et Applications**, CIRM, Marseille, France. (Nov. 1992, p. 1119)

14–18. **Geometrical and Topological Methods in Theoretical Physics**, Université Claude Bernard, Lyon 1, France. (Feb. 1993, p. 182)

14–18. **Workshop in Nonlinear Differential Equations**, University of Campinas (UNICAMP), Campinas, Brazil. (Feb. 1993, p. 182)

14–19. **Groups of Lie Type and Their Geometries**, Como, Italy. (Jan. 1993, p. 58)

14–22. **Integrable Systems and Quantum Groups**, Villa La Querceta, Montecatini Terme, Italy. (Feb. 1993, p. 182)

15–17. **IEEE Computer Society Conference on Computer Vision and Pattern Recognition**, Omni Park Central, New York City, NY. (Nov. 1992, p. 1119)

15–17. **Second GAMM/IFIP Workshop on Stochastic Optimization**, München, Federal Republic of Germany. (Jan. 1993, p. 58)

15–17. **Computer Security Foundations Workshop VI**, Franconia, NH. (Jan. 1993, p. 58)

16–18. **Third IMACS International Workshop on Qualitative Reasoning and Decision Technologies–QR&DT-3**, Polytechnique of Barcelona, Spain. (Please note date change from Jan. 1992, p. 56)

16–18. **Fifth International Conference on Rewriting Techniques and Applications**, Montreal, Canada. (Jan. 1993, p. 58)

17–19. **ATLAST 1993 Linear Algebra Workshops**, Michigan State University, East Lansing, MI. (Dec. 1992, p. 1279)

18–19. **Conference on Integration of Precalculus with Calculus**, Moravian College, Bethlehem, PA. (Dec. 1992, p. 1279)

20–23. **Eighth Annual IEEE Symposium on Logic in Computer Science (LICS)**, Montreal, Canada. (Nov. 1992, p. 1119)

20–25. **NSF Calculus Reform Workshop: Oregon State Program.** (Feb. 1993, p. 183)

20–26. **Konvexgeometrie**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 56)

20–July 2. **NATO Advanced Study Institute: Real & Complex Dynamical Systems**, Hillerod, Denmark. (Jan. 1993, p. 58)

21–23. **Colloquium on Elementary and Analytic Number Theory**, Lillafüred, Hungary. (Jan. 1993, p. 59)

21–25. **Twenty-second Conference on Stochastic Processes and their Applications**, Amsterdam, The Netherlands. (Sep. 1992, p. 773)

21–25. **Graphs on Surfaces**, Johns Hopkins University, Baltimore, MD. (Sep. 1992, p. 773)

21–25. **Fifth International Conference on Formal Power Series and Algebraic Combinatorics**, University of Florence, Florence, Italy. (Oct. 1992, p. 949)

21–26. **Homogeneisation et Methodes de Convergence en Calcul des Variations**, CIRM, Marseille, France. (Nov. 1992, p. 1119)

21–29. **Algebraic Cycles and Hodge Theory**, Villa Gualino, Torino, Italy. (Feb. 1993, p. 183)

22–24. **The Twenty-third Annual International Symposium on Fault-Tolerant Computing (FTCS 23)**, Toulouse, France. (Nov. 1992, p. 1119)

22–25. **Third International Conference on Algebraic Methodology and Software Technology (AMAST '93)**, Enschede, The Netherlands. (Nov. 1992, p. 1119)

22–26. **Cech Birthday Conference**, Northeastern University, Boston, Massachusetts.

(January 1993, p. 59)

23. **Symposium on Some Mathematical Questions in Biology: Theories for the Evolution of Haploid-Diploid Life Cycles**, Snowbird, Utah.

INFORMATION: D. Salter, AMS, P.O. Box 6887, Providence, RI 02940.

23–24. **Test Site Workshop**, Harvard University, Cambridge, MA. (Mar. 1993, p. 279)

23–26. **Convergence in Ergodic Theory and Probability**, Ohio State University, Columbus, OH. (May/Jun. 1992, p. 496)

23–27. **Seventeenth Summer Symposium in Real Analysis**, Macalester College, St. Paul, MN. (Jan. 1993, p. 59)

24–26. **Twenty-fifth Anniversary of the Classification Society of North America**, Pittsburgh, PA. (Dec. 1992, p. 1280)

24–26. **ATLAST 1993 Linear Algebra Workshops**, Los Angeles Peirce College, Woodland Hills, CA. (Dec. 1992, p. 1280)

24–26. **Ninth Summer Conference on General Topology and Applications**, Slippery Rock University, Slippery Rock, PA. (Jan. 1993, p. 59)

25–26. **Second Conference on the Teaching of Calculus**, Harvard University, Cambridge, MA. (Mar. 1993, p. 279)

* 25–July 2. **Symposium on Diophantine Problems in Honor of Wolfgang Schmidt's 60th Birthday**, Boulder, Colorado.

PROGRAM: Each day of the conference there will be lectures from three or four invited speakers. There will also be special sessions of shorter talks.

INVITED SPEAKERS: *Tentative*: A. Baker (Cambridge), J. Beck (Rutgers), W.D. Brownawell (Penn State), J. Coates (Cambridge), D.W. Masser (Basel), P. Philippon (Paris), P. Sarnak (Princeton), H.P. Schlickewei (Ulm), A. Schinzel (Warsaw), J. Silverman (Brown), H. Stark (San Diego), C.L. Stewart (Waterloo), R. Tijdeman (Leiden), R.C. Vaughan (Imperial), P. Vojta (Berkeley), M. Waldschmidt (Paris), G. Wüstholz (Zürich).

INFORMATION: D. Grant and R. Tubbs, Dept. of Math., Campus Box 395, University of Colorado, Boulder, CO 80309; or e-mail: meetings@euclid.colorado.edu.

27–July 2. **NSF Calculus Reform Workshop: St. Olaf College Program.** (Feb. 1993, p. 183)

27–July 3. **Algebraische K-Theorie**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

28–30. **Second International Workshop on Logic Programming and Nonmonotonic Reasoning**, Lisbon, Portugal. (Nov. 1992, p. 1120)

28–July 1. **Fifth Conference on Computer-Aided Verification**, Heraklion, Crete, Greece. (Jan. 1993, p. 59)

28–July 2. **Geometrie Algebrique et Theorie des Codes**, CIRM, Marseille, France. (Nov. 1992, p. 1120)

28–July 2. **IMA Workshop on Applications of Mathematics to Manufacturing Logistics**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Mar. 1993, p. 279)

28–July 3. **Conference in Honour of Jean-Pierre Kahane**, University Paris-Sud at Orsay. (Nov. 1992, p. 1120)

28–July 3. **Sixth International Vilnius Conference on Probability Theory and Mathematical Statistics**, Vilnius, Lithuania. (Jan. 1993, p. 59)

28–July 9. **Conference on Matrix Analysis for Applications**, University of Wyoming, Laramie, WY. (Dec. 1992, p. 1280)

29–July 2. **Number Theoretic and Algebraic Methods in Computer Science**, International Center of Scientific and Technical Information (ICSTI), Moscow. (Sep. 1992, p. 773)

July 1993

2–4. **T.I.Tec/K.E.S. Conference on Nonlinear and Convex Analysis in Economic Theory**, Tokyo, Japan. (Dec. 1992, p. 1280)

4–9. **Fifth International Fuzzy Systems Association World Congress**, Seoul, Korea. (Mar. 1992, p. 250)

4–10. **Freie Randwertprobleme**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

4–10. **Fifth International Congress on Algebraic Hyperstructures and Applications**, Iasi, Romania. (Sep. 1992, p. 773)

4–10. **Methoden der Modul-und Ringtheorie**, Oberwolfach, Federal Republic of Germany. (Jan. 1993, p. 59)

4–16. **Probability Theory of Spatial Disorder and Phase Transition**, Isaac Newton Institute, University of Cambridge, England. (Feb. 1993, p. 183)

5–9. **Communications et Reseaux d'Interconnexion**, CIRM, Marseille, France. (Nov. 1992, p. 1120)

5–9. **The Thirty-seventh Annual Meeting of the Australian Mathematical Society (AMS '93)**, University of Wollongong, Australia. (Nov. 1992, p. 1120)

5–9. **CTAC93 Conference and Workshops**, Australian National University, Canberra, A.C.T., Australia. (Dec. 1992, p. 1280)

5–9. **British Combinatorial Conference**, Keele University, Staffordshire, UK. (Dec. 1992, p. 1281)

5–10. **Summer School on Nonlinear Dynamics and Pattern Formation**, Santiago de Compostela, Spain. (Mar. 1993, p. 280)

5–31. **NSF Regional Geometry Institute: Discrete Geometry**, Smith College, Northampton, MA. (Nov. 1992, p. 1120)

6–9. **European Multigrid Conference '93**, Amsterdam, The Netherlands. (May/Jun. 1992, p. 496)

6–23. **IMA Summer Program on Modeling, Mesh Generations, and Adaptive Numerical Methods for Partial Differential Equations**, University of Minnesota, Minneapolis, MN. (Nov. 1992, p. 1120)

7–9. **Fourth IMACS International Conference on Computational Aspects of Electromechanical Energy Converters and Drives-IMACS-TC1 '93**, Ecole Polytechnique de Montreal, Canada. (Feb. 1993, p. 183)

7–10. **The Second International Conference on Fluid Mechanics (ICFM-II)**, Beijing, China. (Sep. 1992, p. 773)

8–10. **ATLAST 1993 Linear Algebra Workshops**, University of Houston–Downtown, Houston, TX. (Dec. 1992, p. 1281

8–10. **Symposium on Inverse Problems and Optimal Design in Industry**, Philadelphia, PA. (Mar. 1993, p. 280)

9–11. **1993 Annual Meeting of the Australasian Association for Logic**, University of Adelaide, South Australia.

10–August 6. **Joint Summer Research Conferences in the Mathematical Sciences**, University of Washington, Seattle, WA.

INFORMATION: C. Kohanski, AMS, P.O. Box 6887, Providence, RI 02940.

11–15. **Second World Congress on Neural Networks (WCNN '93)**, Portland, OR. (Mar. 1993, p. 280)

11–17. **Nonlinear Evolution Equations, Solutions and the Inverse Scattering Transform**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

11–30. **Summer Research Institute on Stochastic Analysis**, Cornell University, Ithaca, NY.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

12–16. **SIAM Annual Meeting**, Philadelphia, PA. (Mar. 1993, p. 281)

12–16. **Chaotic Numerics (An International Workshop on the Approximation and Computation of Complicated Dynamical Behavior)**, Deakin University, Geelong, Australia. (Oct. 1992, p. 949)

12–16. **Workshop on Algebraic Graph Theory**, International Centre for Mathematical Sciences, Edinburgh, Scotland. (Mar. 1993, p. 281)

12–17. **Colloque Takeuti: Theorie de la Demonstration et Applications en Informatique**, CIRM, Marseille, France. (Nov. 1992, p. 1121)

12–17. **Third International Conference on Nonassociative Algebra and its Applications**, University of Oviedo, Spain. (Nov. 1992, p. 1121)

12–23. **Conference on Universal Algebra and Category Theory**, Mathematical Sciences Research Institute, Berkeley, CA. (May/Jun. 1992, p. 496)

13–21. **Modeling and Analysis of Phase Transitions and Hysteresis Phenomena**, Villa La Querceta, Montecatini Terme, Italy. (Feb. 1993, p. 184)

15–17. **ATLAST 1993 Linear Algebra Workshops**, Georgia State University, Atlanta, GA. (Dec. 1992, p. 1281)

18–23. **NSF Calculus Reform Workshop: Project Calc.** (Feb. 1993, p. 184)

18–23. **NSF Calculus Reform Workshop: Iowa State University Program.** (Feb. 1993, p. 184)

18–24. **Dynamische Systeme**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

18–24. **Twelfth International Conference on Near-rings and Near-fields**, University of New Brunswick, Fredericton, N.B., Canada. (Dec. 1992, p. 1281)

18–24. **International Conference on Combinatorics**, Keszthely, Hungary. (Jan. 1993, p. 60)

19–23. **Singularites**, CIRM, Marseille, France. (Nov. 1992, p. 1121)

19–23. **International Congress on Computer Systems and Applied Mathematics**, St. Petersburg, Russia. (Dec. 1992, p. 1282)

19–23. **Seventh ACM International Conference on Supercomputing**, Tokyo, Japan. (Jan. 1993, p. 60)

19–24. **The Arithmetic of Elliptic Curves**, Anogeia, Crete, Greece. (Jan. 1993, p. 60)

19–August 13. **CRM Summer School on Mathematical Biology**, University of British Columbia. (Jan. 1993, p. 60)

20–29. **1993 ASL European Summer Meeting (Logic Colloquium '93)**, University of Keele, United Kingdom. (Nov. 1992, p. 1121)

21–23. **Second International Symposium on High Performance Distributed Computing (HPDC-2)**, Spokane, WA. (Jan. 1993, p. 60)

22–24. **ATLAST 1993 Linear Algebra Workshops**, University of Maryland, College Park, MD. (Dec. 1992, p. 1282)

23–24. **The Fourth Annual Conference on Technology**, Houston, TX. (Mar. 1993, p. 281)

25–30. **International Workshop on Differential Geometry and its Applications**, Bucharest, Romania. (Mar. 1993, p. 281)

25–31. **Geometric Methods in Theoretical and Computational Mechanics**, Oberwolfach, Fed. Rep. of Germany. (Jan. 1992, p. 57)

26–30. **NATO Advanced Research Workshop: Classical and Axiomatic Potential Theory**, Les Arcs, Savoy, France. (Oct. 1992, p. 950)

26–30. **Groupes Ordonnes et Groupes de Permutations Infinis**, Marseille, France. (Jan. 1993, p. 60)

26–30. **Cryptography and Computational Number Theory**, North Dakota State University, Fargo, ND. (Jan. 1993, p. 60)

26–30. **ICASE/LaRC Short Course on Parallel Computation**, Hampton, VA. (Mar. 1993, p. 281)

26–August 6. **SMS-NATO ASI: Complex Potential Theory**, Université de Montréal, Montréal, Canada. (Dec. 1992, p. 1282)

27–30. **Seventh Workshop on Operator Theory and Boundary Eigenvalue Problems**, Vienna Technical University, Vienna, Austria. (Jan. 1993, p. 60)

31–August 1. **Conference on Logic and Linguistics**, Ohio State University. (Jan. 1993, p. 61)

31–August 6. **Joint Summer Research Conferences in the Mathematical Sciences**, University of Washington, Seattle, WA. (Mar. 1993, p. 282)

August 1993

August–December. **A Semester at CRM: Spatial and Temporal Dynamics**, Université de Montréal. (Jan. 1993, p. 61)

August 1993. **International Conference on New Trends in Computer Science I (NETCOMS I)**, University of Ibadan, Nigeria. (Nov. 1992, p. 1121)

1–7. **Abelsche Gruppen**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

1–14. **Groups 93 Galway/St. Andrews**, Galway, Ireland. (Nov. 1992, p. 1121)

2–6. **Second Gauss Symposium**, Munich, Germany. (Dec. 1992, p. 1282)

2–6. **International Symposium on the Mathematical Theory of Networks and Systems**, Regensburg, Germany. (Sep. 1992, p. 774)

2–13. **Georgia International Topology Conference**, University of Georgia, Athens, GA. (Jan. 1993, p. 61)

* 3–6. **The 8th KAIST Mathematics Workshop**, Korea Advanced Institute of Science and Technology, Taejon, Korea.

PROGRAM: Numerical Analysis and Geometry. The program consists of a series of lectures by invited speakers and some one-hour talks.
CALL FOR PAPERS: Papers are solicited in all areas of numerical analysis and geometry. Small amounts of financial support will be available to a limited number of speakers.
INFORMATION: H. Oh Kim, Director, Korea Advanced Institute of Science and Technology, Mathematics Research Center, Taejon, 305-701, Korea; fax (Korea) 42-869-2710; e-mail: mrc@math1.kaist.ac.kr.

4–6. **SIAM Conference on Simulation and Monte Carlo Methods**, San Francisco, CA. (Dec. 1992, p. 12822)

4–8. **Summer School in Mathematical Quantum Theory**, University of British Columbia, Vancouver, B.C. (Feb. 1993, p. 184)

* 5–9. **Fifth Canadian Conference on Computational Geometry**, University of Waterloo, Waterloo, Ontario, Canada.

INVITED SPEAKERS: R. Seidel (tentative), M. Sharir, T. Shermer, W. Steiger, C. Yap.
CALL FOR PAPERS: Send seven copies of an extended abstract (up to 6 pages) by May 1, 1993.
INFORMATION: A. Lubiw, Dept. of Comp. Sci., University of Waterloo, Waterloo, Ontario, Canada N2L 3G1; e-mail: alubiw@maytag.uwaterloo.ca.

6–19. **Stochastic Analysis and Applications in Physics**, NATO Advanced Study Institute at the Universidade da Madeira. (Jan. 1993, p. 61)

7–21. **Semigroups and their Applications**, York, England. (Sep. 1992, p. 774)

8–11. **Workshop on Hierarchical Test Generation**, Virginia Polytechnic Institute and State University, Blacksburg, VA. (Mar. 1993, p. 282)

8–14. **Konstruktive Approximationstheorie**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

9–12. **Joint Statistical Meetings**, San Francisco, CA. (Nov. 1991, p. 1172)

9–13. **Sixth International Conference on Structural Safety and Reliability (ICOSSAR '93)**, Innsbruck, Austria. (Sep. 1992, p. 774)

9–13. **Analysis Colloquium**, Szeged, Hungary. (Jan. 1993, p. 61)

9–13. **Symposium on Mathematics of Computation 1943–1993: A Half-century of Computational Mathematics**, University of British Columbia, Vancouver, Canada.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

9–14. **Analysis of Dynamical and Cognitive Systems**, Huddinge (Stockholm). (Mar. 1993, p. 282)

10–14. **Summer School in Mathematical Quantum Theory**, University of British Columbia, Vancouver, B.C. (Feb. 1993, p. 185)

13–17. **Second International Colloquium on Numerical Analysis**, Plovdiv, Bulgaria. (Dec. 1991, p. 1341)

14–17. **First Workshop on Oscillation Theory**, Plovdiv, Bulgaria. (Oct. 1992, p. 950)

15. **Tutorial on Numerical Methods in Control, Signal, and Image Processing**, Uni-

versity of Washington, Seattle, WA. (Jan. 1993, p. 61)

15–19. **Joint Mathematics Meetings**, University of British Columbia, Vancouver, British Columbia (including the summer meetings of the AMS, AWM, CMS, MAA, and PME).

INFORMATION: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

15–21. **Noncommutative Algebra and Representation Theory**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

15–27. **XI Latin American School of Mathematics (ELAM)**, Mexico. (Nov. 1992, p. 1121)

*16–17. **Fourth Stockholm Optimization Days**, Royal Institute of Technology, Stockholm, Sweden.

PROGRAM: Theoretical, computational, and applied papers are invited. Sessions are planned on dual optimization methods, inventory control, structural optimization, power planning, and large scale nonlinear programming, among others.
ORGANIZING COMMITTEE: P.O. Lindberg, U. Brannlund, A. Forsgren, K. Svanberg.
INVITED SPEAKERS: M. Bendsoe, DTH, Copenhagen; R. Bixby, Rice U.; A. Conn, IBM; J. Desrosiers, HEC; P. Gill, UCSD; J.-L. Goffin, McGill U.; N. Gould, CERFACS; S. Graves, MIT; B. Hager and D. Hearn, U. of Florida; N. Karmarkar, AT&T; C. Kiwiel, Systems Research Inst., Warsaw; C. Lemarechal, INRIA; W. Murray, Stanford U.; A. Nemirovski, CMI; J. Nocedal, Northwestern U.; P. Pardalos, U. of Florida; C. Sherbrooke, Logistics Management Inst.; Ph. Toint, FUNDP; Y. Zheng, U. of Pennsylvania.
CALL FOR PAPERS: Abstracts should be sent (preferably by e-mail) by June 1 to the address below.
INFORMATION: Optimization Days, Division of Optimization and Systems Theory, KTH, S-100 44 Stockholm, Sweden.

16–19. **Third SIAM Conference on Linear Algebra in Signals, Systems, and Control**, University of Washington, Seattle, WA. (Dec. 1992, p. 1283)

16–20. **First European Nonlinear Oscillations Conference**, Hamburg, Germany. (Sep. 1992, p. 774)

16–20. **Conference on Variational Problems in Differential Geometry and Partial Differential Equations**, Trieste, Italy. (Jan. 1993, p. 61)

16–20. **Twenty-second Annual Conference: 1993 International Conference on Parallel Processing**, The Pennsylvania State University, University Park, PA. (Jan. 1993, p. 61)

17–20. **The Mathematical Heritage of Sir William Rowan Hamilton**, Dublin, Ireland. (May/Jun. 1992, p. 497)

17–20. **International Symposium on Statistics with Non-precise Data**, Innsbruck, Austria. (Sep. 1992, p. 774)

17–21. **Second International Conference on Finite Fields: Theory, Applications, and Algorithms**, University of Nevada, Las Vegas. (Sep. 1992, p. 774)

18–22. **Fourth International Colloquium on Differential Equations**, Plovdiv, Bulgaria. (Dec. 1991, p. 1341)

18–September 4. **Twenty-third Ecole d'Ete de Calcul des Probabilites**, Saint-Flour (Cantal). (Mar. 1993, p. 283)

22–26. **Crypto '93**, University of California, Santa Barbara. (Jan. 1993, p. 61)

22–27. **Colloquium on Topology**, Lillafüred, Hungary. (Jan. 1993, p. 62)

22–28. **Special Complex Varieties**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

*22–28. **Thirty-first International Symposium on Functional Equations**, L. Kossuth University, Debrecen, Hungary.

CHAIRMEN: J. Aczél, W. Benz, Z. Daróczy, and J. Rätz.
INFORMATION: Those wishing to participate should write to Gy. Szabó, Inst. of Math., L. Kossuth Univ., H-4010 Debrecen, Pf.12, Hungary; e-mail: isfe31@huklte51.bitnet; and be sure to include information on their work and interest in the subject.

22–29. **Twenty-ninth International Congress of History of Science**, Zaragoza, Spain. (Apr. 1992, p. 352)

23–27. **Lattices, Ordered Sets, and Universal Algebra (Sixteenth Algebraic Conference in Szeged)**, Szeged, Hungary. (Jan. 1993, p. 62)

23–28. **International Conference on Algebra Dedicated to the Memory of M.I. Kargapolov**, Krasnoyarsk, Russia. (Jul./Aug. 1992, p. 632)

23–September 4. **NATO Advanced Study Institute on Polytopes: Abstract, Convex, and Computational**, Scarborough, Ontario, Canada. (Dec. 1992, p. 1283)

24–27. **Third Kurt Gödel Colloquium**, Brno, Czech Republic. (Jan. 1993, p. 62)

24–28. **Equadiff 8**, Bratislava, Czecho-Slovakia. (Dec. 1992, p. 1283)

25–September 3. **Forty-ninth Biennial Session of the International Statistical Institute**, Firenze, Italy. (Nov. 1991, p. 1172)

29–30. **Conference on Rings, Extensions, and Cohomology on the Occasion of the Retirement of Daniel Zelinsky**, Northwestern University, Evanston, IL. (Dec. 1992, p. 1283)

29–September 4. **Random Graphs and Combinatorial Structures**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

30–September 3. **Inverse Problems: Principles and Applications in Geophysics, Technology, and Medicine**, Potsdam (near Berlin), Germany. (Sep. 1992, p. 774)

30–September 3. **Representations des Groupes et Analyse Complexe**, CIRM, Marseille, France. (Nov. 1992, p. 1121)

30–September 3. **Eleventh International Conference on the New Quality Philosophy in Statistical Research and Education**, Firenze, Italy. (Jan. 1993, p. 62)

*30–September 3. **Conference on the Finite Element Method: Fifty Years of the Courant Element**, Jyväskylä, Finland. (Please note additional information to Jan. 1993, p. 62.)

INVITED SPEAKERS: O. Axelsson, I. Babuska, G.F. Carey, J. Douglas, R. Glowinski, C. Johnson, K. Morgan, K.W. Morton, R. Rannacher, V. Thomee, O. Widlund, M. Zlamal.

30–September 3. **International Workshop on Validated Computation**, University of Oldenburg, Germany. (Feb. 1993, p. 185)

*30–September 3. **Second International Conference on Parallel Computing Technologies (PaCT-93)**, Obninsk, Russia.

PROGRAM: The aim of the conference is to give an overview of new developments, applications, and trends in parallel computing technologies. It is hoped that the conference will help to deepen the understanding of parallel computing technologies by providing a forum for an exchange of views between scientists and specialists from all over the world.
ORGANIZING COMMITTEE: V. Malyshkin (chair), malysh@comcen.nsk.su; V. Anisimov; S. Gusev; N. Kuchin; Ju. Il'ichev; S. Pankratov, pank@comcen.nsk.su; V. Plusnin, Ju. Rudnev, S. Strachov.
CONFERENCE TOPICS: All aspects of the applications of parallel systems; algorithms for all types of parallel computers; languages, environments, and software tools supporting parallel processing; operating systems, scheduling, mapping, load balancing; general architecture concepts, enabling technologies; performance measurement analysis; teaching parallel processing.
INFORMATION: Contact the organizing committe.

September 1993

5–11. **Novikov Conjectures, Index Theorems and Rigidity**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

5–11. **Nonlinear Numerical Methods and Rational Approximation**, University of Antwerp, Belgium. (Oct. 1992, p. 950)

5–12. **First World Conference on Branching Processes**, Varna, Bulgaria. (Jan. 1993, p. 62)

6–8. **Bi-National France-Israel Symposium: The Brownian Sheet—New Results and De-**

velopments, Bar-Ilan University (Israel). (Feb. 1993, p. 185)

*6–10. **Lattice Points in Polyhedra and Applications in Geometry and Topology**, CIRM, Marseille, France. (Please note name change from Mar. 1993, p. 283, and also please refer to Jan. 1993, p. 62)

6–10. **Sommes de Dedekind en Géométrie**, Marseille, France. (Please note that this conference is the same as the one listed immediately prior to this one.)

6–11. **Eleventh International Conference on Topology**, Trieste, Italy. (Jan. 1993, p. 62)

9–15. **IMA Tutorial**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 62)

12–16. **Third Dublin Differential Equations Meeting**, Dublin City University, Dublin, Ireland. (Jan. 1993, p. 62)

12–18. **Topologie**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

13–17. **Fourth European Software Engineering Conference**, Garmisch, Germany. (Jul./Aug. 1992, p. 632)

13–17. **Tenth Conference on Problems and Methods in Mathematical Physics (10. TMP)**, Chemnitz, Federal Republic of Germany. (Feb. 1993, p. 186)

13–17. **Logique de la Connaissance et Théorie de la Décision**, Marseille, France. (Feb. 1993, p. 186)

13–18. **Different Aspects of Differentiability**, Warsaw, Poland. (May/Jun. 1992, p. 497)

14–17. **Mathematical Modelling and Scientific Computation (MMSC-93)**, Sozopol, Bulgaria. (Mar. 1993, p. 283)

17–20. **Technology in Mathematics Teaching (TMT '93): A Bridge between Teaching and Learning**, The University of Birmingham, England. (Dec. 1992, p. 1283)

18–19. **Eastern Section**, Syracuse University, Syracuse, NY.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

19–25. **Mathematical Game Theory**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

20–24. **Methodes Numeriques dans la Theorie des Surfaces de Riemann**, CIRM, Marseille, France. (Nov. 1992, p. 1122)

20–24. **Thirteenth Congress of the Austrian Mathematical Society**, Linz, Austria. (Dec. 1992, p. 1284)

20–24. **IMA Workshop on Probability and Algorithms**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 63)

20–24. **Ordinary Differential Equations and Their Applications**, Firenze, Italy. (Feb. 1993, p. 186)

20–25. **International Conference on Number Theory**, Tula State Pedagogical Institute, Tula, Russia. (Mar. 1993, p. 284)

20–26. **Seventh Symposium on Classical Analysis**, Kazimierz Dolny, Poland. (Dec. 1992, p. 1284)

*20–October 1. **Second Workshop on Composite Media and Homogenization**, International Centre for Theoretical Physics, Trieste, Italy.

DIRECTORS: G. Dal Maso (SISSA), G. Dell'Antonio (Rome, La Sapienza).
INFORMATION: International Centre for Theoretical Physics, I.C.T.P., P.O. Box 586, 34100 Trieste, Italy.

21–24. **Sixth International Workshop on Stochastic Geometry, Stereology, and Image Analysis in honor of L.A. Santalo**, Valencia, Spain. (Mar. 1993, p. 284)

*26–29. **SCAN-93 IMACS/GAMM International Symposium on Scientifc Computation, Computer Arithmetic, Validated Numerics**, Technical University of Vienna, Austria. (Please note additional information to Feb. 1993, p. 186.)

PROGRAM: This conference continues the series of SCAN-xx Symposia. These conferences have traditionally covered the numerical and algorithmic aspects of scientific computing, with a strong emphasis on the algorithmic validation of results and on algorithmic and arithmetic tools for this purpose. There will be plenary sessions of highlighted papers (40 minutes) and parallel sessions of regular papers (25 minutes).
CALL FOR PAPERS: Papers are invited for submission for presentation during the conference. An extended abstract of approximately one printed page must be received by April 30, which must contain sufficient technical detail for refereeing and appropriate scheduling. The extended abstracts must be submitted by e-mail to scan-93@uranus.tuwien.ac.at either without special editing or in LaTeX.
INFORMATION: Organizing Committee SCAN-93, Tech. Univ. Vienna 115.2, Wiedner Hauptstr. 8–10, A-1040 Vienna, Austria.

26–October 2. **Diophantische Approximationen**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

27–28. **Workshop on Large Eddy Simulation in Aerodynamics and the Environment**, Université de Montréal. (Jan. 1993, p. 63)

27–October 1. **Orbites Périodiques des Systèmes Dynamiques**, CIRM, Marseille, France. (Jan. 1993, p. 63)

*27–October 1. **Fourth Conference on Discrete Mathematics**, University of Potsdam, Germany. (Mar. 1993, p. 284)

*28–October 1. **CIRM Workshop on Algebraic Vector Bundles and Applications**, Trento, Italy.

INFORMATION: E. Ballico, Trento; e-mail ballico@itncisca.bitnet or ballico@itnvax.cineca.it and M. Schneider, Bayreuth.

October 1993

1–3. **Joint Meeting with the Deutsche Mathematiker-Vereinigung e.V.**, University of Heidelberg, Heidelberg, Germany.

INFORMATION: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

3–9. **Arbeitsgemeinschaft mit Aktuellem Thema**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

*4–6. **Second International Conference of the ACPC (Austrian Center for Parallel Computation)**, Gmunden (near Salzburg), Austria. (Mar. 1993, p. 284)

6–8. **Games, Logic, and Process**, CIRM, Marseille, France. (Jan. 1993, p. 63)

6–9. **Second IMACS International Conference on Computational Physics**, Parks College of St. Louis University, Cahokia, IL. (Feb. 1993, p. 186)

10–16. **Invariant Ordering in Geometry and Algebra**, Oberwolfach, Federal Republic of Germany. (Feb. 1993, p. 186)

10–16. **Adaptive Methoden für Partielle Differentialgleichungen**, Oberwolfach, Federal Republic of Germany. (Feb. 1993, p. 186)

11–14. **Gestion de Projets Statistiques**, CIRM, Marseille, France. (Jan. 1993, p. 63)

*14–20. **Wavelets: Theory, Algorithms, and Applications**, Taormina, Sicily, Italy. (Please note additional information to Mar. 1993, p. 284)

CONFERENCE TOPICS: Wavelet theory, applications to approximation theory, linear algebra; differential and intergal equations; multigrid methods; continuous and discrete wavelet transform; multiresolution analysis; signal and image processing; medical imaging; frames; wavelet-based fractal analysis; scalar and parallel algorithms for wavelet problems; general applications of wavelets to different scientific fields.
INVITED SPEAKERS: *Preliminary list*: C.K. Chui, Texas A&M U.; W. Dahmen, Inst. fur Geometrie und Praktische Math.; M. Farge, LMD/CNRS Luminy Marseille; S. Mallat, Courant Inst.; C. Micchelli, IBM T.J. Watson; L. Montefusco, U. of Bologna; D. Trigianti, U. of Firenze; M.V. Wickerhauser, Washington U.
CALL FOR PAPERS: Titles and abstracts of contributed papers (including posters and software exhibition) must be received by June 15, 1993. The abstracts should be typed double-spaced, not to exceed one page.

15–16. **Thirteenth Meeting of the Southeastern-Atlantic Regional Conference on Differential Equations**, University of North Carolina at Wilmington, Wilmington, NC. (Mar. 1993, p. 284)

15–17. **Second International Conference on Ordinal Data Analysis**, University of Massachusetts, Amherst, MA. (Mar. 1993, p. 284)

17–23. **Geometrie**, Oberwolfach, Federal Republic of Germany. (Jan. 1992, p. 57)

* 18–20. **Workshop on Coding, System Theory, and Symbolic Dynamics**, Boston area.

PROGRAM: The purposes of this workshop are to promote communication between workers in these three areas, to highlight commonalities, and to present cutting-edge research problems in each field with the hope that cross-fertilization will promote progress. The organizers plan a number of invited tutorial lectures specifically for interspecialty communication. Leading workers in each field will also be invited to present surveys of current research, with less emphasis on solved problems than on open ones. Finally, there will be both invited and contributed papers presenting recent research results. A minimum requirement for any paper will be that it touch at least two of the three areas.

ORGANIZING COMMITTEE: D. Forney, C. Heegard, B. Marcus, M. Trott.

INFORMATION: B. Marcus, marcus@almaden.ibm.com, IBM Almaden Research, Dept. K65/802, 650 Harry Road, San Jose, CA 95120, tel. 408-927-2050.

18–22. **IMA Workshop on Finite Markov Chain Renaissance**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 63)

19–22. **1993 International Conference on Network Protocols (ICNP-93)**, San Francisco, CA. (Jan. 1993, p. 63)

20–22. **Stage de Bibliothécaires de Mathématiques**, CIRM, Marseille, France. (Jan. 1993, p. 63)

22–23. **Central Section**, Texas A&M University, College Station, Texas.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

* 24–27. **Functional Analysis on the Eve of the Twenty-First Century, in Honor of the Eightieth Birthday of Israel M. Gelfand**, Rutgers University, New Brunswick, NJ.

ORGANIZING COMMITTEE: M. Atiyah, F. Browder, A. Connes, S. Gindikin, P. Griffiths, F. Hirzebruch, D. Kazhdan, B. Kostant, J. Lepowsky, G. D. Mostow, I. Piatetski-Shapiro, M. Sato, I. Singer, R. Wilson and E. Witten.

TOPICS: Mathematical physics, especially geometric quantum field theory; representation theory, particularly, certain problems concerning representations of groups over local fields; combinatorics and hypergeometric functions, with emphasis on combinatorial structures underlying various "continuous" constructions; and noncommutative geometry, quantum groups and geometry.

INVITED SPEAKERS: (*preliminary list*): K. Aomoto, M. Atiyah, A. Connes, S. Donaldson, V. Drinfeld, I. Frenkel, M. Gromov, M. Jimbo, M. Kapranov, D. Kazhdan, F. Kirwan, M. Kontsevich, B. Kostant, G. Lusztig, R. MacPherson, O. Mathieu, C. Moeglin, A. Polyakov, I. Singer, E. Witten, and A. Zamolodchikov.

INFORMATION: Mary Anne Jablonski, Administrative Assistant, Gelfand Conference, Rutgers - Department of Mathematics, Hill Center, Busch Campus, New Brunswick, NJ 08903, e-mail: gelfandc@math.rutgers.edu, Phone: 908-932-3921, FAX: 908-932-5530.

24–30. **Mengenlehre**, Oberwolfach, Federal Republic of Germany. (Feb. 1993, p. 186)

25–29. **Third SIAM Conference on Geometric Design**, Seattle, WA. (Jul./Aug. 1992, p. 632)

27–30. **Seventh International Conference on Domain Decomposition Methods**, Penn State University, State College, PA. (Oct. 1992, p. 950)

31–November 6. **Algorithmische Methoden der Diskreten Mathematik**, Oberwolfach, Federal Republic of Germany. (Mar. 1992, p. 251)

November 1993

1–5. **Third SIAM Conference on Geometric Design**, Tempe, AZ. (Dec. 1992, p. 1284)

6–7. **Western Section**, Harvey Mudd College, Claremont, CA.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

15–19. **IMA Workshop on Random Discrete Structures**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 63)

15–19. **Systémes d'Équations Algébriques**, CIRM, Marseille, France. (Jan. 1993, p. 63)

21–27. **Mathematische Modelle in der Biologie**, Oberwolfach, Federal Republic of Germany. (Mar. 1992, p. 251)

22–26. **Géométrie Symplectique et Physique Mathématique**, CIRM, Marseille, France. (Jan. 1993, p. 63)

22–27. **Géometrie Symplectique**, Marseille, France. (Feb. 1993, p. 187)

28–December 4. **Nonlinear Equations in Many-Particle Systems**, Oberwolfach, Federal Republic of Germany. (Mar. 1992, p. 251)

December 1993

1–4. **Joint Meeting with the Sociedad Matematica Mexicana**, Merida, Yucatan, Mexico.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

* 5–9. **1993 International Symposium on Nonlinear Theory and its Applications (NOLTA '93)**, Hawaii.

CONFERENCE TOPICS: *Nonlinear aspects of*: circuits and systems, dynamics, bifurcation, oscillations, numerical methods, self-validating numerics, chemistry and physics, acoustics, circuit simulation, digital/analog VLSI circuits, power systems, neural networks, cellular neural networks, biocybernetics, reactive phenomena, pattern generation, time series analysis, mechanics, control, communication, image processing, chaos, fractals, soliton, fuzzy, information dynamics, Chua's circuits, fluid mechanics, optics, economics, power electronics.

CALL FOR PAPERS: Papers describing original works in all aspects of nonlinear theory and its applications are invited. Authors are invited to submit three copies of a summary of 2 or 3 pages to the address below. The summary should include the author's name(s), affiliation(s), and complete address(es). The authors should also indicate one or more of the above categories that best describe the topics of the paper. Deadline is August 15, 1993.

INFORMATION: Technical Program Committee Chairman, Shun-ichi Amari, Faculty of Eng., Univ. of Tokyo, Bunkyo-ku, Tokyo, 113 Japan; telefax: +81-3-5689-5752; e-mail: amari@sat.t.u-tokyo.ac.jp.

5–11. **Dynamical Zeta Functions**, Oberwolfach, Federal Republic of Germany. (Feb. 1993, p. 187)

5–11. **Model Selection**, Oberwolfach, Federal Republic of Germany. (Feb. 1993, p. 187)

6–10. **International Congress on Modelling Simulation, 1993**, University of Western Australia, Perth. (Feb. 1993, p. 187)

12–18. **General Principles of Discretization Algorithms, Theory, and Applications**, Oberwolfach, Federal Republic of Germany. (Feb. 1993, p. 187)

12–18. **Methoden und Verfahren der Mathematischen Physik**, Oberwolfach, Federal Republic of Germany. (Feb. 1993, p. 187)

January 1994

January–June 1994. **A Semester at CRM: Bifurcations and the Geometry of Vector**

Fields, Université de Montréal. (Jan. 1993, p. 63)

2–8. **Modelltheorie**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 285)

4–7. **International Symposium on Visco-Elastic Fluids**, Tobago (In the Republic of Trinidad and Tobago). (Feb. 1993, p. 187)

4–8. **International Conference on Harmonic Analysis and Operator Theory**, Caracas, Venezuela. (Jan. 1993, p. 64)

5–7. **Semigroup Theory**, Hobart, Tasmania, Australia. (Feb. 1993, p. 187)

9–15. **Algebraic Combinatorics: Association Schemes and Representation Theory**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 285)

12–15. **Joint Mathematics Meetings**, Cincinnati, OH. (including the annual meetings of the AMS, AWM, MAA, and NAM)

INFORMATION: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

23–29. **Singulare Integral- und Pseudo-Differential-Operatoren und Ihre Anwendungen**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 285)

24–28. **IMA Workshop on Mathematical Population Genetics**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 64)

30–February 5. **Nichtstandardanalysis und Anwendungen**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 285)

February 1994

February 1994. **Workshop on Dynamical Disease**, Laurentian Mountains north of Montréal. (Jan. 1992, p. 64)

2–4. **IMACS Symposium on Mathematical Modelling**, Vienna, Austria. (Sep. 1992, p. 775)

6–12. **C^*-Algebren**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 285)

13–19. **Funktionentheorie**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 285)

20–26. **Harmonische Analyse und Darstellungstheorie Topologischer Gruppen**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

27–March 5. **Mathematical Economics**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

28–March 4. **IMA Workshop on Stochastic Networks**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN. (Jan. 1993, p. 64)

March 1994

6–12. **Mathematische Stochastik**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

13–19. **Elementare und Analytische Zahlentheorie**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

18–19. **Southeastern Section**, University of Kentucky, Lexington, Kentucky.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

20–26. **Regelungstheorie**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

25–26. **Central Section**, Kansas State University, Manhattan, KS.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

27–April 2. **Algebraische Gruppen**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

27–April 2. **Endliche Modelltheorie**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

April 1994

3–9. **Arbeitsgemeinschaft Mit Aktuellem Thema (wird in den Mitteilungen der DMV Heft 1/1994 Bekanntgegeben)**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

5–11. **Effective Methods in Algebraic Geometry (MEGA '93)**, Santander, Spain. (Mar. 1993, p. 286)

9–10. **Eastern Section**, Polytechnic University, Brooklyn, NY.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

10–16. **Numerical Linear Algebra with Applications**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

17–23. **Designs and Codes**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

24–30. **Geschichte der Mathematik**, Oberwolfach, Federal Republic of Germany. (Mar. 1993, p. 286)

June 1994

16–18. **Western Section**, University of Oregon, Eugene, Oregon.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

The following new announcements will not be repeated until the criteria in the last paragraph in the box at the beginning of this section are met.

July 1994

* 3–9. **Analysis und Geometrie Singulärer Räume**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: J.-M. Bismut, Orsay; J. Bruning, Augsburg; R.B. Melrose, Cambridge.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

* 5–29. **IMA Summer Program on Molecular Biology**, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN.

INFORMATION: Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church St., SE, Minneapolis, MN 55455.

* 10–16. **Freie Randwertprobleme**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: H.W. Alt, Bonn; A. Friedman, Minneapolis.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

* 17–23. **Algebraische Zahlentheorie**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: C. Deninger, Münster; G. Frey, Essen; P. Schneider, Köln.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

* 24–30. **Complex Geometry: Moduli Problems**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: A. Beauville, Orsay; F. Catanese, Pisa; C. Okonek, Bonn.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

* 31–August 6. **Mechanics of Materials**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: G. Hermann, Stanford; H. Lippmann, München.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

August 1994

3–11. **The International Congress of Mathematicans 1994**, Zürich, Switzerland. (Oct. 1992, p. 951)

*7–13. **Effiziente Algorithmen**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: K. Mehlhorn, Saarbrücken; R.E. Tarjan, Murray Hill.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

*13–17. **Third Colloquium on Numerical Analysis**, Plovdiv, Bulgaria.

CONFERENCE TOPICS: Numerical methods of algebra, of approximation theory, for ordinary and partial differential equations.
CALL FOR PAPERS: Abstracts for contributed papers should be received by January 1, 1994.
INFORMATION: Secretary Stoyan Zlatev, Mathematical Faculty of the Plovdiv University, Tsar Assen Str. 24, Plovdiv 4000, Bulgaria.

*14–20. **Nonlinear Evolution Equations**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: S. Klainerman, Princeton; M. Struwe, Zürich.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

15–17. **Mathfest**, University of Minnesota, Minneapolis, MN (including the summer meetings of the AMS, AWM, MAA, and PME).

INFORMATION: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

*18–23. **Fifth Colloquium on Differential Equations**, Plovdiv, Bulgaria.

CONFERENCE TOPICS: Ordinary differential equations: general, functional, impulsive, stochastic, integro-differential equations, dynamical systems and symplectic geometry, bifurcation theory, invariant manifolds, oscillation theory, difference equations, control theory, numerical analysis, mathematical population dynamics; partial differential equations: linear and nonlinear—general, scattering theory and inverse problems, nonlinear hyperbolic equations—lifespan and blow-up of the solutions, global existence and stability, oscillation theory, numerical analysis, mathematical population dynamics.
CALL FOR PAPERS: Abstracts for contributed papers should be received by January 1, 1994.
INFORMATION: Secretary Stoyan Zlatev, Mathematical Faculty of the Plovdiv University, Tsar Assen Str. 24, Plovdiv 4000, Bulgaria.

*21–27. **Mathematical Models in Phase Transitions**, Oberwolfach, Federal Republic of Germany.

CHAIRMAN: P. Fife, Salt Lake City.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

*28–September 3. **Komplexe Analysis**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: W.P. Barth, Erlangen; H. Grauert, Göttingen; R. Remmert, Münster.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

September 1994

*4–10. **Topologie**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: J. Jones, Coventry; I. Madsen, Aarhus; E. Vogt, Berlin.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

*11–17. **Homotopietheorie**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: M. Hopkins, Cambridge; K. Knapp, Wuppertal; E. Ossa, Wuppertal.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

*15–19. **Fifteenth International Symposium on Mathematical Programming**, University of Michigan, Ann Arbor, MI.

INFORMATION: Send e-mail to xvismp@um.cc.umich.edu or write to 15th International Symposium on Mathematical Programming, Conferences and Seminars, 541 Thompson St., Room 112, Univ. of Michigan, Ann Arbor, MI 48109-1360; Fax: 313-764-2990.

*18–24. **Risk Theory**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: H. Bühlmann, Zürich; P. Embrechts, Zürich; H.U. Gerber, Lausanne; J. Teugels, Leuven.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

*19–23. **3ème Atelier International de Théorie des Ensembles**, CIRM, Marseille, France.

ORGANIZER: P. Dehornoy (U. de Caen).
INFORMATION: Centre International de Rencontres Mathématiques, Case 916, 70, Route Léon-Lachamp, 13288 Marseille Cedex 9; tel: (91) 833000.

*25–October 1. **Mathematical Methods in Tomography**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: A.K. Louis, Saarbrücken; F. Natterer, Münster.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

October 1994

*2–8. **Randelementmethoden: Anwendungen und Fehleranalysis**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: E.P. Stephan, Hannover; W. Wendland, Stuttgart.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

*9–15. **Arbeitsgemeinschaft mit Aktuellem Thema (Wird in den Mitteilungen der DMV Heft 3/1994 Bekanntgegeben)**, Oberwolfach, Federal Republic of Germany.

INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

*16–22. **Geometrie**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: V. Bangert, Freiburg; U. Pinkall, Berlin.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

28–29. **Central Section**, Oklahoma State University, Stillwater, Oklahoma.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

*30–November 5. **Finite Volume Methods**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: D. Braess, Bochum; W. Hackbusch, Kiel; P. Wesseling, Delft.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

November 1994

11–13. **Southeastern Section**, University of Richmond, Richmond, VA.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

*13–19. **Komplexitätstheorie**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: J. v. zur Gathen, Toronto; C.-P. Schnorr, Frankfurt; V. Strassen, Konstanz.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

*20–26. **Mathematical Aspects of Computational Fluid Dynamics**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: K.W. Morton, Oxford; R. Rannacher, Heidelberg; G. Wittum, Heidelberg.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

December 1994

*18–23. **Asymptotik Hochdimensionaler Statistischer Modelle**, Oberwolfach, Federal Republic of Germany.

CHAIRMEN: A. Janssen, Düsseldorf; H. Milbrodt, Dortmund; H. Strasser, Wien.
INFORMATION: Mathematisches Forschungsinstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau.

March 1995

24–25. **Central Section**, DePaul University, Chicago, IL.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

November 1995

3–4. **Central Section**, Kent State University, Kent, Ohio.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

Janaury 1996

10–13. **Joint Mathematics Meetings**, Orlando, Florida (including the annual meetings of the AMS, AWM, MAA, and NAM).

INFORMATION: H. Daly, AMS, P.O. Box 6887, Providence, RI 02940.

March 1996

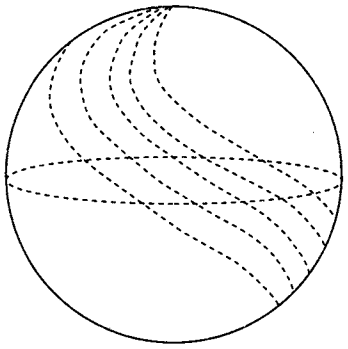
22–23. **Central Section**, University of Iowa, Iowa City, Iowa.

INFORMATION: W. Drady, AMS, P.O. Box 6887, Providence, RI 02940.

CONTEMPORARY MATHEMATICS

Representation Theory of Groups and Algebras

Ronald L. Lipsman, Jeffrey Adams, Rebecca A. Herb, Stephen S. Kudla, Jian-Shu Li, and Jonathan M. Rosenberg, Editors
Volume 145



Touching on virtually every important topic in modern representation theory, this book contains proceedings of the activities of the Representation Theory Group at the University of Maryland at College Park during the years 1989–1992. Covered here are the latest results in the field, providing a readable introduction to the work of some of the best young researchers in representation theory. The book spans a very broad spectrum—for example, within real representation theory, both semisimple and nonsemisimple analysis are discussed; within C^*-algebras, both geometric and nongeometric approaches are studied. In addition, the articles are exceptionally well written and range from research papers aimed at specialists to expository articles accessible to graduate students.

1991 *Mathematics Subject Classification*: 22, 46
ISBN 0-8218-5168-3, 491 pages (softcover), March 1993
Individual member $30, List price $50, Institutional member $40
To order, please specify CONM/145NA

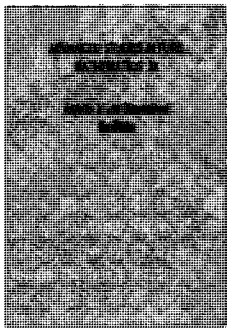
All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* **Order from**: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard.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

New Publications Offered by the AMS

New Series from the AMS!

Advanced Studies in Pure Mathematics contains survey articles as well as original papers of lasting interest. Each volume grows out of a series of symposia and workshops on a specific topic of current interest. *Advanced Studies in Pure Mathematics* is published for the Mathematical Society of Japan by Kinokuniya, Tokyo, and distributed worldwide, except in Japan, by the American Mathematical Society.

ADVANCED STUDIES
IN PURE MATHEMATICS



Aspects of Low Dimensional Manifolds

Yukio Matsumoto and Shigeyuki Morita, Editors
Volume 20

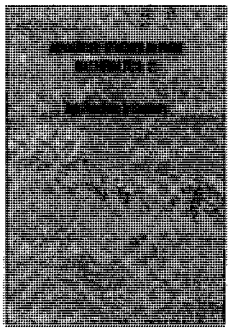
This volume contains ten original papers written by leading experts in various areas of low-dimensional topology. The topics covered here are among those showing the most rapid progress in topology today: knots and links, three-dimensional hyperbolic geometry, conformally flat structures on three-manifolds, Floer homology, and the geometry and topology of four-manifolds. Offering both original results and up-to-date survey papers, *Aspects of Low Dimensional Manifolds* will interest mathematicians, physicists, graduate students, and others seeking a good introduction to the field.

Contents

K. Fukaya, *Floer homology for oriented 3-manifolds*; **S. Kojima**, *Polyhedral decomposition of hyperbolic 3-manifolds with totally geodesic boundary*; **M. Kouno, K. Motegi, and T. Shibuya**, *Behavior of knots under twisting*; **T. Kanenobu and T. Sumi**, *Polynomial invariants of 2-Bridge links through 20 crossings*; **J. Murakami**, *Invariants of spatial graphs*; **S. Matsumoto**, *Foundations of flat conformal structure*; **Y. Kamishima and S. Tan**, *Deformation spaces on geometric structures*; **O. Saeki**, *On 4-manifolds homotopy equivalent to the 2-sphere*; **M. Ue**, *On the deformations of the geometric structures on the Seifert 4-manifolds*; **T. Matumoto**, *Homologically trivial smooth involutions on K3-surfaces.*

(continued)

1991 *Mathematics Subject Classification*: 57
ISBN 4-314-10077-X
376 pages (hardcover), 1992
Individual member $42, List price $70, Institutional member $56
To order, please specify ASPM/20N



Zeta Functions in Geometry

Nobushige Kurokawa and Toshikazu Sunada, Editors
Volume 21

This book contains accounts of work presented during the research conference, "Zeta Functions in Geometry," held at the Tokyo Institute of Technology in August 1990. The aim of the conference was to provide an opportunity for the discussion of recent results by geometers and number theorists on zeta functions in several different categories. The exchange of ideas produced new insights on various geometric zeta functions, as well as the classical zeta functions. The zeta functions covered here are the Selberg zeta functions, the Ihara zeta functions, spectral zeta functions, and those associated with prehomogeneous vector spaces. Accessible to graduate students with background in geometry and number theory, *Zeta Functions in Geometry* will prove useful for its presentation of new results and up-to-date surveys.

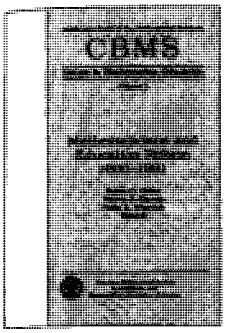
Contents

S. Zelditch, *Spectrum and geodesic flow*; **T. Kimura and T. Kogiso**, *On Adelic zeta functions of prehomogeneous vector spaces with finitely many Adelic open orbits*; **L. Guillopé**, *Fonctions zêta de Selberg et surfaces de géométrie finie*; **M. Wakayama**, *The relation between the η-invariant and the spin representation in terms of the Selberg zeta function*; **A. Gyoja**, *Lefschetz principle in the theory of prehomogeneous vector space*; **K. Takase**, *On special values of Selberg zeta functions*; **C. L. Epstein**, *Some exact trace formulae*; **K. Feng**, *Zeta function; class number and cyclotomic units of cyclotomic function fields*; **B. Z. Moroz**, *Scalar product of Hecke L-functions and its application*; **T. Morita**, *Billiards without boundary and their zeta functions*; **T. Arakawa**, *Selberg zeta functions and Jacobi forms*; **N. Kurokawa**, *Multiple zeta functions: An example*; **S. Koyama**, *Zeta functions of loop groups*; **A. Fujii**, *Some observations concerning the distribution of the zeros of the zeta functions* (I); **H. Yoshida**, *On Hermitian forms attached to zeta functions*; **A. Voros**, *Spectral zeta functions*; **D. A. Hejhal**, *Eigenvalues of the Laplacian for Hecke triangle groups*; **F Sato**, *The Maass zeta functions attached to positive definite quadratic forms.*

1991 *Mathematics Subject Classification*: 11, 14, 58
ISBN 4-314-10078-8
450 pages (hardcover), 1992
Individual member $48, List price $80, Institutional member $64
To order, please specify ASPM/21N

Use the order form in the back of this issue or call 800-321-4AMS (800-321-4267) in the U.S. and Canada to use VISA or MasterCard.

CBMS ISSUES IN MATHEMATICS EDUCATION



Mathematicians and Education Reform 1990–1991

Naomi D. Fisher, Harvey B. Keynes, and Philip D. Wagreich, Editors

Volume 3

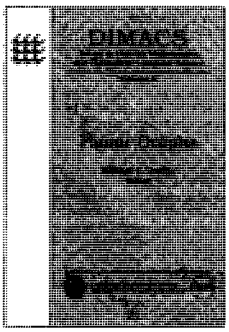
This is the latest volume in the *Issues in Mathematics Education* series, which seeks to stimulate the flow of information among mathematical scientists, mathematics educators, and mathematics teachers about innovative efforts to revitalize the teaching of the mathematical sciences at all levels. The first part of this volume is devoted to detailed descriptions of a wide variety of educational projects undertaken by mathematicians. These descriptions focus for the most part on substantial enterprises with an investment of several years and systematic review and evaluation. By contrast, the second part of the book centers on ideas that could be put into action at a modest level as a springboard for longer term projects. This book is intended to stimulate and inspire mathematical scientists to pursue educational work. In addition, those who have already ventured into educational activities and may be ready for deeper involvement will also benefit from this exploration of what can be done.

Contents

Projects: C. R. Mahoney, *The Ohio State University Young Scholars Program*; **T. M. Apostol and J. F. Blinn**, *Using computer animation to teach mathematics*; **P. Braunfeld**, *Calculus for high school teachers: content, history, pedagogy*; **D. T. Haimo**, *A program for high school teachers on mathematics and its applications*; **E. A. Moussa and J. Goldman**, *A five-year evaluation of a unique graduate program in mathematics education*; **E. Kasimatis and T. Sallee**, *Creating a new college preparatory math course: An overview*; **R. J. Maher**, *Small groups for general student audiences* 1; **Ideas, Issues, and Reactions: H. Edwards**, *Student work and study habits at a comprehensive university: A preliminary report*; **M. Davis**, *Food for thought: Applications to statistics*; **J. Gilman**, *Report on geometry and the imagination*; **N. Casey**, *Language acquisition and mathematics learning*; **M. R. Fellows**, *Computer science and mathematics in the elementary schools*; **C. H. Roberts**, *Promoting mathematics learning among minority students: Critical issues for program planners and mathematics educators*; **H. B. Keynes**, *Systematic reform: Curricula, context, culture, and environment.*

ISBN 0-8218-3503-3, ISSN 1047-398X
185 pages (softcover), April 1993
Individual member $37, List price $62
To order, please specify CBMATH/3N

DIMACS: SERIES IN DISCRETE MATHEMATICS AND THEORETICAL COMPUTER SCIENCE



Planar Graphs

William T. Trotter, Editor

Volume 9

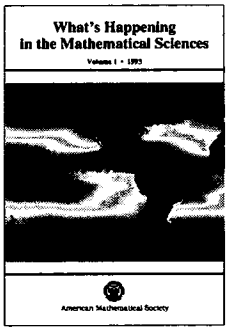
This book contains research articles and extended abstracts submitted by participants in the Planar Graphs Workshop held at DIMACS in November 1991, one of four workshops held during the DIMACS Special Year on Graph Theory and Algorithms. With more than seventy participants, the workshop drew many of the top experts in this area. The book covers a wide range of topics, including enumeration, characterization problems, algorithms, extremal problems, and network flows and geometry.

Contents

D. Archdeacon, C. P. Bonnington, and C. H. C. Little, *Cycles, cocycles and diagonals: A characterization of planar graphs*; **L. S. Heath, S. V. Pemmaraju, and A. Trenk**, *Stack and queue layouts of directed planar graphs*; **E. A. Bender and E. R. Canfield**, *Enumeration of degree restricted rooted maps on the sphere*; **C. P. Bonnington and C. H. C. Little**, *A generalisation of Mac Lane's theorem to 3-graphs*; **F. R. K. Chung and D. Mumford**, *Chordal completions of grids and planar graphs*; **M. D. Hutton and A. Lubiw**, *Upward planar drawing of single source acyclic digraphs*; **S. Khuller and J. (Seffi) Naor**, *Flow in planar graphs: A survey of results*; **H. A. Kierstead and W. T. Trotter**, *Planar graph coloring with an uncooperative partner*; **D. J. Kleitman**, *Partitioning a rectangle into many sub-rectangles so that a line can meet only a few*; **B. Mohar and N. Robertson**, *Disjoint essential circuits in toroidal maps*; **J. Pach and J. Törőcsik**, *Layout of rooted trees*; **D. B. West and T. Will**, *Vertex degrees in planar graphs.*

1991 *Mathematics Subject Classification*: 05C10, 05C35, 05C38, 05C75, 05C85
ISBN 0-8218-6600-1, LC 93-22339, ISSN 1052-1798
149 pages (hardcover), April 1993
Individual member $27, List price $45, Institutional member $36
To order, please specify DIMACS/9N

WHAT'S HAPPENING IN THE MATHEMATICAL SCIENCES



What's Happening in the Mathematical Sciences

Barry A. Cipra

Volume 1

This is the inaugural issue of *What's Happening in the Mathematical Sciences*, an annual publication that surveys some of the important developments in the mathematical sciences over the past year or so. Mathematics is constantly growing and changing, reaching out to other areas of science and helping to solve some of the major problems facing society. Here you can read about how computers can't always be trusted to provide the right answer, how mathematics is contributing to solving environmental problems, and how mathematicians have solved a longstanding problem about the way a drum's shape affects its sound.

What's Happening in the Mathematical Sciences aims to inform the general public about the beauty and power of mathematics.

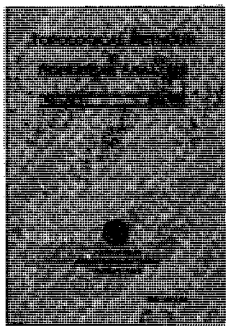
Contents

Equations come to life in mathematical biology; New computer insights from "transparent" proofs; You can't hear the shape of a drum; Environmentally sound mathematics; Disproving the obvious in higher dimensions; Collaboration closes in on closed geodesics; Crystal clear computations; Camp geometry; Number theorists uncover a slew of prime impostors; Map-coloring theorists look at new worlds.

1991 *Mathematics Subject Classification*: 00A06
ISBN 0-8218-8999-0, ISSN 1065-9358
46 pages (softcover), April 1993

The American Mathematical Society is pleased to offer single issues of this publication free of charge. Shipping and handling is $7.00. Because of limited quantities, requests for multiple copies will be considered on a case-by-case basis. Requests should be sent to the AMS Director of Publications, Samuel M. Rankin III at the AMS Providence office. To order, please specify HAPPENING/1N.

New Journal from the Juliusz Schauder Center!



Topological Methods in Nonlinear Analysis

Kazimierz Gęba, Lech Górniewicz, and Andrzej Granas, Editors

This new international journal contains high-quality research and survey papers on a wide range of topics in nonlinear analysis, with a focus on those using topological methods. Published quarterly by the Juliusz Schauder Center, with the assistance of Nicolas Copernicus University for Nonlinear Studies, in Turoń, Poland. The journal captures the flavor of both the pure and applied aspects of this area. The central topics are:

Nonlinear PDEs and ODEs, elliptic and evolution equations; Differential inclusions, control theory; Dynamical systems, Hopf bifurcation, Conley index; Fixed point and homotopy methods, techniques of critical point theory; and Convex analysis, game theory, mathematical economics.

With the current-day interest in nonlinear analysis, this journal will make an important addition to individual and institutional libraries.

Topological Methods in Nonlinear Analysis is distributed worldwide by the American Mathematical Society. Please call for a free sample issue while they last.

Editorial Committee

T. B. Benjamin, H. Brezis, M. Burnat, A. Dold, S. Eilenberg, E. Fadell, K. Fan, K. Geba, L. Górniewicz, A. Granas (Secretary), B.-J. Jiang, O. Ladyzhenskaja, M. Lassonde, J. Leray, A. Marino, J. Mawhin, L. Nirenberg, C. Olech, and S. Takahashi.

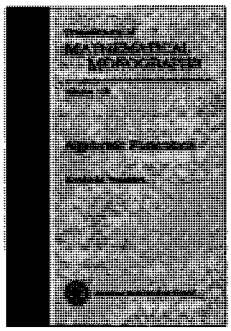
Contents

Section I: S. Eilenberg, *Karol Borsuk, a personal reminiscence*; **A. Granas and J. Jaworoski**, *Reminiscences of Karol Borsuk*; **P. Hilton**, *On some contributions of Karol Borsuk to homotopy theory*; **H. Steinlein**, *Spheres and symmetry: Borsuk's antipodal theorem*; **J. West**, *Contributions of Karol Borsuk to infinite-dimensional topology*; **J. Segal**, *Contributions of Karol Borsuk to infinite-dimensional topology*; **Section II: A. Fonda, M. Ramos, and M. Willem**, *Subharmonic solutions for second order differential equations*; **K. Gęba and W. Marzantowicz**, *Global Hopf bifurcation*; **J. R. Lee and M. Frigon**, *Existence principles for Carathéodory differential equations in Banach spaces*; **A. K. Ben-Naoum and J. Mawhin**, *Periodic solutions of some semilinear wave equations on balls and on spheres*; **E. N. Dancer**, *Generic domain dependence for non-smooth equations and the open set problem for jumping nonlinearities*; **J.-N. Corvellec, M. Degiovanni, and M. Marzocchi**, *Deformation properties for continuous functionals and critical point theory*; **K. Kuperberg, W. Kuperberg, P. Minc, and C. S. Reed**, *Examples related to Ulam's fixed point problem.*

ISSN 1230-3429
Individual price $100, List price $200
To order, please specify 93TMNA/N

Discounts for libraries in developing countries are possible; write to the TMNA office in Poland to see if you are eligible.

TRANSLATIONS OF MATHEMATICAL MONOGRAPHS



Algebraic Functions

Kenkichi Iwasawa

Translated by Goro Kato

Volume 118

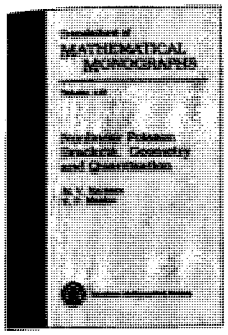
This is a translation of Iwasawa's 1973 book, *Theory of Algebraic Functions*, originally published in Japanese. Because the book treats mainly the classical part of the theory of algebraic functions, emphasizing analytic methods, it provides an excellent introduction to the subject from the classical viewpoint. Directed at graduate students, the book requires some basic knowledge of algebra, topology, and functions of a complex variable.

Contents

Preparation from valuation theory; Algebraic theory of algebraic function fields; Riemann surfaces; Algebraic function fields and closed Riemann surfaces; Analytic theory of algebraic function fields.

(*continued*)

1991 *Mathematics Subject Classification*: 14H05, 30F10; 33E05
ISBN 0-8218-4595-0, LC 92-39922, ISSN 0065-9282
287 pages (hardcover), April 1993
Individual member $79, List price $131, Institutional member $105
To order, please specify MMONO/118N



Nonlinear Poisson Brackets. Geometry and Quantization

M. V. Karasev and V. P. Maslov

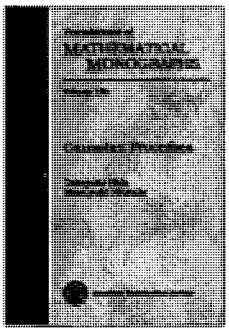
Volume 119

This book deals with two old mathematical problems. The first is the problem of constructing an analog of a Lie group for general nonlinear Poisson brackets. The second is the quantization problem for such brackets in the semiclassical approximation (which is the problem of exact quantization for the simplest classes of brackets). These problems are progressively coming to the fore in the modern theory of differential equations and quantum theory, since the approach based on constructions of algebras and Lie groups seems, in a certain sense, to be exhausted. The authors' main goal is to describe in detail the new objects that appear in the solution of these problems. Many ideas of algebra, modern differential geometry, algebraic topology, and operator theory are synthesized here. The authors prove all statements in detail, thus making the book accessible to graduate students.

Contents

Poisson manifolds; *Analog of the group operation for nonlinear Poisson brackets*; *Poisson brackets in* $\mathbb{R}^{2n}$ *and semiclassical approximation*; *Asymptotic quantization*; *Appendix* I: *Formulas of noncommutative analysis*; *Appendix* II: *Calculus of symbols and commutation relations.*

1991 *Mathematics Subject Classification*: 58G, 58F06, 81S10; 81Q20, 16S32
ISBN 0-8218-4596-9, LC 92-42061, ISSN 0065-9282
366 pages (hardcover), April 1993
Individual member $102, List price $170, Institutional member $136
To order, please specify MMONO/119N



Gaussian Processes

Takeyuki Hida and Masuyuki Hitsuda

Volume 120

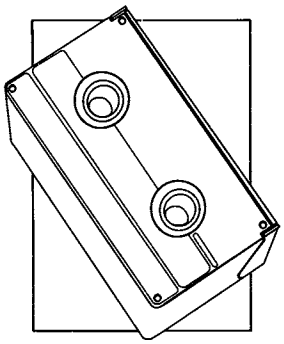
Aimed at students and researchers in mathematics, communications engineering, and economics, this book describes the probabilistic structure of a Gaussian process in terms of its canonical representation (or its innovation process). Multiple Markov properties of a Gaussian process and equivalence problems of Gaussian processes are clearly presented. The authors' approach is unique, involving causality in time evolution and information-theoretic aspects. Because the book is self-contained and only requires background in the fundamentals of probability theory and measure theory, it would be suitable as a textbook at the senior undergraduate or graduate level.

Contents

Foundations of probability theory and limit theorems; *Systems of Gaussian random variables*; *Stationary Gaussian processes and their representations*; *Canonical representation of Gaussian processes: general theory and multiplicity*; *Multiple Markov Gaussian processes*; *Equivalence of Gaussian processes*; *Stochastic integrals and martingales.*

1991 *Mathematics Subject Classification*: 60G15; 60J99
ISBN 0-8218-4568-3, LC 92-32176, ISSN 0065-9282
182 pages (hardcover), April 1993
Individual member $59, List price $99, Institutional member $79
To order, please specify MMONO/120N

VIDEOTAPES

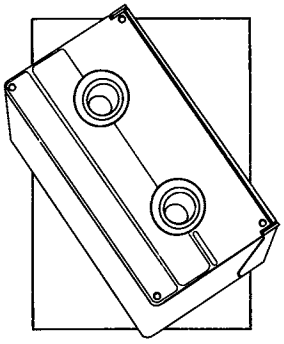


Wavelets Making Waves in Mathematics and Engineering

Ingrid Daubechies

Combining an informal interview and an introductory-level lecture on wavelets, this videotape makes an excellent classroom enrichment tool, as well as fascinating viewing for those interested in this cutting-edge topic. The interview portion of the tape contributes an engaging personal flavor as Daubechies covers some of the most important applications of wavelets and discusses how she became interested in mathematics and the challenges of balancing a family and a demanding career. In the lecture, Daubechies, one of the world's leading experts in wavelets, describes some of the important developments in the theory. Starting from basic definitions and presenting a clear and well-paced lecture, Daubechies makes the subject accessible to undergraduate mathematics majors.

1991 *Mathematics Subject Classification*: 42, 46, 94
ISBN 0-8218-8082-9
NTSC format on 1/2" VHS videotape; approx. 90 minutes, February 1993
Individual member $34.95, List price $54.95, Institutional member $44.95
To order, please specify VIDEO/85N



Some Mathematics of Baseball

Henry O. Pollack

Get out your mitts, your baseballs, your bats—and your calculators? This videotape of the 1991 Pi Mu Epsilon J. Sutherland Frame Lecture presents a delightful tour through a myraid of ways of applying mathematics to baseball; and the best thing is, you don't have to be a baseball fan to enjoy it! Witty, engaging, and indefatigable, Pollak pursues his topic with a passion: "Once this gets in your blood, you just don't stop!" He doesn't just stick to those dry statistics that sportswriters bandy about—he actually builds models to analyze the game and discusses why the models work in some ways and don't in others. Well-paced and lucid, with a judicious use of numbers and calculations, the lecture is accessible to students having a familiarity with basic probability theory. It makes an excellent classroom enrichment tool, especially when shown around the time of the World Series.

1991 *Mathematics Subject Classification*: 00
ISBN 0-8218-8083-7
NTSC format on 1/2" VHS videotape; approx. 60 minutes, February 1993
Individual member $34.95, List price $54.95, Institutional member $44.95
To order, please specify VIDEO/86N

AMS Reports and Communications

Recent Appointments

Committee members' terms of office on standing committees expire on January 31 following the year given in parentheses following their names, unless otherwise specified.

Joan S. Birman, Robert M. Fossum, Franklin P. Peterson, and Steven H. Weintraub have been appointed by President Ronald L. Graham to the special *Committee on Meetings of the Council*. Professor Fossum will serve as chair.

Upon recommendation of the Editorial Boards Committee, the Council has elected the following: M. Salah Baouendi (1995) as the Society's representative to the *American Journal of Mathematics Editorial Committee*;

Craig Huneke (1995), Linda Preiss Rothschild (1995), and J. T. Stafford (1995) to the *Contemporary Mathematics Editorial Committee*. Professor Huneke will serve as chair. The continuing members of the committee are Clark Robinson (1994) and Peter M. Winkler (1994);

Elias M. Stein (1995) to the *Journal of the AMS Editorial Committee*. Other members of the committee are H. Blaine Lawson, Jr. (1994), Andrew M. Odlyzko (1994), and Wilfried Schmid (1993), chair;

Gregory L. Cherlin (1996) and Mark Mahowald (1996) to the *Transactions and Memoirs Editorial Committee*. Continuing members of the committee are Avner D. Ash (1994), James E. Baumgartner (1995), chair, Robert L. Bryant (1995), Sun-Yung Alice Chang (1994), Richard T. Durrett (1994), Philip J. Hanlon (1995), David Jerison (1994), Wen-Ching Winnie Li (1995), John J. Mallet-Paret (1995), Judith D. Sally (1993), Peter B. Shalen (1995), and Masamichi Takesaki (1993).

Roy L. Adler (ex officio) was appointed and Susan J. Friedlander (1995) was reappointed by then chair of the Board of Trustees, Paul J. Sally, Jr., to the *Membership Committee*. Hugo Rossi (1994) was appointed chair. Continuing members of the committee are M. Salah Baouendi (1993), Carol-Ann Blackwood, consultant, and Wen-Ching Winnie Li (1993).

Elliott H. Lieb, M. Susan Montgomery, Samuel M. Rankin III, and Paul J. Sally, Jr. have been appointed by chair of the Board of Trustees, John C. Polking, to the special *Committee on Copyright*. Professor Sally has also been appointed chair.

M. Salah Baouendi (1994), Hyman Bass (1994), Lenore Blum (1994), Ingrid Daubechies (1994), Persi W. Diaconis (1994), James A. Donaldson (1994), Robert M. Fossum (ex officio), Ronald L. Graham (ex officio), Rebecca A. Herb (1994), D. J. Lewis (1994), Peter W. K. Li (1994), Richard S. Palais (1994), Carl Pomerance (1994), and William Yslas Velez (1994) have been appointed by President Ronald L. Graham to the *Committee on Committees*. Professor Lewis has been appointed chair.

Felix Browder, Susan J. Friedlander, Ronald L. Graham, and David Kazhdan were appointed by Ex-President Michael Artin to the *Advisory Committee on Former Soviet Union Mathematics*. Other members of the committee are Michael Artin, William H. Jaco, Robert D. MacPherson, chair, Cathleen S. Morawetz, John C. Polking, Linda Preiss Rothschild, and Daniel Stroock.

Richard A. Askey (MAA), Thomas F. Banchoff (MAA), H. W. Lenstra (AMS), and Peter M. Winkler (AMS) have been appointed by Presidents Donald L. Kreider (MAA) and Ronald L. Graham to the AMS-MAA *Joint Program Committee for the Cincinnati Meeting*. Professor Lenstra has been appointed chair.

Officers of the Society 1992 and 1993

Except for the Members-at-Large of the Council, the month and year of the first term and the end of the present term are given. For Members-at-Large of the Council, the last year of the present term is listed.

COUNCIL

Presidents
Michael Artin 2/91–1/93
Ronald L. Graham 2/93–1/95

Ex-President
Michael Artin 2/93–1/94

President-Elect
Ronald L. Graham 2/92–1/93

Vice Presidents
Lenore Blum 1/90–1/93
Chandler Davis 2/91–1/94
Linda Keen 2/92–1/95
Anil Nerode 2/93–1/96

Secretary
Robert M. Fossum 1/89–1/95

Associate Secretaries
Joseph A. Cima 1/89–1/93
W. Wistar Comfort 1/83–1/93
Robert J. Daverman 2/93–1/95
Andy Roy Magid 1/88–1/94
Lesley M. Sibner 2/93–1/95
Lance W. Small 1/88–1/94

Treasurer
Franklin P. Peterson 8/73–1/95

Associate Treasurer
Steve Armentrout 7/77–1/93
B. A. Taylor 2/93–1/95

MEMBERS-AT-LARGE

All terms are for 3 years and expire on January 31 following the year given.

1992
Sheldon Axler

Joan S. Birman
Charles Herbert Clemens
Carl Pomerance
Shing-Tung Yau

1993
David A. Cox
John M. Franks
Frank Gilfeather
Steven H. Weintraub
Ruth J. Williams

1994
Ruth M. Charney
Carl C. Cowen, Jr.
Rebecca A. Herb
Elliott H. Lieb
Gunther A. Uhlmann

1995
Svetlana R. Katok
Steven George Krantz
James I. Lepowsky
Peter W. K. Li
Susan Gayle Williams

MEMBER OF EXECUTIVE COMMITTEE

Members of the Council, as provided for in Article 7, Section 4 (last sentence) of the Bylaws of the Society.

Joan S. Birman 2/93–1/96
Arthur M. Jaffe 2/91–1/95
Hugo Rossi 1/89–1/93

PUBLICATIONS AND COMMUNICATIONS COMMITTEES

***Bulletin* Editorial Committee**
Murray H. Protter 2/92–1/95
Frank S. Quinn 2/91–1/94

***Colloquium* Editorial Committee**
G. D. Mostow 2/91–1/94

Journal of the AMS
Wilfried Schmid 1/87–1/94

***Mathematical Reviews* Editorial Committee**
Philip J. Hanlon 2/93–1/96
B. A. Taylor 1/90–1/93

***Mathematical Surveys and Monographs* Editorial Committee**
Marc A. Rieffel 1/90–1/95

***Mathematics of Computation* Editorial Committee**
Walter Gautschi 1/84–1/96

Chair, Committee on Science Policy
Frank W. Warner III 2/92–1/94

Chair, Committee to Monitor Problems in Communication
Judy Green 1/92–1/94

***Proceedings* Editorial Committee**
Irwin Kra 2/91–1/95

Representative on the *American Journal of Mathematics*
M. Salah Baouendi 1/88–1/95

***Transactions and Memoirs* Editorial Committee**
James E. Baumgartner 1/88–1/95

BOARD OF TRUSTEES

Roy L. Adler 2/93–1/98
Steve Armentrout
(ex officio) 7/77–1/93
Michael Artin
(ex officio) 2/91–1/93
Frederick W. Gehring 1/83–1/93
Ronald L. Graham
(ex officio) 2/93–1/95
Maria M. Klawe 2/92–1/97
M. Susan Montgomery 1/86–1/96
Franklin P. Peterson
(ex officio) 8/73–1/95
John C. Polking 1/90–1/95
Paul J. Sally, Jr. 1/84–1/94
B. A. Taylor
(ex officio) 2/93–1/95

Council Meeting in Springfield, Missouri

The Council of the American Mathematical Society met at 7:00 p.m. on Thursday, 19 March 1992, in the Texas Room of the Springfield Holiday Inn–University Plaza Hotel, Springfield, Missouri. There were nineteen members present. President Artin presided.

In 1990 the Society changed the date when newly elected officers assume duties. The individuals elected or appointed to the Council in 1991 took office on 01 February 1992. Newly elected or appointed members were: President-Elect Ronald L. Graham, Vice President Linda Keen, Members-at-Large Ruth Charney, Carl C. Cowen, Jr., Rebecca Herb, Elliott Lieb, and Gunther A. Uhlmann. The following Representatives of Committees also took office: *Bulletin* Editorial Committee, Frank S. Quinn; *Colloquium* Editorial Committee, G. D. Mostow; Committee to Monitor Problems in Communications, Judy Green; *Mathematical Surveys* Editorial Committee, Marc Rieffel; *Proceedings* Editorial Committee, Irwin Kra; Science Policy Committee, Frank W. Warner; and *Transactions* and *Memoirs* Committee, James E. Baumgartner.

The Minutes of the January 92 Council were distributed by mail. It was noted that, aside from the reports from the tellers in Section 3.1 of those minutes which were approved by the Council, the other reports from the various committees were not acted upon by the Council. That is, when the minute states that a "report is filed in the AMS Committee Report Book for 1992, Report No. XXXXXX-YY", it means that the committee report has been filed in that book. This does not imply any action on the report by the Council. When action on a report, or part of a report, is taken by the Council, this is reported in the minute. The Council requested that a statement to this effect be made in the minutes.

Minute 3.10, **Committee on Professional Ethics**, should read as follows:

> The committee report is filed in the AMS Committee Report Book for 1992, Report No. 920218-02. When this report was presented to the Council, some members indicated it was unsatisfactory and requested more information. It was pointed out that some information was available in the executive session of the 11/91 ECBT minutes. After some discussion, it was requested that an *ad hoc* committee be appointed to inquire into the issues of the Committee on Professional Ethics and unresolved cases. The committee appointed consists of Birman, chair, Gilfeather, and Lieb. It was asked to report to the March 92 Council.

Minute 3.12, ***Mathematical Reviews* Editorial Committee (MREC)**, records that the report of this committee is Report No. 920218-02. This should be changed to Report No. 920131-02.

The minutes were approved as amended.

The Secretary reported the results of the Council Election to the Executive Committee and the representative to the Joint Policy Board for Mathematics. The minute was approved by the Council and

is on file in the AMS Committee Report Book for 1992, Report No. 920408-01. The Council elected Arthur Jaffe to a four-year term on the Council's Executive Committee and it elected Linda Keen to a two-year term as Council Representative on the Joint Policy Board for Mathematics.

The Council discharged several committees with thanks.

The Council noted the occasion of the celebration of the Fortieth Anniversary of the founding of the Society for Industrial and Applied Mathematics (SIAM) by passing the following resolution:

> Physical scientists, engineers, and others have contributed much to mathematics by posing problems that have generated a huge amount of mathematical research. Forty years ago the Society for Industrial and Applied Mathematics was founded to promote basic research in and further the applications of mathematics to industry and science. The Council of the American Mathematical Society recognizes the important contributions SIAM has made in advancing and promoting applied mathematics within the mathematical sciences. The AMS and SIAM have worked closely together over the years on various common projects such as joint meetings. The Joint Policy Board for Mathematics is a prime example of a venue where the AMS and SIAM have joined forces to promote common interests. The Council of the AMS congratulates SIAM on the occasion of its Fortieth Anniversary and looks forward to continued cooperation with SIAM in all areas of research and applications of mathematics and in promoting mathematics to all users of the mathematical sciences.

The Council received the report from its Nominating Committee which made recommendations for nominations for the 1992 Election. These were considered in Executive Session. The list of nominees has appeared in past issues of the *Notices* and will not be reproduced here. The election has already taken place.

The Executive Director, William H. Jaco, gave his annual report to the Council.

In 1986, the Board of Trustees adopted a policy of keeping AMS investment portfolios free of companies doing business in South Africa. This policy was adopted without consulting the Council. The Board has considered changing the policy. When the Investment Committee of the Board of Trustees met during the November 1991 ECBT meeting, they reviewed the returns earned by the Society's endowment and quasi-endowment funds with the two independent investment managers who manage these funds. Both of the investment managers have stated that the returns on these portfolios would have been higher by an amount in the range of two to four percentage points if they had been able to manage the funds with enough flexibility to allow investment in pharmaceutical companies doing business in South Africa. In addition to the issue which was raised regarding pharmaceutical companies, the process of evaluating alternative investment managers and mutual funds is greatly complicated by the South Africa-free policy. Initial quantitative screens of potential investment managers do not separately identify South Africa-free portfolios; the universe of South Africa-free mutual funds is limited.

The Board of Trustees requested Council consideration as to whether the Society's policy on investment in companies doing business in South Africa remains appropriate. In particular, the Council was asked to consider whether to recommend one of the following policies to the Board of Trustees:

- Eliminate the prohibition on investment in companies doing business in South Africa.
- Prohibit investment in companies doing business in South Africa, unless such companies follow the Sullivan Principles. (Nearly all pharmaceutical companies doing business in South Africa follow the Sullivan Principles.)
- Prohibit investment in companies doing business in South Africa, unless there are humanitarian reasons for excepting particular companies. (Under such a policy, it would be considered appropriate to invest in pharmaceutical companies because of the humanitarian uses to which their products are put.)

The Council tabled action on this until its next meeting.

After some discussion at the January 92 Council related to the report of the Committee on Professional Ethics (COPE), a special committee consisting of Joan Birman, Chair, Frank Gilfeather, and Elliott Lieb, was established to inquire into the issues of the Committee on Professional Ethics and unresolved cases. The report of the committee is filed in the AMS Committee Report Book for 1992, Report No. 920403-02.

The committee moved two resolutions which were adopted by the Council:

The first was:

> The Council thanks Professor Mary Ellen Rudin for the sensitive and tactful way she handled the business before CAFTES during 1991. The Council also thanks Professor Rudin on behalf of the AMS for handling as best she could a very unpleasant job in one regrettable case.

The second was:

> The Council establish a committee to make recommendations to the Council on the AMS role in the area of professional ethics. In particular this committee (Review of Ethics (ROE)) should analyze and review the operation of COPE. This ROE Committee is further charged to consider alternate modes by which the AMS could effectively handle cases of professional ethics and conduct. This committee (ROE) is to bring to the Council next January (1993) recommendations:
>
> • Of a set of Guidelines for Professional Conduct for the Society, or a recommendation that one not be established.

- Recommendations of a charge and operating procedures for COPE or an alternate structure to take its place.

The Review of Ethics Committee is to cease operation after the January 1993 Annual Meeting.

The Council tabled discussion of a special membership category until its next meeting.

It then considered itself a Committee of the Whole to discuss several items, among them the question of restructuring the committees of the Society, the operational planning process, the situation in the former Soviet Union, the current employment situation, and letters to the editor of the *Notices*.

It adjourned shortly after midnight.

Robert M. Fossum
Secretary
Urbana, Illinois

Council Meeting in Providence

The Council of the American Mathematical Society met at 2:00 p.m. on Tuesday, 08 September 1992 in the Marriott Hotel, Providence, Rhode Island. Thirty members attended. President Artin presided. The Minutes of the March 92 Council had been distributed by mail and were were approved as submitted. Minutes of business by mail were also approved.

The Council approved a resolution of thanks and congratulations to Dr. Judith S. Sunley of the National Science Foundation:

> The Council of the American Mathematical Society sends congratulations on the occasion of your promotion to the position of Executive Officer, Mathematical and Physical Sciences, at the National Science Foundation. The Council thanks you for your exemplary and effective service as Director of the Division of Mathematical Sciences and looks forward to continued cooperation with you in serving the mathematical community.

It agreed to the formal discharge of several committees.

The March 1992 Council had discussed and tabled to this meeting action on investments in companies conducting business in South Africa. The Council considered this question again, and again it tabled a resolution that would allow investments in certain of these companies.

The Council made several editorial appointments that had been recommended by the Editorial Boards Committee (EBC). A request by the *Proceedings* Editorial Committee to increase temporarily the page allocation for the PAMS was supported by the EBC and endorsed by the Council.

The EBC recommended enlarging the Committee on the History of Mathematics to four members. This was approved by the Council.

The Nominating Committee nominated members for election by the Council to the *Notices* Editorial Committee and the Committee to Monitor Problems in Communication. These nominations were considered in executive session. Sheldon Axler, Susan Friedlander, and Carl Riehm were elected to four-year terms on the *Notices* Editorial Committee. Efraim Armendariz and Judy Green were elected to three-year terms on the Committee to Monitor Problems in Communication (1993).

The Committee on Professional Ethics presented a report that was considered in Executive Session. After hearing the report, the Council requested that a special committee be appointed to gather facts concerning the complaint that had been brought to the committee, to review the findings of the Committee on Professional Ethics, and to investigate the merits of the case. This special committee was requested to report back to the Council.

According to the Bylaws, dues and privileges of membership of the various categories of members shall be determined by the Council in consultation with the Board of Trustees. The Council considered several categories of membership and made some revisions in the dues and privileges of each.

The affiliation of Institutional Associate is limited to organizations in North America that are not eligible for Institutional Membership and wish to contribute less than the $2,000 per year required from Corporate Members. At the present time, the privileges granted to this group are:

- Entitled to elect two nominees for membership.
- Entitled to the normal 20% discount (one discount per title, and the books and journals purchased at discounted prices are not for resale).

The Council agreed to add the following privileges for Institutional Associate:

- 5% discount on mailing lists rented from the Society.
- 5% discount on space ads placed in Society publications.

The Council approved dues of $2,500 ($3,500 with copyright privilege) and privileges for Corporate Membership as follows.

- One complimentary mailing list per year.
- Complimentary subscriptions to the *Notices*.
- Complimentary subscriptions to *Abstracts*.
- Complimentary *Combined Membership List*.
- Complimentary *Mathematical Sciences Professional Directory*.
- Complimentary Corporate Representative (like nominee) memberships.
- Employees may register for AMS meetings at member rates.
- 10% discount on advertising.
- 10% discount on AMS publications (books, journals - only one copy per title at corporate member rate).
- Complimentary listings in *EIMS*.
- Complimentary use of the Employment Register.
- Complimentary electronic position listings through the Employment Section of e-MATH (an electronic clearinghouse for the global mathematics community).

The Council approved dues of $16 per year for Category–S Membership (for individuals residing in developing countries) and changed the privileges so that these members have a choice of receiving either the *Notices* or the *Bulletin* (but not both).

The Council discussed a report from its Committee on Science Policy concerning a Society-sponsored Postdoc-

toral Program in the mathematical sciences. It passed a resolution that the Council **"urges support for this program and recommends that the Committee on Science Policy moves this along and brings back a concrete recommendation to the January 93 Council."**

The Council approved the proposal to appoint a task force on resource analysis and asked for a preliminary report to the January 1994 Council and a final report to the Spring 1994 Council.

The Council agreed that the Committee on Research in Undergraduate Mathematics should become a standing, joint AMS-MAA Committee with charge as in Attachment A.1 of the Minutes of this Council meeting.

The Council agreed to establish a standing Committee on the High School Lecture Series with the following charge:

1. The High School Lecture Series be established as an annual series (held at at most two sites each year in the spring, possibly in conjunction with Mathematics Awareness Week). This involves a financial commitment of approximately $15,500 (with no videotaping), which will come from AMS General Funds if outside funding is not available.
2. A Selection Committee be appointed to recommend sites and select speakers. The staff and logistical support will be provided by the Meetings staff, and the Director of Meetings will serve as staff liaison to the Selection Committee.

The Council approved the resolution below on international representation on editorial committees of the Society.

> The Council encourages the Editorial Boards Committee to include, where desirable, international members on editorial committees.

While sitting in closed executive session the Council agreed to the ECBT recommendation to reappoint Franklin Peterson to a two-year term as Treasurer and Robert Fossum to a two-year term as Secretary. Both terms begin on 01 February 1993. The Council requested that the ECBT Nominating Committee, when making such recommendations in the future, should provide the Council with a review of the performance of the individuals it recommends for reappointment.

Vice-President Davis, the official AMS representative to the Canadian Mathematical Society, submitted a report.

The Committee on Committees subcommittee on Restructuring presented the Council with a preliminary draft of a report for discussion.

The special Committee on Nomination Procedures submitted a report.

Council members Cox, Fossum, Keen, and Lieb submitted a resolution for consideration by the Council. After some discussion, the resolution

> It is the sense of the Council, previous resolutions of the Council and the ECBT not withstanding, that the AMS publications policy and practice should be, in all cases, to strive to be author friendly. Everything possible should be done, within reason, to create an atmosphere that encourages authors to submit material to the AMS for publication. As an example, every author should receive a complimentary copy of every book that the AMS publishes with that author's contribution, including second and further editions, translations, etc. This should not be interpreted to mean a diminishing of other benefits (free reprints, etc.) now in place. Furthermore it should be the policy of AMS to allow authors to retain copyright (if they wish) in their work and in the image of their work, provided they assign to AMS the right to publish and the right to permit others (with or without payment of fees to AMS) to republish or translate the work.

was adopted by the Council. In addition, the Council requested that staff produce a report, due by the January 1993 Council meeting, discussing what the implications of this resolution on copyright retention by authors would have for the Society.

Several items, not on the agenda, were proposed but failed to receive the required two-thirds vote of the members present in order to be considered.

The Council adjourned shortly before midnight.

Robert M. Fossum
Secretary
Urbana, Illinois

The Business Meeting in San Antonio

The Business Meeting of the Society was held at 5:00 p.m. on 14 January 1993 in San Antonio, Texas. President Artin presided.

The Secretary presented an agenda for the meeting on behalf of the Council that had met on the Tuesday prior.

Agenda

- Report of the Secretary.
- Consideration of a resolution on Departmental Examinations proposed by Robert O. Stanton, St. John's University.
- Discussion on a motion by Saunders Mac Lane concerning the Society's Strategic and Operating Plan.

The Council recommended that the resolution by Stanton, having been considered at the previous Business Meeting and referred to the Society's Committee on Education and having been submitted well within the deadline for inclusion on the agenda of this meeting, should be placed on the agenda. With regard to the motion by Mac Lane, the Council recommended that the Business Meeting devolve into a Committee of the Whole for debate on the matter.

The agenda, as recommended by the Council, was adopted by unanimous consent.

President Artin called on the Secretary to report. The Secretary announced the results of the 1992 Election by Members (reported in the January 1993 issue of the *Notices*). He also reported that the Council had passed a resolution that recommended that the Annual Meeting, scheduled for Denver, Colorado, in January 1995, be moved to a site in a state other than Colorado (see page 245 of the March 1993 issue of the *Notices*).

He asked for and received permission to publish the remaining portion of his report in the *Notices*.

The President then called to the floor the following resolution proposed by Robert O. Stanton:

A Resolution on Departmental Examinations

Whereas:

> Departmental examinations can discourage innovative teaching techniques and impede advances in education.
>
> Students for whom English is a second language are frequently put at an unfair disadvantage, because of unfamiliar phrasing of the questions on a departmental examination.
>
> Because of different emphases, levels of preparation, styles of instruction, etc., departmental examinations do not fulfill the goal of a uniform measure of ability for different sections of the same course.
>
> Any individual who is regarded as sufficiently competent to be entrusted with the day-to-day teaching of a course should a fortiori be considered capable of creating appropriate examinations and grading systems.

Be it resolved that:

> The American Mathematical Society considers it a principle of academic freedom that all individuals teaching university mathematics courses shall have the right to prepare their own examinations and to set their own grading scales.

The Business Meeting of January 1992 had referred this resolution to the Society's Committee on Education. That committee reported as follows:

> The Committee on Education discussed [the resolution] at its meeting of April 5, 1992. The Committee feels that there are cogent arguments on both sides of the "uniform examination" issue and that both sets of arguments are consistent with the principles of academic freedom. Therefore, it would be unwise for the American Mathematical Society to adopt the proposed resolution.
>
> Accordingly, the Committee on Education recommends that you vote AGAINST this motion.

Professor Stanton was informed of this report. He requested, on 11 May 1992, that "notwithstanding the recommendation of the Committee, I believe that the membership of the Society as a whole has the right to consider this issue. Therefore I request that the proposal be placed on the agenda for the Business Meeting of January 1993."

The Committee on the Agenda for the Business Meeting recommended that this be placed on this agenda. The January 1993 Council, in the action that recommended placing this resolution on the floor of the Business Meeting, recommended that members vote to reject the resolution.

After a short debate, the resolution failed by a show of hands.

The President then devolved the meeting into a Committee of the Whole House with the Secretary presiding. Upon rising, the Chair of the Committee of the Whole House reported that the committee recommended the following:

> The resolution proposed by Saunders Mac Lane (see below) should be referred to the Board of Trustees' Long Range Planning Committee (LRPC) for consideration. The LRPC will report to the January 1994 Business Meeting at which the resolution will be on the agenda for action.

Saunders Mac Lane's resolution read as follows:

> Resolved: That the AMS Strategic and Operating Plan be withdrawn for reconsideration; in particular, for inclusion in the plan of major attention to the support and encouragement of mathematical research.

The recommendation of the Committee of the Whole House was approved.

The Secretary asked for and received unanimous consent to consider two resolutions:

> The Society appreciates the welcome extended by and the facilities available in the City of San Antonio. It thanks the Local Arrangements Committee, whose local members, Shahir Ahmad, chair, Don Bailey, Carol Redfield, David A. Sanchez, Gene Sims, and Betty Travis have contributed time and energy to insure the success of this Annual Meeting.
>
> The Society has prospered under the leadership of President Michael Artin. It thanks him for the two years of devotion, wisdom, insight, and dedication he has contributed to the Society. It wishes him a fruitful and prosperous future and hopes that it can continue to call on him to serve mathematics and the Society in the future.

Both resolutions were approved by acclamation. The meeting adjourned at 5:35 p.m.

Robert M. Fossum
Secretary
Urbana, Illinois

Backlog of Mathematics Research Journals

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

Observed Waiting Time. The quartiles give a measure of normal dispersion. They do not include extremes which may be misleading. Waiting times are measured in months from receipt of manuscript in final form to publication of the issue. When a paper is revised, the waiting time between an editor's receipt of the final revision and its publication may be much shorter than is the case otherwise, so these figures are low to that extent.

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

Journal	Number Issues per Year	Approximate Number Pages per Year	Backlog of Printed Pages 12/31/92	Backlog of Printed Pages 12/31/91	Editor's Estimated Time for Paper Submitted Currently to be Published (in Months)	Observed Waiting Time in Latest Published Issue (in Months) Q_1	M	Q_3
Acta Inform.	8	798	192	292	5	5	6	7
Aequationes Math.	6	640	510	251	10	9	10	10
Algebras Groups Geom.	4	600	120	NR	NR	3	5	5
Algorithmica	12	1152	1152	349	24	26	26	30
Amer. J. Math.	6	1400	2400	1400	26	18	23	29
Ann. Appl. Probab.	4	1200	NR	250	6	11	13	14
Ann. of Math.	6	1320	1770	700	24	10	19	19
Ann. Probab.	4	2200	600	550	18	15	17	19
Ann. Sci. École Norm. Sup.	6	720	536	400	17	13	16	17
Ann. Statist.	4	2100	500	225	18	14	15	17
Appl. Math. Lett.	6	600	0	90	4	4	5	7
Appl. Math. Optim.	6	672	224	24	18	16	16*	17
Arch. Hist. Exact Scis.	8	800	0	NR	9	11	11	11
Arch. Math. Logic	6	480	0	0	5–9	6	7	8
Arch. Rational Mech. Anal.	16	1600	0	NR	7	6	7	8
Bull. Austral. Math. Soc.	6	1000	NR	600	NR	14	15	15
Bull. Soc. Math. France	4	980	280	300	14	14	19	20
Canad. J. Math.	6	1344	682	800	15–18	16	19	25
Canad. Math. Bull.	4	512	250	200	18	13	16	21
Circuits Systems Signal Proc.	4	512	272	85	10	14	16	20
Comm. Algebra	12	4500	2450	969	9	7	10	11
Comm. Math. Phys.	21	4536	NR	0	8	5	7	12
Comm. Partial Diff. Equations	12	2100	200	NR	12	6	9	13
Comp. Math. Appl.	24	2400	600	400	8	7	9	12
Computing	8	768	NR	102	6	6	6	7
Constr. Approx.	4	544	136	0	6	9	10	12
Discrete Comput. Geom.	8	900	300	300	14	9	14	18

Journal	Number Issues per Year	Approximate Number Pages per Year	Backlog of Printed Pages 12/31/92	Backlog of Printed Pages 12/31/91	Editor's Estimated Time for Paper Submitted Currently to be Published (in Months)	Observed Waiting Time in Latest Published Issue (in Months) Q_1	Observed Waiting Time in Latest Published Issue (in Months) M	Observed Waiting Time in Latest Published Issue (in Months) Q_3
Duke Math. J.	12	2400	0	200	9	8	10	14
Houston J. Math.	4	600	300	400	12	11	12	18
Illinois J. Math.	4	704	717	826	12	23	24	25
IMA J. Appl. Math.	6	624	NR	0	14	11	13	13
IMA J. Math. Appl. Med. Biol.	4	300	NR	80	NR		NA	
IMA J. Math. Control Inform.	4	400	0	50	10	11	14	16
IMA J. Numer. Anal.	4	600	300	100	15	11	18	23
Indiana Univ. Math. J.	4	1200	0	NR	9	5	10	14
Inst. Hautes Études Sci. Publ. Math.	2	400	200	300	12		NA	
Internat. J. Math. Math. Sci.	4	832	200	150	NR	11	16	23
Invent. Math.	12	2688	0	0	6	8	10	11
Israel J. Math.	12	1536	900	NR	15	13	18	21
J. Algebraic Geom.	4	684	170	0	13	6	8	10
J. Algorithms	4	700	NR	NR	NR	15	17	19
J. Amer. Math. Soc.	4	1000	250	0	15	15	17	19
J. Amer. Statist. Assoc.	4	1260	0	NR	6	12	13	16
J. Appl. Math. Stochastic Anal.	4	400	350	220	8		NA	
J. Assoc. Comput. Mach.	5	1250	688	1500	18	15	20	26
J. Austral. Math. Soc. Ser. A	6	850	NR	1000	NR	19	22	27
J. Austral. Math. Soc. Ser. B	2	320	NR	200	NR	13	16	17
J. Classification	2	300	200	300	15		**	
J. Complexity	4	500	275	225	16	10	12	14
J. Comput. System Sci.	6	1030	500	120	18	24	27	31
J. Differential Geom.	6	1500	1200	2000	10–12	13	15	23
J. Geom. Anal.	6	585	427	NA	9	17	18	20
J. Integral Equations Appl.	4	700	100	10	10		**	
J. Math. Biol.	8	864	0	0	11–12	14	14	15
J. Math. Phys.	12	3500	NR	0	NR	4	4*	5
J. Operator Theory	4	800	NR	NR	NR	29	31	35
J. Symbolic Logic	4	1600	400	100	27	13	14	15
Linear Algebra Appl.	18	5400	800	600	14	12	12*	12
Manuscripta Math.	16	1792	0	0	5	4	4	5
Math. Ann.	12	2304	0	0	10–12	8	9	18
Math. Biosci.	12	1800	400	200	7	6	8	8
Math. Comput. Modelling	12	1800	400	200	8	9	11	14
Math. Comp.	4	1700	180	400	14	12	14	18
Math. Control Signals Sys.	4	460	100	200	12	6	10	22
Math. Oper. Res.	4	1020	600	600	20	19	19	20
Math. Programming Ser. A	9	1080	NR	NR	NR	18	20	26
Math. Social Sci.	6	600	200	0	10	8	10	11
Math. Systems Theory	4	400	400	0	12	9	11	13
Math. Z.	12	2016	0	0	10–11	10	11	12
Mem. Amer. Math. Soc.	6	3200	3733	1633	26	15	19	23
Michigan Math. J.	3	624	200	320	18	12	19	25
Monatsh. Math.	8	704	NR	0	6	8	9	10
Numer. Funct. Anal. Optim.	6	800	100	100	9	8	10	13
Numer. Math.	12	1632	0	0	4–7	7	13	16
Oper. Res.	6	1152	655	425	13	11	14	17
Pacific J. Math.	10	2000	2000	NR	16	15	18	21
Probab. Theor. Relat. Fields	14	1904	0	0	9	8	12	15
Proc. Amer. Math. Soc.	12	3645	3949	3076	20	19	19	21

Journal	Number Issues per Year	Approximate Number Pages per Year	Backlog of Printed Pages 12/31/92	Backlog of Printed Pages 12/31/91	Editor's Estimated Time for Paper Submitted Currently to be Published (in Months)	Observed Waiting Time in Latest Published Issue (in Months) Q_1	Observed Waiting Time in Latest Published Issue (in Months) M	Observed Waiting Time in Latest Published Issue (in Months) Q_3
Proc. London Math. Soc.	6	1344	230	300	16–17	11	12	13
Quart. Appl. Math.	4	800	1000	1000	27	22	25	27
Quart. J. Math. Oxford Ser. A (2)	4	512	384	128	24	19	21	25
Quart. J. Mech. Appl. Math.	4	660	300	0	15	11	12	14
Results Math.	4	800	NR	NR	NR	17	18	19
Rocky Mountain J. Math.	4	1600	400	600	18	30	33	39
Semigroup Forum	6	816	0	521	8	8	11	16
SIAM J. Appl. Math.	6	1800	750	339	9	10	11*	13
SIAM J. Comput.	6	1350	900	665	15	13	15*	15
SIAM J. Control Optim.	6	1650	962	825	14	15	16*	16
SIAM J. Discrete Math.	4	680	255	95	13	9	15*	16
SIAM J. Math. Anal.	6	1650	0	0	18–24	7	8*	8
SIAM J. Matrix Anal. Appl.	4	1200	1500	887	13	19	19*	22
SIAM J. Numer. Anal.	6	1800	250	172	18–24	10	10*	13
SIAM J. Optimization	4	920	560	250	13	13	14*	15
SIAM J. Sci. Comput.	6	1500	550	301	13	12	13*	14
SIAM Rev.	4	680	0	0	12–18	7	8*	9
Topology Appl.	18	1980	440	1550	12	14	14	15
Trans. Amer. Math. Soc.	12	5500	4125	8250	27	28	28	31

NR means no response received.
NA means not available or not applicable.
* From date accepted.
** Date of receipt of manuscript not indicated in this journal.

PROCEEDINGS OF SYMPOSIA IN PURE MATHEMATICS

Differential Geometry

Robert E. Greene and S. T. Yau, Editors
Volume 54

These three parts contain the proceedings of the AMS Summer Institute on Differential Geometry, held at the University of California, Los Angeles, in July 1990. This was the largest AMS Summer Institute ever, reflecting the wide-ranging and intense research activity in the subject. The parts contain many extensive survey articles presenting perspectives on relatively broad topics; these articles would be accessible to advanced graduate students. In addition, the authors of the research articles were encouraged to survey the relevant literature. The three parts together offer the deepest and most comprehensive survey of recent research in differential geometry available today.

1991 *Mathematics Subject Classification*: 32, 53, 58, 81, 83
ISBN (*Set*) **0-8218-1493-1**; ISBN (*Part* 1) **0-8218-1494-X**; ISBN (*Part* 2) **0-8218-1495-8**; ISBN (*Part* 3) **0-8218-1496-6**
560 pages (*Part* 1); 655 pages (*Part* 2); 710 pages (*Part* 3) (hardcover), March 1993
Set: **Individual member** $155, List price $259, Institutional member $207
Part 1: **Individual member** $53, List price $89, Institutional member $71
Part 2: **Individual member** $58, List price $96, Institutional member $77
Part 3: **Individual member** $62, List price $103, Institutional member $82
To order, please specify PSPUM/54NA (Set), PSPUM/54.1NA (Part 1), PSPUM/54.2NA (Part 2), PSPUM/54.3NA (Part 3)

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

Miscellaneous

Personals

Xianke Zhang, of the University of Science and Technology of China, has been appointed an Associate Member of the International Centre for Theoretical Physics (ICTP, IAEA, and UNESCO) from January 1, 1991 to December 31, 1996.

J. F. Traub, the Edwin Howard Armstrong Professor of Computer Science at Columbia University, has been named the Accademia Nazionale dei Lincei in Rome to present the 1993 *Lezioni Lincee*. The *Lezioni Lincee* carries an award of ten million lire plus all travel and living expenses.

Deaths

A. de Castro Brzezicki, Professor Emeritus of the University of Seville (Spain), died on December 31, 1992, at the age of 70. He was a member of the Society for 21 years.

Alfred H. Clifford, Professor Emeritus of Tulane University, died on December 27, 1992, at the age of 84. He was a member of the Society for 60 years.

Jean A. Dieudonné, of Paris, France, died on November 29, 1992, at the age of 86. He was a member of the Society for 44 years.

J. H. McDonnell, of British Aerospace, Lancashire, England, died on January 13, 1993, at the age of 61. He was a member of the Society for 1 year.

Hanno Rund, of the University of Arizona, died on January 5, 1993, at the age of 67. He was a member of the Society for 37 years.

Robert J. Walker, Professor Emeritus of Cornell University, died on November 25, 1992, at the age of 83. He was a member of the Society for 62 years.

Memorial Gifts and Commemorative Gifts to the American Mathematical Society

You have an opportunity to honor the memory of a colleague, friend or family member with a memorial gift in support of the Society's work to promote mathematical scholarship and research.

If you would like to make a donation, please complete the attached form and return it to the address below. The Society will acknowledge your gift by sending notification to the person you designate. In addition, an acknowledgment will be sent to you upon receipt of the gift, and your name will be listed in the *Notices* annual listing of Contributions.

Memorial gifts to the Society, or gifts in honor of special occasions, are a distinctive way to remember a colleague, friend or family member while supporting the work of the American Mathematical Society.

Enclosed is my (our) memorial gift of $_____ to the American Mathematical Society.

Please print

Donor's name_____ Street address_____

City/State/Zip_____

❑ In Memory of _____ ❑ In Honor of _____

Please indicate whom the AMS should notify:

Name_____ Street address_____

City/State/Zip_____

Please make checks payable to the American Mathematical Society and send them to the following address:
American Mathematical Society • P. O. Box 5904 • Boston, MA 02206-5904

For further information contact the AMS Development Office at 401-455-4114

To use VISA or MasterCard*, send to: American Mathematical Society • P. O. Box 6248 • Providence, RI 02940-6248

❑ VISA ❑ MasterCard Card number: _____ Expiration date: _____

Signature: _____

* Please note: A minimum gift of $20.00 is requested on Visa or MasterCard.

❑ Please check if you do not wish this information to be printed in the *Notices* annual listing of contributions.

Classified Advertisements

SUGGESTED USES for classified advertising are positions available, books or lecture notes for sale, books being sought, exchange or rental of houses, and typing services.

THE 1993 RATE IS $65 per inch on a single column (one-inch minimum), calculated from the top of the type; $35 for each additional ½ inch or fraction thereof. No discounts for multiple ads or the same ad in consecutive issues. For an additional $10 charge, announcements can be placed anonymously. Correspondence will be forwarded.

Advertisements in the "Positions Available" classified section will be set with a minimum one-line headline, consisting of the institution name above body copy, unless additional headline copy is specified by the advertiser. Advertisements in other sections of the classified pages will be set according to the advertisement insertion. Headlines will be centered in boldface at no extra charge. Classified rates are calculated from top of type in headline to bottom of type in body copy, including lines and spaces within. Any fractional text will be charged at the next ½ inch rate. Ads will appear in the language in which they are submitted.

Prepayment is required of individuals but not of institutions. There are no member discounts for classified ads. Dictation over the telephone will not be accepted for classified advertising.

DEADLINES are listed on the inside front cover or may be obtained from the AMS Advertising Department.

U. S. LAWS PROHIBIT discrimination in employment on the basis of color, age, sex, race, religion or national origin. "Positions Available" advertisements from institutions outside the U. S. cannot be published unless they are accompanied by a statement that the institution does not discriminate on these grounds whether or not it is subject to U. S. laws. Details and specific wording may be found near the Classified Advertisements in the January and July/August issues of the *Notices*.

SITUATIONS WANTED ADVERTISEMENTS from involuntarily unemployed mathematicians are accepted under certain conditions for free publication. Call toll-free 800-321-4AMS (321-4267) in the U.S. and Canada for further information.

SEND AD AND CHECK TO: Advertising Department, AMS, P.O. Box 6248, Providence, Rhode Island 02940. AMS location for express delivery packages is 201 Charles Street, Providence, Rhode Island 02904. Individuals are requested to pay in advance, institutions are not required to do so. AMS FAX 401-455-4004.

FLORIDA

UNIVERSITY OF MIAMI
Lecturer

The Department of Mathematics and Computer Science of the University of Miami in Coral Gables, Florida, has a full-time Lecturer position opening available June 1, 1993. Candidates must have a Master's degree in the mathematical sciences and outstanding teaching credentials or potential. Candidates will be responsible for teaching, coordinating and supervising introductory mathematics courses. Salary will be competitive. The University of Miami is an equal opportunity affirmative action employer and a smoke/drug free workplace. Send vitae and three letters of recommendation to:

Professor Alan L. Zame
Department of Mathematics and
Computer Science
University of Miami
P.O. Box 249085
Coral Gables, Florida 33124-4250

UNIVERSITY OF MIAMI
Lecturer

The Department of Mathematics and Computer Science of the University of Miami in Coral Gables, Florida, has five full-time Lecturer position openings available for fall 1993. Candidates must have a Master's degree in the mathematical sciences and outstanding teaching credentials or potential. Candidates will be responsible for teaching introductory mathematics courses. Salary will be competitive. The University of Miami is an equal opportunity affirmative action employer and a smoke/drug free workplace. Send vitae and three letters of recommendation to:

Professor Alan L. Zame
Department of Mathematics and
Computer Science
University of Miami
P.O. Box 249085
Coral Gables, Florida 33124-4250

ILLINOIS

WESTERN ILLINOIS UNIVERSITY
Department of Mathematics

The Department of Mathematics invites applications for two tenure-track positions at the Assistant Professor level beginning Fall 1993 subject to funding. Position 1–Mathematics Education (elementary or middle school experience preferred). Position 2–Mathematics Education (secondary school experience) preferred/will consider Applied and Computational Mathematics. Doctorate is required. Successful candidates must demonstrate superior teaching and participate in research and service activities. The department offers both the Bachelors and Masters degrees in mathematics.

Send vita, copies of graduate transcripts and at least three letters of reference to: M. Scott, Chairperson, Department of Mathematics, Western Illinois University, Macomb, IL 61455.

THE SELECTION PROCESS WILL BEGIN MARCH 22, 1993. WIU IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER. APPLICATIONS ARE ESPECIALLY INVITED FROM MINORITIES, WOMEN, AND PERSONS WITH DISABILITIES.

MISSOURI

UNIVERSITY OF MISSOURI-ST. LOUIS

The Department of Mathematics and Computer Science seeks applicants for a tenure-track position in the field of Algebraic Geometry at the rank of assistant professor. Duties include teaching and research.

Candidates for the position should hold the Ph.D. degree in mathematics (or equivalent terminal degree). Preference will be given to candidates with at least three years experience in teaching and research.

The University of Missouri-St. Louis is located in suburban St. Louis, Missouri, and is one campus of the four-campus University of Missouri System.

Please send a vita, and have three letters of recommendation sent to Dr. Gail Ratcliff, Department of Mathematics and Computer Science, University of Missouri-St. Louis, St. Louis, MO 63121-4499. E-mail inquiries should be sent to ratcliff@arch.umsl.edu. Review of applications will begin on March 31, 1993. Applications will be considered until the position is filled. The University of Missouri is an Affirmative Action/Equal Opportunity Employer.

NEW YORK

THE COLLEGE AT NEW PALTZ

MATHEMATICS. Assistant Professor, tenure track. Ph.D. in Mathematics Education, or in Mathematics with expertise in Mathematics Education. The department offers bachelors and masters degrees in mathematics, mathematics education and computer science, and works closely with a long established School of Education. The College is located in the Hudson Valley/Catskill region of New York, known for its natural beauty and easy access to NYC. Send resume and 3 reference letters concerning both teaching ability and scholarly work to Prof. L. Fialkow, Math Search, Box 10, The College at New Paltz, NY 12561. Review begins immediately. AA/EOE.

PENNSYLVANIA

SENIOR BIOSTATISTICIAN

Philadelphia area pharmaceutical company seeks individual to perform protocal design and development, preparation of plans for Phase III studies in cardiovascular research area. Define programming requirements for data sets, data listings, and tables for FDA submissions. Provide statistical consulting as required for research and product development. Qualified applicants should possess a Ph.D. in statistics and three years experience as a statistician. Applicants must possess knowledge of SAS and FORTRAN programming and ability to per-

form statistical computing and original design of statistical protocals. Annual salary $55,700.00. Submit resume to Philadelphia Job Bank, 444 N. 3rd Street-3rd Floor, Philadelphia, PA 19123. Refer to J.O. 4496489.

VIRGINIA

NEWPORT NEWS PUBLIC SCHOOLS
Math Careers in Teaching

Newport News Public Schools is a dynamic school division which is striving to become an example of a world class educational system. The school system is currently looking for math majors who have a desire to make a difference and help young people be prepared for the math challenge of tomorrow. To help reach this goal, twelve new math teacher/specialist positions are being created. The successful applicants will teach, assist in curriculum development, and help develop an instructional program to meet the needs of students in the 21st century. Resources in the area providing research opportunities include National Aeronautics and Space Administration, Langley Research Center, (NASA), and the Continuous Electron Beam Accelerator Facility, (CEBAF).

You do not have to be an education major to qualify. If you have a masters degree in math, effective human relations skills, enjoy working with young people, and would like the opportunity to make a difference, please contact: Jack E. Wood, Personnel Coordinator, Newport News Public Schools, 12465 Warwick Blvd., Newport News, VA 23606-0130. Additional information and application instructions will be sent all written inquiries.

NEW ZEALAND

THE UNIVERSITY OF WAIKATO
Hamilton, New Zealand
Lectureships in Mathematics and Statistics

The University of Waikato invites applications for two Lectureships in Mathematics and Statistics within the Department of Mathematics and Statistics.

The Department wishes to appoint to one of these Lectureships a statistician with a strong research record in areas associated with its graduate programme in industrial statistics, but specialists in any area of statistics are encouraged to apply. The Department's statisticians collaborate closely with colleagues in the Waikato Centre for Applied Statistics and at the nearby Ruakura research establishment of the Ministry of Agriculture and Fisheries.

The other Lectureship will be in pure mathematics (including mathematical logic); preference will be given to candidates with research interests in some aspect of algebra. It is expected that the persons appointed to each of these Lectureships will have research interests that link with those of existing staff in the Department.

The current salary range for lecturers is currently NZ$37,440.00 - NZ$49,088.00.

Information on the conditions of appointment and details of the method of application are available from Academic Staffing, Personnel, The University of Waikato, Private Bag 3105, Hamilton, New Zealand. Telephone (0064) 7 856 2889, FAX (0064) 7 856 0135, or e-mail: rgtysec16@waikato.ac.nz (via Internet). Applications quoting reference number A93/5 should reach Academic Staffing, Personnel by **20 May 1993**.

Places for applicants children may be available in the creche run by the Campus Creche Society (Inc). Equal opportunity is University policy.

POSITIONS WANTED

Ph.D. 1969, in Computational Mathematics. Twenty years teaching experience. Seventeen published papers, one recently accepted for publication. Desire 1–3 year appointment.

Contact: Wyman Fair, 1018 Cardinal Drive, West Chester, PA 19382.

Married couple, daughter, son, son-in-law with 4 doctoral degrees, 2 U.S. passports, 3 green cards, 107 publications, experience in industry, in schools, in colleges teaching math, computer science, physics, and successfully supervising 16 doctoral dissertations will share 1–5 teaching and/or research positions. Specialties include algebra, geometry, logic. Martin Greendlinger, 887 North Taney Street, Philadelphia, PA 19130.

PUBLICATIONS FOR SALE

MATH SCI PRESS, 53 Jordan Rd., Brookline, MA 02146, 617-738-0307. **Constrained Mechanics and Lie Theory** and **Geometric Structures in Nonlinear Physics**, both by R. Hermann and $95. 44 titles. Write or phone for **Special Sale Prices**.

SENDERO SCIENTIFIC PRESS

Sendero Scientific Press recommends: **Honors Calculus** by Henry Helson. This book presents a rigorous treatment of calculus in clear and simple language. It covers univariate calculus in about 200 pages, and there are additional chapters on vectors and multivariate calculus. It is particularly suitable for gifted students or students who have taken calculus in high school. A preliminary edition was published by the author, and a second edition is in preparation. For examination copies or orders for this or his other succinct book, **Linear Algebra**, write directly to the author at 15 The Crescent, Berkeley, CA 94708. For information on Sendero Scientific Press, write Stephen Parrott, Director, 1678 Shattuck Ave. #70, Berkeley, CA 94709 or see our Nov., Jan., Mar. ads.

PUBLICATIONS WANTED

Wanted: Mathematical books, journals, reprints, ephemera. Contact R. K. Dennis, Math. Dept., White Hall, Cornell U., Ithaca, NY 14853-7901. Tel: 607-255-4027, FAX: 607-255-7149. e-mail: dennis@math.cornell.edu

NEW AND RECENT TITLES

New Textbook!

DIFFERENTIABLE MANIFOLDS

A First Course

L. CONLON, Washington University, St. Louis, MO

The basics of differentiable manifolds, global calculus, differential geometry, and related topics constitute a core of information essential for the first or second year graduate student preparing for advanced courses in differential topology and geometry. Here is a text designed to cover this material in a careful and detailed manner, presupposing only a good grounding in general topology, calculus, and modern algebra. It is ideal for a full year Ph.D. qualifying course and sufficiently self-contained for private study by non specialists wishing to survey the topic. Among the basic themes emphasized by the author is the role of differentiation as a process of linear approximation to nonlinear problems. The well understood methods of linear algebra are applied to the resulting linear problems and, where possible, the results are reinterpreted in terms of the original nonlinear problem.

CONTENTS: Topological Manifolds • Local Theory • Global Theory • Flows and Foliations • Lie Groups • Convectors and 1-Forms • Multilinear Algebra • Integration and Cohomology • Forms and Foliations • Riemannian Geometry • Appendices •Index

1993 369 PP. HARDCOVER
$49.50 ISBN 0-8176-3626-9
BIRKHÄUSER ADVANCED TEXTS: BASLER LEHRBÜCHER

COMPLEXITY THEORY OF REAL FUNCTIONS

KER-I KO, State University of New York at Stony Brook, NY

"The intended audience is specialists in discrete computational complexity, recursion theory, or numerical analysis. Only a basic knowledge of real analysis is needed. The book is well written."

– COMPUTING REVIEWS

1991 309 PP. HARDCOVER
$49.50 ISBN 0-8176-3586-6
PROGRESS IN THEORETICAL COMPUTER SCIENCE

Three Easy Ways to Order!

- **CALL:** Toll-Free 1-800-777-4643. In NJ please call (201) 348-4033. Your reference number is Y692.
- **WRITE:** Birkhäuser, Dept. Y692, 44 Hartz Way, Secaucus, NJ 07096-2491
- **VISIT:** Your Local Technical Bookstore, or urge your librarian to order for your department.

Payment can be made by check, money order or credit card. Please enclose $2.50 for shipping & handling for the first book ($1.00 for each additional book) and add appropriate sales tax if you reside in NY, NJ, MA, VT, PA, VA, TX or CA. Canadian residents please add 7% GST. Prices are valid in North America only, are payable in U.S. currency or its equivalent, and are subject to change without notice. For price and ordering information outside North America, please contact Birkhäuser Verlag AG, Klosterberg 23, CH-4010, Basel, Switzerland. FAX 061 271 7666.

REPRESENTATION AND CONTROL OF INFINITE DIMENSIONAL SYSTEMS

Volume II

A. BENSOUSSAN, I.N.R.I.A., France; **G. DA PRATO**, Scuala Normale Superiore, Pisa, Italy; **M.C. DELFOUR**, Universite de Montreal, Canada & **S.K. MITTER**, M.I.T., Cambridge, MA

This book, presented in two volumes, is a self-contained account of this theory of quadratic cost optimal control for a large class of infinite-dimensional systems. Some of the material covered here appears for the first time in book form. Will be useful for mathematicians and theoretical engineers interested in the field of control.

New-

VOLUME II

CONTENTS: Control of Linear Finite Dimensional Differential Systems Revisited • Controllability • Quadratic Optimal Control: The Finite Time Horizon Case • Quadratic Optimal Control: The Infinite Time Horizon Case

1993 APPROX. 326 PP. HARDCOVER
$65.00 (TENT.) ISBN 0-8176-3642-0
SYSTEMS & CONTROL: FOUNDATIONS & APPLICATIONS

Also Available-

VOLUME I

1992 320 PP. HARDCOVER
$74.50 ISBN 0-8176-3641-2
SYSTEMS & CONTROL: FOUNDATIONS & APPLICATIONS

Forthcoming -

A TOPOLOGICAL INTRODUCTION TO NONLINEAR ANALYSIS

R.F. BROWN, University of California, Los Angeles, CA

Here is a book for the student or professional mathematician who would like to understand some of the beautiful results at the heart of nonlinear analysis. It is based on carefully-expounded ideas from several branches of topology, and illustrated by a wealth of figures. Though the author uses a high level of mathematical sophistication, the pace is relatively leisurely and it is essentially self-contained.

CONTENTS: Preface • **Part I: Fixed Point Existence Theory** • The Topological Point of View • Ascoli-Arzela Theory • Brouwer Fixed Point Theory • Schauder Fixed Point Theory • Equilibrium Heat Distribution • Generalized Bernstein Theory • **Part II: Degree and Bifurcation** • Some Topological Background • Brouwer Degree • Leray-Schauder Degree • Properties of the Leray-Schauder Degree • A Separation Theorem • Compact Linear Operators • The Degree Calculation • The Krasnoselskii-Rabinowitz Theorem • Nonlinear Sturm-Liouville Theory • Euler Buckling • Appendices •Index

1993 APPROX. 180 PP. SOFTCOVER
$24.50 (TENT.) ISBN 0-8176-3706-0

Forthcoming!

ELLIPTIC BOUNDARY PROBLEMS FOR DIRAC OPERATORS

B. BOOSS-BAVNBEK, Roskilde University, Roskilde, Denmark & **K.P. WOJCIECHOWSKI**, IUPUI, Indianapolis, IN

The major goal of this book is to make the theory of elliptic boundary problems accessible to mathematicians and physicists working in global analysis and operator algebras. It focuses on elliptic differential operators of first order as, for example the Cauchy-Riemann operator, the signature operator, the Dirac operator over spin manifolds, and other generalized Dirac operators. It also deals with related, global, boundary problems like the Atiyah-Patodi-Singer condition, the Calderon projection, and other analytically or geometrically defined projections.

Part One presents the analytic preliminaries and then focuses on the role of the Grassmannian of pseudo-differential projections. The second part is devoted to applications such as the index theory of generalized Atiyah-Patodi-Singer problems, cutting and pasting of the index, and the index of the General Linear Conjugation Problem.

The authors have created a book that is suitable reading for professional mathematicians and physicists and will serve as a text for a graduate level course in partial differential equations. They have also made the subject accessible to people working in special areas of such applied topics as high energy physics, nuclear engineering, space and flight engineering, electronics, and materials science.

JULY 1993 APPROX. 300 PP., 38 ILLUS. HARDCOVER
$49.50 (TENT.) ISBN 0-8176-3681-1
MATHEMATICS: THEORY AND APPLICATIONS

SPACE STRUCTURES

Their Harmony and Counterpoint
Fifth Printing, Revised, 1991

A.L. LOEB, Harvard University, Cambridge, MA

"The author's enlightening, clear and appropriately serious writing style, together with the modest demands upon the mathematical experience of the reader, creates a pleasant impression of accessibility and shows that "Mathematics, rightly viewed, possesses not only truth, but supreme beauty - a beauty cold and austere."

– MATHEMATICAL REVIEWS

1991 188 PP. HARDCOVER
$34.50 ISBN 0-8176-3588-2
A PRO SCIENTIA VIVA TITLE
DESIGN SCIENCE COLLECTION

Birkhäuser

Boston Basel Berlin

Princeton

Invitation to Mathematics

Konrad Jacobs

Based on a well-received course designed for philosophy students, this book is an informal introduction to mathematical thinking for undergraduate students. Jacobs discusses an unusually wide range of topics, including such items of contemporary interest as knot theory, optimization theory, and dynamical systems.

30 halftones. 90 line illustrations.
Paper: $29.95 ISBN 0-691-02528-2
Cloth: $60.00 ISBN 0-691-08567-6

Lectures on the Arithmetic Riemann-Roch Theorem

Gerd Faltings

The arithmetic Riemann-Roch Theorem has been shown recently by Bismut-Gillet-Soulé. The proof mixes algebra, arithmetic, and analysis. The purpose of this book is to give a concise introduction to the necessary techniques, and to present a simplified and extended version of the proof. It should enable mathematicians with a background in arithmetic algebraic geometry to understand some basic techniques in the rapidly evolving field of Arakelov-theory.

Annals of Mathematics Studies
Paper: $14.95 ISBN 0-691-02544-4
Cloth: $39.50 ISBN 0-691-08771-7

The Global Nonlinear Stability of the Minkowski Space

Demetrios Christodoulou and Sergiu Klainerman

The aim of this work is to provide a proof of the nonlinear gravitational stability of the Minkowski space-time. More precisely, the book offers a constructive proof of global, smooth solutions to the Einstein Vacuum Equations, which look, in the large, like the Minkowski space-time. In particular, these solutions are free of black holes and singularities.

Princeton Mathematical Series
Cloth: $69.50 ISBN 0-691-08777-6

Hypo-Analytic Structures

Local Theory

François Treves

François Treves provides a systematic approach to the study of the differential structures on manifolds defined by systems of complex vector fields. Serving as his main examples are the elliptic complexes, among which the De Rham and Dolbeault are the best known, and the tangential Cauchy-Riemann operators.

Princeton Mathematical Series
Cloth: $65.00 ISBN 0-691-08744-X

Nilpotence and Periodicity in Stable Homotopy Theory

Douglas C. Ravenel

This volume describes some major advances made in algebraic topology in recent years. During the last ten years a number of significant advances have been made in homotopy theory, and this book fills the need for an up-to-date text on that topic.

Annals of Mathematics Studies
Paper: $22.50 ISBN 0-691-02572-X
Cloth: $59.50 ISBN 0-691-08792-X

The Admissible Dual of *GL(N)* via Compact Open Subgroups

Colin J. Bushnell and Philip C. Kutzko

Here is a full description of a method for analyzing the admissible complex representations of the general linear group $G = Gl(N,F)$ of a non-Archimedean local field F in terms of the structure of these representations when they are restricted to certain compact open subgroups of *G*. The authors define a family of representations of these compact open subgroups, which they call simple types.

Annals of Mathematics Studies
Paper: $24.95 ISBN 0-691-02114-7
Cloth: $59.50 ISBN 0-691-03256-4

Geometry on Poincaré Spaces

Jean-Claude Hausmann and Pierre Vogel

A Poincaré space is a topological space satisfying Poincaré duality, as a compact manifold. This book explains how to perform, in the category of Poincaré spaces, a certain number of geometric constructions which are usual in the world of manifolds (surgery, handle techniques, transversality, etc.).

Mathematical Notes
Paper: $24.95 ISBN 0-691-02113-9

Scattering in Quantum Field Theories

The Axiomatic and Constructive Approaches

Daniel Iagolnitzer

Axiomatic and constructive approaches to quantum field theory first aim to establish it on precise, non-perturbative bases: general axioms and rigorous definition of specific theories respectively. This book provides a modern, self-contained, and coherent presentation of important developments from the last twenty years, most of which have not been treated or discussed in detail in earlier books.

Princeton Series in Physics
Editors: Philip W. Anderson, Arthur S. Wightman, and Sam B. Treiman
Cloth: $49.50 ISBN 0-691-08589-7

Princeton University Press

41 WILLIAM ST., PRINCETON, NJ 08540 • ORDERS: 800-777-4726 • OR FROM YOUR LOCAL BOOKSTORE

TEX *without* Bitmaps

Wouldn't it be nice to be able to preview DVI files at any magnification, not just those for which bitmap fonts have been pre-built? Or to produce truly resolution-independent output that will run on any PostScript device, whether image setter or laser printer?

Perhaps you are looking for an alternative to Computer Modern? There now exist complete outline font sets which include math fonts that are direct replacements for those in CM. Even if you do want to remain faithful to CM, there are distinct advantages to switching to the outline version of the fonts. We supply the tools to do all of this:

DVIWindo — *preview DVI files calling for outline fonts*

* Preview at arbitrary magnification
* Preview in MS Windows™ — a simple, standardized user interface
* Print to any printer with a Windows printer driver
* Show EPSF files with preview on screen — and insert TIFF images

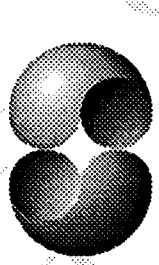
DVIPSONE — *partial font downloading for speed and efficiency*

* Avoid running out of memory on the printer
* Produce truly resolution-independent and page-independent output
* Designed from the bottom up for use with outline fonts on the PC

Fonts — *available from Y&Y in Adobe Type 1™ form (ATM compatible)*

* BSR Computer Modern fonts — with accented characters built in
* LaTeX + SLiTeX font set — line, circle, symbol, lcmss*, and logo*
* AMS font set — Euler, math symbol and Cyrillic fonts
* Lucida® Bright + Lucida New Math — a complete alternative to CM

Resolution-independent PostScript files using outline fonts can be printed by any service bureau, not just those with TEXpertise — and that translates into considerable savings for you. Is it perhaps time to get rid of those huge, complex directories full of bitmap fonts?



Y&Y, 106 Indian Hill, Carlisle, MA 01741 — (800) 742-4059 — (508) 371-3286 — Fax: (508) 371-2004

Lucida is a registered trademark of Bigelow & Holmes Inc. Type 1 is a trademark of Adobe Systems Inc. TEX is a trademark of the American Mathematical Society

NEW!! — KLUWER FOR MATHEMATICS — in 1993

Applied Categorical Structures

A Journal Devoted to Applications of Categorical Methods in Algebra, Analysis, Order, Topology and Computer Science

Editor: **R. Lowen,** *University of Antwerp, Belgium*

1993 Volume 1 (4 issues) ISSN 0927-2852
Institutional rate: $185.00/Dfl.342.00 Individual rate: $112.50/Dfl.180.00

This journal aims to promote communication and increase dissemination of new results and ideas among mathematicians and computer scientists who use categorical methods in their research.

Editorial Board: J. Adámek, B. Banaschewski, H.L. Bentley, G.C.L. Brümmer, E. Colebunders, P.J. Collins, A. Császár, H. Ehrig, M. Erné, M. Fourman, A. Frölicher, E. Giuli, J. Gray, K.A. Hardie, H. Herrlich, S.S. Hong, M. Husek, J.R. Isbell, D.C. Kent, H. Kleisli, J. Lawson, F.E.J. Linton, L.D. Nel, R. Nakagawa, H. Porst, G. Preuss, D. Pumplün, H. Röhrl, S. Salbany, D.S. Scott, Z. Semadeni, M.B. Smyth, G.E. Strecker, R. Street, W. Tholen, O. Wyler

Set-Valued Analysis

An International Journal Devoted to the Theory of Multifunctions and Its Applications

Editor-in-Chief: **Biagio Ricceri,** *University of Catania, Italy*

1993 Volume 1 (4 issues) ISSN 0927-6947
Institutional rate: $185.00/Dfl.342.00 Individual rate: $112.50/Dfl.180.00

This international journal is devoted to all aspects of mathematical analysis involving multifunctions (set-valued maps) and topics related to them.

Editorial Board: Z. Artstein, J.-P. Aubin, G. Beer, Y.G. Borisovich, J.M. Borwein, A. Bressan, F.E. Browder, C. Castaing, A. Cellina, K.-C. Chang, B. Cornet, K. Fan, H. Frankowska, L. Górniewicz, A. Granas, A.D. Ioffe, P.S. Kenderov, M. Kisielewicz, S. Levi, V.L. Levin, E. Michael, M.Z. Nashed, C. Olech, J.-P. Penot, S.M. Robinson, R.T. Rockafellar, W. Takahashi, E. Tarafdar, A.A. Tolstonogov, M. Valadier, R.J.-B. Wets

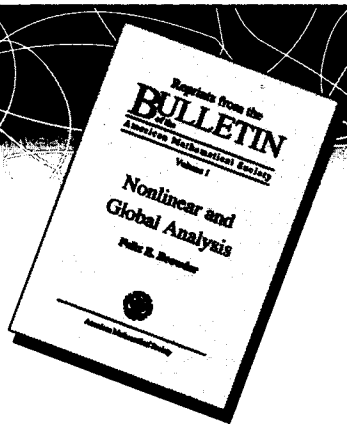
Kluwer Academic Publishers
P.O. Box 358 • Accord Station • Hingham, MA 02018-0358
P.O. Box 322 • 3300 AH Dordrecht • The Netherlands

Paper submissions should be sent in triplicate to:
Journals Editorial Office
P.O. Box 17 • 3300 AA Dordrecht
The Netherlands

Kluwer Academic Publishers is offering a 25% discount on all books to individual members of the American Mathematical Society. Orders must be prepaid, sent directly to the publishers and include the signed statement, "I am a member of the AMS, this purchase is for my own personal use."

New Series from the AMS

Bulletin Reprint Series



Nonlinear and Global Analysis

Felix E. Browder, Editor
Volume 1

This volume contains a number of research-expository articles that appeared in the *Bulletin of the AMS* between 1979 and 1984 and that address the general area of nonlinear functional analysis and global analysis and their applications. The central theme concerns qualitative methods in the study of nonlinear problems arising in applied mathematics, mathematical physics, and geometry. Since these articles first appeared, the methods and ideas they describe have been applied in an ever-widening array of applications. Readers will find this collection useful, as it brings together a range of influential papers by some of the leading researchers in the field.

1991 *Mathematics Subject Classification*: 35, 47, 49, 58
ISBN 0-8218-8500-6, 625 pages (softcover), December 1992
Individual member $44, List price $73, Institutional member $58
To order, please specify BULLRE/INA

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

International Press Company Presents:

Communications in Analysis and Geometry

Editor-in-Chief: Peter Li, Univ. California, Irvine
Editors: C. Gordon, K. Uhlenbeck, T. Wolff,
R. Friedman, R. Schoen

This journal publishes high quality papers on subjects related to classical analysis, partial differential equations, algebraic geometry, differential geometry, and topology. There will be four issues published annually. To prevent a backlog, the publisher may occasionally increase the number of pages for each issue. Accepted papers will appear within three months of their acceptance.

Selected Contributors to the January 1993 issue:
O. Filho, S. X. He, B. Rodin, R. C. Penner, S. Chang,
S. Y. Cheng, R. Hamilton

Subscriptions: Institutions/Libraries $160.00
Individuals $75.00
ISSN 1019-8385

To Order, contact: Elizabeth Johnstone
International Press Company
P.O. Box 2872
Cambridge, MA 02238-2872

International Press Company Presents:

Chern, A Great Geometer

Editor: Shing-Tung Yau

This book is a presentation by distinguished mathematicians and physicists on their personal relationship with the world famous mathematician S.S. Chern. It includes a biography and a comment by Chern himself. Historically interesting photographs are included.

Discount Price $20 360 pp. ISBN 962-7670-02-2

Mathematical Physics Series, Vol. 1
General Editor: Elliott Lieb, Princeton University

Essays on Mirror Manifolds

Editor: Shing-Tung Yau

As part of our series in mathematical physics, this volume is a collection of excellent papers by distinguished mathematicians and theoretical physicists. It contains both introductory discussions on the theory of mirror manifolds as well as papers describing more recent results.

Discount Price $20 512 pp. ISBN 962-7670-01-4

To Order: Elizabeth Johnstone, International Press Co.
P.O. Box 2872, Cambridge, MA 02238-2872

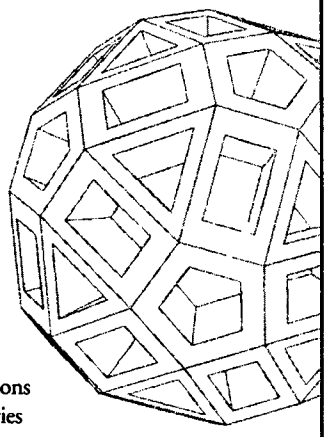
H. S. M. Coxeter on the Zometool

"The Zometool considerably simplifies the procedure of construction and unifies the study of space frame structures into one coherent system, of great educational value in the teaching of solid geometry, science, art, engineering and architecture."

H. S. M. Coxeter

Call us at (505) 989-4065
for a free sample and info.

BioCrystal, Inc.
4593 N. Broadway C-111 • Boulder, CO 80304



Zometool

The unique 31 zone construction kit for rapidly creating and visualizing:
- Penrose tiles and quasi-crystals
- N-Dimensional fractal geometries
- Regular polytopes up to 31 dimensions
- 2,3, & 4D Golden Section geometries

Translations of
MATHEMATICAL MONOGRAPHS
Volume 112

Introduction to the General Theory of Singular Perturbations

S. A. Lomov

This book is aimed at researchers and students in physics, mathematics, and engineering. It contains the first systematic presentation of a general approach to the integration of singularly perturbed differential equations describing nonuniform transitions, such as the occurrence of a boundary layer, discontinuities, boundary effects, and so on. The method of regularization of singular perturbations presented here can be applied to the asymptotic integration of systems of ordinary and partial differential equations.

1991 *Mathematics Subject Classification* : 34
ISBN 0-8218-4569-1, 375 pages (hardcover), Dec. 1992
Indiv. member $121, List price $201, Inst. member $161
To order, please specify MMONO/112NA

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

AMERICAN MATHEMATICAL SOCIETY

Application for Membership 1993

(January–December)

Date..... 19.....

Please read the reverse side of this form to determine what membership category you are eligible for. Then fill out this application and return it as soon as possible.

Subscriptions to the Notices *and the* Bulletin *(New Series) are included as part of your membership.*

.....
Family Name *First* *Middle*

Please indicate below the way your name should appear in the Combined Membership List.

.....
Family Name *First* *Middle or Initial*

Place of Birth .....
City *State* *Country*

Date of Birth .....
Day *Month* *Year*

If formerly a member of AMS, please indicate dates .....

Check here if you are now a member of either MAA ☐ or SIAM ☐

Degrees, with institutions and dates .....

.....

.....

Present position .....

Firm or institution .....

.....
City *State* *Zip/Country*

Primary Fields of Interest (choose five from the list at right)

....

Secondary Fields of Interest (choose from the list at right)

....

Address for all mail

.....

.....

.....

Telephone number(s) .....

Electronic address .....

.....
Signature

Prepayment Methods and Mailing Addresses

All payments must be in U.S. Funds.

Send checks, money orders, UNESCO coupons to American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904

To use VISA or MasterCard, fill in information requested and mail to American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248 or call (401) 455-4000 or 1-800-321-4AMS.

For Foreign Bank Transfers: The name and address of the AMS bank is State Street Bank and Trust Company, ABA #011000028, Account #0128-262-3, 225 Franklin St., Boston, MA 02110.

VISA ☐ *MasterCard* ☐ ....
Account number *Expiration date*

Fields of Interest

If you wish to be on the mailing lists to receive information about publications in fields of mathematics in which you have an interest, please consult the list of major headings of the 1991 Mathematics Subject Classification below. Select no more than five category numbers and fill in the numbers where indicated on the left. These categories will be added to your computer record so that you will be informed of new publications or special sales in the fields you have indicated.

00 General
01 History and biography
03 Mathematical logic and foundations
04 Set theory
05 Combinatorics
06 Order, lattices, ordered algebraic structures
08 General algebraic systems
11 Number theory
12 Field theory and polynomials
13 Commutative rings and algebras
14 Algebraic geometry
15 Linear and multilinear algebra; matrix theory
16 Associative rings and algebras
17 Nonassociative rings and algebras
18 Category theory, homological algebra
19 *K*-theory
20 Group theory and generalizations
22 Topological groups, Lie groups
26 Real functions
28 Measure and integration
30 Functions of a complex variable
31 Potential theory
32 Several complex variables and analytic spaces
33 Special functions
34 Ordinary differential equations
35 Partial differential equations
39 Finite differences and functional equations
40 Sequences, series, summability
41 Approximations and expansions
42 Fourier analysis
43 Abstract harmonic analysis
44 Integral transforms, operational calculus
45 Integral equations
46 Functional analysis
47 Operator theory
49 Calculus of variations and optimal control; optimization
51 Geometry
52 Convex and discrete geometry
53 Differential geometry
54 General topology
55 Algebraic topology
57 Manifolds and cell complexes
58 Global analysis, analysis on manifolds
60 Probability theory and stochastic processes
62 Statistics
65 Numerical analysis
68 Computer science
70 Mechanics of particles and systems
73 Mechanics of solids
76 Fluid mechanics
78 Optics, electromagnetic theory
80 Classical thermodynamics, heat transfer
81 Quantum theory
82 Statistical mechanics, structure of matter
83 Relativity and gravitational theory
85 Astronomy and astrophysics
86 Geophysics
90 Economics, operations research, programming, games
92 Biology and other natural sciences, behavioral sciences
93 Systems theory; control
94 Information and communication, circuits

M3NO

Membership Categories

Please read the following to determine what membership category you are eligible for, and then indicate below the category for which you are applying.

*For **ordinary members** whose annual professional income is below $45,000, the dues are $81, for those whose annual professional income is $45,000 or more, the dues are $108.*

*The **CMS Cooperative Rate** applies to ordinary members of the AMS who are also members of the Canadian Mathematical Society and reside outside of the U.S. For members whose annual professional income is $45,000 or less, the dues are $69 and for those whose annual professional income is above $45,000, the dues are $92.*

*For a **joint family membership**, one pays ordinary dues, based on his or her income, and the other pays ordinary dues based on his or her income, less $20. (Only the member paying full dues will receive the* Notices *and the* Bulletin *as a privilege of membership, but both members will be accorded all other privileges of membership.)*

*Minimum dues for **contributing members** are $162.*

*For either **students** or **unemployed individuals**, dues are $27, and annual verification is required.*

*The annual dues for **reciprocity members** who reside outside the U.S. and Canada are $54. To be eligible for this classification, members must belong to one of those foreign societies with which the AMS has established a reciprocity agreement, and annual verification is required. Reciprocity members who reside in the U.S. or Canada must pay ordinary member dues ($81 or $108).*

*The annual dues for **Category-S members**, those who reside in developing countries are $27.*

*Members can purchase a **multi-year membership** by prepaying their current dues rate for either two, three, four or five years. This option is not available to either unemployed or student members.*

1993 Dues Schedule (January through December)

For any category of membership where more than one dues level is given, see the above for descriptions of Members' Categories.

Ordinary member ..... ☐ $81 ☐ $108

CMS Cooperative rate ..... ☐ $69 ☐ $92

Joint family member (full rate) ..... ☐ $81 ☐ $108

Joint family member (reduced rate) ..... ☐ $61 ☐ $88

Contributing member (minimum $162) ..... ☐

Student member (please verify)[1] ..... ☐ $27

Unemployed member (please verify)[2] ..... ☐ $27

Reciprocity member (please verify)[3] ..... ☐ $54 ☐ $81 ☐ $108

Category-S member ..... ☐ $27

Multi-year membership ..... $ ..... for ..... years

1 Student Verification (sign below)

I am a full-time student at .....

..... currently working toward a degree.

2 Unemployed Verification (sign below) *I am currently unemployed and actively seeking employment. My unemployment status is not a result of voluntary resignation or of retirement from my last position.*

3 Reciprocity Membership Verification (sign below) *I am currently a member of the society indicated on the right and am therefore eligible for reciprocity membership.*

Reciprocating Societies

- ☐ Allahabad Mathematical Society
- ☐ Asociación Matemática Española
- ☐ Australian Mathematical Society
- ☐ Berliner Mathematische Gessellschaft e.V.
- ☐ Calcutta Mathematical Society
- ☐ Dansk Matematisk Forening
- ☐ Deutsche Mathematiker-Vereinigung e.V.
- ☐ Edinburgh Mathematical Society
- ☐ Gesellschaft für Angewandte Mathematik und Mechanik
- ☐ Glasgow Mathematical Association
- ☐ Indian Mathematical Society
- ☐ Iranian Mathematical Society
- ☐ Irish Mathematical Society
- ☐ Íslenzka Staerðfraeðafélagið
- ☐ Israel Mathematical Union
- ☐ János Bolyai Mathematical Society
- ☐ Korean Mathematical Society
- ☐ London Mathematical Society
- ☐ Malaysian Mathematical Society
- ☐ Mathematical Society of Japan
- ☐ Mathematical Society of the Philippines
- ☐ Mathematical Society of the Republic of China
- ☐ New Zealand Mathematical Society
- ☐ Nigerian Mathematical Society
- ☐ Norsk Matematisk Forening
- ☐ Österreichische Mathematische Gesellschaft
- ☐ Polskie Towarzystwo Matematyczne
- ☐ Punjab Mathematical Society
- ☐ Ramanujan Mathematical Society
- ☐ Real Sociedad Matemática Española
- ☐ Sociedad Colombiana de Matemática
- ☐ Sociedad de Matemática de Chile
- ☐ Sociedad Matemática de la Republica Dominicana
- ☐ Sociedad Matemática Mexicana
- ☐ Sociedade Brasileira Matemática
- ☐ Sociedade Brasileira de Matemática Aplicada e Computacional
- ☐ Sociedade Paranaense de Matemática
- ☐ Sociedade Portuguesa de Matemática
- ☐ Societat Catalana de Matemàtiques
- ☐ Société de Mathématiques Appliquées et Industrielles
- ☐ Société Mathématique de Belgique
- ☐ Société Mathématique de France
- ☐ Société Mathématique Suisse
- ☐ Southeast Asian Mathematical Society
- ☐ Suomen Matemaattinen Yhdistys
- ☐ Svenska Matematikersamfundet
- ☐ Union Mathemática Argentina
- ☐ Union of Czechoslovak Mathematicians and Physicists
- ☐ Unione Matematica Italiana
- ☐ Vijnana Parishad of India
- ☐ Wiskundig Genootschap

.....

Signature

Order Form

Ordered by:

Name _____

Address _____

_____

City _____ State _____ Zip _____

Country _____

Code _____

Mail to (if different):

Name _____

Address _____

_____

City _____ State _____ Zip _____

Country _____

Code _____

For orders with remittances:
American Mathematical Society
P. O. Box 5904
Boston, MA 02206-5904
401-455-4000

For VISA or MasterCard orders:
American Mathematical Society
P. O. Box 6248
Providence, Rhode Island 02940-6248
800-321-4AMS (321-4267)

Qty	Code	Title	Price	Total
			$	$
		Optional delivery by air to foreign addresses, add $6.50 per copy.		
		Residents of Canada, please include 7% GST. Total due		$

NOTI

__ Check or Money Order __ VISA __ MasterCard

Card Number _____ Expiration Date _____

Signature _____

CHARGE BY PHONE IN THE UNITED STATES AND CANADA 800-321-4AMS (321-4267)

Customers in these areas should request price information and order directly from the indicated distributors: **EUROPE, MIDDLE EAST, AFRICA**: Oxford University Press, Walton Street, Oxford OX2 6DP England, Tel: 0865 56767, Telefax 0865 56646, Telex 837330 OXPRES G; exclusive distributor of AMS books. **JAPAN:** Maruzen Co. Ltd., P. O. Box 5050, Tokyo International 100-31, Japan. Tel. Tokyo 03-3272-7211, Telex J26516; exclusive distributor of AMS books and journals. **INDIA**: Allied Publishers Pvt. Ltd., 15, J. N. Herdia Marg., Ballard Estate, Bombay 400038, India; exclusive distributor of AMS books.

Please send me information about AMS membership

__ individual membership
__ institutional membership
__ corporate membership
__ institutional associate

Publications, videotapes, and miscellaneous items are sent via UPS to U.S. residential addresses, RPS or UPS to U.S. business addresses, and as printed matter elsewhere unless another delivery method is requested. Charges for surface delivery are paid by the AMS. For air delivery outside the U.S., please include an additional $6.50 per item. **Software** is sent via UPS Second Day Air to U.S. addresses and via U.S. Postal Service air parcel post to addresses outside the United States. Add shipping and handling for software: $8 per order in the U.S. and Canada; outside the U.S. and Canada $35 per order ($15 per order for AMS-TeX and/or AMSFonts only). **Journal back numbers,** *Mathematical Reviews* indexes, and review volumes are sent via surface mail to any destination unless air delivery is requested. Postage for surface mail is paid by the AMS. Air delivery rates, which will be quoted upon request, must be paid by the purchaser.

Staple here

Fold here

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 554B PROVIDENCE, RI

POSTAGE WILL BE PAID BY ADDRESSEE

Membership and Customer Services
AMERICAN MATHEMATICAL SOCIETY
P. O. Box 6248
Providence, RI 02940-9943

Fold here

Fasten PAYMENT securely

Change of Address

Members of the Society who move or who change positions are urged to notify the Providence Office as soon as possible.

Journal mailing lists must be printed four to six weeks before the issue date. Therefore, in order to avoid disruption of service, members are requested to provide the required notice well in advance.

Besides mailing addresses for members, the Society's records contain information about members' positions and their employers (for publication in the *Combined Membership List*). In addition, the AMS maintains records of members' honors, awards, and information on Society service. Information of the latter kind appears regularly in *Notices*.

When changing their addresses, members are urged to cooperate by supplying the information requested below. The Society's records are of value only to the extent that they are current and accurate.

If your address has changed or will change within the next two or three months, please fill out this form, supply any other information appropriate for the AMS records, and mail to the address given below.

Name: _____ Customer code: _____

Change effective as of: _____

Old mailing address: _____

NEW mailing address: _____

New position: _____

If mailing address is not that of your employer, please supply the following information:

New employer: _____

Location of employer: _____
City State/Province Country Zip Code

Telephone number(s): _____

Electronic address(es): _____

Recent honors and awards: _____

Personal items for publication in *Notices*: _____

Mail completed form to:

Customer Services, AMS, P.O. Box 6248, Providence, RI 02940

or send the above information by e-mail to:

amsmem@math.ams.org or cust-serv@math.ams.org

Staple here

Fold here

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 554B PROVIDENCE, RI

POSTAGE WILL BE PAID BY ADDRESSEE

Membership and Customer Services
AMERICAN MATHEMATICAL SOCIETY
P. O. Box 6248
Providence, RI 02940-9943

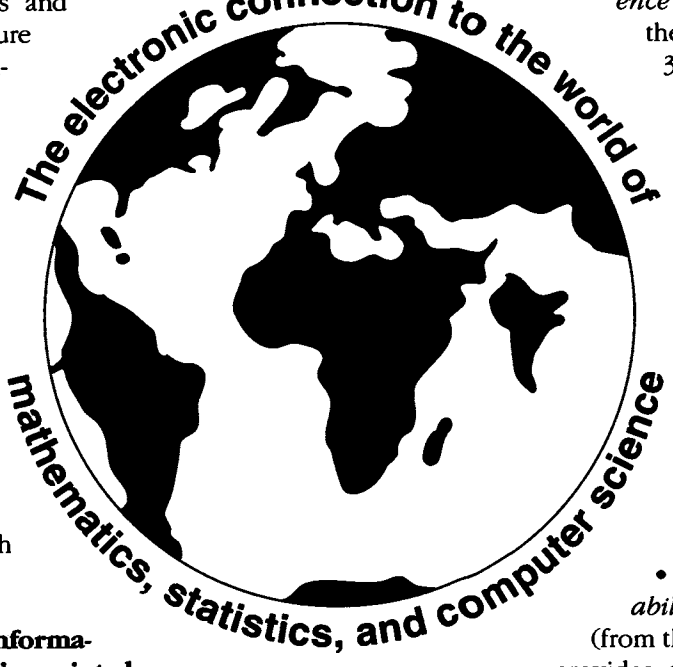
Fold here

Fasten PAYMENT securely

MathSci® Online

from the American Mathematical Society

MathSci Online offers you immediate access to evaluative reviews and abstracts of the world's literature on mathematics, statistics, computer science, and their applications, including operations research, econometrics, engineering, physics, biology and many other related fields. Anyone with a personal computer and modem or an Internet account can access this online interactive database easily. A valuable feature of MathSci Online is that it is updated frequently. Approximately 9,000 new entries are added each month.



MathSci Online includes information published in the following printed publications:

- *Mathematical Reviews* (MR) dating back to 1940, with reviews from 1980 to the present, is the recognized reviewing and abstracting journal covering the published mathematical research literature. Over 47,000 reviews or abstracts are published each year in twelve monthly issues.

- *Current Mathematical Publications* (CMP). This journal of current research, published every three weeks, is a subject index of recent and forthcoming mathematical publications.

- *Computing Reviews* (CR) and *ACM Guide to Computing Literature* (ACL), published by the Association for Computing Machinery, offers reviews and indexes to information in all areas of computer science.

- *Technical Reports in Computer Science* (STR), available in print from the AMS, offers a listing of over 35,000 reports collected by Stanford University over the past thirty years from approximately 100 computer science departments and research groups worldwide.

- *Current Index to Statistics* (CIS), published by the American Statistical Association and the Institute of Mathematical Statistics, provides an index to materials published in statistics.

- *Index to Statistics and Probability* (TUKEY) from 1910–1968 (from the Information Access Series), provides a variety of access points to 25,000 works in statistics.

MathSci Online is available on DIALOG, the European Space Agency (ESA-IRS), and NACSIS (Japan). Both DIALOG and ESA can be accessed via the Internet.

MathSci Tapes - All the information from MathSci Online is also available for lease on magnetic tape. Updates are provided monthly in ASCII format. Current and retrospective files are available. Retrieval software is not included.

MathSci Disc - *Mathematical Reviews* and *Current Mathematical Publications* are also available on compact disc. MathSci Disc is a convenient, easy-to-use reference tool.

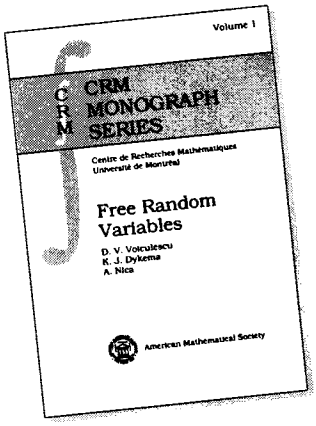
For more information please call or write:
American Mathematical Society, Database Services, P.O. Box 6248, Providence, RI 02940 USA
800-321-4AMS (U.S. and Canada), 401-455-4166 (worldwide), mathsci@math.ams.org (Internet), 401-455-4004 (fax)

DIALOG information: 1-800-3DIALOG; ESA-IRS information: 39(6)941801; NACSIS information: 81-3-3942-2351

American Mathematical Society & Centre de Recherches Mathématiques

New Series!

CRM Monograph Series



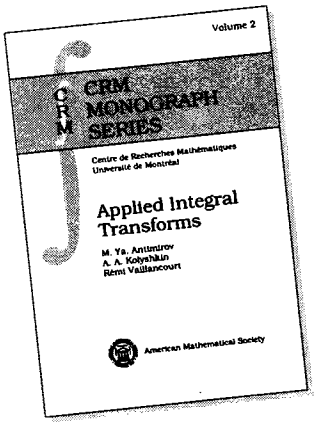
Volume 1

Free Random Variables

D. V. Voiculescu, K. J. Dykema, and A. Nica

This book represents the first comprehensive introduction to free probability theory, a highly noncommutative probability theory with independence based on free products instead of tensor products. Basic examples of this kind of theory are provided by convolution operators on free groups and by the asymptotic behavior of large Gaussian random matrices. In addition to researchers and graduate students in mathematics, this book is of interest to physicists and others who use random matrices.

1991 *Mathematics Subject Classification*: 46; 47, 60
ISBN 0-8218-6999-X, 70 pages (hardcover), December 1992
Individual member $23, List price $39, Institutional member $31
To order, please specify CRMM/1NA



Volume 2

Applied Integral Transforms

M. Ya. Antimirov, A. A. Kolyshkin, and Rémi Vaillancourt

The first section of this book, which proceeds mainly by examples and includes exercises, requires little mathematical background and can be considered an introduction to the subject of integral transforms. In the second part of the book, the method of integral transforms is used to solve modern applied problems in convective stability, temperature fields in oil strata, and eddy current testing. The choice of topics reflects the author's research experience and involvement in industrial applications.

1991 *Mathematics Subject Classification*: 35; 76, 80, 78, 44
ISBN 0-8218-6998-1, 265 pages (hardcover), February 1993
Individual member $40, List price $66, Institutional member $53
To order, please specify CRMM/2NA

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

TRANSLATIONS OF MATHEMATICAL MONOGRAPHS

Arithmetic of Probability Distributions, and Characterization Problems on Abelian Groups

Gennadiĭ Fel'dman
Volume 116

This book studies the problem of the decomposition of a given random variable into a sum of independent random variables (components). Starting from the famous Cramér theorem, which says that all components of a normal random variable are also normal random variables, the central feature of the book is Fel'dman's use of powerful analytical techniques. The first part of the book presents results on the arithmetic of probability distributions of random variables with values in a locally compact abelian group. The second part studies problems of characterization of a Gaussian distribution of a locally compact abelian group by the independence or identical distribution of its linear statistics.

1991 *Mathematics Subject Classification*: 60; 22, 43
ISBN 0-8218-4593-4, 223 pages (hardcover), March 1993
Individual member $76, List price $127, Institutional member $102
To order, please specify MMONO/116NA

Uncountably Categorical Theories

Boris Zilber
Volume 117

The 1970s saw the appearance and development in categoricity theory of a tendency to focus on the study and description of uncountably categorical theories in various special classes defined by natural algebraic or syntactic conditions. In *Uncountably Categorical Theories*, Zilber's goal is to develop a structural theory of categoricity, using methods and results of the special classification theory, and to construct on this basis a foundation for a general classification theory of categoricity, that is, a theory aimed at describing large classes of uncountably categorical structures not restricted by any syntactic or algebraic conditions.

1991 *Mathematics Subject Classification*: 03, 05
ISBN 0-8218-4586-1, 122 pages (hardcover), March 1993
Individual member $58, List price $97, Institutional member $78
To order, please specify MMONO/117NA

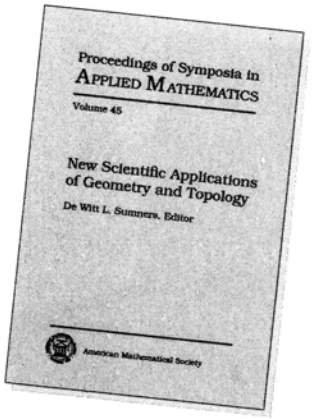
All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* **Order from**: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS (321-4267) in the U.S. and Canada to charge with VISA or MasterCard.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

Proceedings of Symposia in APPLIED MATHEMATICS

Volumes 45 & 46

New Scientific Applications of Geometry and Topology

De Witt L. Sumners, *Editor*

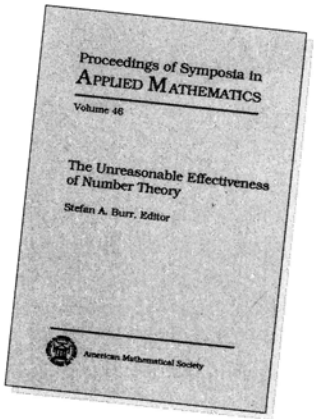


Based on an AMS Short Course held in January 1992, this book contains articles by a chemist and a biologist about mathematics, and four articles by mathematicians writing about science. All are expository and require no specific knowledge of the science and mathematics involved. Because this book communicates the excitement and utility of mathematics research at an elementary level, it is an excellent textbook in an advanced undergraduate mathematics course.

1991 *Mathematics Subject Classification*: 53, 57; 82, 92
ISBN 0-8218-5502-6, 250 pages (hardcover), November 1992
List price $49, Individual member $29, Institutional member $39
To order, please specify PSAPM/45NA

The Unreasonable Effectiveness of Number Theory

Stefan A. Burr, *Editor*



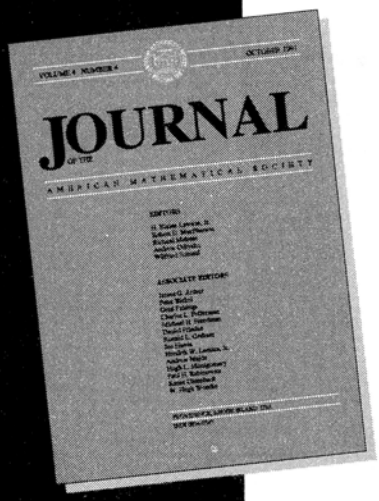
This book is based on the AMS Short Course, The Unreasonable Effectiveness of Number Theory, held in Orono, Maine, in August 1991. This short course provided some views into the great breadth of applications of number theory outside cryptology and highlighted the power and applicability of number theoretic ideas. This book will appeal to a general mathematical audience as well as to researchers in other areas of science and engineering who wish to learn how number theory is being applied outside of mathematics. All of the chapters are written by leading specialists in number theory and provide excellent introductions to various applications.

1991 *Mathematics Subject Classification*: 11
ISBN 0-8218-5501-8, 125 pages (hardcover), November 1992
List price $37, Individual member $22, Institutional member $30
To order, please specify PSAPM/46NA

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

Journals
from the
American Mathematical Society

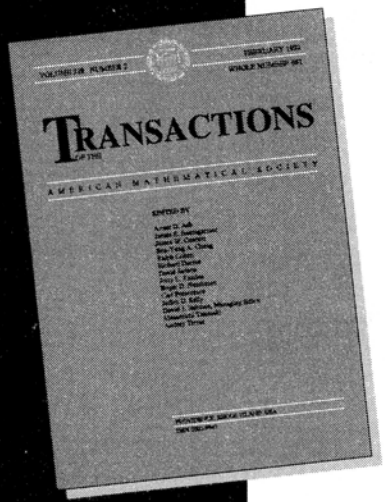
Journal of the American Mathematical Society



When the *Journal of the American Mathematical Society* first appeared in 1988, it gained instant respect for its careful selection of relevant, important, and timely research. The editors are devoted to publishing research articles of the highest quality in all areas of pure and applied mathematics. Editors of this journal include: Michael Artin, H. Blaine Lawson, Jr., Richard Melrose, Wilfried Schmid, and Robert E. Tarjan.

1993 Subscription Prices List $144*, Institutional member $115*, Individual member $86* (ISSN 0894-0347). Back volumes are also available. Call AMS Customer Services for prices.
To order, please specify 93JAMS/NA

Transactions of the American Mathematical Society



American Mathematical Society journals are respected worldwide for publishing high-quality research. *Transactions of the American Mathematical Society* features well-written papers devoted to pure and applied mathematics. This important monthly journal was first published in 1900.

1993 Subscription Prices List $893**, Institutional member $714** (ISSN 0002-9947). Back volumes are also available. Call AMS Customer Services for prices.
To order, please specify 93TRAN/NA

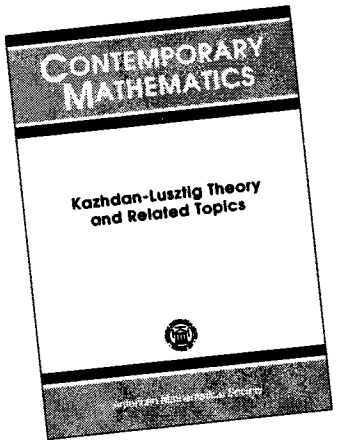
*Postage surcharge: India $18; other foreign $8. Optional delivery: First class $13; airmail $36.
Postage surcharge: India $50; other foreign $27. Optional delivery: First class $38; airmail $127. All prices subject to change. *Prepayment required.* **Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.

CONTEMPORARY MATHEMATICS

Volumes 139 & 140

Kazhdan-Lusztig Theory and Related Topics

Vinay Deodhar, *Editor*

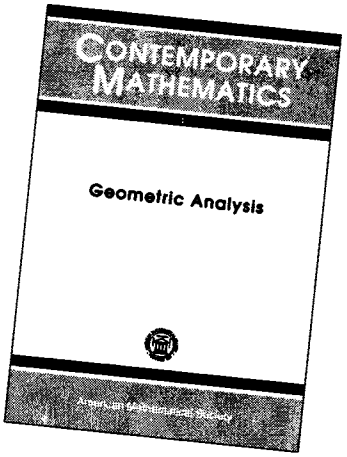


This book is perhaps the first to discuss all aspects of the theory and will give readers a flavor of the range of topics involved. The articles present recent work in Kazhdan-Lusztig theory, including representations of Kac-Moody Lie algebras, geometry of Schubert varieties, intersection cohomology of stratified spaces, and some new topics such as quantum groups.

1991 *Mathematics Subject Classification*: 14, 17, 20, 22; 51, 55
ISBN 0-8218-5150-0, 277 pages (softcover), December 1992
Individual member $28, List price $46, Institutional member $37
To order, please specify CONM/139NA

Geometric Analysis

Eric L. Grinberg, *Editor*



This volume contains the refereed proceedings of the Special Session on Geometric Analysis held at the AMS meeting in Philadelphia in October 1991. The papers in this collection should help to better define the notion of geometric analysis by illustrating emerging trends in the subject. Containing articles varying from the expository to the technical, this book presents the latest results in a broad range of analytic and geometric topics.

1991 *Mathematics Subject Classification*: 53, 58, 52, 44
ISBN 0-8218-5153-5, 167 pages (softcover), December 1992
Individual member $24, List price $40, Institutional member $32
To order, please specify CONM/140NA

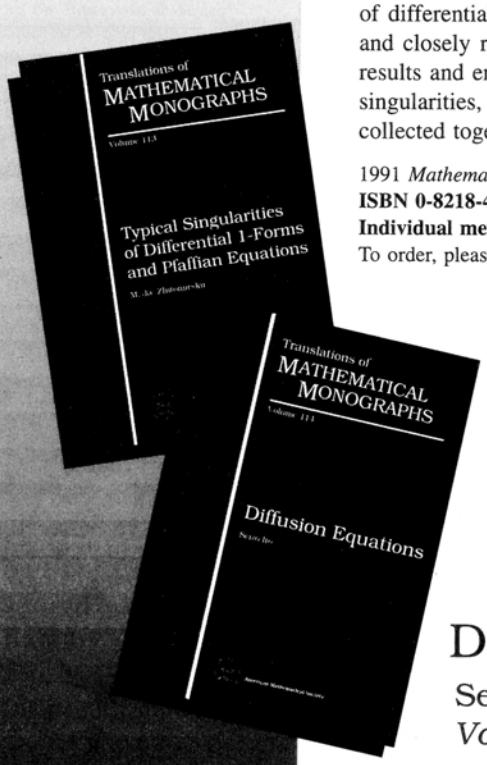
All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* **Order from:** American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS in the U.S. and Canada to charge with VISA or MasterCard. Residents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

TRANSLATIONS OF MATHEMATICAL MONOGRAPHS

Typical Singularities of Differential 1-Forms and Pfaffian Equations

M. Ja. Zhitomirskiĭ

Volume 113



In addition to collecting results on the geometry of singularities and classification of differential forms and Pfaffian equations, this monograph discusses applications and closely related classification problems. Zhitomirskiĭ presents proofs with all results and ends each chapter with a summary of the main results, a tabulation of the singularities, and a list of the normal forms. The main results of the book are also collected together in the introduction.

1991 *Mathematics Subject Classification*: 58; 35, 53, 93
ISBN 0-8218-4567-5, 176 pages (hardcover), December 1992
Individual member $70, List price $116, Institutional member $93
To order, please specify MMONO/113NA

Diffusion Equations

Seizô Itô

Volume 114

This book presents a self-contained exposition of the theory of initial-boundary value problems for diffusion equations. Intended as a graduate textbook, the book is of interest to mathematicians as well as theoretical physicists. Because it uses as little knowledge of functional analysis as possible, the book is accessible to those with a background in multivariable calculus, elementary Lebesgue integral theory, and basic parts of the theory of integral equations. Itô treats diffusion equations with variable coefficients associated with boundary conditions and the corresponding elliptic differential equations.

1991 *Mathematics Subject Classification*: 35
ISBN 0-8218-4570-5, 225 pages (hardcover), December 1992
Individual member $56, List price $93, Institutional member $74
To order, please specify MMONO/114NA

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

MAA Minicourse Preregistration Form, Vancouver, Canada

August 15–19, 1993

To register for MAA Minicourse(s), please complete THIS FORM or a PHOTOCOPY OF THIS FORM and return it with your payment to:

Minicourse Coordinator
Mathematical Association of America
1529 Eighteenth Street, N.W.
Washington, DC 20036
Telephone: 202-387-5200

(Please print) Surname _____ First _____ Middle _____ Telephone: _____

Street address _____ City _____ State _____ Zip _____

- Deadline for MAA Minicourse preregistration: June 11, 1993 (After this date, potential participants are encouraged to call the MAA headquarters at 800-331-1622 or 202-387-5200.)
- Deadline for cancellation in order to receive a 50% refund: August 2, 1993
- Each participant must fill out a separate Minicourse Preregistration form.
- Enrollment is limited to two Minicourses, subject to availability.
- Please complete the following and send both form and payment to the Minicourse Coordinator at the above address:

  I would like to attend ☐ 1 Minicourse ☐ 2 Minicourses

  Please enroll me in MAA Minicourse(s): #____ and #____

  In order of preference, my alternatives are: #____ and #____

- PAYMENT

  Check enclosed: US$ _____ Credit card type: ☐ MasterCard ☐ Visa

  Credit card # _____ Expiration date: _____

  Your Employing Institution _____ Signature (as it appears on credit card) _____

Minicourse Number and Name	Organized by	Fee
1. The Fibonacci and Catalan numbers	Ralph P. Grimaldi	US$36
2. Teaching applied mathematics via *Maple*	Robert J. Lopez	US$45
3. Environmental modeling via the qualitative, visual, and computational	B. A. Fusaro	US$45
4. Implementing the Harvard calculus curriculum	Wayne Raskind	US$45
5. Teaching finite mathematics to a large class of arts and education students	J. Chris Fisher	US$45
6. Combinatorial design theory	Eric Mendelsohn	US$36
7. Lagrange multipliers	Edward J. Barbeau, Jr.	US$36
8. Earth algebra: College algebra with applications to environmental issues	Christopher Schaufele & Nancy E. Zumoff	US$36
9. Round-robin tournaments: an introduction	John W. Moon	US$45
10. Iteration	Ronald J. Lancaster	US$36
11. Learning abstract algebra by programming in ISETL	Ed Dubinsky & Rina Zazkis	US$45

☐ I plan on preregistering for the Vancouver, Canada meetings **ONLY** in order to attend the MAA Minicourse(s) indicated above. It is my understanding that, should the course(s) of my choice be filled, a full refund of the Vancouver meetings preregistration fee will be made.

Preregistration/Hotel Form, Vancouver, Canada
International Joint Mathematics Meetings
August 15–19, 1993

Based on form of payment, please complete this form and return to:

In U.S. Funds: Mathematics Meetings Service Bureau (MMSB)
P. O. Box 6887
Providence, Rhode Island 02940 U.S.A.
401-455-4143

In Canadian Funds: CMS Executive Office
577 King Edward, Suite 109
P. O. Box 450, Station A
Ottawa, Ontario, Canada K1N 6N5
613-564-2223

DEADLINES

Ordinary Preregistration (including tickets)	June 11, 1993
Hotel Reservations through MMSB	June 11, 1993
Final Preregistration (no hotel or tickets)	July 19, 1993
Hotel Changes/Cancellations through MMSB*	July 1, 1993
50% Refund on Banquets & Tours* (no refunds after this date)	August 2, 1993
50% Refund on Joint Meetings Preregistration* (no refunds after this date)	August 11, 1993

*Cancellations and/or changes to preregistration, tickets, and reservations at the Holiday Inn must be made through the MMSB, regardless of where the original payment was sent.

REGISTRATION FEES

JOINT MATHEMATICS MEETINGS	Preregistration by July 19, 1993 US$	CDN$
Member of AMS, CMS, MAA, ΠΜΕ	135	165
* Emeritus Member of AMS or MAA and Retired CMS	35	43
* Nonmember	210	256
* Students:		
High School	2	2
Graduate or Undergraduate	35	43
* High School Teachers or Librarians	30	37
* Unemployed	35	43

(N.B.: A separate form appears in this issue for preregistration for MAA Minicourses)

* See the section on "How to Preregister".

PREREGISTRATION SECTION:

1) _____ Telephone: _____
(Please print) Surname First Middle

2) _____ _____
(Mailing address) (e-mail address)

☐ **I do not wish my badge and program to be mailed; however, the mailing address for my acknowledgment is given above.**

3) Badge information: Affiliation _____ MR Classification # _____

4) Member of AMS ☐ CMS ☐ MAA ☐ ΠΜΕ ☐ Nonmember ☐ Member of other organizations: AWM ☐ NAM ☐

5) Students: Grad ☐ Undergrad ☐ High School ☐ 6) Emeritus/CMS Retired member ☐ Unemployed ☐ Librarian ☐ High School Teacher ☐

7) Joint Meetings fee US$_____ CDN$ _____ 8) Hotel Deposit (if applicable) US$_____ CDN$ _____

9) Subtotal of Payments for Social Events (see other side) US$_____ CDN$ _____

10) **Total amount enclosed for 4 through 9** US$_____ CDN$_____ **Method of Payment:** ☐ Credit Card (Visa or MasterCard only)
☐ Purchase Order (original institutional PO attached) ☐ Check (payable to AMS or CMS)

Credit card type: _____ Card number: _____ Expiration date: _____
If this is your credit card, please print your name as it appears on the credit card on the line below and sign your name.
If this is not your credit card, please print card holder's name as it appears on the credit card on the line below and have the card holder sign:

See reverse for registration for social events and/or hotel reservations.

For office use only:

Codes:	Options:	Hotel:	Room type:
Dates:	Hotel Deposit	Total Amt. Paid:	
Special Remarks:			

PREREGISTRATION/HOTEL FORM, Vancouver, Canada August 15–19, 1993

SOCIAL EVENTS SECTION:

Opening Banquet:	____ tkts @ US$27/CDN$33 each =	US$ ____CDN$ ____	Vegetarian ☐	Kosher ☐
Salmon Barbecue:	____ adult tkts @ US$27/CDN$33 each =	US$ ____CDN$ ____	Vegetarian ☐	Kosher ☐
	____ children tkts @ US$13.50/CDN$16.50 each = (10 years & under)	US$ ____CDN$ ____	Vegetarian ☐	Kosher ☐
Children's Reception:	____ children @ US$5/CDN$6 per child =	US$ ____CDN$ ____		
MAA 25-Year Banquet:	____ tkts @ US$26/CDN$31.50 each =	US$ ____CDN$ ____	Vegetarian ☐	Kosher ☐
ΠΜΕ Banquet:	____ tkts @ US$12/CDN$14.50 each =	US$ ____CDN$ ____	Vegetarian ☐	
	____ ΠΜΕ member tkts @ US$8/CDN$10 each =	US$ ____CDN$ ____	Vegetarian ☐	
City Tour:	____ adult tkts @ US$24/CDN$29 each =	US$ ____CDN$ ____	8/15 Tour ☐	8/17 Tour ☐
	____ children* tkts @ US$14/CDN$17 each =	US$ ____CDN$ ____	8/15 Tour ☐	8/17 Tour ☐
North Shore Tour:	____ adult tkts @ US$36/CDN$43.50 each =	US$ ____CDN$ ____	8/16 Tour ☐	8/18 Tour ☐
	____ children* tkts @ US$21/CDN$25.50 each =	US$ ____CDN$ ____	8/16 Tour ☐	8/18 Tour ☐
Victoria Tour:	____ adult tkts @ US$61.50/CDN$75 each =	US$ ____CDN$ ____		
	____ children* tkts @ US$33/CDN$40 each =	US$ ____CDN$ ____		
Whistler Tour:	____ adult tkts @ US$36/CDN$44 each =	US$ ____CDN$ ____		
	____ children* tkts @ US$17.50/CDN$21 each =	US$ ____CDN$ ____		
Steam Train/Boat Tour:	____ adult tkts @ US$50.50/CDN$61.50 each =	US$ ____CDN$ ____		
	____ seniors/youths* tkts @ US$43.50/CDN$53 each =	US$ ____CDN$ ____		
	____ children* tkts @ US$19/CDN$23 each =	US$ ____CDN$ ____		
Total enclosed for social events:		US$ ____CDN$ ____ (Enter this amount in item #9 on the reverse side of this form)		

*Where indicated, children's fares apply to those aged 12 years and under. For the Steam Train/Boat Tour, senior/youth fares apply to those aged 12 to 18 years, or 60+ years, children's fares apply to those aged 5 to 11 years, and there is no charge for children four years and under.

☐ I plan to attend the Jeffery-Williams Reception on Tuesday, August 17. Number of people: _____

ACCOMMODATION SECTION:

For statistical purposes, please check one of the following:

☐ I will be residing on campus at UBC.

☐ I will make reservations at a local hotel/motel directly.

☐ I live in the area or will be staying privately with family or friends in the area.

☐ I will be sharing a room with someone who has made reservations at the Holiday Inn through the Service Bureau.

If you wish to make a reservation(s) at the Holiday Inn through the Service Bureau, please complete the information below. For further information on housing and instructions on how to get a room, see the section on "How to Get a Room".

Group rates quoted below are in Canadian funds and are subject to a 10% Provincial Rooms Tax and a 7% GST.

GUARANTEE REQUIREMENTS: US$41/CDN$50 by check, or supply your VISA, MasterCard, or American Express number on the reverse side of this form, together with mailing address for confirmation of room reservation.

Holiday Inn Vancouver Centre

Please circle room type requested: Single: CDN$110 Double(one/two beds): CDN$120 Triple: CDN$130 Quad: CDN$140

I will arrive on (date) _____ at _____ a.m./p.m., and depart on (date) _____ at _____ a.m./p.m.

Please list other room occupants

FULL NAME	ARRIVAL DATE	DEPARTURE DATE

Please list any special requests below:

UNIVERSITY OF BRITISH COLUMBIA

REQUEST FOR ACCOMMODATION AT WALTER GAGE COMPLEX

Joint AMS/CMS/MAA Mathematics Meeting

August 15 - 22, 1993

LAST NAME:	FIRST NAME:
ADDRESS1:	
ADDRESS2:	
CITY:	STATE/PROVINCE: / ZIP/POSTCODE:
COUNTRY:	TELEPHONE NUMBER:

Month Day — ***Arrival Date*** — **CHECK IN after 2:00 pm**

Month Day — ***Departure Date*** — **CHECK OUT before 11:00 am**

	Room/Night
Shared Washroom	
☐ Single room with shared washroom (SS)	CDN$34.00
Private Washroom	
☐ Single room (single bed) (SP)	CDN$55.00
☐ Suite (double bed) (ST1)	CDN$73.00
☐ Deluxe suite (twin beds; living room with TV, telephone, sofa-bed; kitchenette) (DS)	CDN$85.00

If requesting a Suite, please advise number of people: ☐

Single rooms with shared washroom will be substituted when requests for private washroom cannot be accommodated.
All rates quoted in Canadian funds and subject to applicable taxes.

PAYMENT INFORMATION:

- Full payment in Canadian funds is due at check-in by cash, travellers' cheques, VISA or MasterCard (no personal cheques).
- There is no guarantee required for shared washroom accommodation. However, private washroom accommodation has to be guaranteed with VISA or MasterCard or with a deposit by bankdraft in Canadian funds for the equivalent of one night.
- A one-night cancellation charge applies if cancellation in writing is not received 48 hours prior to check-in date.
- Refunds of deposits will incur a $15.00 administration charge.

☐ VISA ☐ MASTERCARD Expiry Date: ☐☐ Month Year

CARD NO.

X
CARDHOLDER'S SIGNATURE

DATE SIGNED

Please mail or fax this request no later than July 12, 1993

UBC CONFERENCE CENTRE, RESERVATIONS OFFICE
5961 Student Union Blvd., Vancouver, BC V6T 2C9 Canada
Tel: (604) 822-1010 Fax: (604) 822-1001

Group Code G30815A

Additional Information

Name of Delegate: _____

Single Room (Shared Washroom Accommodation):

If you are planning to stay in a room with a shared washroom, please indicate here if you are:

❑ Male or ❑ Female.

❑ I wish to be adjacent to the following persons:

	Name	Relationship spouse, child (indicate age), or colleague	Sex M or F
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____

Nonfamily members must send in their own request for accommodation forms.

Adjacent rooms cannot be guaranteed to delegates arriving or departing on different dates.

Special Housing Requests:

Delegates with special housing requests are urged to submit their accommodation forms to the Conference Centre as soon as possible.

If faxing, please remember to fax both sides of this form.

MATHEMATICS

BOOKS Large Discounts for Members of the AMS

25% DISCOUNT ON THESE TITLES FOR INDIVIDUAL MEMBERS ONLY

Dimension and Extensions

by **J.M. Aarts** *and* **T. Nishiura**

North-Holland Mathematical Library Volume 48

1993 xiv + 332 pages
Price: US $ 106.50 / Dfl. 170.00
ISBN 0-444-89740-2

With the classical dimension theory as a model, the inductive, covering and basic aspects of the dimension functions are investigated in this volume, resulting in extensions of the sum, subspace and decomposition theorems and theorems about mappings into spheres. Presented are examples, counterexamples, open problems and solutions of the original and modified compactification problems.

Quo Vadis, Graph Theory?

A Source Book for Challenges and Directions

edited by **J. Gimbel, J.W. Kennedy** *and* **L.V. Quintas**

Annals of Discrete Mathematics Volume 55

1993 viii + 398 pages
Price: US $ 140.75 / Dfl. 225.00
ISBN 0-444-89441-1

Graph Theory (as a recognized discipline) is a relative newcomer to Mathematics. The first formal paper is found in the work of Leonhard Euler in 1736. In recent years the subject has grown so rapidly that in today's literature, graph theory papers abound with new mathematical developments and significant applications. The contributors to this volume have together provided a comprehensive reference source for future directions and open questions in the field.

Sets, Graphs and Numbers

A Birthday Salute to Vera T. Sós and András Hajnal

Proceedings of the Conference, Budapest, Hungary, 20-26 January 1991

edited by **G. Halász, L. Lovász, D. Miklós** *and* **T. Szőnyi**

Colloquia Mathematica Societatis János Bolyai Volume 60

1992 752 pages
Price: US $ 272.00 / Dfl. 435.00
ISBN 0-444-98681-2

To celebrate the sixtieth birthdays of Sós and Hajnal, this book reflects the broad interests and far-reaching impact of the work of these two mathematicians. The following experts were invited to organise sessions: B. Bollobás (extremal graph theory), H. Niederreiter (number theory), A. Schrijver (combinatorial optimization), J. Spencer (probabilistic methods in combinatorics) and E. Szemerédi (theory of computing).

Group Representations

by **G. Karpilovsky**

Volume 2

North-Holland Mathematics Studies Volume 177

1993 xvi + 902 pages
Price: US $ 203.25 / Dfl. 325.00
ISBN 0-444-88726-1

The principal object of this multi-volume treatise is to provide, in a self-contained manner, comprehensive coverage of the mainstream of group representation theory. This second volume deals with projective representations and the Schur multiplier (some further topics pertaining to projective representations will be covered in the next volume). The bibliography is extensive, leading the reader to various references for detailed discussions on the main topics as well as on related subjects.

Topological, Algebraic and Combinatorial Structures

Frolík's Memorial Volume

edited by **J. Nešetřil**

Reprinted from the journal Discrete Mathematics

Topics in Discrete Mathematics Volume 8

1993 432 pages
Price: US $ 181.25 / Dfl. 290.00
ISBN 0-444-89236-2

With contributions from many researchers, this book is dedicated to the memory of Zdenk Frolík, the prominent Czechoslovakian mathematician who died in 1989 at the age of only 56 years. One of his achievements was the founding of the Winter School of Abstract Analysis, which transcended boundaries of individual fields of mathematics. This book pays tribute to Frolík's versatility and his belief that there is only one Mathematics.

40% DISCOUNT ON THIS TITLE FOR LIBRARIES AND INDIVIDUAL MEMBERS

Topoi

The Categorial Analysis of Logic

Second Revised Edition

by **R. Goldblatt**

Studies in Logic and the Foundations of Mathematics Volume 98

1984 1st repr. 1986 xvi + 552 pages
Price: US $ 145.00 / Dfl. 232.00
ISBN 0-444-86711-2

"...an excellent expository text... Dr. Goldblatt is completely successful in achieving his aim to introduce the reader to the notion of a topos and to explain what its implications are for logic and the foundations of mathematics."

Mathematical Chronicle

"...very clearly written... an excellent place to start finding out about topos theory."

Mathematical Review

40% Discount valid through June 1993

SPECIAL DISCOUNT ORDER FORM

Send this form (or a photocopy) to:

ELSEVIER SCIENCE PUBLISHERS
Attn: Marijcke Haccou, P.O. Box 103
1000 AC Amsterdam, The Netherlands
FAX: (31)(20) 5862-616

Customers in the USA and Canada:
ELSEVIER SCIENCE PUBLISHERS
Attn: Judy Weislogel, P.O. Box 945
Madison Square Station
New York, NY 10160-0757, USA
FAX: (212) 633-3880

Yes, please send me ..... copy(ies) of	List price as shown	Discount price

I am a **member** of the American Mathematical Society.
My **membership number** is: _____

☐ **Payment enclosed:** (Bank Draft, Eurocheque, International Money Order, Postal Cheque).

☐ **Charge my credit card:** ☐ Access ☐ Eurocard ☐ MasterCard ☐ American Express ☐ VISA

Card No.: _____ Valid until: _____

Name _____

Address _____

_____

Date _____ Signature _____

ELSEVIER SCIENCE PUBLISHERS
IMPRINT: NORTH-HOLLAND

No postage will be added to prepaid book orders. US $ prices are valid only in the USA and Canada. In all other countries the Dutch Guilder (Dfl.) price is definitive. Customers in The Netherlands please add 6% BTW. All prices are subject to change without prior notice.

SPRINGER FOR MATHEMATICS

SECOND EDITION

J. STILLWELL, Monash University, Clayton, Australia

CLASSICAL TOPOLOGY AND COMBINATORIAL GROUP THEORY

This introduction to topology stresses its geometric and combinatorial aspects. By focusing on the historical background, it also stresses the intuitive aspects and the visual interpretation of results.

By limiting the attention to dimensions fewer than 3, the discussion remains close to concrete physical experience while still providing ample scope for analytic, geometric and algebraic ideas. By focusing on the fundamental group in the interaction with combinatorial group theory, the discussion is able to not only use the generality of the combinatorial approach but also to emphasize the two-way interaction between topology and algebra. The book includes algorithms for topological problems. While most of the results and proofs presented here are known, some have been simplified or placed in a new perspective. Over 300 illustrations, numerous interesting exercises, and challenging open problems are included.

1993/334 PP., 312 ILLUS./HARDCOVER
$49.00/ISBN 0-387-97970-0
GRADUATE TEXTS IN MATHEMATICS, VOL. 72

L. CARLESON, Mathematics Institute, Royal Institute of Technology, Stockholm, Sweden and **T. GAMELIN**, University of California, Los Angeles, CA

COMPLEX DYNAMICS

Complex Dynamics discusses the properties of conformal mappings in the complex plane, a subject that is closely connected to the study of fractals and chaos. Indeed the culmination of the book is a detailed study of the famous Mandelbrot set, which describes very general properties of such mappings. The book focuses on the analytic side of this contemporary subject. The text was developed out of a course taught over several semesters; with a focus on helping students and instructors to familiarize themselves with complex dynamics. Topics covered include: conformal and quasi-conformal mappings, fixed points and conjugations, basic rational iteration (the Julia set), classification of periodic components, critical points and expanding maps, some applications of conformal mappings (e.g. Hermann rings), the local geometry of the Fatou set, quadratic polynomials, and the Mandelbrot set.

1993/APP. 184 PP., 28 ILLUS./SOFTCOVER
$29.00/ISBN 0-387-97942-5
UNIVERSITEXT

SECOND EDITION

P.J. OLVER, University of Minnesota, Minneapolis, MN

APPLICATIONS OF LIE GROUPS TO DIFFERENTIAL EQUATIONS

Symmetry methods have long been recognized to be of great importance for the study of the differential equations arising in mathematics, physics, engineering, and many other disciplines. The purpose of this book is to provide a solid introduction to those applications of Lie groups to differential equations which have proved to be useful in practice, including determination of symmetry groups, integration of ordinary differential equations, construction of group-invariant solutions to partial differential equations, symmetries and conservation laws, generalized symmetries, and symmetry methods in Hamiltonian systems. The computational methods are presented so that graduate students and researchers in other fields can readily learn to use them.

Following an exposition of the applications, the book develops the underlying theory. Many of the topics are presented in a novel way, with an emphasis on explicit examples and computations. Further examples, as well as new theoretical developments, appear in the exercises at the end of each chapter.

1993/APP. 500 PP., 10 ILLUS/HARDCOVER
$59.00(TENT.)/ISBN 0-387-94007-3
GRADUATE TEXTS IN MATHEMATICS, VOL. 107

E. DIBENEDETTO, Northwestern University, Evanston, IL

DEGENERATE PARABOLIC EQUATIONS

Mathematicians have only recently begun to understand the local structure of solutions of degenerate and singular parabolic partial differential equations. The problem originated in the mid '60s with the work of DeGiorgi, Moser, Ladyzenskajia and Uraltzeva. This book is an account of the developments in this field over the past five years. It evolved out of the 1990-Lipschitz Lectures given by Professor DiBenedetto at the *Institut für angewandte Mathematik of the University, Bonn.*

1993/APP. 365 PP., 11 ILLUS./SOFTCOVER
$35.00(TENT.)/ISBN 0-387-94020-0
UNIVERSITEXT

SECOND EDITION

N. KOBLITZ, University of Washington, Seattle, WA

INTRODUCTION TO ELLIPTIC CURVES AND MODULAR FORMS

The theory of elliptic curves and modular forms provides a fruitful meeting ground for such diverse areas as number theory, complex analysis, algebraic geometry, and representation theory. This book starts out with a problem from elementary number theory and proceeds to lead its reader into the modern theory, covering such topics as the Hasse-Weil L-function and the conjecture of Birch and Swinnerton-Dyer.

The second edition of this text includes an updated bibliography indicating the latest, dramatic changes in the direction of proving the Birch and Swinnerton conjecture. It also discusses the current state of knowledge of elliptic curves.

1993/APP. 264 PP., 24 ILLUS./HARDCOVER
$49.00/ISBN 0-387-97966-2
GRADUATE TEXTS IN MATHEMATICS, VOL. 97

E. ENGELER, Eidgenossische Technische Hochschule Zürich, Switzerland

FOUNDATIONS OF MATHEMATICS

Questions of Analysis, Geometry & Algorithmics

This book is concerned with those foundational questions in elementary algebra, calculus, and geometry- those that are almost always left unanswered in undergraduate courses in these subjects. Among the topics considered are nonstandard analysis, the relationship between classical geometric theorems (such as those of Pascal and Desargues) and field axioms, questions of decidability, and combinatorial logic. An attractive feature is the case given in the historical context in which foundational questions have arisen, and the attention to early attempts that were made to resolve them.

1993/APP. 105 PP., 29 ILLUS./HARDCOVER
$52.00/ISBN 0-387-56422-5

Three Easy Ways to Order:

- **CALL:** Toll Free 1-800-SPRINGE(R) 1-800-777-4643. In NJ call 201-348-4033 (8:30 am – 5:30 pm EST). Your reference number is S262.
- **WRITE:** Send payment plus $2.50 postage and handling for first book and $1.00 for each additional book to: Springer-Verlag New York, Inc., Dept. #S262, PO Box 2485, Secaucus, NJ 07096-2491. (NY, NJ, MA, PA, VA, VT, TX and CA residents add sales tax, Canadian residents add 7% GST.)
- **VISIT:** Your technical bookstore.

Instructors: Call or Write for information on textbook examination copies!