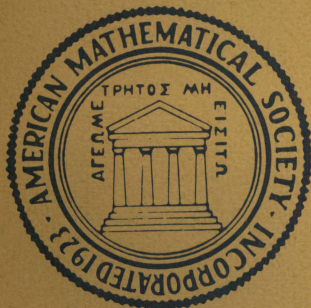


COMPUTER ALGEBRA SHORT COURSE
ANN ARBOR MEETING

See page 321

Notices

of the
American Mathematical Society



June 1980, Issue 202

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Volume 27, Number 4

June 1980

CALENDAR OF AMS MEETINGS

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

ABSTRACTS OF PAPERS presented at a meeting of the Society are published in the journal *Abstracts of papers presented to the American Mathematical Society* in the issue corresponding to that of the **Notices** which contains the program of the meeting. Abstracts should be submitted on special forms which are available in many departments of mathematics and from the office of the Society in Providence. 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 submitted for consideration for presentation at special sessions is usually three weeks earlier than that specified below. For additional information consult the meeting announcement and the list of organizers of special sessions.

MEETING NUMBER	DATE	PLACE	ABSTRACT DEADLINE	ISSUE
779	August 18-22, 1980 (84th Summer Meeting)	Ann Arbor, Michigan	JUNE 3	August
780	October 17-18, 1980	Storrs, Connecticut	AUGUST 21	} October
781	October 31-November 1, 1980	Kenosha, Wisconsin	AUGUST 25	
782	November 14-15, 1980	Knoxville, Tennessee	SEPTEMBER 19	November
783	January 7-11, 1981 (87th Annual Meeting)	San Francisco, California	OCTOBER 22	January 1981
	May 15-16, 1981	Pittsburgh, Pennsylvania		
	January 13-17, 1982 (88th Annual Meeting)	Cincinnati, Ohio		

Notices DEADLINES

ISSUE	NEWS	ADVERTISING
August 1980	June 3	June 18
October 1980	August 25	September 3

Deadlines for announcements intended for the Special Meetings section are the same as for News.

Other Events Sponsored by the Society

1980	ANNOUNCEMENT APPEARS
June 15-27	AMS-SIAM Summer Seminar on Mathematical Aspects of Physiology, University of Utah, Salt Lake City, Utah Feb. Issue, p. 158
July 14-August 2	AMS Summer Institute on Operator Algebras and Applications, Queen's University, Kingston, Ontario, Canada April Issue, p. 261
August 16-17	AMS Short Course: Computer Algebra—Symbolic Mathematical Computation, University of Michigan, Ann Arbor This Issue, p. 321

Notices

of the American Mathematical Society

Volume 27, Number 4, June 1980

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Ellensburg, June 20-21, 1980, Central Washington University

Program for the 778th Meeting

The seven hundred seventy-eighth meeting of the American Mathematical Society will be held at Central Washington University (CWU) in Ellensburg, Washington, on Friday and Saturday, June 20-21, 1980. The meeting will be held in conjunction with sectional meetings of the Mathematical Association of America (MAA) and the Society for Industrial and Applied Mathematics (SIAM). All sessions will take place in Lind Hall, which is located on East 8th at Chestnut.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Far Western Sectional Meetings, an invited one-hour address will be given by DAVID G. CANTOR of the University of California, Los Angeles. The title of his talk is *On some applications of transfinite diameter to number theory*. There will also be an hour address at the banquet Friday evening sponsored jointly by the AMS and MAA. The speaker will be HUGH BURKHARDT, Shell Centre for Mathematics Education, Nottingham, England, and the title of his talk is *England's experience with problem solving curricula: how it has affected the way we teach mathematics*.

There will be sessions for contributed ten-minute papers. Late papers will be accepted for presentation at the meeting, but will not appear in the printed program.

The MAA speakers and their titles are: DONALD W. BUSHAW, Washington State University, *Minimal competencies, maximal confusion, and mean people*; LARRY RUNYON, Shoreline Community College, *Cold calculating conservation*; and ALFRED B. WILLCOX, Executive Director of the MAA, *Mathematics: Where are we going? What mathematics educators can do about it*. The MAA program will emphasize mathematics education and will include a panel discussion titled *Mathematical services provided for our students*. The moderator will be HOWARD E. ZINK and the participants will be VERNON R. HOOD, NICKOLA NICKOLOFF, THEODORE WHITE and EDWARD B. WRIGHT.

The SIAM program will sponsor a session on advances in optimization theory with emphasis on computational methods in optimization. There will be about six forty-minute talks scheduled on Saturday morning and afternoon. Further information can be obtained from Alan Gibbs, Battelle Northwest, Mathematics Building, Room 1103, P. O. Box 999, Richland, Washington 99352.

Registration

The registration desk for the meeting will be located in Lind Hall, and will be open from 10:30 a.m. to noon and 1:00 p.m. to 4:30 p.m. on Friday, and 8:30 a.m. to 11:00 a.m. on Saturday. Registration fees will be \$3 for members of AMS, MAA, or

SIAM; \$5 for nonmembers; and \$1 for students and unemployed persons.

Accommodations

Dormitory lodging and meal package plans are available through the Conference Center, Central Washington University, Ellensburg, WA 98926, (Telephone 509-963-1141), and are as follows:

Plan A at \$26.80 per person includes lodging June 19; breakfast, lunch and lodging June 20; and breakfast June 21.

Plan B at \$14.60 per person includes lunch and lodging June 20, and breakfast June 21.

These rates are for double occupancy; for single occupancy add \$3.00 per person per night. The rooms are college dormitory rooms, clean and comfortable, but not luxurious. Each room has two single beds, a telephone, but no television or private bath; all linens are provided. The meals are served cafeteria style according to the following schedule: breakfast 7:00–8:00 a.m.; lunch 12:00–1:00 p.m. Individuals interested in these package plans should contact Mrs. Everell Purcell at the CWU Conference Center for further details and reservation forms. The deadline for return of the completed forms is June 10.

The following motels are located in Ellensburg, Washington, zip code 98926. The Regalodge and Thunderbird Motel are located approximately 1/2 mile from Campus and are the nearest. Rates do not include the tax and are subject to change by June. Participants should make reservations directly with the motel.

Harold's Magic Key Inn, 601 North Water
Telephone: 509-925-4141

Single	\$19–20	3 Doubles	\$42
Double	24–25	2 Bedroom/kitchen	42
Double/twin	27		

Holiday Inn, 1700 Canyon Road

Telephone: 509-925-9801

Single	\$29.00	Double	33.50
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Regalodge, 6th and Water

Telephone: 509-925-3116

Single	\$16.00	Double/double	\$22.50
Single (2)	21.50	Double/double(4)	26.50

Thunderbird Motel, West 8th

Telephone: 509-962-9856

Single	\$20–22	Double/double	\$27–32
Single (2)	25	2 Queens	29–39

Waits Motel, 205 West 6th

Telephone: 509-962-9801

Single	\$16.00	Double (2)	\$19.50
Double	18.50	Double/double	23.00

A KOA campground is located three miles west of campus:

KOA Kampground, West Ellensburg Interchange
Ellensburg, WA 98926

Telephone: 509-925-9319

Participants not reserving university housing with the breakfast and lunch plans will be given directions to nearby campus and local dining facilities. The MAA will sponsor a banquet on Friday night, in the form of a Western-style barbecue featuring roast New York sirloin of beef, which will be served in the Holmes Dining Hall patio area. The invited dinner speaker at the banquet will be HUGH BURKHARDT. Advance reservations are required, and payment of \$10.50 per person (payable to C. W. U. Conference Center) must reach Mrs. Everell Purcell at the Conference Center not later than June 5. The banquet will be preceded by a social hour at a location to be announced.

Those who have arrived by Thursday evening are cordially invited to an open house after 7:00 p.m. at the home of Dale Comstock of the CWU Department of Mathematics (now Dean of the Graduate School and Research), located at 106 North Mt.

Daniels Drive in Grässlands subdivision. Directions may be obtained at the CWU Conference Center in Courson Hall on East 8th Avenue.

Travel

Ellensburg is beautifully situated in a hill-rimmed agricultural valley at the intersection of Interstate 82 and Interstate 90. Public transportation to the city is limited, but includes direct Greyhound Bus service, or flights by Hughes Airwest and Cascade Airways to Yakima, which is 35 miles south on Interstate 82. Central Washington University will operate a shuttle from Yakima airport to Ellensburg at regular intervals on Thursday, June 19, and Friday, June 20. Please inquire at the Hughes Airwest desk. Persons planning to use this service should advise Mrs. Everell Purcell of the Conference Center about their travel arrangements, including the date, flight number, and arrival time.

PROGRAM OF THE SESSIONS

The time limit for each contributed paper in the AMS general sessions is ten minutes. To maintain the schedule, the time limits will be strictly enforced.

Abstracts for papers presented in AMS sessions at this meeting will be found in the June 1980 issue of *Abstracts of papers presented to the American Mathematical Society*. Numbers in parentheses following the listings below indicate the order in which the abstracts are printed in that journal.

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, 1:30 P. M.

MAA Invited Address, 207 Lind Hall

1:30- 2:30 *Cold calculating conservation.* LARRY RUNYAN, Shoreline Community College

FRIDAY, 2:45 P. M.

AMS Invited Address, 207 Lind Hall

2:45- 3:45 *On some applications of transfinite diameter to number theory.* Professor DAVID G. CANTOR, University of California, Los Angeles (778-A4)

FRIDAY, 4:00 P. M.

MAA Invited Address, 207 Lind Hall

4:00- 5:00 *Mathematics: Where are we going? What mathematics educators can do about it.* ALFRED B. WILLCOX, Executive Director of the MAA

FRIDAY, 5:30 P. M.

MAA Banquet

5:30- 6:30 Pre-banquet social hour at a place to be announced.

7:00- 9:00 Banquet at Holmes Dining Hall patio area. Invited Lecture: *England's experience with problem solving curricula: how it has affected the way we teach mathematics.* HUGH BURKHARDT, Shell Centre for Mathematics Education, Nottingham, England

SATURDAY, 9:00 A. M.

AMS Session of Contributed Papers, 209 Lind Hall

- 9:00- 9:10 (1) *A two parameter family of Liapunov functions for a class of Lienard equations.* Professor LARRY ANDERSON* and Ms. SARAH DUCICH, Whitman College (778-B1)
- 9:15- 9:25 (2) *General boundary value problems for linear elliptic systems of mixed order.* Preliminary report. JOHN A. LADWIG, University of Oregon (778-B4)
- 9:30- 9:40 (3) *Two theorems on Nevanlinna deficiencies for meromorphic functions over parabolic Riemann surfaces.* Preliminary report. Professor CHEN-HAN SUNG, University of Notre Dame (778-B5)

- 9:45- 9:55 (4) *Operators on weighted spaces of continuous functions.* Preliminary report. Professor ROBERT A. FONTENOT, Whitman College (778-B2)
- 10:00-10:10 (5) *Paradox involving dual sine series.* Professor ROBERT B. KELMAN, Colorado State University (778-B3)
- 10:15-10:25 (6) *Rectangular bands in universal algebra: two applications.* Professor MATTHEW GOULD, Vanderbilt University (778-A1)
- 10:30-10:40 (7) *Parametric solutions for a sum of seven cubes equal to a sum of three fifth powers.* Dr. DAVID ZEITLIN, Minneapolis, Minnesota (778-A3)
- 10:45-10:55 (8) *A new and proper generalization of Fermat's last theorem (FLT).* Dr. C. MUSÈS, Research Center for Mathematics and Morphology, Santa Barbara, California (778-A2) (Introduced by K. Demys)

SATURDAY, 9:00 A. M.

MAA Panel Discussion, 207 Lind Hall

9:00-10:00 *Mathematical services provided for our students*

SATURDAY, 10:15 A. M.

MAA Business Meeting, 207 Lind Hall

SATURDAY, 11:00 A. M.

MAA Invited Address, 207 Lind Hall

11:00-12:00 *Minimal competencies, maximal confusion, and mean people.* DONALD W. BUSHAW, Washington State University

Eugene, Oregon

Kenneth A. Ross
Associate Secretary

Invited Speakers at AMS Meetings

The individuals listed below have accepted invitations to address the Society at the times and places listed. For some meetings, the lists of speakers are incomplete.

Ann Arbor, Michigan, August 1980

Dan Burghlea	Jack C. Kiefer
Ciprian Foiaş	Michael E. O'Nan
Howard Garland	Julia B. Robinson
Heini Halberstam	(Colloquium Lecturer)
Robert P. Kaufman	Jacobus H. Van Lint

Storrs, Connecticut, October 1980

Goro Azumaya	R. B. Melrose
William E. Fulton	Michael C. Reed

Kenosha, Wisconsin, October-November 1980

Igor Dolgachev	Vera S. Pless
Stephen C. Kleene	Peter B. Shalen

San Francisco, California, January 1981

Shmuel Agmon	Mark Kac
Gregory V. Chudnovsky	(Colloquium Lecturer)
Roger Keith Dennis	Peter D. Lax
Feza Gursey	(Retiring Address)
James E. Humphreys	Masamichi Takesaki
	Michele Vergne

Organizers and Topics of Special Sessions

Names of organizers of special sessions to be held at meetings of the Society are listed below, along with the topic of the session. Most of the papers presented at special sessions are by invitation. Other papers will be considered at the request of the author provided that this is indicated clearly on the abstract form and it is submitted by the deadlines given below. These deadlines are usually three weeks earlier than the normal abstract deadlines for meetings. Papers not selected for special sessions will automatically be considered for regular sessions unless the author gives specific instructions to the contrary.

August Meeting in Ann Arbor

Deadline: Expired

Bruce C. Berndt	<i>Analytic number theory</i>
Andreas R. Blass	<i>Topos theory</i>
Lamberto Cesari	<i>Current trends in nonlinear analysis</i>
Pao-Liu Chow	<i>Stochastic analysis</i>
David L. Colton	<i>Mathematical methods in wave propagation</i>

SPECIAL SESSIONS (continued)

Martin D. Davis

Models of arithmetic

Vera S. Pless

Codes, groups, and designs

George B. Purdy

Extremal problems in combinatorial geometry

Maxwell O. Reade

Univalent functions: recent developments

B. David Saunders

Closed-form solutions of differential equations obtained by computer

Stephen B. Seidman

Applications of mathematics to anthropology and sociology

Alberto Torchinsky

Hardy spaces and harmonic analysis

Joseph L. Ullman

Orthogonal polynomials and other extremal polynomials

October Meeting in Storrs

Deadline: July 31

Ron C. Blei and Stuart J. Sidney

Harmonic analysis

Roger Lee Cooke

History and philosophy of mathematics

Anthony W. Knap

Representations of Lie groups

Jonathan D. Lubin

Elliptic curves and arithmetic geometry

Michael C. Reed

To be announced

Charles E. Rickart

Algebra of analytic functions

John M. Rinzel

Mathematical models in neuro and developmental biology

Martin H. Schultz

Scientific computing and numerical analysis

Fall Meeting in Kenosha

Deadline: August 4

Leo P. Comerford, Jr., Ronald W. Gatterdam, and Kenneth W. Weston

Combinatorial group theory

Donald A. Lutz

Ordinary differential equations in the complex domain

Joel L. Roberts

Commutative algebra and algebraic geometry

Robert I. Soare

Recursion theory

Norbert J. Wielenberg

Discrete groups and low dimensional topology

January 1981 Meeting in San Francisco

Deadline: October 1

Gary Chartrand and Arthur T. White

Graph theory

Frederick R. Cohen

Homotopy theory

M. Deza and Ronald L. Graham

L_1 and related metric spaces

Donald W. Dubois

Real function fields

Richard S. Elman

Quadratic form theory

Garret J. Etgen and Kurt Kreith

Qualitative theory of differential equations

Robert P. Gilbert

Elliptic systems in the plane

S. J. Lomonaco, Jr.

Low dimensional topology

Melvyn B. Nathanson

Number theory

Roy Ryden and Hank Tropp

History of contemporary mathematics

Alexander P. Stone

Differential geometry and global analysis

LECTURES ON MATHEMATICS IN THE LIFE SCIENCES

(ISSN 0075-8523)

SOME MATHEMATICAL QUESTIONS IN BIOLOGY. X.
edited by Simon Levin

This volume contains lectures given at a Symposium on Some Mathematical Questions in Biology, held in Washington, D.C., on February 14, 1978, in conjunction with the annual meeting of the American Association for the Advancement of Science. The Symposium was supported by the National Institutes of Health and cosponsored by the Society for Industrial and Applied Mathematics.

The contents of the volume are as follows:

Joseph B. Keller, *Stochastic theories of carcinogenesis and population genetics*

G. F. Oster and S. M. Rocklin, *Optimization models in evolutionary biology*

Peter H. Richter, *Pattern formation in the immune system*

Alan S. Perelson, *Optimal strategies for an immune response*

H. C. Longuet-Higgins, *Perception of melodies*

Volume 11

179 + viii pages

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ANN ARBOR MEETINGS, August 18-22, 1980

Second Announcement

The August 1980 Joint Mathematics Meetings, including the 84th summer meeting of the AMS, the 60th summer meeting of the Mathematical Association of America, the 1980 annual meeting of the Institute of Mathematical Statistics, and the 1980 annual meeting of Pi Mu Epsilon, will be held August 18-22, 1980, at the University of Michigan, Ann Arbor.

The members of the Local Arrangements Committee are Paul T. Bateman (ex officio), Morton Brown, Frederick W. Gehring, George E. Hay, Marshall D. Hestenes, Melvin Hochster, Fred Hoppe, Paul Howard, Phillip S. Jones, Wilfred Kaplan, Wilfred M. Kincaid, William J. LeVeque (ex officio), Judith Q. Longyear, M.S. Ramanujan, Ethel Rathbun, Marjorie D. Reade, Maxwell O. Reade (chairman), David P. Roselle (ex officio), Joseph L. Ullman, and James G. Wendel (publicity director).

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DEADLINES

Abstracts for consideration for special sessions	Expired
Abstracts, contributed papers	June 3
Summer List of Applicants	July 3
Preregistration and housing	July 3
Preregistration cancellations (50% refund)	August 15

84TH SUMMER MEETING OF THE AMS

August 19-22, 1980

Colloquium Lectures

There will be one series of four Colloquium Lectures presented by Julia B. Robinson of the University of California, Berkeley. The title of the lecture series is "Between logic and arithmetic." The lectures will be given at 1:00 p.m. on Tuesday, August 19, and at 8:45 a.m. on Wednesday, Thursday, and Friday, August 20-22. The topics of the four lectures are: *Fifty years after Gödel's discoveries*; *Diophantine equations*; *Definability in fields*; and *Nonstandard models of arithmetic*.

Prize Session

The 1980 LeRoy P. Steele prizes and the Norbert Wiener Prize in Applied Mathematics will be awarded at a session at 4:00 p.m. on Thursday, August 21.

Invited Addresses

By invitation of the Program Committee, there will be eight invited one-hour addresses. The speakers, their titles, and times of the talks are as follows: DAN BURGHELEA, Ohio State University, *Whitehead torsion old and new, and its relationship to geometric topology*, 11:15 a.m. Thursday.

CIPRIAN FOIAS, Indiana University, *The norm preserving lifting of intertwining operators and its applications*, 11:15 a.m. Friday.

HOWARD GARLAND, Yale University, *The arithmetic theory of loop groups*, 10:00 a.m. Thursday.

HEINI HALBERSTAM, University of Nottingham, England, and University of Illinois at Urbana-Champaign, *Sieves and combinatorial inequalities: From Eratosthenes to Chen*, 10:00 a.m. Friday.

ROBERT P. KAUFMAN, University of Illinois at Urbana-Champaign, *Some applications of Nevanlinna theory to differential equations*, 11:15 a.m. Wednesday.

JACK C. KIEFER, University of California, Berkeley, *Optimum combinatorial designs*, 1:00 p.m. Thursday.

MICHAEL E. O'NAN, Rutgers University, *Sporadic simple groups: A survey*, 3:45 p.m. Tuesday.

JACOBUS H. VAN LINT, Technical University of Eindhoven, Netherlands, *Good codes*, 10:00 a.m. Wednesday.

All of these hour talks will be given in the Rackham Lecture Hall. Professor Kiefer's talk is jointly sponsored by the Institute of Mathematical Statistics.

AMS Short Course Series

The announcement in the April Notices (page 264), asserting there would be no short course in Ann Arbor, was premature. See page 321 of this issue.

PREREGISTRATION AND HOUSING

Preregistration. Preregistration for these meetings **MUST BE COMPLETED** by July 3, 1980. All those wishing to preregister must complete the form which appears at the back of this issue of the **Notices** and submit it along with the appropriate fee(s) to the Mathematics Meetings Housing Bureau in Providence by July 3.

Preregistration fees. Preregistration fees do not represent an advance deposit for lodgings. One must however, preregister for the meetings in order to obtain confirmed hotel or university accommodations through the Mathematics Meetings Housing Bureau, as outlined in the column to the right. Please note that **separate fees and checks** are required for the Joint Mathematics Meetings and MAA Minicourse. Checks for the former should be made payable to the Society, and for the latter to the MAA. Those who preregister for the Joint Mathematics Meetings pay lower fees than those who register at the meetings. The preregistration fees are as follows:

JOINT MATHEMATICS MEETINGS

Member of AMS, IMS, MAA, IIME	\$28
Nonmember	38
Student/Unemployed	5

MAA MINICOURSE — All participants \$15

AMS SHORT COURSE. See page 321.

A \$2 charge will be imposed for all invoices prepared when preregistration forms are submitted without accompanying check(s) for the preregistration fee(s) or are accompanied by an amount insufficient to cover the total fee(s). Preregistration forms received well before the deadline of July 3, which are not accompanied by correct payment, will be returned to the participant with a request for resubmission and full payment.

A fifty percent refund of the preregistration fee(s) will be made for all cancellations received in Providence no later than August 15, 1980. **No refunds will be granted for cancellations received after that date**, or to persons who do not attend the meetings.

Those who preregister for either the Joint Mathematics Meetings or MAA Minicourse, or both, will be able to pick up their badges and other material in Ann Arbor after 2:00 p.m. on Sunday, August 17, during the hours the Joint Mathematics Meetings registration desk is open.

Summer List of Applicants. The AMS-MAA-SIAM Committee on Employment Opportunities, which is charged with operation of the Employment Register and which oversees publication of *Employment Information in the Mathematical Sciences*, will publish a summer list of applicants prior to the Ann Arbor meeting in August 1980.

To be included in the list, applicants should complete the special applicant preregistration form found at the back of this issue of the **Notices**. The completed form should be submitted with the meeting preregistration form. The deadline for receipt of applicant forms is the same as for preregistration for the Joint Meetings (July 3, 1980). See the section on **Other Events of Interest** for more details.

Mathematics Meetings Housing Bureau. The form for requesting accommodations will be found at the back of this issue of the **Notices**. The use of the services offered by the Mathematics Housing Bureau requires preregistration for the meetings. Persons desiring confirmed hotel or university accommodations should complete the form, or a reasonable facsimile, and send it to the Mathematics Meetings Housing Bureau, P.O. Box 6887, Providence, Rhode Island 02940, so that it will arrive no later than July 3, 1980.

Please note that there are separate sections on the form for requesting residence hall housing, hotel accommodations, or rooms in the Michigan League or Cambridge House (formerly Michigan Union). Please read carefully the sections on **University Housing** and **Hotel Accommodations** before completing the form.

Reservations will be made in accordance with preferences indicated on the reservation form, insofar as this is possible. All residence hall reservations will be confirmed by the Housing Bureau, all hotel reservations will be confirmed directly by the hotels, and all reservations at the League and Cambridge House will be confirmed by those facilities. No deposit is required for university housing; deposit requirements will be communicated to participants by the hotels at time of confirmation. **DO NOT INCLUDE PAYMENT FOR YOUR HOUSING WITH MEETING PREREGISTRATION FEE(S)**. All reservation requests must be received in writing and processed through the Housing Bureau in Providence. Telephone requests cannot be accepted.

Participants planning to share accommodations should provide the name of each person with whom they plan to occupy a room. Each person should, however, complete a separate preregistration form. In order to avoid confusion or disappointment, parties planning to share rooms should send in their forms together.

Please make all reservation changes with the Housing Bureau in Providence prior to August 15, 1980. After that date, changes and cancellations for university housing should be telephoned in to the telephone center at the registration desk. The message center will open at 2:00 p.m. on Sunday August 17. Cancellations or changes of hotel accommodations should be made directly with the hotels after August 15.

Special Sessions

By invitation of the same committee, there will be thirteen special sessions of selected twenty-minute papers.

Analytic number theory, to be held Thursday and Friday, organized by BRUCE C. BERNDT of the University of Illinois at Urbana-Champaign. The tentative list of speakers includes Krishnaswami Alladi, George E. Andrews, David M. Bressoud, J. Brian Conrey, Harold G. Diamond, Ronald J. Evans, Sidney W. Graham, James L. Hafner, Marvin I. Knopp, Grigori Kolesnik, Jeffrey C. Lagarias, L. Alayne Parson, Don Redmond, and Jeff D. Vaaler.

Topos theory, to be held Friday, organized by ANDREAS R. BLASS of the University of Michigan, Ann Arbor. The tentative list of speakers includes Michael P. Fourman, Peter Johnston, and Joachim Lambek.

Current trends in nonlinear analysis, to be held Tuesday afternoon and Wednesday morning, arranged by LAMBERTO CESARI of the University of Michigan, Ann Arbor. The tentative list of speakers includes Melvyn S. Berger, Robert M. Goor, Jack K. Hale, Rangachary Kannan, B. K. Lahiri, V. Lakshmikantham, Alan C. Lazer, Johannes C. C. Nitsche, W. V. Petryshyn, Simeon Reich, Jane Cronin Scanlon, Edward Silverman, and C. Vinti.

Stochastic analysis, to be held Tuesday afternoon, Wednesday morning, and Thursday morning, arranged by PAO-LIU CHOW of Wayne State University. The tentative list of speakers includes Alain Bensoussan, Albert T. Bharucha-Reid, Donald A. Dawson, Wendell H. Fleming, Hui-Hsiung Kuo, Harry Kesten, Werner E. Kohler, Thomas G. Kurtz, George C. Papanicolaou, Mark A. Pinsky, Habib Salehi, Daniel W. Stroock, and Murad S. Taqqu. Professor Chow's session is jointly sponsored by the Institute of Mathematical Statistics.

Mathematical methods in wave propagation, to be held Thursday and Friday, arranged by DAVID L. COLTON of the University of Delaware. The tentative list of speakers includes Clifford O. Bloom, Jeffrey M. Cooper, Ronald J. DiPerna, Robert P. Gilbert, R. Goodrich, Albert E. Heins, Irvin W. Kay, A. Kirsch, Peter D. Lax, Walter Littman, C. J. Lozano, Richard C. MacCamy, Robert F. Millar, Cathleen S. Morawetz, Alexander G. Ramm, Jeffrey B. Rauch, Victor Twersky, and Vaughan H. Weston.

Models of arithmetic, to be held Tuesday afternoon, Wednesday morning, and Thursday morning, arranged by MARTIN D. DAVIS of the Courant Institute of Mathematical Sciences, New York University. The tentative list of speakers includes Andreas R. Blass, Julia Knight, Simon Kochen, Saul Kripke, Richard J. Lipton, Angus J. MacIntyre, George H. Mills, Jan Mycielski, Mark E. Nadel, James H. Schmerl, Stephen G. Simpson, Craig A. Smorynski, and L. Vandendries.

Codes, groups, and designs, to be held Thursday and Friday, arranged by VERA S. PLESS of the University of Illinois at Chicago Circle. The tentative list of speakers includes Edward F. Assmus, Jr.,

Eiichi Bannai, Elwyn R. Berlekamp, Kenneth P. Bogart, Robert Calderbank, Paul Canion, John H. Conway, W. Cary Huffman, Noboru Ito, Jeffrey Leon, Jacobus H. Van Lint, Judith Q. Longyear, F. Jessie Mac Williams, Vera S. Pless, Chester J. Salwach, Neil J. A. Sloane, and Harold N. Ward.

Extremal problems in combinatorial geometry, to be held Tuesday afternoon and Wednesday morning, arranged by GEORGE B. PURDY of Texas A & M University. The tentative list of speakers includes Joel C. Gibbons, Ronald L. Graham, William O. J. Moser, George B. Purdy, Kenneth B. Stolarsky, Ernst G. Straus, and John E. Wetzel.

Univalent functions: Recent developments, to be held Tuesday afternoon, Wednesday morning, and all day Thursday, organized by MAXWELL O. READE, University of Michigan, Ann Arbor. The tentative list of speakers includes Hassoon S. Al-Amiri, Roger W. Barnard, Louis Brickman, Douglas M. Campbell, Paul J. Eenigenburg, Adolph W. Goodman, David J. Hallenbeck, James A. Hummel, Frank R. Keogh, William E. Kirwan II, Richard J. Libera, Albert E. Livingston, Thomas H. MacGregor, Edward P. Merkes, S. S. Miller, John A. Pflatzgraff, John R. Quine, Jr., Malcolm S. Robertson, Herb Silverman, Glenn E. Schober, Evelyn Marie Silvia, Ted J. Suffridge, and Donald R. Wilken.

Mathematical symbolic manipulation on the computer, to be held Tuesday afternoon and Wednesday morning, organized by B. DAVID SAUNDERS of Rensselaer Polytechnic Institute. The tentative list of speakers includes Gregory Butler, B. F. Caviness, Bruce Char, George E. Collins, James Davenport, David A. Ford, Jerald Kovacic, John McKay, Maxwell A. Rosenlicht, Michael Singer, Hale F. Trotter, and David Y. Y. Yun.

Applications of mathematics to anthropology and sociology, to be held Tuesday afternoon, Wednesday morning, and Thursday morning, organized by STEPHEN B. SEIDMAN of George Mason University. The tentative list of speakers includes Paul A. Ballonoff, Steven Berkowitz, John P. Boyd, Michael F. Capobianco, Brian L. Foster, Charles H. Goldberg, Penelope J. Greene, Frank Harary, Jack Hunter, Samuel Leinhardt, Dwight W. Read, Robert G. Reynolds, Ronald E. Rice, Lee Sailer, Stephen B. Seidman, and Stanley S. Wasserman.

Hardy spaces and harmonic analysis, to be held Thursday afternoon and all day Friday, organized by ALBERTO TORCHINSKY of Indiana University, Bloomington. The tentative list of speakers includes Earl R. Berkson, Donald L. Burkholder, Eugene B. Fabes, David Jerison, Kent G. Merryfield, Umberto Neri, Donald E. Sarason, David A. Stegenga, Stephen Wainger, Guido L. Weiss, and R. L. Wheeden.

Orthogonal polynomials and other extremal polynomials, to be held Tuesday afternoon, Wednesday morning, and Thursday morning, organized by JOSEPH L. ULLMAN of the University of Michigan, Ann Arbor. The tentative list of speakers includes Richard A. Askey, James Ward Brown, Charles K. Chui, George Gasper, Jr., Mourad E. H. Ismail,

Computer Algebra—Symbolic Mathematical Computation

August 16-17, 1980

The American Mathematical Society, in conjunction with its eighty-fourth summer meeting, will present a one and one-half day short course entitled *Computer Algebra — Symbolic Mathematical Computation* on Saturday and Sunday, August 16 and 17, 1980, on the University of Michigan campus in Ann Arbor. The program is under the direction of David Y. Y. Yun, Manager of Computer Algebra, Mathematical Sciences Department, IBM Watson Research Center.

The course will attempt to establish the scope and the significant results as well as the potentials and limitations of computerizing symbolic and algebraic calculations. Unlike numerical analysis, the emphasis in computer algebra is on the determination of algorithmic solvability and the realization of computational processes for obtaining exact, symbolic, closed-form solutions to mathematical problems. A comprehensive overview together with in-depth presentations of selected theoretical results and algorithms of computer algebra will be given. Currently, feasible machine computations range from manipulation of symbols and simplification of formal expressions, through closed-form summation and decision procedures for integration and differential equations, to definitions of and computations in abstract algebraic domains, such as groups, rings, and fields. Such symbolic and algebraic modes of solving problems are most familiar to mathematicians, for whom computations beyond simple manipulative algebra are often useful or even necessary to test conjectures, to generate examples of or counter-examples to theories, or to gain insight by applying trial transformations. Many of these capabilities have been collected in interactive computer systems which provide convenient user interfaces to these computational tools. Some of the available computer algebra systems include the micro-processor based mu-MATH, the portable and versatile ALTRAN, REDUCE, and SAC, and the comprehensive MACSYMA and SCRATCHPAD residing on large, essentially dedicated, main-frame machines. A representative selection of these systems will be demonstrated and the participants will have the opportunity to try solving their favorite computational problems symbolically.

The course will consist of six lectures of seventy-five minutes each. The title of each lecture reflects the central theme, and one or two key subjects will be discussed in depth. Many related areas will also be covered to provide an overview of the theme topic that includes historical perspectives, surveys of existing results, mathematical and theoretical backgrounds, computational techniques and algorithms, implementational realities or empirical comparisons, and open problems for future research. Each lecture will follow from, and build on the material of, the previous ones. The titles and speakers for the six talks are:

Introduction to computer algebra — Systems and basic algorithms, Anthony C. Hearn, Chairman,

Computer Science Department, University of Utah; *Algebraic computations and structures*, James H. Davenport, Mathematical Sciences Department, IBM Watson Research Center (also University of Cambridge);

Solution of equations by constructive algebraic mappings, David Y. Y. Yun, Manager of Computer Algebra, Mathematical Sciences Department, IBM Watson Research Center;

Algebraic numbers and polynomial factorization, Hale F. Trotter, Chairman, Department of Mathematics, Princeton University;

Computational group theory, Charles C. Sims, Department of Mathematics, Rutgers University;

Algorithms for solving differential equations in finite terms, B. F. Caviness, Chairman, Computer Science Graduate Committee, Department of Mathematical Sciences, Rensselaer Polytechnic Institute.

At the end of each day (approximately 4 to 5 p.m.), there will be a demonstration and hands-on systems session where participants can explore and experiment with symbolic and algebraic facilities, as well as carry on general discussions with the lecturers.

Synopses of the lectures and accompanying reading lists appear, starting on page 336 of this issue of the **Notices**. A basic knowledge of algebra and calculus together with some exposure to general (independent of any particular computer programming language) algorithmic specifications of computational processes will be presumed. Those who wish to get the most benefit from the course should consult Chapters 7 and 8 of *The Design and Analysis of Computer Algorithms*, by Aho, Hopcroft, and Ullman, Addison-Wesley, 1974, or Chapter 4 of *The Art of Computer Programming, Vol. 2: Seminumerical Algorithms*, by D. Knuth, Addison-Wesley, 1969. An overview of the current activities in computer algebra can be obtained by scanning *Lecture Notes in Computer Science, No. 72: Symbolic and Algebraic Computation*, E. W. Ng (editor), Springer-Verlag, 1979. The reading lists also give a variety of sources for study prior to the course.

The short course is open to all who wish to participate upon payment of the registration fee. Participants may preregister for the course until July 3, 1980, for \$18; a special preregistration fee of \$3 has been set for students and unemployed individuals. After the preregistration deadline, the fees will be increased to \$20 and \$5, respectively. (Housing and preregistration forms appear at the back of this issue.)

The short course was recommended by the Society's Committee on Employment and Educational Policy, whose members are Lida K. Barrett (chairman), Arthur P. Mattuck, Donald C. Rung, Hans Schneider, Robert J. Thompson, and William P. Ziemer.

The short course series is under the direction of the CEEP Short Course Subcommittee, whose members are Ronald L. Graham (chairman), Robert M. McKelvey, Cathleen S. Morawetz, and Barbara L. Ososky.

Committee on the Agenda for Business Meetings

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

- (a) doing nothing;
- (b) conferring with supporters and opponents to arrive at a mutually accepted amended version to be circulated in advance of the meeting;
- (c) recommending and planning a format for debate to suggest to a Business Meeting;
- (d) recommending referral to a committee;
- (e) recommending debate followed by referral to a committee.

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

The committee consists of Marion B. Pour-El, David A. Sanchez, Barnet M. Weinstock, and Guido L. Weiss, with the secretary as chairman.

In order that a motion for the Business Meeting of August 21, 1980, receive the service to be offered by the committee in the most effective manner, it should have been in the hands of the secretary by July 21, 1980.

Everett Pitcher, Secretary

Samuel Karlin, Attila Mate, H. N. Mhaskar, Paul G. Nevai, Mizanur Rahman, Joseph L. Ullman, R. A. Zalik, and Lynn Ziegler.

Contributed Papers

There will be sessions for contributed ten-minute papers on Tuesday afternoon, Wednesday morning, Thursday morning, Thursday afternoon, Friday morning, and Friday afternoon. The deadline for abstracts is *June 3, 1980*.

Audio-Visual Equipment

Rooms where special sessions and contributed-paper sessions will be held will be equipped with an overhead projector, screen, and blackboard.

Committee on Employment and Educational Policy (CEEP)

The Society's Committee on Employment and Educational Policy (CEEP) will have an open session at 7:30 p.m. on Monday, August 18, where a preliminary report on the 1980 AMS Nonacademic Salary Survey will be presented by Robert J. Thompson of Sandia National Laboratories, Albuquerque.

Council Meeting

The Council of the Society will meet at 4:00 p.m. on Tuesday, August 19, in the Michigan League.

Business Meeting

The Business Meeting of the Society will take place at 5:00 p.m. on Thursday, August 21, in the Rackham Lecture Hall. The secretary notes the following resolution of the Council: Each person who attends a Business Meeting of the Society shall be willing and able to identify himself as a member of the Society. In further explanation, it is noted that each person who is to vote at a meeting is thereby identifying himself as and claiming to be a member

of the American Mathematical Society. For additional information on the Business Meeting, please refer to the box titled Committee on the Agenda for Business Meetings.

ACTIVITIES OF OTHER ORGANIZATIONS

The Mathematical Association of America (MAA) will hold its 60th summer meeting on August 18-20, Monday-Wednesday. The Business Meeting of the MAA will take place at 10:00 a.m. on Tuesday, August 19, at which the Carl B. Allendoerfer, Lester R. Ford, and George Pólya awards will be presented. A series of three Earle Raymond Hedrick Lectures will be given by George Andrews of Pennsylvania State University.

Information regarding a minicourse to be offered by the MAA in Ann Arbor is contained in the box on page 324

There will be a dinner at 7:00 p.m. on Tuesday, August 19, in the Michigan League for those who have been members of the MAA for twenty-five years or more. Similar dinners have been held at each of the last several summer meetings and have proved to be pleasant occasions. Twenty-five year members of the MAA who have reserved tickets may pick them up at the Transparency section of the registration desk, and should do so prior to 4:30 p.m. on Tuesday. The cost of each ticket is \$12, including sales tax and gratuity. Spouses are invited.

For a more detailed listing of the activities of the MAA, see the Timetable.

The Institute of Mathematical Statistics (IMS) will hold its 1980 annual meeting on August 18-21, Monday-Thursday. The 1980 Wald Lectures will be given by Peter J. Bickel, University of California, Berkeley, on *Robustness*. The three lectures in this series will be given at 2:15 p.m. on Monday-Wednesday, August 18-20. Special invited papers will be

TIMETABLE

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

AMERICAN MATHEMATICAL SOCIETY SHORT COURSE SERIES		
SATURDAY, August 16	COMPUTER ALGEBRA—SYMBOLIC MATHEMATICAL COMPUTATION	
11:00 a.m. - 4:00 p.m.	REGISTRATION	
1:00 p.m. - 2:15 p.m.	Introduction to computer algebra—systems and basic algorithms Anthony C. Hearn	
2:30 p.m. - 3:45 p.m.	Algebraic computations and structures James H. Davenport	
4:00 p.m. - 5:00 p.m.	Systems demonstration and hands-on session	
SUNDAY, August 17		
8:00 a.m. - 2:00 p.m.	REGISTRATION	
9:00 a.m. - 10:15 a.m.	Solution of equations by constructive algebraic mappings David Y. Y. Yun	
10:30 a.m. - 11:45 a.m.	Algebraic numbers and polynomial factorization Hale F. Trotter	
1:00 p.m. - 2:15 p.m.	Computational group theory Charles C. Sims	
2:30 p.m. - 3:45 p.m.	Algorithms for solving differential equations in finite terms B. F. Caviness	
4:00 p.m. - 5:00 p.m.	Hands-on session and general discussion	
JOINT MATHEMATICS MEETINGS		
SUNDAY, August 17	American Mathematical Society	
2:00 p.m. - 8:00 p.m.	REGISTRATION	
MONDAY, August 18	AMS	Other Organizations
8:00 a.m. - 4:30 p.m.	REGISTRATION	
8:00 a.m. - 4:30 p.m.	AMS BOOK SALE	MAA BOOK SALE
9:00 a.m. - 9:10 a.m.		Mathematical Association of America WELCOME ADDRESS
9:10 a.m. - 10:00 a.m.		MAA - THE EARLE RAYMOND HEDRICK LECTURES: Lecture I George Andrews
10:00 a.m. - 11:00 a.m.		Institute of Mathematical Statistics SPECIAL INVITED PAPER I
10:10 a.m. - 11:00 a.m.		MAA - INVITED ADDRESS Mathematicians, cryptography and computers in the Second World War Peter J. Hilton
11:10 a.m. - noon		MAA - INVITED ADDRESS Some ideas in nonlinear analysis Ivar Stakgold
11:10 a.m. - noon		MAA - INVITED ADDRESS A course designed to reduce math anxiety Barbara Riehl
11:15 a.m. - 12:15 p.m.		IMS - SPECIAL INVITED PAPER II
12:45 p.m. - 1:15 p.m.		MAA - Films on mathematics and art Michela Emmer
1:00 p.m. - 5:00 p.m.	EXHIBITS	
1:20 p.m. - 2:10 p.m.		MAA - THE EARLE RAYMOND HEDRICK LECTURES: Lecture II George Andrews
2:15 p.m. - 3:15 p.m.		IMS - WALD LECTURE I Robustness Peter J. Bickel

Mathematical Association of America Minicourse
TEACHING CALCULUS USING INFINITESIMALS

August 18-19, 1980

On Monday and Tuesday evenings (August 18-19), there will be a minicourse on *Teaching calculus using infinitesimals*. Over the past dozen years a number of instructors have taught such a course to a variety of students from the high school to university level. A few of these courses have been honor sections, but most have been mainstream calculus sections. This minicourse will report on both the conduct of these courses and the results in terms of student perception of the course. There will be two sample lectures and problem sessions which illustrate the content and pedagogy of calculus with infinitesimals, a short lecture on the mathematical underpinnings of infinitesimals, and a panel discussion by instructors who have taught such courses. The minicourse will be conducted by FRANK WATTENBERG of the University of Wisconsin, Madison.

Enrollment is limited to thirty participants, and there is a registration fee of \$15. If more than

thirty persons preregister for the minicourse, requests will be processed on a first-come, first-served basis, and checks will be returned to those not enrolled. The minicourse is open only to persons who have registered for the Joint Mathematics Meetings. Those interested may preregister for both the minicourse and the Joint Mathematics Meetings by completing the preregistration/housing form at the back of this issue of the Notices. Please note that a separate check payable to the Mathematical Association of America must be submitted for the \$15 minicourse fee, while checks for the Joint Mathematics Meetings fees, social events, etc., should be made payable to the American Mathematical Society. The deadline for preregistration is July 3, 1980.

Since last-minute openings may occur, interested parties should inquire at the meeting registration desk.

given by B. Mandelbrot (title to be announced); T.L. Lai, *Adaptive design in regression and control*; and Rudy Beran, *Differentiable functionals and robustness: The nonindependent and identically distributed case*. The IMS Business Meeting will take place at 5:30 p.m. on Tuesday, August 19. For a more detailed listing of the activities of the IMS, please see the Timetable.

Pi Mu Epsilon (IIME) will hold its annual meeting on August 19-20, Tuesday-Wednesday. The J. Sutherland Frame Lecture will be given by Richard A. Askey at 8:30 p.m. on Tuesday, August 19. Professor Askey's title is *Ramanujan and some extensions of the Gamma and Beta functions*.

The Association for Women in Mathematics (AWM) will present a symposium at 3:00 p.m. on Wednesday, August 20, about Anna Johnson Pell Wheeler, the first woman lecturer in the AMS Colloquium Series. AWM would be interested in hearing from any of Professor Wheeler's former students, who should write to Bettye Anne Case, 2405 Idyllic Terrace, Tallahassee, Florida 32303. The AWM Open Membership Meeting will take place at 4:00 p.m. on Wednesday, August 20.

The Mathematicians Action Group (MAG) will sponsor a panel discussion on *Democracy in the AMS?* at 8:00 p.m. on Monday, August 18. The panel will be followed by the MAG Business Meeting at 9:00 p.m.

OTHER EVENTS OF INTEREST

Summer List of Applicants. The AMS-MAA-SIAM Committee on Employment Opportunities, which is charged with operation of the Employment Register and which oversees publication of *Employ-*

ment Information in the Mathematical Sciences, will publish a summer list of applicants prior to the Ann Arbor meeting in August 1980.

Copies of the 1980 summer list will be available at the Transparency Section of the registration desk for \$1. Following the meeting, they may be purchased from the Providence office for \$1. The list should prove useful to employers who have last minute openings, later in the summer or in the fall.

The applicant résumé form, as well as the preregistration form for the Joint Meetings, will also appear in the May issue of the publication *Employment Information in the Mathematical Sciences*.

The form includes a coded strip summarizing the information contained on the applicants' form. Please be sure to provide the coded summary in addition to completing the résumé form to be posted at the meeting. These strips will be used to prepare the printed lists of preregistered applicants.

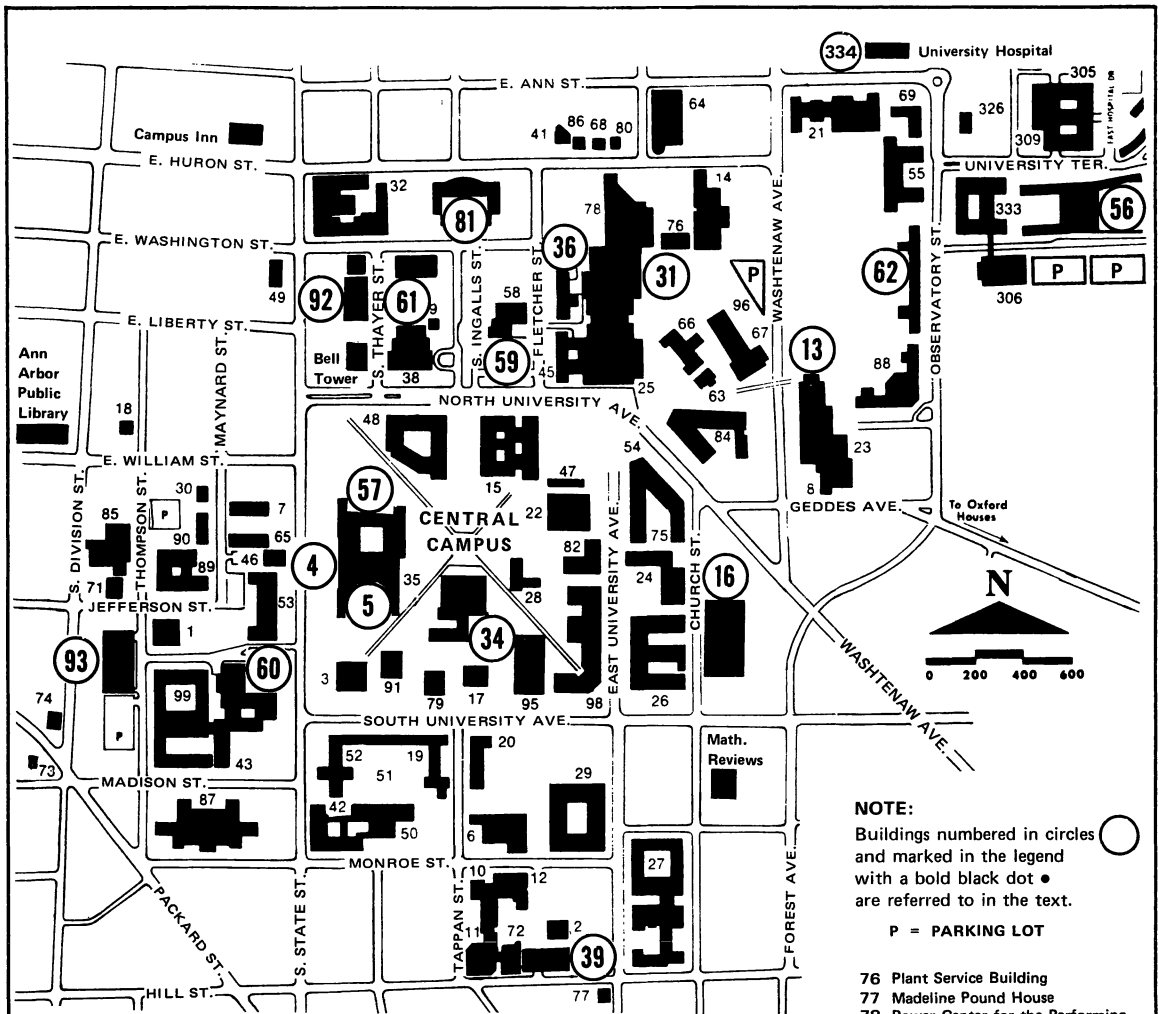
Great care should be taken in preparing the coded strip as well as the résumé form in order to assure that the listings are readable. Please study the instructions carefully before filling out the form.

Instead of an Employment Register at the summer Meeting in Ann Arbor, there will be an opportunity for posting of both applicant and employer résumé forms in or near the main meeting registration area. No provisions will be made for interviews; arrangements will be the responsibility of the employer and the applicant. Messages may be left in the message box located in the registration area. **There will be no special room set aside for interviews.**

Special applicant and employer forms will be available at the Transparency Section of the registration desk for both applicants and employers who

TIMETABLE

MONDAY, August 18	American Mathematical Society	Other Organizations
3:20 p.m. - 4:10 p.m.		MAA - INVITED ADDRESS Pensively penetrating Penrose's pentapièces John H. Conway
3:30 p.m. - 5:30 p.m.		IMS - INVITED SESSION I Stochastic analysis Masatoshi Fukushima Paul Malliavin Mark Pinsky (chairman) Daniel Stroock
3:30 p.m. - 5:30 p.m.		IMS - CONTRIBUTED PAPER SESSION
4:15 p.m. - 5:30 p.m.		MAA - PANEL DISCUSSION: Employment opportunities for non-Ph.D. mathematicians David Ballew (moderator) Opportunities in industry Donald Bushaw Opportunities in secondary teaching Arthur Coxford Opportunities in computer science Orrin E. Taulbee
4:15 p.m. - 5:30 p.m.		MAA - PANEL DISCUSSION: Machine-grading of college mathematics courses Lisl Gaal E. O. Milton
7:00 p.m. - 9:00 p.m.		MAA - Minicourse on teaching calculus using infinitesimals Frank Wattenberg
7:00 p.m. - 10:00 p.m.		Pi Mu Epsilon - Reception
7:00 p.m. - 10:00 p.m.		IMS - COUNCIL MEETING
7:00 p.m. - 10:00 p.m.		MAA - Informal Meeting CUPM Panel on the Calculus Sequence
7:30 p.m. - 9:30 p.m.	Committee on Employment and Educational Policy - Open Session on 1980 AMS Nonacademic salary survey Robert J. Thompson	
7:30 p.m. - 9:30 p.m.		MAA - Section Officers Meeting
7:30 p.m.		MAA - Introduction to the use of computer generated graphics in undergraduate mathematics education Gerald J. Porter
8:00 p.m. - 9:00 p.m.		Mathematicians Action Group PANEL DISCUSSION: Democracy in the AMS?
9:00 p.m. - 10:00 p.m.		MAG - BUSINESS MEETING
TUESDAY, August 19	AMS	Other Organizations
8:30 a.m. - 4:30 p.m.		REGISTRATION
8:30 a.m. - 4:30 p.m.		EXHIBITS
8:30 a.m. - 4:30 p.m.	AMS BOOK SALE	MAA BOOK SALE
9:00 a.m. - 9:50 a.m.		MAA - THE EARLE RAYMOND HEDRICK LECTURES: Lecture III George Andrews
10:00 a.m. - 10:50 a.m.		MAA - BUSINESS MEETING
10:00 a.m. - 12:15 p.m.		IMS - INVITED SESSION II Statistical theory for orientation data R. W. Beran John Kent M. A. Stephens Geoffrey S. Watson (chairman) John Wellner
10:00 a.m. - 12:15 p.m.		IMS - CONTRIBUTED PAPER SESSION
11:00 a.m. - 11:50 a.m.		MAA - INVITED ADDRESS Building algebraic models Georgia Benkart



THE UNIVERSITY OF MICHIGAN

Ann Arbor

CENTRAL CAMPUS

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| <ul style="list-style-type: none"> 1 Administration Building 2 Afroamerican and African Studies Center 3 Alumni Memorial Hall (Museum of Art) ● 4 James B. Angell Hall ● 5 Angell Auditorium Unit 6 Architecture and Design Building 7 Betsy Barbour House 8 Margaret Bell Pool 9 Burton Memorial Tower 10 Business Administration Building 11 Business Administration Assembly Hall 12 Business Administration Library ● 13 Central Campus Recreation Building 14 Central Energy Plant 15 Chemistry Building ● 16 Church St. Parking Structure 17 William L. Clements Library of Americana 18 Continuing Education of Women 19 John Cook Residence 20 Martha Cook Building 21 Couzens Hall 22 Samuel Trask Dana Natural Resources Building 23 Dance Building | <ul style="list-style-type: none"> 24 David M. Dennison Physics and Astronomy Building 25 School of Dentistry Building 26 East Engineering Building 27 East Quadrangle (Residential College) 28 Economics Building 29 School of Education Building 30 Extension Service Building ● 31 Fletcher St. Parking Structure 32 Henry S. Frieze Building ● 34 Harlan Hatcher Graduate Library 35 Haven Hall ● 36 Health Service Building 38 Hill Auditorium ● 39 Hill St. Parking Structure 41 Institute of Human Adjustment Counseling Division 42 Hutchins Hall 43 International Center 45 Kellogg Foundation Institute 46 Kelsey Museum of Archaeology 47 Key Office 48 Edward Henry Kraus Natural Science Building 49 Lane Hall 50 Law Library (Legal Research Building) 51 Law Quadrangle | <ul style="list-style-type: none"> 52 Lawyers Club 53 Literature, Science, and the Arts Building 54 Clarence C. Little Science Building 55 Alice Crocker Lloyd Hall (Pilot Program) ● 56 Mary Markley Hall ● 57 Mason Hall 58 Lydia Mendelssohn Theatre ● 59 Michigan League ● 60 Cambridge House (Michigan Union) ● 61 Modern Language Building ● 62 Mosher-Jordan Hall 63 Museums Annex 64 Neuroscience Building 65 Helen Newberry Residence 66 North Hall 67 North University Building 68 Nursing Annex I 69 Observatory 71 Parking and Publications Building 72 Paton Accounting Center 73 Perry Building 74 Introductory Psychology and Project Outreach 75 College of Pharmacy Building | <ul style="list-style-type: none"> 76 Plant Service Building 77 Madeline Pound House 78 Power Center for the Performing Arts 79 President's Residence 80 Psychological Clinic ● 81 Rackham Building 82 Harrison M. Randall Laboratory 84 Alexander G. Ruthven Museums Building. (Anthropology Paleontology, Zoology, and Exhibit Museums) 85 Institute for Social Research 86 Social Work Center Building 87 South Quadrangle 88 Stockwell Hall 89 Student Activities Building 90 Student Publications Building 91 Tappan Hall ● 92 Thayer St. Parking Structure ● 93 Thompson St. Parking Structure 95 Undergraduate Library 96 University Herbarium 98 West Engineering Building 99 West Quadrangle 305 East Medical Center Parking Structure 306 Thomas Francis Jr. School of Public Health Building 309 Hospital Personnel and Finance Building 326 Simpson Memorial Institute 333 Henry F. Vaughan Public Health Building ● 334 University Hospital |
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NOTE:

Buildings numbered in circles and marked in the legend with a bold black dot ● are referred to in the text.

P = PARKING LOT

TIMETABLE

TUESDAY, August 19	American Mathematical Society	Other Organizations
11:00 a.m. - 11:50 a.m.		MAA - INVITED ADDRESS Microcomputers in a two-year college mathematics class John Kostoff
noon - 1:00 p.m.		IIME - COUNCIL LUNCHEON
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE I Between logic and arithmetic: Fifty years after Gödel's discoveries Julia B. Robinson	
afternoon	Special Sessions Sessions for Contributed Papers	
2:15 p.m. - 3:15 p.m.		IMS - WALD LECTURE II Robustness Peter J. Bickel
3:00 p.m. - 5:30 p.m.		IIME - CONTRIBUTED PAPER SESSION
3:30 p.m. - 5:15 p.m.		IMS - INVITED SESSION III Statistical models of dependence and their applications Freeman Gilbert C. Leith Murray Rosenblatt (chairman) David Slepian
3:30 p.m. - 5:15 p.m.		IMS - CONTRIBUTED PAPER SESSION
3:45 p.m. - 4:45 p.m.	INVITED ADDRESS Sporadic simple groups: A survey Michael E. O'Nan	
4:00 p.m. - 10:00 p.m.	COUNCIL MEETING	
5:00 p.m. - 7:00 p.m.		MAA - Reception hosted by the Michigan Section of the Association
5:30 p.m. - 6:30 p.m.		IMS - BUSINESS MEETING
6:30 p.m. - 8:15 p.m.		IIME - BANQUET
7:00 p.m.		MAA - BANQUET FOR 25-YEAR MEMBERS
7:00 p.m. - 9:00 p.m.		MAA - Minicourse on teaching calculus using infinitesimals Frank Wattenberg
7:00 p.m. - 9:00 p.m.		MAA - PANEL DISCUSSION: CUPM Panel for modeling and operations research
7:00 p.m. - 9:30 p.m.		MAA - FILM PROGRAM
7:00 p.m.		Sampling and estimation, inferential statistics, Part II
7:30 p.m.		Dragon fold
7:40 p.m.		Curves of constant width
8:00 p.m.		Conics
8:12 p.m.		The definite integral
8:30 p.m.		Journey to the center of a triangle
8:42 p.m.		Regular homotopies in the plane, Part I
8:59 p.m.		The seven bridges of Königsberg
9:05 p.m.		A non-Euclidean universe
8:00 p.m.		WINE AND CHEESE TASTING
8:30 p.m. - 9:30 p.m.		IIME - J. SUTHERLAND FRAME LECTURE Ramanujan and some extensions of the gamma and beta functions Richard A. Askey
WEDNESDAY, August 20	AMS	Other Organizations
8:00 a.m. - 9:00 a.m.		IIME - DUTCH TREAT BREAKFAST
8:30 a.m. - 4:30 p.m.		REGISTRATION
8:30 a.m. - 4:30 p.m.		EXHIBITS
8:30 a.m. - 4:30 p.m.	AMS BOOK SALE	MAA BOOK SALE

wish to post a résumé. Employers who do not plan to attend, and wish to display literature only, may do so at no charge. This material must, however, be received in the Providence Office (MSER, P.O. Box 6248, Providence, RI 02940) no later than July 3. Information cannot be taken over the telephone, either in Providence after July 3 or at the meeting.

Applicants who submit an applicant form, but do not plan to attend the meeting will be listed on the printed list only. There is no provision made for posting résumés for participants who do not attend the meeting.

Exhibits. The book and educational media exhibits will be located in the Ballroom of the Michigan League, and will be open from 1:00 p.m. to 5:00 p.m. on Monday, August 18; and from 8:30 a.m. to 4:30 p.m. on Tuesday and Wednesday, August 19-20.

AMS Book Sale. Books published by the AMS will be sold for cash prices somewhat below the usual prices when these same books are sold by mail. The book sale will be located in the Ballroom of the Michigan League, and will be open from 8:00 a.m. to 4:30 p.m., Monday August 18, and 8:30 a.m. to 4:30 p.m., Tuesday and Wednesday, August 19-20.

Second-hand Book and Journal Exchange. It has been proposed that the AMS determine whether there is an interest in a Second-Hand Book Exchange at the annual and summer meetings. The exchange will be tested on a small scale at the Ann Arbor meeting.

At the AMS Book Sale tables in the exhibit area (the same room where registration will take place) notebooks will be available with lists of books on mathematics for sale or being sought. There will be separate notebooks of books for sale and books wanted with names and addresses of the owners (or seekers). The details of the transactions themselves would have to be arranged by the participants and the AMS will not accept responsibility for settling disputes if arrangements go awry. Professor Keith Dennis has volunteered to keep the lists for a period of about two months after the meeting, and to send copies to anyone interested for the cost of copying and mailing. (His address: Department of Mathematics, White Hall, Cornell University, Ithaca, New York 14853.)

It is necessary to charge a small fee to cover the cost of preparing the notebooks. Each person participating is asked to pay \$2 for the first page and \$1 for each additional page (one side is one page). Books for sale must be listed on separate pages from books wanted, and the lists made up on 8.5" X 11" papers.

Please include the information below.

Books Offered: Name, address, telephone, will or will not be at the meeting. Author, title, publisher, year of publication, type of binding. Condition of the publication (for example, slightly used, annotated lightly or heavily, like new). Price

or book wanted in trade.

Books Wanted: Name, address, telephone, will or will not be at the meeting. Author, title, publisher, edition, price one is willing to pay.

Those who use this service at the meeting will be asked to make suggestions concerning its usefulness or improvement. If the interest is sufficient, the service will be continued at the next Annual Meeting, possibly at that time expanded to include lists from libraries seeking replacements for lost out-of-print books and lists from second-hand book dealers.

Please send your lists to:

Promotion Department, AMS
P. O. Box 6248, Providence, RI 02940

Make checks payable to the AMS. If you have questions call Phoebe Murdock, 401-272-9500 extension 237.

Mathematical Reviews Open House. The staff of *Mathematical Reviews* invites meeting participants to visit the MR offices on Thursday, August 21. The offices are located at 611 Church Street, one block east of the University of Michigan campus. In order to have an advance count of the number of visitors, participants are asked to pick up free tickets for the open house (which will cover various time periods between 2:00 p.m. and 4:00 p.m.) from the MR desk, where staff members will be available to answer questions regarding MR. This desk will be located in the registration area and staffed during the hours the registration desk is open.

INFORMATION FOR PARTICIPANTS

Registration

Meeting preregistration and registration fees only partially cover expenses of holding meetings. All who do not preregister, but attend the meetings in Ann Arbor, are expected to register during the hours listed below. The fees for registration at the meetings are:

JOINT MATHEMATICS MEETINGS

Member of AMS, IMS, MAA, IIME	\$30
Nonmember	40
Student/Unemployed	10
MAA MINICOURSE — All participants	\$15
AMS SHORT COURSE. See page 321.	

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

Students are considered to be only those currently working toward a degree, who do not receive compensation totaling more than \$7,000 from employment, fellowships, and scholarships.

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

TIMETABLE

WEDNESDAY, August 20	American Mathematical Society	Other Organizations
8:45 a.m. - 9:45 a.m. morning	COLLOQUIUM LECTURE II Between logic and arithmetic: Diophantine equations Julia B. Robinson Special Sessions Sessions for Contributed Papers	
9:00 a.m. - 10:30 a.m.		IME - CONTRIBUTED PAPER SESSION
10:00 a.m. - 11:00 a.m.	INVITED ADDRESS Good codes Jacobus H. Van Lint	
10:00 a.m. - noon		IMS - INVITED SESSION IV Random measures and geometric models Maury Bramson Ken Hochberg Stanley Sawyer (chairman) Hans Weinberger
10:00 a.m. - noon		IMS - CONTRIBUTED PAPER SESSION
11:15 a.m. - 12:15 p.m.	INVITED ADDRESS Some applications of Nevanlinna theory to differential equations Robert P. Kaufman	
12:45 p.m. - 1:15 p.m.		MAA - Films on mathematics and art Michela Emmer
1:00 p.m. - 2:00 p.m.		IMS - SPECIAL INVITED PAPER III
1:20 p.m. - 2:10 p.m.		MAA - INVITED ADDRESS Some personal experience for populari- zation of mathematics in China L. K. Hua
2:15 p.m. - 3:15 p.m.		IMS - WALD LECTURE III Robustness Peter J. Bickel
3:00 p.m. - 4:00 p.m.		Association for Women in Mathematics SYMPOSIUM: Anna Johnson Pell Wheeler, AMS Colloquium Lecturer, 1927 (with remarks by her students and colleagues) Paul Campbell Bettye Anne Case (moderator) Louise Grinstein Ruth McKee Nancy Owens
3:20 p.m. - 4:10 p.m.		MAA - INVITED ADDRESS The ellipsoidal algorithm for linear programming Vasik Chvatal
3:20 p.m. - 4:10 p.m.		MAA - INVITED ADDRESS Mathematical modeling in the biological sciences John A. Jacquez
3:30 p.m. - 5:00 p.m.		IME - CONTRIBUTED PAPER SESSION
3:30 p.m. - 5:15 p.m.		IMS - INVITED SESSION V Applied probability Michael Harrison Sidney Resnick Sheldon Ross Howard Taylor (chairman)
3:30 p.m. - 5:15 p.m.		IMS - CONTRIBUTED PAPER SESSION
4:00 p.m. - 5:00 p.m.		AWM - OPEN MEMBERSHIP MEETING
4:20 p.m. - 5:10 p.m.		MAA - INVITED ADDRESS An introduction to the finite element method Richard S. Falk
4:20 p.m. - 5:10 p.m.		MAA - Session on archives and history of mathematics G. Bailey Price (presider) Who gave you the E? or The origins of Cauchy's vigorous calculus Judith V. Grabiner

Registration dates and location. The Joint Mathematics Meetings registration desk will be open during the following hours:

JOINT MATHEMATICS MEETINGS

Ballroom, Michigan League

Sunday, August 17	2:00 p. m. — 8:00 p. m.
Monday, August 18	8:00 a. m. — 4:30 p. m.
Tuesday, August 19	} 8:30 a. m. — 4:30 p. m.
Wednesday, August 20	
Thursday, August 21	

ASSISTANCE AND INFORMATION DESK

Lobby, Rackham Building

Friday, August 22 8:30 a. m. — 1:30 p. m.

Please note that the Joint Mathematics Meetings registration desk will not be open on Friday, August 22, and that the telephone message center will not be in operation. Other services provided at the registration desk during the meeting will also no longer be available (see section below on Registration Desk Services). There will, however, be a small desk set up in the lobby outside Rackham Lecture Hall, where local information will be available and where a staff member will provide limited assistance to participants. No registration or cash transactions will be possible at this desk.

Registration Desk Services

AMS/MAA Information. Information on the publications and activities of both organizations may be obtained at this section of the registration desk.

Audio-Visual Assistance. A member of the AMS staff will be happy to assist speakers unfamiliar with the overhead projector, or consult with speakers with special requirements.

Baggage and Coat Check. Participants may leave baggage, parcels, coats, etc., for safekeeping at the meeting registration desk during the hours it is open, provided these items are picked up before the desk closes for the day. Articles left after closing time cannot be reclaimed until the following morning.

Check Cashing. The meeting cashier will cash personal or travelers' checks up to \$50, upon presentation of a meeting registration badge, and provided there is enough cash on hand.

Comments, Complaints, and Emergencies. A log for registering participants' comments or complaints about the meeting is kept at the Transparencies section of the registration desk. All participants are encouraged to use this method of helping us improve future meetings. Comments on all phases of the meeting are welcome. If you would like to receive a written reply, please furnish your name and address.

Participants with problems of an immediate nature requiring action at the meeting, should see the meeting manager, who will be happy to assist you or put you in touch with someone who can.

Mail. All mail and telegrams for persons attending the meetings should be addressed in care of

Joint Mathematics Meetings, Department of Mathematics, 3220 Angell Hall, University of Michigan, Ann Arbor, Michigan 48109. Mail and telegrams so addressed may be picked up at the Joint Mathematics Meetings registration desk in the Ballroom of the Michigan League during the hours that desk is open. US mail not picked up will be forwarded after the meeting to the mailing address given on the participant's registration record.

Local Information. This section of the desk will be staffed by members of the Local Arrangements Committee and other volunteers from the Ann Arbor mathematical community. Information on bus tours and other events and activities of interest in the area can be obtained, and several brochures on local attractions are available.

Personal Messages. Participants wishing to exchange messages during the meeting should use the mailbox mentioned above. Message pads and pencils are provided.

Telephone Messages. A telephone message center will be located in the same area to receive incoming calls for participants. The center will be open from August 17 through August 21, during the same hours as the Joint Mathematics Meetings registration desk. Messages will be taken and the name of any individual for whom a message has been received will be posted until the message has been picked up at the message center. The telephone number of the message center will be published in a future issue of the **Notices**.

Participants are advised that it will be extremely difficult to get telephone messages to them in the residence halls during the meetings, and all concerned are advised to use the message center, if at all possible. Messages can, however, be taken at the front desk of Mosher-Jordan and Markley Halls and placed on a message board. The telephone numbers of these desks are 313-764-2106 and 313-764-1126. In extreme emergencies, campus security can notify individuals. Their number is 313-763-1131.

Tickets. Tickets for the various social events may be purchased at the Transparencies section of the registration desk. Tickets for the bus tours may be purchased at the Local Information section.

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

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

University Housing.

Participants desiring confirmed reservations for on-campus housing must preregister prior to the deadline of July 3, 1980. Rooms may be available for those who do not preregister, but this cannot be

TIMETABLE

WEDNESDAY, August 20	American Mathematical Society	Other Organizations
4:20 p.m. - 5:10 p.m.		MAA - Session on archives and history of mathematics (continued) Archives of American mathematics Albert C. Lewis Applications of mathematics in rocket work and computing during World War II J. Barkley Rosser
5:00 p.m. - 6:00 p.m.		MAA - Committee on Two-Year Colleges Informal Meeting
6:30 p.m.		PICNIC
7:00 p.m. - 10:00 p.m.		IMS - COUNCIL MEETING
9:00 p.m.		BEER PARTY
THURSDAY, August 21	AMS	Other Organizations
8:30 a.m. - 4:30 p.m.		REGISTRATION
8:45 a.m. - 9:45 a.m.	COLLOQUIUM LECTURE III Between logic and arithmetic: Definability in fields Julia B. Robinson	
morning	Special Sessions Sessions for Contributed Papers	
10:00 a.m. - 11:00 a.m.	INVITED ADDRESS The arithmetic theory of loop groups Howard Garland	
10:00 a.m. - noon		IMS - INVITED SESSION VI Statistics: Theory and practice, theory vs. practice George Box Leo Breiman (chairman) Bradley Efron David Hinkley
10:00 a.m. - noon		IMS - CONTRIBUTED PAPER SESSION
11:15 a.m. - 12:15 p.m.	INVITED ADDRESS Whitehead torsion old and new, and its relationship to geometric topology Dan Burghlelea	
afternoon	Special Sessions Sessions for Contributed Papers	
1:00 p.m. - 2:00 p.m.	INVITED ADDRESS Optimum combinatorial designs Jack C. Kiefer	
2:00 p.m. - 4:00 p.m.		MATHEMATICAL REVIEWS OPEN HOUSE
4:00 p.m. - 5:00 p.m.	PRIZE SESSION	
5:00 p.m. - 6:00 p.m.	BUSINESS MEETING	
8:30 p.m.		CONCERT
FRIDAY, August 22	AMS	
8:30 a.m. - 1:30 p.m.		ASSISTANCE AND INFORMATION DESK
8:45 a.m. - 9:45 a.m.	COLLOQUIUM LECTURE IV Between logic and arithmetic: Nonstandard models of arithmetic Julia B. Robinson	
10:00 a.m. - 11:00 a.m.	INVITED ADDRESS Sieves and combinatorial inequalities: From Eratosthenes to Chen Heini Halberstam	
11:15 a.m. - 12:15 p.m.	INVITED ADDRESS The norm preserving lifting of intertwining operators and its applications Ciprian Foias	
morning and afternoon	Special Sessions Sessions for Contributed Papers	

guaranteed. There are several choices of accommodations available at the University of Michigan:

Residence Hall Housing. Mosher-Jordan Hall (62 on the campus map) is air-conditioned; Mary Markley Hall (56 on the campus map) is not. All families must be housed in Markley. The two complexes are within a three-minute walk of each other (approximately 200 yards). Accommodations in these halls include breakfast, served daily in Markley Hall. The cost of the breakfast is included in the room/cot rates given below.

There is no charge for infants occupying a crib provided by the parents. (The university has no access to cribs; see the section on **Crib Rental** for more information.) Cots are available for children 12 years of age or under. Use of these cots is limited to one cot per double room, and one parent or adult must occupy one of the beds in the room where a child of 12 or younger sleeps. Any child over 12 years of age must occupy a bed, and will be charged the same rate as an adult. Children under 12 may, of course, occupy a bed, provided the adult room rate is paid. The rates for these accommodations, including breakfast, are as follows:

	<u>With</u> <u>air-conditioning</u>	<u>Without</u> <u>air-conditioning</u>
Single	\$18.25	\$15.25
Double	\$14.25 per person	\$12.25 per person
Cot	\$ 7.75	\$ 7.75

All rates quoted are subject to a four percent state sales tax.

All double rooms in Mosher-Jordan and Markley contain two twin beds; double beds are not available. Participants will share several large communal bathrooms on each floor. The room/cot charge includes linens for the week. Included are two sheets and blanket, pillow and case. Two fresh towels and one washcloth are provided daily. Each room contains, in addition to the beds, two dressers, two desks, two student chairs, one lounge chair, two lamps, ashtrays, drinking glasses, and soap. Toilet tissue is provided in the bathrooms.

Laundry centers are located in both residence halls. These are coin-operated, and cost 50¢ for the washer and 10¢ for the dryer. Ironing boards and irons are available at the respective front desks. Participants must provide their own laundry soap or detergent.

There are several lounges and reading rooms in both buildings, some with television sets. There are no telephones in the individual residence hall rooms. There are, however, pay phones in each building in the lobby area.

Consumption of alcoholic beverages by participants is permitted in the residence halls. The legal drinking age is 21. Pets are not allowed.

Check-in for rooms in either Markley or Mosher-Jordan will take place at the front desk in the Jordan wing of Mosher-Jordan Hall on Observatory Street. The desk will be open 24 hours daily during the period Sunday through Wednesday, August 17-

20. Thereafter, the desk will be open for check-in from 9:00 a. m. to 10:00 p. m. daily. Breakfast tickets will be issued at housing check-in.

It will not be possible for participants to occupy residence hall rooms prior to Friday, August 15, or after noon on Saturday, August 23. If housing requests are received for dates before August 15 or after August 23, they will be honored for the period August 15-22 only. Residence hall reservations do not require an advance deposit; however, full payment for rooms at the residence hall must be made at check-in time. Cash and personal or travelers' checks will be accepted; credit cards will not be honored. A key deposit of \$5 will be collected at check-in, and refunded when the keys are returned. Two keys will be issued; one key opens the front door of the residence hall, and the other is the room key.

Cambridge House (formerly Michigan Union) (60 on the Campus map). Most rooms in Cambridge House have two single beds, are air-conditioned, with private bath, telephone, and television set. The rates here, also subject to the four percent state sales tax, are: Single \$25; Double \$35. A cot can be added at an additional cost of \$5/day. Participants should use the Thompson Street entrance when checking in. The desk is staffed 24 hours daily. When away from the desk, the attendant may be summoned by ringing the bell. The Cambridge House will accept cash, personal or travelers' checks, and Visa or Master Charge. There is free parking for guests staying at Cambridge House.

Michigan League (59 on the campus map). A limited number of rooms with two single beds and private baths are available at the Michigan League. All rooms are air-conditioned. The rates here are also subject to the four percent state sales tax, and are: Single \$26; Double \$32. The League will accept cash, personal or travelers' checks, but **not** credit cards. Participants should use the Ingalls Street entrance when checking in. The desk is staffed 24 hours daily. When away from the desk, the attendant may be summoned by ringing the bell.

Campus Food Services

Mary Markley Hall. A full-course, hot breakfast will be served daily from Monday, August 18, through Saturday, August 23, in Markley Hall for the participants staying in the residence halls. Participants not staying in the residence halls will not be able to get breakfast in Markley. The dining room in Markley will not be open for lunch or dinner. There are vending machines in both residence halls offering some of the following: pastries, chips, candy, cigarettes, soft drinks, milk, and ice cream. These machines are accessible 24 hours each day, seven days each week.

Michigan League. The cafeteria in the League is not open for breakfast, but there is a snack bar in the basement where anyone can get breakfast starting at 7:15 a. m. for approximately \$1.50, and lunch

at a nominal price. The snack bar remains open until 4:00 p.m. The cafeteria is open for lunch from 11:30 a.m. to 1:15 p.m. (\$1.85 for daily special, to about \$3 à la carte), and for dinner from 5:00 p.m. to 7:15 p.m. (\$2.25 for daily special, to about \$5 à la carte). Also, there is a vending machine area in the League where soft drinks, coffee, candy, etc. are available; hours are 7:15 a.m. to 11:00 p.m. The various food services in the League are open to all participants.

Cambridge House (formerly Michigan Union). Participants staying in rooms at the Cambridge House can obtain, at an additional charge, a continental breakfast at the University Club in the Michigan Union complex. This breakfast is served Monday through Friday, from 7:00 a.m. to 10:30 a.m. The Club also serves lunch from 11:30 a.m. to 1:30 p.m., but no dinner is served.

Hotel Accommodations

Blocks of rooms have been set aside for use by participants at the Bell Tower Hotel and the Campus Inn. Both hotels are within easy walking distance of campus; exact locations are shown on the campus map. Participants desiring hotel accommodations should so indicate on the housing form at the back of this issue of the **Notices**, and **submit it to arrive on or before the deadline of July 3, 1980**. Confirmations will be sent by the hotels, and participants will be advised of deposit requirements at time of confirmation.

The following codes apply: FP = Free Parking; SP = Swimming Pool; AC = Air-Conditioned; TV = Television; CL = Cocktail Lounge; RT = Restaurant. In all cases "Single" refers to one person in one bed; "Double" refers to two persons in one double bed. "Twin" refers to two persons in two single beds. All rates quoted are subject to four percent state sales tax, and two percent county sales tax.

Bell Tower Hotel

300 South Thayer Street, 48104
Telephone: 313-769-3010

Single: \$30-33 Double/Twin \$38-41
Code: AC, TV, CL, RT

Campus Inn

615 East Huron at State, 48104
Telephone: 313-769-2200

Single: \$37-40 Double/Twin \$45-48
Code: FP, SP, AC, TV, CL, RT

MISCELLANEOUS INFORMATION

Camping. There are several excellent campgrounds located approximately thirty miles from campus. Information concerning campgrounds (and picnic areas) will be available at the Local Information Section of the Joint Mathematics Meetings registration desk.

Athletic Facilities. Extensive indoor and outdoor recreational facilities are available. The Central Campus Recreation Building (CCRB) (13 on the campus map) contains courts for racquetball, squash,

volleyball, and basketball, and a swimming pool, indoor jogging track, weight-training room, saunas and other features. Nearby outdoor facilities include a jogging track, softball fields and tennis courts. Hours of availability and reservation procedures will be posted. Use of indoor facilities will involve a small fee. When preregistering, the cost is \$1 per day, or \$3 per week. Recreation passes can also be purchased at the Mosher-Jordan Hall desk during the meetings at a cost of \$2 per day, or \$6 per week.

Book Stores. The campus bookstore, located in the basement of the Michigan Union (60 on the campus map) will be open 9:00 a.m. to 5:30 p.m., weekdays. In addition, there are off-campus book stores located on State Street, East University, and South University Avenue, nearby.

Out-of-town papers, and esoteric literature may be found at the Blue Front, located at the intersection of South State and Packard, which is about five blocks from Angell Hall (4 on the campus map). The Blue Front is open from 7:00 a.m. to 10:00 p.m. daily.

Child Care. The Little Angels Nursery at 2455 Washtenaw, Ann Arbor, Michigan 48104 (telephone 313-769-9561) will accept children between the ages of two-and-one-half and five-and-one-half, Monday through Friday, from 7:15 a.m. to 5:30 p.m. Rates are \$1.50 per hour for one child, or \$2 per hour for two children from the same family. Children can bring their own lunch, or the nursery will provide a nutritious noontime meal for \$1. Participants should call the day before to make reservations.

A list of babysitters will be available at the Local Information Section of the registration desk.

Crib Rental. Rental cribs are available from A-1 Rental, Inc., 2285 West Liberty, Ann Arbor, Michigan 48103 (telephone 313-663-0060). Advance reservations should be made by mail.

Entertainment. The University of Michigan is pleased to host the August 1980 Joint Mathematics Meetings on the silver anniversary of the last such occasion in August 1955. The Local Arrangements Committee has planned a number of activities for participants and their families.

On Tuesday, August 19, the committee has arranged a tasting of from 18 to 24 assorted wines in the Rackham Assembly Hall, Room 4600, from 8:00 p.m. to 11:00 p.m. Due to space, the number of participants will be limited. Those wishing to attend are urged to purchase their tickets at \$8.50 each when preregistering, since local liquor laws prohibit sale of tickets at the door.

On Wednesday, August 20, the traditional summer picnic will be held at Romanoff's on Pontiac Trail, a private picnic grounds 8.5 miles northeast of Ann Arbor. An ox roast will be featured, accompanied by assorted relishes, American potato salad, German potato salad, Boston baked beans, Italian rigatoni, rye and French breads, coffee, iced tea, milk, and Michigan melon. Again, the number who will be able to attend is limited, and those

wishing tickets must purchase them when preregistering. Adult tickets are \$8, including transportation. No ticket is required for a child under six years of age, but children six and over must purchase an adult ticket. Beer will be sold by the glass during the picnic, and the traditional summer beer party will follow the picnic. Buses for the trip to Romanoff's will leave Mosher-Jordan Hall at 5:00 p. m. and 6:00 p. m., and from Thompson Street entrance to the Cambridge House at 5:30 p. m. All buses will stop at the Michigan League before proceeding to Romanoff's. The meal will be served at 6:30 p. m. The first bus returning to campus will leave at 9:00 p. m., and the last bus at 11:00 p. m. All buses will be clearly marked "MATHEMATICS MEETINGS," and monitors will be on hand to assist participants with tickets.

On Thursday, August 21, a concert will be given in the Rackham Lecture Hall at 8:30 p. m. by Jerome Jelinek, a cellist and member of the University of Michigan School of Music, and Joseph Gurt, a pianist and member of the Eastern Michigan University faculty. There will be no admission charge. The program will be published in a later issue of the Notices.

Two special bus trips are planned for Thursday, August 21. The bus charge for each of these two trips is \$1 per passenger, round-trip. Since the maximum number of passengers to be accommodated on each of the two trips is 125, interested persons must purchase their bus tickets at the Local Information Section of the registration desk **before noon on Wednesday, August 20**. No tickets will be sold at the bus boarding stops. If there is not enough interest in these trips, they will be canceled and an announcement will be made some time after noon on Wednesday, August 20.

One trip will be a guided tour of the Ford Motor Company's River Rouge Plant, a modern, automated assembly-line. The buses for this trip will leave from Mosher-Jordan Hall at 9:00 a. m. and proceed directly to the Ford plant, where a company guide will join the group for a tour of the factory. After the tour, which should last about two hours, the bus will return to Mosher-Jordan Hall, arriving at about 1:30 p. m. There will be no lunch stop on this trip. There is no admission charge for the tour of the Ford plant.

The second bus trip will be to the Greenfield Village-Henry Ford Museum complex. Greenfield Village is a 240 acre indoor-outdoor museum containing nearly a hundred historic buildings and artifacts (Edison's laboratory, a London clocktower, Henry Ford's early home, a Cotswold cottage, a steam locomotive that runs, an operating paddle-wheel steamboat, etc.). The Ford Museum is devoted to items illustrating America's inventive genius. The buses for this trip will leave from Mosher-Jordan Hall at 9:30 a. m., and leave the Museum-Village complex at 4:30 p. m., to arrive back at Mosher-Jordan Hall at about 6:00 p. m. There is a restaurant at the Museum-Village complex. Ad-

mission to the Museum or Village costs \$4.25 for adults, and \$2.25 for children 6 to 10 years of age. Separate admission charges are made for the Museum and the Village. (On one trip it is customary to choose one of the two to visit.)

Libraries. The university's general library (Harlan Hatcher Graduate Library, 34 on the campus map) will be open 8:00 a. m. to 10:00 p. m., Monday through Friday; Saturday, 10:00 a. m. to 6:00 p. m.

The Mathematics Library, located in Room 3027 on the third floor of Angell Hall (4 on the campus map) will be open from 8:00 a. m. to 10:00 p. m., Monday through Thursday, and 8:00 a. m. to 5:00 p. m. on Friday.

The Ann Arbor Public Library, located four blocks from Angell Hall at the corner of East William and South Fifth Avenue, will be open from 10:00 a. m. to 9:00 p. m. on Monday, and from 9:00 a. m. to 9:00 p. m., Tuesday through Friday.

Local Information. Information will also be available at the Local Information Section of the registration desk on other local places of interest.

Medical Services. The University Health Service (36 on the campus map) will be open from 8:00 a. m. to 5:00 p. m., Monday through Friday, and 8:00 a. m. to noon on Saturday. Emergency service is available at the Health Service from 5:00 p. m. to midnight, Monday through Friday.

The Emergency Clinic located in University Hospital (334 on the campus map) will be open twenty-four hours every day.

Parking. All university parking lots and structures are patrolled by the Ann Arbor city police, and one must have a university parking permit. Guest permits will be sold at the desk in Mosher-Jordan Hall at a cost of \$1 per day. Participants are cautioned that one must have a permit even for metered campus lots, in addition to putting money in the meter. University parking structures on campus are listed in bold-face type in the legend for the campus map. In addition, participants should be aware that there are university lots adjacent to Mosher-Jordan Hall and Mary Markley Hall.

Travel. Ann Arbor is a city of 100,000 located about 45 miles west of Detroit. It enjoys excellent accessibility by air or road, and is also served by Greyhound, Shortway, and North Star bus lines. Amtrak provides excellent service, with three trains daily each way between Chicago and Detroit which stop at Ann Arbor.

Major airlines have scheduled flights to Detroit Metropolitan Airport, which is located conveniently between Ann Arbor and Detroit. Frequent bus and limousine service from the airport is available for the twenty-eight mile trip to Ann Arbor. The current round-trip limousine fare is \$13.70, with departures scheduled every thirty minutes on the hour and half-hour. The current taxi fare between Detroit Metro and Ann Arbor is \$21. Taxis can accommodate four passengers. Please note that both limousine

and taxi rates are subject to change. All major car rental companies have offices at the airport, and several have offices in Ann Arbor.

Participants who plan on using the limousine service from Detroit Metro to the campus are asked to supply flight information on the preregistration/housing form so that the limousine company will be able to provide adequate equipment for all planning to travel to Ann Arbor at the same time from Detroit Metro. The limousine will take participants to Mosher-Jordan, if so requested.

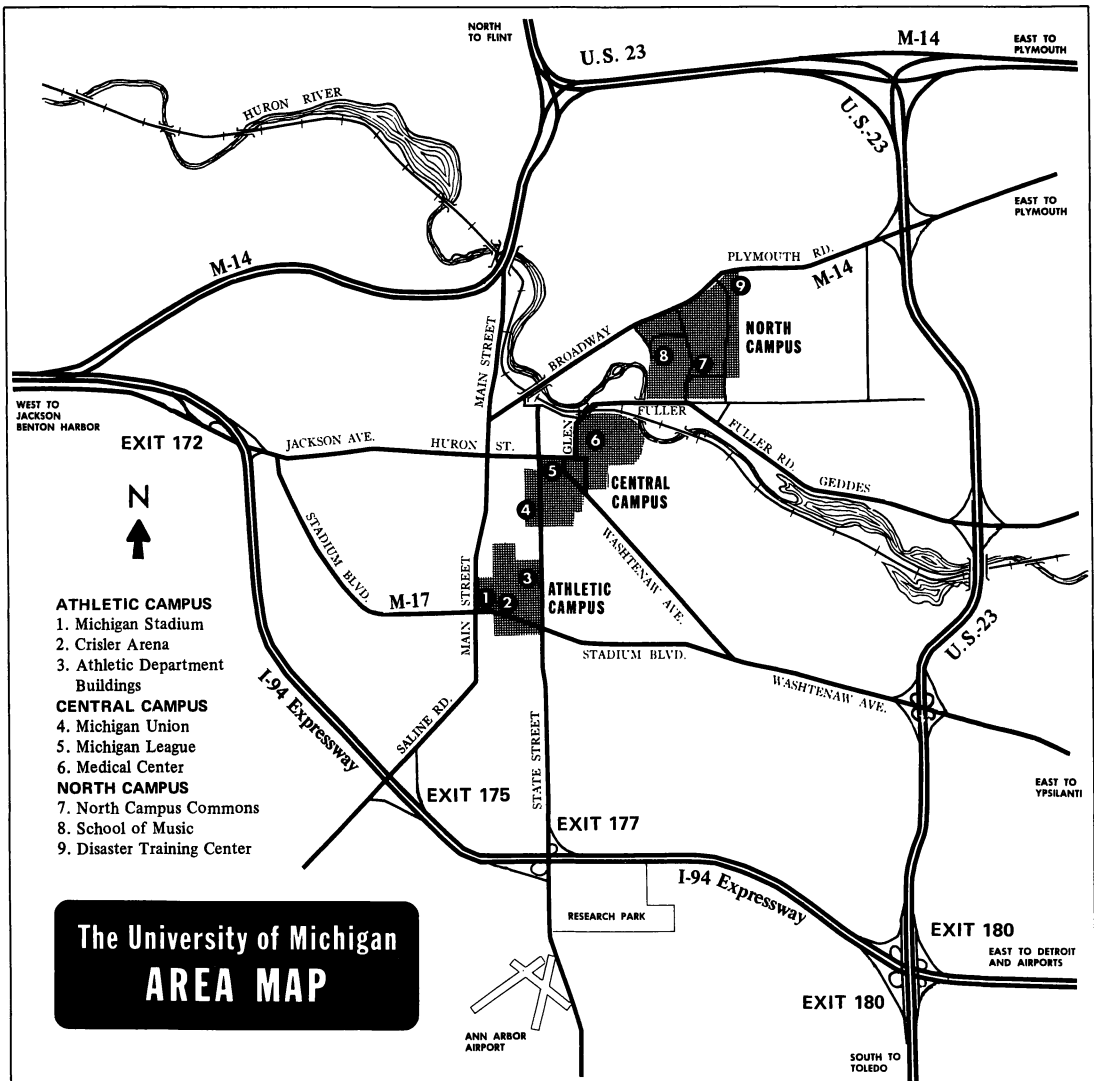
Participants wishing return limousine service from the residence halls to Detroit Metro should notify the desk in Mosher-Jordan Hall twenty-four hours in advance. The regularly scheduled limousine

stops at Cambridge House (where schedule information is available) and at the downtown Ann Arbor hotels.

Weather. The weather in Ann Arbor in late August is often warm and humid with daytime highs in the 80s and lows in the 60s (Fahrenheit). Since 1940, August temperature extremes have ranged from 99° F. (1955) to 40° F. (1965). Average rainfall for the month is 2.69 inches with thunderstorms occurring on the average on 6 days in the month.

Paul T. Bateman
Urbana, Illinois
Associate Secretary

Paul T. Bateman
Associate Secretary



American Mathematical Society Short Course Series
Computer Algebra—Symbolic Mathematical Computation
Synopses of the Talks, and Reading Lists

Introduction to Computer Algebra—Systems and Basic Algorithms (Anthony C. Hearn). It has been over twenty-six years since the first use of the computer for performing algebraic computations was reported. Since that time, systems and programs for algebraic computation have been developed which can routinely perform a wide range of complicated mathematical operations. The needs of practical users of these systems led to the emergence of computer algebra as an academic field of study in the early 1960s. The links between this work and the basic mathematics being automated have made the field a rich source of challenging problems, especially in the area of algorithm design. Several of the more complex algorithmic problems in the field will be considered in later lectures of this course.

In this lecture, we shall discuss some of the basic principles. These include such issues as the representation and manipulation of the basic data structures (numbers, polynomials, rational functions and general expressions), the symbolic simplification of expressions and the various evaluation mechanisms. The trade-offs between rule based (or pattern matching) solutions to some of these problems and more formal algorithmic methods will also be considered. Several of these issues raise important questions in the areas of algorithm complexity and efficiency, many of which are still unanswered. We shall illustrate these points by looking at the approaches taken in some of the existing algebra systems. Various applications of these systems will also be considered.

W. S. Brown and A. C. Hearn, *Applications of symbolic algebraic computation*, Computer Physics Communications 17 (1979), pp. 207-215.

J. Moses, *Algebraic simplification: A guide for the perplexed*, Communications of the ACM 14 (1971), pp. 527-537.

———, *The evolution of algebraic manipulation algorithms*, Proceedings of the IFIP Congress 1974, North Holland, Amsterdam and London, American Elsevier, New York, 1974, pp. 483-488.

Many of the articles in the following Proceedings and journal issues are also relevant.

Lecture notes in computer science, No. 72: *Symbolic and algebraic computation*, E. W. Ng (editor), Springer-Verlag, Berlin and New York, 1979. *SIAM Journal on Computing* 8, No. 3 (1979).

Algebraic Computations and Structures (James Davenport). This lecture aims to cover the theoretical basis of computer algebra: to discuss the objects which computer algebra manipulates and the sort of manipulations it can perform. We will not go into great detail on the algorithms, and we will largely be concerned with questions like "Can X be computed?" rather than "How do we compute X efficiently?"

What might we want to compute with? Integers, rational numbers give no real problem—use "bignum" arithmetic with no intrinsic limit on the size of integers. Numbers mod p (p normally, but not necessarily, prime) are easy, and very efficient if p is small. Elements of groups (and other abstract algebraic structures) are a somewhat specialized area. Polynomials (univariate or multivariate, since a multivariate polynomial is just a univariate polynomial whose coefficients are multivariate polynomials in fewer variables. This may not be the most efficient way, however): addition and multiplication are easy—g.c.d.s are possible, but factorization is very difficult. (Note that this contrasts with non-constructive algebra, in which the ability to take g.c.d.s implies unique factorization, and vice versa.) Rational functions (which require g.c.d.s of polynomials for practically everything) can be very time-consuming, and there is great scope for "clever" algorithms to minimize the number of g.c.d.s.

Algebraic Extensions can cause great problems. There are many "schoolboy" fallacies to do with algebraic numbers and algebraic functions, and it is remarkably easy to write computer programs to reproduce them. One of the major problems with algebraic expressions is ensuring uniqueness—not only must we replace $(\sqrt{3})^2$ by 3, but we must also regard $1/(\sqrt{5}-2)$ as equal to $\sqrt{5}+2$, and treat $(\sqrt{2})(\sqrt{3})-\sqrt{6}$ as being zero. Further problems arise because algebraic extensions of unique factorization domains are in general not unique factorization domains.

More general functions (exponentials, logarithms etc.) can cause great problems, even in apparently trivial matters, since it is not obvious how to test two such functions for equality (why is $1-\sin^2 x = \cos^2 x$?). This whole area depends on so-called Structure Theorems, which describe the possible dependencies between such functions. Matrices should not be too difficult, but it turns out that classical (Gaussian elimination) techniques for determinants or inverses rapidly become very expensive.

We can approximate expressions by various forms of algebraic series (as opposed to numerical expressions), such as Taylor, Laurent, Puiseux series. The obvious way to do this is to expand everything to, say, the 10th power in x , but there are techniques for computing with recurrence relations for the series, so that another term can always be obtained relatively cheaply. If time permits we will also describe methods for accelerating the convergence of sum series, which leads to Gosper's algorithm for summations in closed form.

A. C. Norman, *Computing with formal power series*, ACM Transactions on Mathematical Software 1 (1975), pp. 346-356.

R. E. Zippel, *Univariate power series expansions in algebraic manipulation*, Proceedings of the 1976 ACM Symposium on Symbolic and Algebraic Computation, R. D. Jenks (editor), Yorktown Heights, New York, 1976.

Solution of Equations by Constructive Algebraic Mappings (David Y. Y. Yun). This lecture will concentrate on the algorithmic aspects of computer algebra. Several algebraic homomorphic mapping techniques (also known as projection and lifting) have found lasting value in symbolic and algebraic computation. They are pairs of mutually inverse algebraic mappings including evaluation and interpolation, Fast Fourier Transform and its inverse, residue arithmetic and Chinese Remainder Algorithm, p -adic arithmetic and Hensel's construction. Several uses of these techniques for efficient computation in the multivariate case will be discussed, with solution of equations as the binding theme.

We will give an introduction to their computational complexity, a comparison of these techniques, and one or two detailed derivations starting with the problem definition, applying the mapping techniques, until the specification of an effective algorithm for its solution. The various computational problems susceptible to these mapping techniques, particularly those that can benefit from the unifying perspective of residue arithmetic, include: solution of systems of linear equations with algebraic entries or the generation of classes of numerical algorithms for specially structured matrices, such as circulant, Toeplitz, or Hankel; computation of greatest common divisors and convergents of continued fractions viewed as solving linear Diophantine equations; other computations dealing with convolutions, bilinear forms, and digital filters, elementary divisors and class numbers, Padé and Hermite rational approximation of functions.

For multivariate and sparse polynomials, computational efficiencies are further enhanced by p -adic constructions (which are deferred to the next lecture for comprehensive coverage) together with the technique of probabilistic projection and algebraic Weierstrass approximations. The numerical problem of finding zeros of polynomials will be treated algebraically via Sturm sequences and interval arithmetic to achieve "infallible" isolation. Van der Waerden and Lazard's method of finding finite isolated solutions, computation of resultants and elimination theory, equation and system decomposition, and computation of Groebner bases for multivariate polynomial ideals will be consolidated toward the solution of systems of algebraic equations.

David Y. Y. Yun, *Uniform bounds for a class of algebraic mappings*, SIAM Journal on Computing 8, No. 3, August 1979.

Papers by Brown, Brown and Traub, Collins, and Heindel, Journal of ACM 18, No. 4, October 1971.

F. G. Gustavson and D. Y. Y. Yun, *Fast algorithms for rational Hermite approximation and*

solution of Toeplitz systems, IEEE Transactions on Circuits and Systems, Vol. CAS-26, No. 9, September 1979.

Papers by Buchberger, Yun and Gustavson, Moenck and Carter, Lazard, Schwartz, and Zippel, *Lecture notes in computer science*, No. 72: *Symbolic and algebraic computation*, E. W. Ng (editor), Springer-Verlag, Berlin and New York, 1979.

Algebraic Numbers and Polynomial Factorization (Hale F. Trotter). Algebraic numbers. Exact results from approximate calculations—real and p -adic. Factoring polynomials by square-free decomposition. Complete factorization over finite fields, over p -adic fields, over the rationals, and over algebraic number fields. Galois groups: why they may be needed and how to find them. Computing other properties of algebraic number fields. Algebraic function fields.

Section 4.6, *The art of computer programming*, Vol. 2: *Seminumerical algorithms*, by D. Knuth, Addison-Wesley, Reading, Mass., 1969.

E. R. Berlekamp, *Factoring polynomials over large finite fields*, Mathematics of Computation 24 (1970), pp. 713-735.

M. Mignott, *An inequality about factors of polynomials*, Mathematics of Computation 28 (1974), pp. 1153-1157.

Papers by Yun, Trager, Yun, and Lipson, *Proceedings of the 1976 ACM Symposium on symbolic and algebraic computation*, R. D. Jenks (editor), Yorktown Heights, New York, 1976.

D. Y. Y. Yun, *Hensel meets Newton—algebraic construction in an analytic setting*, Analytic Computational Complexity, Academic Press, New York, 1976.

P. S. Wang, *Factoring multivariate polynomials over algebraic number fields*, Mathematics of Computation 30 (1976), pp. 324-336.

P. J. Weinberger and L. P. Rothschild, *Factoring polynomials over algebraic number fields*, ACM Transactions on Mathematical Software 2, No. 4 (1976), pp. 335-350.

H. Zassenhaus, *On Hensel factorization*, I, Journal of Number Theory 1 (1969), pp. 291-311.

Computational Group Theory (Charles C. Sims).

The development of the modern digital computer has had a significant influence on group theory. There is a growing list of results in group theory, which, at least at the present time, could not have been obtained without the use of a computer. In addition, computers are increasingly being used to answer questions about groups which arise in other areas of mathematics, such as combinatorics and topology. This talk will deal with the basic algorithms and data structures for determining properties of groups described either by generating permutations or by generators and relations.

Charles C. Sims, *Group theoretic algorithms, a survey*, Proceedings of the International Congress of Mathematicians, Olli Lehto (editor), Helsinki, 1978, pp. 979-985.

C. Sims, *Some group theoretic algorithms*, Topics in Algebra (Proc. Summer Res. Inst. of the Australian Math. Soc., Canberra, 1978), Lecture Notes in Math., vol. 697, Springer-Verlag, Berlin and New York, 1978, pp. 108-124.

Cannon, Dimino, Havas, and Watson, *Implementation and analysis of the Todd-Coxeter algorithm*, Mathematics of Computation 27 (1973), pp. 463-490.

M. F. Newman, *Calculating presentations for certain kinds of quotient groups*, Proceedings of the 1976 ACM Symposium on Symbolic and Algebraic Computation, R. D. Jenks (editor), Yorktown Heights, New York, 1976.

Algorithms for Solving Differential Equations in Finite Terms (B. F. Caviness). This talk will survey the current status of algorithmic methods for performing indefinite integration and solving differential equations in closed form. The capabilities built into the MACSYMA, REDUCE, and SCRATCHPAD computer algebra systems will be described and a few computational examples will be presented.

Some of the mathematical underpinnings of the integration and ODE (Ordinary Differential Equation) algorithms implemented in computer algebra systems will be presented including aspects of the Liouvillian theory of elementary functions, the Risch integration algorithm, recent work on the integration of algebraic functions, structure theorems for simplification of transcendental functions, Kovacic's algorithm for the algebraic solution of second order linear homogeneous ODEs with rational function coefficients, and Singer's method for elementary function solutions of general linear homogeneous ODEs.

If time permits, a small problem, typical of this research area, will be treated in some depth. An example is the problem of finding an efficient algorithm to compute the minimal algebraic extension of $Q(x)$ that contains the arguments of the logarithmic terms in the integral of a given rational function.

Sections 10 and 5, *Lecture notes in computer science*, No. 72: *Symbolic and algebraic computation*, E. W. Ng (editor), Springer-Verlag, Berlin and New York, 1979.

H. I. Epstein and B. F. Caviness, *A structure theorem for the elementary functions and its application to the identity problem*, International Journal of Computer and Information Sciences 8 (1979), pp. 9-37 (especially sections 1-3 for an introduction to some basic material).

J. Moses, *Symbolic integration: The stormy decade*, Communications of the ACM 14 (1971), pp. 548-560. This is a survey paper on the status of integration in finite terms up to 1971.

R. H. Risch, *The problem of integration in finite terms*, Transactions of the American Mathematical Society 139 (1969), pp. 167-189.

M. Rosenlicht, *On Liouville's theory of elementary functions*, Pacific Journal of Mathematics 65, no. 2 (1976), pp. 485-492.

M. Rothstein, *Aspects of symbolic integration and simplification of exponential and primitive functions*, Ph.D. Thesis, University of Wisconsin, 1976 (especially section 8). This thesis is available from University Microfilms International in Ann Arbor, Michigan and in London, England.

Storrs, October 17-18, 1980, University of Connecticut, Storrs

First Announcement of the 780th Meeting

The seven hundred eightieth meeting of the American Mathematical Society will be held at the University of Connecticut, Storrs, Connecticut, on Friday and Saturday, October 17-18, 1980.

Invited Addresses. By invitation of the Committee to Select Hour Speakers for Eastern Sectional Meetings, invited one-hour addresses will be given by GORO AZUMAYA, Indiana University, Bloomington; WILLIAM E. FULTON, Brown University; R. B. MELROSE, Massachusetts Institute of Technology; and MICHAEL C. REED, Duke University.

Special Sessions. By invitation of the same committee, there will be eight special sessions of selected twenty-minute papers. Some of the topics of these special sessions, and the names of the mathematicians organizing them, are:

Harmonic analysis, RON C. BLEI and STUART J. SIDNEY, University of Connecticut, Storrs.

History and philosophy of mathematics, ROGER LEE COOKE, University of Vermont.

Representations of Lie groups, ANTHONY W. KNAPP, Cornell University.

Elliptic curves and arithmetic geometry, JONATHAN D. LUBIN, Brown University.

Topic to be announced, MICHAEL C. REED, Duke University.

Algebra of analytic functions, CHARLES E. RICKART, Yale University.

Mathematical models in neuro- and developmental biology, JOHN M. RINZEL, National Institutes of Health.

Scientific computing and numerical analysis, Martin H. Schultz, Yale University.

Most of the papers to be presented at the special sessions are 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 submit it by July 31, 1980, three weeks earlier than the normal deadline for contributed

papers, in order that it may be considered for inclusion in a special session.

Contributed Papers. There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in departments of mathematics, and should be sent to the American Mathematical Society, P. O. Box 6248, Providence,

Rhode Island 02940, so as to arrive by the deadline of August 21.

Information on accommodations, food services, parking, registration, travel, etc., will appear in the August Notices.

Raymond Ayoub
University Park, Pennsylvania Associate Secretary

Kenosha, Oct. 31-Nov. 1, 1980, University of Wisconsin, Parkside

First Announcement of the 781st Meeting

The seven hundred eighty-first meeting of the American Mathematical Society will be held at the University of Wisconsin-Parkside, Kenosha, Wisconsin, on Friday, October 31, and Saturday, November 1, 1980.

Invited Addresses. By invitation of the 1979 Committee to Select Hour Speakers for Western Sectional Meetings there will be four invited one-hour addresses. The speakers, their institutions, and the scheduled times of their talks are as follows: IGOR DOLGACHEV, University of Michigan, Ann Arbor, 11:00 a.m. on Friday; STEPHEN C. KLEENE, University of Wisconsin, Madison, 1:45 p.m. on Friday; VERA S. PLESS, University of Illinois at Chicago Circle, 11:00 a.m. on Saturday; PETER B. SHALEN, Rice University, 1:45 p.m. on Saturday.

Special Sessions. By invitation of the same committee there will be five special sessions of selected twenty-minute papers. The topics of these special sessions and their organizers are:

Combinatorial group theory, LEO P. COMERFORD, JR., RONALD W. GATTERDAM, and KENNETH W. WESTON, University of Wisconsin, Parkside.

Ordinary differential equations in the complex domain, DONALD A. LUTZ, University of Wisconsin, Milwaukee.

Commutative algebra and algebraic geometry, JOEL L. ROBERTS, University of Minnesota, Minneapolis.

Recursion theory, ROBERT I. SOARE, University of Chicago.

Discrete groups and low dimensional topology, NORBERT J. WIELENBERG, University of Wisconsin, Parkside.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone submitting an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract and submit it by August 4, 1980, three weeks before the normal deadline for contributed papers.

There will also be sessions for contributed ten-minute papers as needed. Abstracts should be sent to the American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940, so as to arrive by the deadline of August 25, 1980.

Details regarding accommodations and registration will appear in the August Notices.

Kenosha has direct limousine service to and from O'Hare Airport in Chicago.

Paul T. Bateman
Urbana, Illinois Associate Secretary

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Number 137(1976)

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1980 AMS ELECTIONS

COUNCIL NOMINATIONS FOR VICE-PRESIDENT AND MEMBER-AT-LARGE

One vice-president and five members-at-large will be elected by the Society in the fall of 1980.

The vice-president will serve for a term of two years, effective January 1, 1981. The Council has nominated two candidates for this position. They are:

Paul R. Halmos Murray H. Protter

Nominations by petition are acceptable. Refer to the two previous issues of the *Notices* (February, pp. 160-161; April, pp. 274-275) for the rules and the form of the petition.

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

Donald L. Burkholder O. Carruth McGehee
Eugenio Calabi Michele Vergne
Alan J. Hoffman Scott Warner Williams
Linda Keen

Nominations by petition are acceptable. See the references above. If the total number of nominees is less than ten, it will be brought up to ten by the Council before the ballot is circulated.

PRESIDENT'S CANDIDATES FOR THE NOMINATING COMMITTEE, 1981-1982

There are four members of the Nominating Committee to be elected in the fall of 1980. President Peter D. Lax has named the following six candidates:

Ronald G. Douglas Paul Meier
Jerome A. Goldstein Ivan Niven
Reuben Hersh Michael C. Reed

Nominations by petition are acceptable. Refer to the two previous issues of the *Notices* (February, pp. 162-163; April, pp. 276-277) for the rules and form of the petition. If the total number of candidates is less than eight, the number will be brought up to eight by the president.

LETTERS TO THE EDITOR

Re: Pontryagin's Autobiography in *Uspekhi*

The November 1978 issue of the *Notices* carried an article, *The Situation in Soviet Mathematics*, that was written by a group of Soviet emigres. This article ended with the following statement:

"Although the authors of the above report are now outside the Soviet Union, revealing their names could do harm to persons in the USSR connected with them. We believe the authors have made every effort to present a true picture of the situation."

This statement was followed by the names of sixteen mathematicians including my own. The "Situation" dealt with alleged anti-Semitism in mathematics in the Soviet Union. The article has generated a number of letters in the *Notices* on the subject of anti-Semitism in the USSR. The present letter is intended to throw further light on this subject.

The sixth issue of volume 33 (1978) of the prestigious Soviet journal, *Uspekhi Matematicheskikh Nauk* is partly a "Festschrift" honoring Academician L. S. Pontryagin on his seventieth birthday. It is customary in such an issue to include a biographical article on the honored mathematician. Pontryagin, contrary to the normal procedure, chose to write an autobiographical memoir. This begins with a copy of the citation by the Chairman of the Presidium of the Supreme Soviet of the USSR, Leonid Brezhnev, of the award of the order of Lenin to Pontryagin. Towards the end of Pontryagin's autobiography there appears the following paragraph (as translated by Ann Dowker):

"In following the Soviet point of view in the Executive Committee of the I.M.U., we sometimes met with serious opposition from other members, but there were others who warmly supported us. One of the most serious problems that we had to deal with was the new composition of the Executive Committee for the period 1975 to 1978. There was an attempt by the Zionists to take the International Union of Mathematicians into their hands. They attempted to raise N. Jacobson, a mediocre scientist but an aggressive Zionist, to the presidency of the International Union of Mathematicians. I managed to repel this attack. Now, having left the Executive Committee, I would like to think that the situation has improved markedly as regards this problem."

I first learned about this from the translator, who had been shocked to find this passage in a reputable mathematical journal and had sent advance copies of the excerpt to me and to Professor Kurt Hirsch, the editor of *Russian Mathematical Surveys* (the English translation of *Uspekhi*). I, of course, was also shocked to read Pontryagin's statement. After consulting a number of friends, I decided to write a statement refuting Pontryagin's allegations and request its publication in *Uspekhi*. I wrote such a statement which was translated into Russian by two Soviet emigré friends. The Russian text together with the following accompanying letter was sent to the Editor-in-Chief of *Uspekhi*, the distinguished mathematician, Academician P. S. Aleksandrov.

July 1, 1979

Academician P. S. Aleksandrov
Editor-in-Chief
Uspekhi Matematicheskikh Nauk
Leninski Prospect 15
117071 Moscow B71, USSR

Dear Academician Aleksandrov:

I am enclosing some comments in the form of a "Letter to the Editor" that I should like to have published as soon as possible in *Uspekhi*. I realize that the publication of such a letter may be a violation of the established principles for the journal. On the other hand, I presume that the publication of personal attacks on mathematicians and of anti-Semitic propaganda is also a violation of established principles. The mathematical public at large will certainly regard Academician Pontryagin's reference to me in his article in this light. To those of us who are old enough to remember the Nazi period, Academician Pontryagin's offensive paragraph will bring to mind some of the anti-Semitic and racist writings that appeared in German mathematical literature in Nazi times. We certainly hope that your distinguished journal is not destined to become a second *Deutsche Mathematik*. I believe that it is now essential that the editors take extraordinary measures to re-establish the good reputation of the journal, and the publication of my letter would be a step in this direction.

I observed that the editorial board made a mild disclaimer of responsibility for the contents of Academician Pontryagin's article in the footnote on page 7.* I have heard also that an earlier version of this article contained some other passages that were deemed too offensive to publish, and were therefore deleted. Since the reference to me was not deleted at the same time, your responsibility in this affair is thereby magnified. It is indeed astonishing that the editors did not send me a copy of Academician Pontryagin's statement prior to publication. This type of courtesy was extended to him prior to the publication of the now famous article *The Situation in Soviet Mathematics* that appeared in the November, 1978, issue of the Notices of the American Mathematical Society.

My colleagues at Yale, in the National Academy of Sciences, and my former colleagues on the Executive Committee of the International Mathematical Union were shocked and dismayed when they learned about Academician Pontryagin's article. Some expressed doubts on the sanity of the author. It is quite clear that when this bizarre attack becomes widely known it will have a serious inhibiting effect on scientific exchanges between the USA and the USSR. Moreover, it may very well have repercussions at the political level at this critical juncture in relations between our two countries.

There are a number of options open to me. These include the following: (1) to bring a suit in a Soviet court against Academician Pontryagin and the Editors of *Uspekhi* for libel to me and for anti-Semitic writing; (2) to bring a libel suit against the same defendants in an American court (this is feasible since the article has been distributed in this country); (3) to obtain full publicity on this matter in the world scientific press by publishing this letter and the enclosed draft "Letter to the Editor"; (4) to publicize this in the public press, and to bring it to the attention of political figures in the USA, especially members of the US Congress, who have expressed an interest in alleged discrimination against Jews and other violations of human rights in the USSR.

Which of these options I exercise will depend somewhat on your reaction to my letter.

Of course, I realize that the Editorial Board comprises men of good will who bear no responsibility in this affair

*The text of this footnote is: "In publishing this article, the editorial board provides the reader with the opportunity of acquainting himself, not only with a scientific autobiography of great interest, by an eminent mathematician, but also with some of his personal views and assessments, concerning different aspects of scientific life in our country."

and may even have waged a (losing) battle behind the scenes to prevent the publication of the slanderous statements of Academician Pontryagin. To them I wish to express my regret for the pain that all of this has caused them. I am sure that they will understand that in lodging this protest I have been motivated by considerations that go beyond the personal ones. To many of us, Academician Pontryagin's attack appears to be a part of a broader campaign of anti-Semitic activities that includes discrimination on admission of Jews to universities and in the awarding of doctoral degrees to Jews. These practices, that we have heard much about recently, will, in the long run, have a very detrimental effect on Soviet mathematics, whose magnificent achievements we so greatly admire.

I shall allow two months for a reply to this letter. If I do not receive a satisfactory reply by September 1, then I shall assume that none will be forthcoming and I will act accordingly.

Sincerely yours,
Nathan Jacobson

Copies of this letter and the enclosed statements are being sent to the following:

1. Academician A. P. Aleksandrov
2. All members of the Editorial Board of *Uspekhi*
3. Philip Handler, President, National Academy of Sciences, USA.
4. F. S. Malone, Foreign Secretary, National Academy of Science, USA.
5. All members of the I.M.U. Executive Committee for 1971-1974.
6. L. A. E. Carleson, President, International Union of Mathematicians
7. Deane Montgomery, Past President, International Union of Mathematicians
8. Peter Lax, President, American Mathematical Society
9. Lipman Bers, Chairman, US National Committee

The English version of my "Letter to the Editors of *Uspekhi*" is as follows:

Editors, *Uspekhi Matematicheskikh Nauk*,

I wish to correct some statements by Academician L. Pontryagin in his article that has appeared in *Uspekhi Matematicheskikh Nauk* v. 33, 6 (203) (1978), pp. 3-21. In referring to the election of the Executive Committee for 1975-1978, Academician Pontryagin writes in part: "There was an attempt by the Zionists to take the International Union of Mathematicians into their hands. They attempted to raise N. Jacobson, a mediocre scientist but aggressive Zionist, to the presidency of the International Union of Mathematicians. I managed to repel this attack". I offer the following facts as a rebuttal for Academician Pontryagin's assertions.

In 1972 I was offered a position on the Executive Committee (as a Vice-President) to serve out the unexpired term of Professor Adrian Albert who died on June 7, 1972. I reluctantly accepted this, making it clear to the Executive Committee representative who contacted me that I did not wish to continue on the Committee after 1974. The subject of my becoming President for 1975-1978 was broached to me on several occasions. However, there were cogent reasons that led me to maintain my position that I could not serve in any capacity beyond 1974. In a letter to a member of the Executive Committee dated June 20, 1973, I wrote the following:

"The other matter I want to write you about at this time is that of a successor for me on the Executive Committee. As you know, I took this position and the vice-presidency on the understanding that I would just serve out Albert's term. I was very serious about this, and I have not veered away from this intention in the slightest. I certainly am flattered by your confidence in my ability to serve on the Executive Committee and perhaps even to be President. Whether justified or not, this is not the point. As you know, I have been heavily involved in administrative work for about four years. I do not believe

it would be fair to me or to Yale to continue with these activities after next year. I am in the midst of an ambitious writing project and I have several students working with me. I have experienced a sense of frustration in not having adequate time during the past few years to devote to the primary functions of a mathematician and teacher.”

Recent correspondence with members of the Executive Committee for 1971-1974 and with Professor Deane Montgomery, who was elected President for 1975-1978, indicates that they were aware of my determination not to serve beyond 1974. It is conceivable that Academician Pontryagin was not aware of these facts. This is beside the point, since he evidently had the clear responsibility of checking the accuracy of his allegations before including them in his article.

It is well known that the word “Zionist” has two distinct meanings: (1) a political one meaning a supporter of the State of Israel, and (2) a synonym for “Jew.” Since the International Union of Mathematicians is a strictly non-political organization, one must conclude that Academician Pontryagin is using the word in the second sense. This makes clear the true nature of his attack.

Nathan Jacobson
[followed by a partial list
of honors I have received]

Academician Aleksandrov apparently answered my letter promptly. However, his reply was held up by some breakdown of the delivery system of the local post office, so that it did not reach me until October 3. A translation of his reply is as follows:

Esteemed colleague Jacobson:

My position as editor-in-chief of the journal *Uspekhi Matematicheskikh Nauk* with regard to the article of Academician Pontryagin, which was published in this journal, is as follows. Although I do not share many of the views of the author, I nevertheless wish to state that the article does not contain any criminal aspects which would require me as editor-in-chief to veto the publication of the article. Such aspects might consist, in particular, of any anti-Semitic attack, on the one hand, and any personal insult, on the other. Either would have resulted not only in a reaction by me as editor, but also by the appropriate judicial authorities. Your contrary opinion in this matter seems to me to be based on a misunderstanding.

In the first place, the word “Zionist” in the Russian language is in no way synonymous with the word “Jew.” The basic meaning of the word “Zionist” is completely clear and definite: it refers to a Jewish nationalist. The struggle with Zionism never signified in the Russian national consciousness a struggle with the Jewish ethnic group or anti-Semitism. The word “anti-Semite,” applied to anyone publicly or in print, is insulting, and a person who has uttered it is liable to the responsibility analogous to that to which one would be liable if one were to use with respect to a person of the Jewish nationality the abusive expressions which were to be encountered during tsarist times among people who were anti-Semitically inclined.

In the second place, the facts cited by you in order to refute Pontryagin’s assertions—those demonstrating your unwillingness to accept the position repeatedly offered to you of president of IMU—are not in any way in contradiction with the actual content of Pontryagin’s assertion.

In the text of Pontryagin’s article which was submitted to the Editorial Board, the paragraph with your name was lacking, consequently there was no reason to send you a copy of the article. The paragraph was inserted by Pontryagin only during the final proofreading. The consideration which induced Pontryagin to add this paragraph was, apparently, the receipt of galley proofs of the article in Notices, certified by your signature, containing sharp attacks, in particular personal attacks, on Academician Pontryagin.

I believe that the best solution to the entire incident would be if you would not insist on the printing of your letter; this can only result in the further concentration of

public attention on questions which by no means contribute to a peaceful and productive environment in the relations between mathematicians of various countries and nationalities.

With expression of my absolute respect,
P. S. Aleksandrov

My answer to Aleksandrov was the following letter:

October 8, 1979

Academician P. S. Aleksandrov
Editor-in-Chief
Uspekhi Matematicheskikh Nauk
Leninski Prospect 15
117071 Moscow, B71, USSR

Dear Academician Aleksandrov:

I am writing to respond to your letter of August 6 that finally reached me on October 3. The letter had been sent from Moscow, August 7, by air mail unregistered and it was addressed to: Professor Nathan Jacobson, Yale University, New Haven, Connecticut, USA. The envelope contained a stamp from the local post office indicating that the delay was caused by an inadequate address. (It was marked “No Yale Station Box number.”)

While I do not agree with any of the points that you made in your letter, I do not wish to engage in a debate on generalities. I wish to stick to the primary issue, namely, that Academician Pontryagin has slandered me in his autobiographical article published in *Uspekhi*. He has done so in calling me a “mediocre scientist” and “aggressive Zionist.” The first is evidently intended to be a gratuitous insult. The second is certainly not intended to be a compliment either, particularly when put in the context of a long-standing intensive Soviet anti-Zionist campaign that has sometimes entered the realm of anti-Semitic fantasy.

I have the right to defend myself by revealing what was, in fact, my role in the election of the Executive Committee of the IMU for 1975-1978. Although I could have written considerably more, I believe that my “Letter to the Editors” is adequate to convince any reasonable person that Academician Pontryagin’s assertion that there existed a Zionist plot to seize control of the IMU has no basis in fact, and to conclude that this was made with malicious intent.

I call your attention to the fact that the 15 September issue of *Science* contains a letter by Academician Pontryagin in which he seeks to defend himself against an accusation of anti-Semitic activities that had appeared in an article published in *Science*, 15 December, 1978. A copy of his letter is enclosed. The *Science* article contained a more explicit and detailed charge of anti-Semitism than appeared in the article *The Situation in Soviet Mathematics* to which you alluded in your letter. As noted in my letter of July 1, the text of *The Situation* was sent to Academician Pontryagin prior to publication. I believe that in fairness the least you can do is to permit me to respond to a wholly unjustified malicious attack.

I certainly can not go along with your opinion that it would be best if I did not insist on the publication of my “Letter” in *Uspekhi*. It is the publication of Academician Pontryagin’s attack on me that has the potential of doing great harm to the relations between the Soviet mathematical community and mathematical communities of the West. This matter will simply not go away of itself. The burden of corrective action to mitigate the effects of the incident clearly rests with him and with you. That his attack on me is regarded as a matter of the utmost seriousness in the USA and other western countries can be seen from a number of protests that this has already generated. Two examples of such protests are enclosed. The first is a resolution that was passed by the Section of Mathematics of the National Academy of Sciences. The second is a resolution that was passed at a recent meeting of the Council of the American Mathematical Society. It was agreed at the meeting that the reference to Pontryagin’s attack on me would be deleted if I requested. I did ask that part (ii) of the resolution be dropped, so this does not appear in the official record of the meeting. Nevertheless it indicates the sentiment of an important section of the American mathematical community.

Publication of my "Letter" particularly if accompanied by a forthright statement dissociating the editorship from Academician Pontryagin's slanderous statements, would be regarded as a positive step toward a resolution of this issue. On the other hand, failure to publish my "Letter" will have serious consequences of the sort I indicated in my letter of July 1, and it is most likely that there will be a strong reaction within the American Mathematical Society once the whole story of the dreadful incident becomes known and the restraining influence that I have exercised thus far is removed.

I shall allow one month for a reply to this letter.

Sincerely yours,
Nathan Jacobson

encl: 1. Pontryagin's letter to *Science*. 2. Resolution of the Section of Mathematics of the NAS. 3. Resolution of the Council of the AMS.

Copies sent to the same list as my letter of July 1.

The following persons on my list also wrote letters to Aleksandrov supporting the request that my "Letter" to the editors of *Uspekhi* be published in the journal: Professor Lipman Bers, President Philip Handler of the National Academy of Sciences, USA, President Peter Lax of the AMS, Professor Deane Montgomery.

After waiting a long time—considerably longer than the month set in my second letter to Aleksandrov—I received a reply. A translation of this letter reads as follows:

22 January 1980

Professor N. Jacobson
Yale University

Dear Professor Jacobson:

The Editorial Board of the journal *Uspekhi Matematicheskikh Nauk* has studied your "Letter to the Editors" and the attached materials.

The Editorial Board took into account the following:

1. In a footnote to L. S. Pontryagin's article in our journal it is stated that the article contains "the personal views and assessments" of its author. The same assertion is made in the letter to you of 6 August by the Editor-in-Chief of our journal in which he writes directly that he "does not share many of the points of view" of the author of the article.

2. A precedent was set by the publication in the *Notices of the American Mathematical Society*, certified by your signature, of the article "The Situation in Soviet Mathematics." In this article L. S. Pontryagin specifically is subjected personally to attacks. In that same article we read, "When the Siberian division of the Academy was opened, numerous middle-level scientists were elected to the Academy." In fact, then, your signature appears on a contention that "numerous" members of the Siberian Department of the Academy of Sciences of the USSR are scientists of the middle level. In a widely circulated document with the same title, *The Situation in Soviet Mathematics*, also certified by your signature, a whole group of leading Soviet mathematicians, including a member of the Editorial Board of this journal, came under attack.

3. In the *Notices* no refutation on the part of Soviet mathematicians has been published.

4. The publication of your letter would call for the publication of a commentary on it and would thus lead to a continuation of the polemics started in the pages of the *Notices* and to further concentration of public attention on questions which are of absolutely no assistance to the fruitful work of mathematicians of various countries and nationalities.

Based on these considerations the Editorial Board by majority vote adopted the decision not to publish your letter.

(signed) P. S. Aleksandrov
Chief Editor of the Journal

A few comments on Aleksandrov's two letters may be in order.

The distinction between "Zionist" and "Jew" emphasized in the first letter corresponds to the Soviet legal position and is one that very likely would be taken by a Soviet court. However, this distinction largely disappears in anti-Semitic literature published in the Soviet Union. A reader interested in extensive documentation can find it in a pamphlet entitled *Soviet Antisemitic Propaganda* published by the Institute of Jewish Affairs, 13-16, Jacob's Well Mews, London W1H 5PD, England. Copies may be obtained also from The American Jewish Committee, Foreign Affairs Department, 165 E. 56th Street, New York, NY 10022.

There was only one reference to Pontryagin in the article "The Situation in Soviet Mathematics" that was published in the *Notices*: "After the death of I. G. Petrovsky, a new editorial board was appointed in 1975 with L. S. Pontryagin as editor. The table at the bottom of the page traces the development of a new editorial policy" [for *Sbornik*]. The table referred to gives the total number of articles and the number by Jewish authors in volumes 81-104. A direct allegation of anti-Semitism on the part of Pontryagin appeared in an earlier version of the "Situation" that was distributed at the Helsinki Congress. My name appeared at the end of this article too. I had agreed to its inclusion on the understanding that this version would not be published, but that it might be circulated privately in a limited way. Perhaps the distribution of copies of this article at Helsinki is what provoked Pontryagin to launch his slanderous attack on me.

In his second letter Aleksandrov cites as a precedent for Pontryagin's attack a number of statements made in the article "The Situation" published in the *Notices*. As stated in the last paragraph, the statement "In this article L. S. Pontryagin specifically is subjected to attacks" is false. The second citation on "middle-level scientists" appears in the article under the heading *The role of the Academy of Sciences*. A more complete excerpt that gives the thrust of the paragraph is the following:

"Until the late fifties only mathematicians of great scientific stature were elected members and corresponding members of the Academy. Then the situation changed radically. When the Siberian division of the Academy was opened, numerous middle-level scientists were elected to the Academy because of their invitation to work in Siberia. At approximately the same time the government announced a number of vacancies for applied mathematicians involved in classified research. These vacancies were filled by people relatively unknown in the mathematical world. As a result the scientific level of the mathematical division of the Academy fell significantly."

It is absurd to equate this statement referring to a number of unnamed persons to the slanderous attack on me. It is absurd also to call the sentence signed by me and fifteen other mathematicians as a "certification" of the contents of the article.

Aleksandrov observes also that no refutation on the part of Soviet mathematicians of the charges of anti-Semitism has appeared in the Notices. This has a simple explanation: no refutation has been offered—in spite of the fact that the President of the Soviet Academy of Sciences, Academician A. P. Aleksandrov, as well as Pontryagin and Academician Vinogradov were sent copies of the Notices article prior to publication.

It is interesting to note that the decision not to publish my “Letter” in *Uspekhi* was made by a majority of the Editorial Board and not unanimously. This is a hopeful sign. I have learned also that the editorial footnote on page 7 of Pontryagin’s article was made without the participation of a number of editors and some of these had, after its publication, called attention to the vagueness of the footnote and its inadequacy in dissociating the editorship from the contents of Pontryagin’s article.

What conclusions can be drawn from all of this? Concerning Pontryagin, these are obvious and need not be stated. However, it should be added that he plays a very important role in the Soviet mathematics establishment, as editor-in-chief of *Mathematicheskii Sbornik*, as head of the mathematics section of the publication house Nauka, and as a member of the Soviet National Committee that decides who shall attend international conferences in mathematics. Also, for eight years Pontryagin was a member of the Executive Committee of the International Mathematical Union, the body that has the responsibility of organizing the international congresses and of selecting the Fields medalists. It was the Soviet National Committee which, in Pontryagin’s own words, voted unanimously not to include G. Margoulis as a member of the Soviet delegation to the last congress at Helsinki. This, in spite of the fact that Pontryagin, as a member of the Executive Committee of the IMU, knew that Margoulis had been selected as a Fields medalist—the only one from the USSR. Independently of this honor, one would think that the Soviet National Committee would have been aware of Margoulis’ outstanding contributions to mathematics. Could the fact that Margoulis is Jewish have had anything to do with the unanimous decision of the Soviet National Committee not to include him in the Soviet delegation?

It is more difficult to assess the significance of the refusal of the Editorial Board to publish my “Letter,” since we lack information on what constraints were imposed by political authorities. The bureaucratic style of Aleksandrov’s letters as compared with the graceful style of other writings of his suggests the existence of such constraints. It is interesting to compare the action of the Editorial Board of *Uspekhi* with the manner in which this matter was handled in the English translation of the journal *Uspekhi*. In the forthcoming translation of Pontryagin’s article the following footnote has been added to the paragraph referring to me:

“The council of the London Mathematical Society, the British Library Lending Division, and the

Editor of the *Russian Mathematical Surveys* wish to dissociate themselves from the personal attack of one distinguished mathematician against an equally distinguished mathematician, both Honorary Members of the London Mathematical Society. The accusations which Academician Pontryagin makes are without foundation.

“We have invited Professor Jacobson to make a statement setting out the true facts as corroborated by documentary evidence. The substance of his reply below is also included in a letter to the Editors of the *Uspekhi Matematicheskikh Nauk*, which he has submitted to them for publication. He writes:

“ ‘Each Executive Committee of the IMU proposes a slate of candidates for its successor, with the possible help of suggestions from National Committees. I believe that few, if any, such suggestions were made for nominations to the 1975-1978 Committee, and I am unaware of any outside “Zionist” pressure to influence the nominations. I believe that I was the only Jew (or as Academician Pontryagin puts it, “Zionist”) on the Executive Committee. If there had been a “Zionist” plot to seize control of the IMU, I must therefore have been involved in it. However, the facts are quite the opposite of what is suggested by Academician Pontryagin.

“ ‘In 1972 I was offered, and reluctantly accepted a position on the Executive Committee (as a Vice-President), to serve out the unexpired term of Professor A. A. Albert, who died on 6 June 1972. Although I had made it clear from the outset that I had cogent reasons for declining to continue on the Committee in any capacity beyond 1974, the question of my becoming President for 1975-1978 was broached to me on several occasions. However, my resolve not to serve beyond 1974 remained firm. That this was the situation has been confirmed in recent correspondence with members of the Executive Committee for 1971-1974 and with Professor Deane Montgomery, who was elected President for 1975-1978.’ ”

I conclude by quoting from two letters. The following is from a letter by Professor Bers:

“Professor N. Jacobson was both insulted and slandered in *Uspekhi*. The statement that he was to become President of IMU as a result of a “Zionist” plot is as blatantly absurd as is the description of his work as “mediocre.” It also awakens unpleasant memories. The least that the Editors could do is to publish Professor N. Jacobson’s letter.”

Finally I quote the following sentence from a letter by Dr. Philip Handler:

“At the very least Academician Pontryagin owes Professor Jacobson a formal apology for all the world’s mathematicians to see.”

N. Jacobson
Yale University

Peer Review

The letter-to-the-editor of Robert Hermann in the January 1980 *Notices* made for interesting reading, but I am afraid that peer review, in all its ramifications, is here to stay, not only as an administrative convenience, but also as an invariant of the peers who habitually control certain areas of research. Anything truly new or requiring extraordinary diligence and breadth, such as the program Dr. Hermann espouses, is automatically suspect and certainly inconvenient. Any bureaucracy, such as that at NSF, is inherently incapable of risk-taking. The essence of bureaucracy is the administration of an existing order; anything new, particularly if well off the beaten path, is anathema and has little chance for recognition: A prophet is without honor in his own country.

A format which would seem to avoid many of the pitfalls and oft-expressed doubts concerning "peer review" would be the coupling of peer review with the process of dialectic: the apposition of opposites in the hope that the truth which lies somewhere in between will emerge. It is true that good old-fashioned debate has gone out of style, but if a reviewer's report does indeed betray an extremely casual reading, strong biases, fundamental misconceptions or errors of fact, or misapplications of the philosophy of science, then it would seem that in the interests of simple truth and justice the proposer/author should have a right of appeal. Such an appeal procedure, based on specifics, would of course place severe demands upon the bureaucrat or his surrogate. He would no longer be able simply to defer judgment to the reviewers and a judgment would have to be made upon the merits of the case rather than administrative convenience.

Confrontation—good old-fashioned debate—when reviewers have made significant and palpable errors would seem to offer many desirable features if we truly value scientific truth and optimal scientific advance.

William C. Hoffman
Oakland University

Publications on Statistical Distributions

A Dictionary and Bibliography of Statistical Distributions is now in its final stages of preparation. Both discrete and continuous distributions are included, whether univariate or multivariate. Further, a Display of Literature on Statistical Distributions in Scientific Work will be organized during the forthcoming program of the NATO Advanced Study Institute on Statistical Distributions in Scientific Work to be held at Trieste, Italy during July 10-August 1, 1980 (cf. listing in *Special Meetings* section). One or two copies of relevant literature in the form of reprints, reports, computer programs, theses, books, etc., would be most welcome as soon as possible. (No need to send the materials again if they have already been sent.) Please send these to: Professor G. P. Patil, Department of Statistics, 318 Pond Laboratory, Pennsylvania State University, University Park, Pennsylvania 16802, USA.

G. P. Patil
Pennsylvania State University

Letters submitted for publication in the *Notices* are reviewed by the editorial committee whose task is to determine which ones are suitable for publication. The publication schedule requires from two to four months between receipt of the letter in Providence and the publication of the earliest issue of the *Notices* in which it could appear. The committee adopted a policy that the *Notices* does not ordinarily publish complaints about reviews of books or articles, although, following an instruction from the Council, rebuttals and correspondence concerning reviews in the *Bulletin* will be considered for publication. Letters submitted for consideration by the editorial committee should be mailed to the Editor of the *Notices*, American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02940.

Employment at Bachelors and Masters Level

I was very surprised to read in the letter by E. Y. Rodin (*Notices*, January 1980) that a student in the USA "who graduates with a Bachelor's or Master's degree in Mathematics has almost no chance of obtaining professional employment." A further quote is: "My impression is that even people in the liberal arts have an easier time in finding employment corresponding to their background, than mathematicians."

The reason why I am writing is that the situation seems to be different in the UK. Of course, part of the problem with the above quote is what is meant by "employment corresponding to their background." However a Careers Information Sheet published by the Association of Graduate Careers and Advisory Services in the UK, says quite specifically that "Graduates in mathematical disciplines have a very wide choice of employment." A Report from the Social Science Research Council (1972) by R. R. McLone on "The training of mathematicians" says, "There is a demand from industry and commerce for graduates . . . with a sound basis of mathematics who appreciate the wide range of applicability of their subject, who can translate problems initially expressed in non-mathematical terms into a form amenable to mathematical treatment, and subsequently re-express the result in a form readily assimilated by non-mathematical colleagues."

The actual figures may be of interest. In 1977 the total number of mathematics graduates in the UK was 2,829. Of those 367 went into teacher training, and 383 into other full-time further study or training. Only 154 were unemployed or in temporary employment at 31 December following graduation, and 195 unknown.

The 1,497 in UK employment were distributed over types of work as follows. General traineeships, 14; nonspecialist administration, 49; scientific research, design and development, 129; production operation/management, 16; buying, selling and marketing, 53; computer programming, 503; systems analysis, 85; computer operation, 24; operational research, 29; O. and M., work study and other, 86; accountancy (training in a practice), 176; other accountancy, 72; other financial work, 63; actuarial work, 90; statistics (excluding scientific, actuarial and market research), 27; teaching and lecturing (without training), 38; others, 43. (These figures

come from the Universities Statistical Record, and are publicly available.)

As regards the influence that these data should have on our teaching of undergraduates, my own feeling is that they imply that all mathematics undergraduates, apart from the central topics of pure mathematics, should do some computing, some statistics, and some physical applied mathematics, in order to have some preparation for various types of employment. They should also get from a university degree an idea of mathematics as understood by practising research mathematicians. By this I mean the question of attitude rather than particular topics at an advanced level. Also, at Bangor the teaching of applied mathematics is presented with an emphasis on its computational aspect. We feel this is sensible educationally, and also in view of the proportion of people going into some form of computational work.

The question that remains from the above is: is the experience of graduate mathematicians in the UK radically different from those in the USA?

Ronald Brown
University of Wales, Bangor

Soviet Mathematicians

In the many discussions in the **Notices** on the extent of anti-Semitism in mathematical life in the USSR, one point I have not seen made is that in present times, the circumstance of being born Jewish is a very different bag of beans from what it used to be prior to the founding of the State of Israel. In those days, a Jew could say that he had as much reason to identify himself with the interests of the nation in which he lived as did most others, and that laws and practices directed against Jews were punishing him for an accident of birth over which he had no control.

The present situation is quite different. Jews are no longer a "homeless people" but—in some sense—a political nation, the overwhelming majority of whose members live in other countries. Thus, when a citizen of Fredonia actively proclaims his Jewish identity, his government cannot be sure whether he is expressing a religious view, pride in his cultural heritage, or allegiance to a foreign power.

In the case of the Soviet Union, which (whatever were the underlying causes) sees missiles with thermonuclear warheads pointed at its heartlands from many directions, and which considers Israel in active sympathy with that development, the question must be especially acute. It should surprise no one if the Soviet Jewish community is viewed as fertile breeding ground for subversive activity, if Jewish professionals who wish to emigrate are feared as potential conveyors of information important for national defense, and if there is a reluctance to train Jews professionally for fear they will later emigrate and take their skills (learned at State expense) with them. The continuing short wave broadcasts from Israel, appealing to Jews to leave the land in which they are "aliens" and to take up residence in their "true home-

land," are surely unlikely to calm those fears.

The situation is complicated by the fact that in the USSR there is now considerable opportunity for assimilation. The scion of a mixed marriage (a proportionately large number) automatically gets a choice of two "Nationalities" for his (or her) documents, and there are also further legal routes for changing one's name. Thus, the fact of being Jewish is now less an accident of birth than it used to be, and has become, at least for many, a conscious act of choice.

Under the circumstances, what strikes me is less the incidence of anti-Semitism (although I'm sure the tensions have opened the gates to quite enough of it) but, on the whole, the government's restraint. Much publicity has been given to individual cases of Jews who come into political difficulty when they apply to emigrate, yet, for the most part, Jews who wish to do so are emigrating routinely and without incident, and in large numbers. This is a privilege enjoyed almost exclusively by Jews, as emigration from the USSR is in general not permitted. Established Jewish professionals who do not actively oppose the aims of the government do not feel threatened. Students born partly Jewish who choose the other Nationality have, apparently, no trouble with University admission and are treated equally in their studies, while those who call themselves Jews are still welcome at most Universities, if not always the one of their choice.

There is no doubt the situation is short of ideal, but I compare it with our own treatment of Japanese-Americans during the last World War, and I wonder what would happen now to an American mathematician engaged in secret work for the Lockheed Corporation, who should decide openly to declare his disenchantment with capitalism and his intention to emigrate to the Soviet Union.

Robert Finn
Stanford University

Berufsverbot

A letter to the editor (by A. Dress, I. Pieper, and U. Knauer) was published in the **Notices** under the title "The case of H. E. Gross" [January 1980, pp. 76-77]. The diction and content of this letter is qualified to defame Germany (Federal Republic), especially in the eyes of our American colleagues.

In this letter, our "Verfassungsschutz," a body whose function is to protect our constitution, is given the image of a state police force. In contrast to the intelligence service of a totalitarian dictator, the "Verfassungsschutz" has no police power whatsoever! Indeed, the separation of our "Verfassungsschutz" from our executive administration is viewed as an essential achievement of a democratic government. The "Verfassungsschutz" is controlled by an appropriate Minister of Interior together with a body of members of our Parliament representing all the various factions of Parliament.

The idea of "Berufsverbot," or "denial of a profession," is used in communist propaganda, and

also by A. Dress, I. Pieper, U. Knauer, to defame Germany. In reality "Berufsverbot" is imposed in the Federal Republic only in judgements against criminally convicted lawyers and physicians who are alcoholics. In cases like the one spoken of here, the facts are entirely different.

The right of every German citizen to equal access to an official office together with the special privileges of civil servants are unique in the world. This right is anchored in the constitution (Grundgesetz) and is recognized by the courts of law. When one strives for such a position, he must offer a guarantee that he will not become a revolutionary with a government salary and with his right to a pension. On the contrary, he must at all times support the basic principles of democratic freedom. In order to have a guarantee of this, the government employment office asks the "Verfassungsschutz" if it has legally useable knowledge to deny such a position to an applicant. If there is such knowledge, then the applicant can receive a review by a government commission that works independently of the "Verfassungsschutz." The applicant has a right to legal counsel. If a negative decision is given to the applicant he has all the legal rights of the courts of appeal.

Usually, membership in a Nazi party or a communist party implies denial. It must be noted that the DKP (West German communist party), is strictly Soviet oriented, and, in a narrow sense, cooperates with the SED (the communist party of East Germany). The DKP-communists, therefore, have nothing in common with some other possibly respectable West European communists. No DKP member dares to exhaust all the legal stages of appeal to our Supreme Court, because they know that the Communist Party of Germany and all its successors have been officially declared to be illegal.

The signers of this letter would like to state clearly that they support the veracity of their free nation and that this has nothing to do with McCarthyism. We welcome the government's efforts to prevent a tragedy like that of 1933 and to insure that our civil servants cannot request "help" from the Soviet army such as in Afghanistan.

We regret that the Committee on Human Rights of Mathematicians was misled, in the case of Gross, by distorted facts and by communist propaganda.

Werner Heise
 Helmut Karzel
 Hans-Joachim Kroll
 Kay Sörensen
 Institut für Mathematik
 Der Technischen
 Universität München

Editor's Note. Professor Boris M. Schein's letter to the editor in the April 1980 Notices (pages 279-280) referred to "eight problems," only six of which were actually printed. Two problems and the relevant comments by Professor Schein were hastily omitted as the issue was composed because of typographical errors in the problems which could not be corrected in time to meet the deadline. These problems are stated, in correct form, below with Professor Schein's comments on them:

(1) Let $\{x\}$ denote the fractional part of x . Find $\lim_{n \rightarrow \infty} \{(2 + \sqrt{3})^n\}$.

(2) Prove that the first thousand digits after the point in the decimal expansion of $(6 + \sqrt{35})^{1979}$ are zeros.

Problem (1) was given at the Russian Republican Mathematical Olympiad for the high school students in 1978, at which students had several hours at their disposal to solve the problems. Problem (2) is stated incorrectly, for the first thousand digits are 9s, not zeros. The correct variant of this problem was given at a competition in 1965 for high school students who were also students of the Evening Mathematical School at Moscow University. The students could solve this problem at home, and were given two months to do so. Sixty-nine students took part in this competition; only nine could solve this problem (two of them produced solutions with defects).



**MEMOIRS OF THE AMERICAN
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H-SPACES WITH TORSION

by *John R. Harper*

The central topic is the construction of simply connected finite H-spaces exhibiting torsion in homology. Any odd prime can appear as a torsion coefficient, in contrast to simply connected Lie groups, where torsion coefficients are limited to 2, 3, 5. The examples are constructed and analyzed by means of unstable Adams resolutions of spaces. A substantial part of the paper is an exposition of the work of Massey and Peterson in this direction. Besides the main examples, other applications of the theory are made.

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QUERIES

Edited by Hans Samelson

QUESTIONS WELCOMED from AMS members regarding mathematical matters such as details of, or references to, vaguely remembered theorems, sources of exposition of folk theorems, or the state of current knowledge concerning published or unpublished conjectures.

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

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

QUERIES

216. Howard Kleiman (Queensborough Community College (CUNY)). Does a theorem of the following type exist in the literature? **THEOREM.** Let $f(x, y) = x^n + \sum_{j=1}^n A_j(y)x^{n-j}$ where $A_j(y) \in \mathbb{Z}[y]$ and $f(x, y)$ is absolutely irreducible. Let $l(y)$ be the index of some root $\beta(y)$ of $f(x, y)$, i. e., the product of those prime factors of the discriminant $D_f(y)$ of f (an element of $\mathbb{Z}[y]$) that factor into distinct prime ideals in the extension $\mathbb{Q}(y)(\beta(y))$. Then if $f(x, y_0)$ is irreducible over \mathbb{Q} for some integer $y = y_0$, every rational prime p which divides the index of $\beta(y_0)$ divides $l(y_0)$.

217. Aristide Leonte (Department of Mathematics, University of Craiova, Str. A. I. Cuza, 13, 1100 Craiova, Romania). Let $f \in C([0, 1])$ and, for $\alpha > 0$, let $(P_\alpha f)(x) = (\Gamma(\alpha))^{-1} \int_0^x (x-t)^{\alpha-1} f(t) dt$. It is not very difficult to show that P_α is a linear operator, $\|P_\alpha f\| \leq (\Gamma(\alpha+1))^{-1} \|f\|$ and $P_{\alpha+\beta} f = (P_\alpha P_\beta) f$, $\lim_{\alpha \rightarrow 0} P_\alpha f = f$. What is known about the differential operator of the semigroup $(P_\alpha)_{\alpha > 0}$?

218. P. Flor (Institut für Mathematik, Universität Graz, A-8010 Graz, Elisabethstrasse 11, Austria). I am looking for information about the structure of the sets $A - A$ where A is an infinite set of integers. In particular, I am keen on references about the following special cases: (1) If A has positive lower asymptotic density, what inferences can be drawn about $A - A$? (2) What assumptions on A permit the inference that $A - A$ must contain a nontrivial subgroup of \mathbb{Z} ?

219. R. N. Gupta (Reader in Mathematics, Panjab University, Chandigarh-160014, India). If I is a right quasiregular left ideal of a ring R then is I contained in $J(R)$, the Jacobson radical of R ? I would like to know from colleagues in ring-theory what is known in this matter. If R is a ring (with 1) such that $J(R) = 0$ and $R^t = \{x \in R \ni nx = 0 \text{ for some natural number } n\}$, then is it the case that $J(R/R^t) = 0$?

RESPONSES

The replies below have been received to queries published in recent issues of the **Notices**. The editor would like to thank all who have replied.

206. (vol. 27, p. 67, January 1980, H. L. Bentley). The question is to organize a schedule for a bridge club, for certain numbers of pairs and a certain

length of time, satisfying certain conditions.

There is an extensive literature on problems of this type. A bibliography appears in my Ph.D. dissertation (University of Montana, 1977). It seems unlikely that the problem for 12 pairs has a good approximate solution. For 24 pairs there is a schedule for seven months which provides that no pair meets another pair more than once that can be adapted so that no woman is a hostess more than once. (G. W. Beynon, *Bridge director's manual*, Coffin, Waltham, MA, 1961, p. 149.) (Contributed by Paul Smith)

Second response to 206.

There is a solution (available on request) saying that under the given conditions there is a schedule such that each pair plays 9 others, but no solution with 9 replaced by 10. (Contributed by J.-C. Bermond)

209. (vol. 27, p. 179, February 1980, Chao-Ping Chang). Show that if $\sigma(m) = [(m-1)/2\pi] \cdot \arccos(m^{-1}/(m-1))$, then $\sigma(m)$ is never an integer for any integer $m \geq 2$.

The answer is yes. In fact, $\sigma(m) = \{(m-1)/2\pi\} \cdot \cos^{-1}\{m^{-1}/(m-1)\}$ is irrational when m is rational and not equal to 0, 1 and 2. When $m = 2$, it is $\pm 1/6 \pmod{\mathbb{Z}}$. Let $m = p/q$ be a rational number with $q > 0$ and $(p, q) = 1$, p, q integers. Assume $p \neq 0$ or q so that $m \neq 0, 1$. Let $z = \exp(2\pi i, \sigma(m)/m-1)$ and assume that $\sigma(m)$ is rational so that z is a primitive r th root of 1 for some positive integer r . Let $w = z + 1/z = 2 \cdot m^{-1}/(m-1)$ so that w is an algebraic integer. w is clearly in \mathbb{R} . *Case 1.* $p > q > 0$. $w^{p-q} = 2^{p-q} \cdot q^q/p^q$ is then an algebraic integer in \mathbb{Q} , hence in \mathbb{Z} . Since $(p, q) = 1$, we have p dividing 2 so that $p = 2, q = 1$ and $m = 2$. (This takes care of the query.) *Case 2.* $p < q$. $w^{q-p} = 2^{q-p} \cdot p^q/q^q$ lies in \mathbb{Z} as in Case 1. We now have $q = 1$ or 2. *Case 2a.* $q = 1$. p is then negative and $w^{q-p} = 2^{q-p} \cdot p < 0$. Since w is real, p must be even ($= m$). Writing $m = -2n$, we see that: (*) $w^{1+2n} = 2^{1+2n} \cdot (-2n)$ is a negative even integer. *Fact.* If s and t are integers coprime to r (the order of z), then $(z^s - 1)/(z^t - 1)$ is a unit in the ring of algebraic integers. Since $w = z^{-1}(z^4 - 1)/(z^2 - 1)$, it becomes clear that r must be divisible by 4. Thus, $-z$ is also a primitive r th root of 1 so that $-z$ is conjugate to z over \mathbb{Q} . This conjugation changes w to $-w$ and contradicts (*). *Case 2b.* $q = 2$. p is again negative. Set $n = -p$ to get: (**) $w^{2+n} = 2^n n^2$, n positive integer, and

n is odd. As in Case 2a, r must be divisible by 4 and the argument repeats to give a contradiction. (Contributed anonymously and by Raphael M. Robinson)

PROBLEM LIST

NONSUFFICIENTLY LARGE 3-MANIFOLDS

At the conclusion of the special session on *Nonsufficiently large 3-manifolds* at San Antonio, Texas, January 2-6, 1980, a special session was held on open problems. The following list resulted. In problems 1–5 below assume that M is a closed, orientable, irreducible, non-Haken 3-manifold with infinite fundamental group. The questions relate to the finite-sheeted covers of these manifolds. These covers can frequently be found when enough is known about the residual properties of the base space.

1. **W. Thurston.** Waldhausen has asked whether M has a finite-sheeted cover which is Haken.
2. **W. Thurston.** Does M have a finite-sheeted cover \tilde{M} with $H_1(\tilde{M}; \mathbb{Z})$ infinite?
3. **W. Thurston.** Does every Haken M^3 have a finite-sheeted cover with infinite first homology?
4. **W. Thurston.** Find good examples of M as above with finite-sheeted covers which are surface bundles over S^1 . *Note.* There are good examples of 3-dimensional reflection groups which have subgroups of finite index corresponding to hyperbolic manifolds which fiber over S^3 , while the group itself is the fundamental group of an orbifold, not a manifold.
5. **W. Thurston.** Add the hypothesis that M is hyperbolic and ask the same questions.

(*Remark.* Relevant background material for problems 1–5 above can be found in

(a) John Millson, *On the first Betti number of a constant negatively curved manifold*, *Ann. of Math.* **104** (1976), 235–247.

(b) Peter Scott, *Subgroups of surface groups are almost geometric*, *J. London Math. Soc.* **17** (1978), 555–565.)

6. **W. Thurston.** Let M^3 be irreducible, closed, orientable, non-Haken, with infinite fundamental group.

- (a) Does $\pi_1 M^3$ determine M^3 ?
- (b) Is $\pi_0 \text{Diff } M \rightarrow \text{Out } \pi_1 M$ injective?
- (c) Is M^3 geometric?
- (d) Are all finite group actions on geometric M^3 equivalent to geometric actions?

7. **W. Thurston.** Let M^3 be irreducible, non-Haken, with infinite fundamental group. Suppose M^3 is not Seifert-fibered. Does M^3 admit a foliation without Reeb components? (*Note.* There exist Seifert fiber spaces which do not admit such foliations.)

8. **W. Thurston.** Same hypothesis as in problem 7. Sue Goodman has asked how many such manifolds have Anosov flows.

9. **W. Thurston.** Is the Seifert-Weber dodecahedral space a Haken manifold? This space is obtained by identifying opposite faces of a dodecahedron using a $3/10$ right-handed twist, and it was described by Seifert and Weber in 1933 as one of the first known examples of a hyperbolic 3-manifold. [C. Weber and H. Seifert, *Die beiden Dodekaederräume*, *Math. Z.* **37** (1933), 237–253]

10. **W. Thurston.** Is there a good orientation dependent characteristic class of 3-manifolds?

11. **W. Thurston.** Is there a good invariant measuring “handedness” of a knot?

12. **R. Osborne.** Is there a workable algorithm for detecting incompressible surfaces in 3-manifolds? Is there any algorithm for detecting the nonexistence of incompressible surfaces. (Haken’s algorithm will eventually find all incompressible surfaces, but it is not an effective computational tool.)

13. **W. Thurston.** Is there a workable algorithm for classifying incompressible surfaces? More explicitly, is there a finite set of 2-dimensional train tracks such that

- (a) Every surface they carry is incompressible.
- (b) Every incompressible surface is isotopic to a surface carried by the tracks.

(*Remark.* Two-dimensional train tracks are branched 2-manifolds, i. e. locally 2-dimensional manifolds except for the following types of singularities:

(1) A finite number of branches where the track is locally like the product of the letter Y with the unit interval, smoothed so that the two sheets are tangent along the branch line.

(2) If sheets A and B (resp. B and C) meet at a branch line I_1 (resp. I_2), then $I_1 \cap I_2$ is a single transverse double point.)

14. **W. Neumann.** Can a 3-dimensional homology sphere which has a free involution with nontrivial Browder-Livesay invariant bound a contractible 4-manifold?

15. **W. Neumann.** Given two free involutions on a 3-dimensional homology sphere, are their Browder-Livesay invariants equal? [Reference: S. Lopez de Medrano, *Involutions on manifolds*, Springer-Verlag, Berlin and New York, 1971; also W. Browder and G. R. Livesay, *Fixed point free involutions on homotopy spheres*, *Bull. Amer. Math. Soc.* **73** (1967), pp. 242–245]

16. **K. Uhlenbeck.** In a Riemannian 3-manifold, is every minimal immersion of a surface which is homotopic to an incompressible embedding itself an embedding?

(*Remark.* Schoen and Shalen proved this when the surface is T^2 . This could have applications to the classification of finite group actions on 3-manifolds as in the proof of the Smith conjecture.)

Moving from Academic to Nonacademic Employment

At the Annual Meeting in San Antonio, the Society's Committee on Employment and Educational Policy presented another in its series of panel discussions on nonacademic employment opportunities for mathematicians. This session was arranged by Audrey Terras of the University of California, San Diego, a member of the Employment Concerns Subcommittee of CEEP who served as moderator. The members of the panel (with one or two exceptions) had held academic positions prior to moving to industrial organizations or government supported research laboratories. Wendell H. Fleming of Brown University, a member of the CEEP Data Subcommittee, gave a preview of some of the information on nonacademic employment which appeared in his article in the February 1980 Notices (page 170 ff).

Texts of the talks given by five of the speakers are reproduced below. In the discussion session following these talks, Lida K. Barrett, chairman of CEEP, asked the members of the panel, all of whom had written theses in "pure" mathematics, if any would select an applied subject instead if they had it to do over. To a person, they agreed that they would not.

ROBERT R. CLOUGH

Burroughs Corporation

Introduction. It gives me great pleasure to be among mathematicians again for the first time in six years. I would like to thank Audrey Terras and the American Mathematical Society for inviting me to share my experience of moving from academic to nonacademic employment.

I want to discuss three aspects of the transition.

1. How to get a job.
2. Industrial life.
3. Salaries and raises.

How to get a job. I am no expert on how to get a job, but I can tell you what worked for me.

First, I filled out the required civil service forms and sent in my application for a federal government job. Second, I contacted two Chicago employment counselors who specialize in data processing jobs. They started arranging interviews with prospective employers. Third, I called on the personnel offices of companies in Chicago. Fourth, I wrote letters to executives of companies for which I thought I might like to work.

All four thrusts paid off in job offers. I had an offer from a federal government installation in response to my civil service application and offers from eight big accounting firms in response to my calls on personnel offices and letters to executives. I accepted the offer from Burroughs Corporation that resulted from an interview arranged by an employment counselor.

At this juncture, I should mention a ramification of using an employment counselor. Many, but not all, companies pay the fee of the counselor. If a counselor arranges an interview with a company that does not pay his fee, he may require you to sign, before the interview, a contract stating that you will pay the fee before your first day of work if you should accept the job. The fee could run in the neighborhood of fifteen percent of your first year's salary. It is partially refundable if you lose your job before some minimum time such as ninety days.

Industrial life. There are evidently many different kinds of work available, and I can tell you only what I have found working for Burroughs. I have no opportunity to engage in my field of research, which was algebraic topology. Nevertheless, data processing offers plenty of opportunities to think creatively, to

use mathematical reasoning, and to apply elementary mathematics.

My life style with Burroughs is somewhat different from my life style at Notre Dame. I cannot now choose my working hours and days as freely as I could. Typically the task at hand dictates my working hours. There are classes to teach, crises to meet, new machines to install, conversions to manage, and competitive benchmarks to run. There is also time to study and to attend classes. Generally, my job with Burroughs is probably more exciting and varied than my job at Notre Dame, but certainly it is no more interesting.

Salary and raises. When I was at Notre Dame there were rumors that industry paid much higher salaries than universities. Some people do make very high salaries in industry, but I believe that salaries in industry are not as high as the academic community generally supposes. I believe that most people making the transition make more money in industry than at a university, but not a great deal more.

Since 1973, salaries in industry have about kept up with inflation. However, as salaries increase, people move into higher tax brackets and discover that their real incomes are probably constant or decreasing. I imagine that most of you have experienced the same thing.

Conclusion. Academic and nonacademic employment both have their exciting and their dull moments. All told I cannot say that I prefer either to the other. I had six great years at Notre Dame and now I have had six great years with Burroughs. If you are interested in making the change, and if you think you might like to move to Chicago and work for Burroughs, why not discuss it with me later this evening?

Thank you, and happy new year.

Answer to Lida Barrett's question: If I had known in 1964 what I know today, I would not have chosen another program of graduate study. This is because I do not believe that our colleges and universities are or should be trade schools.

JOANNE HELTON

General Atomic Company

Since September of 1974 I have been working as a computational physicist in the theory group of the fusion division at the General Atomic Company,

located in San Diego, California. My Ph.D. is in mathematics and is from Stanford University. My experience in applied mathematics in an industrial research setting has been quite rewarding. By talking about what I do, I hope I can indicate the type of person who might be happy working in such an atmosphere.

General Atomic is engaged in a broad spectrum of research at the leading edge of advanced energy-related technology. My division is engaged in fusion research, development, design and construction. In my kind of fusion we study tokamaks, and General Atomic presently has the largest tokamak in the world—Doublet III. We want to know how various design features will affect the efficiency and stability of the plasma discharge in these tokamaks in order to design the next generation tokamaks which will actually achieve thermonuclear ignition. Frequently this information can be found in the numerical analysis of various partial differential equations, and this is how I spend my time.

The fusion research effort is very much a group effort. It is important to be able to work easily with others and also to easily direct the technical efforts of others. It is crucial to be able to communicate and work with people from many different disciplines. For me this includes theoretical physicists, experimental physicists, nuclear engineers, and so on. Such communication requires first acquiring a thorough understanding of the problem, and then the flexibility to see the problem from very different points of view. The cooperative solution of a problem often proceeds somewhat as follows. First, the physical problem is identified; then the problem must be formulated in a solvable mathematical form. Since the problems are often nonlinear and multi-dimensional, analytical solutions are rarely possible. More generally, solution methods must be selected, computer programs written, and so on. When a solution is found to the problem, the reliability of the mathematical formulation and of the solution method must be determined. If the mathematics and the physics have been correctly matched, then it may be possible to compare the solution with experimental data. If the comparison is reasonable, the theoretical approach is at least partially validated, and the techniques can be used to predict the outcome of future experiments. Finally, the essence of the solution must be communicated to people in other disciplines.

In fusion there are many, varied, interesting problems to be solved involving the numerical solution of differential equations. Relevant coursework, involving differential equations and numerical analysis, helps one to approach such problems. It is also important to have had some physics courses. It is almost essential to have had some computing experience. Advanced programming capabilities can be acquired on the job.

The solution to most interesting problems requires considerable developmental work in mathematics. The problem we need to solve often turns out to be the particularly nasty case which the

mathematicians have so far postponed. In my work it is necessary to have a problem-solving mentality where one wants to solve the problem at hand, however unpleasant this may be, and not to simplify the problem and then solve the wrong problem in an elegant manner. Of course, if an elegant solution can be found to the “right” problem, that is the ideal case. As you might guess, it helps to be enthusiastic about the development of nuclear fusion and to believe in the importance of theoretical support.

We have graduate students, no undergraduates. We have seminars, attend meetings and so on; foreign travel is common and funded since fusion research is a major international program. A great deal of our work results in the eventual publication of papers in journals such as the *Journal of Computational Physics*, *Nuclear Fusion*, *Computer Physics Communications*, *Physics of Fluids*, and so on. So long as the problem is of some importance to the nuclear fusion effort there is a great deal of freedom in problem choice. There are no teaching obligations and an abundance of interesting problems, and I prefer the work to a traditional academic job.

We are working to demonstrate fusion’s scientific feasibility, to achieve simultaneously in one device the physical parameters that are required for the net production of fusion energy. Our tokamak DIII has been designed to address the scientific feasibility of magnetic confinement fusion and to demonstrate the potential economic advantages of noncircular plasma cross section. In magnetic confinement fusion a suitably shaped magnetic field confines the plasma and we have at General Atomic the most sophisticated magnetic confinement system.

I enjoy my work very much. I chose it as an alternative to academic work. It is satisfying and rewarding in that the problems are very real and the correct solution of these problems just might advance the design of a fusion reactor.

CHARLOTTE LIN

Schlumberger-Doll Research Center

Job Description. I am one of about 100 Ph.D.’s at Schlumberger’s research laboratory. Schlumberger’s primary business is oil exploration: “logging”—as a function of depth—responses to electrical, nuclear or acoustic “tools” lowered into a drilled oil-well. The worldwide share of well-logging (~85%) is maintained, despite prices much higher than the competition, by scientific superiority; that entails commitment to basic research.

The project I chose fits into a program investigating the “micro-physics” (dielectric function, resistivity, acoustic scattering and velocity, 2-phase fluid flow) governing macroscopic rock formation properties (permeability, fracturability, porosity, oil recovery efficiency). Program investigators’ results have appeared in such journals as *Physical Review*, *Geophysics*, and *Proceedings of the Institute of Electrical and Electronics Engineers*.

The “rock physics” depends on the rock type.

Angular rock grains scatter sound differently than spherical ones, distribution and size of constrictions in “pore-space” affect fluid flow, pore-paths transverse to current flow enhance electrical response. I work on geometric and topological description and modelling, using a scanning electron microscope, computer graphics, software from medical tomography, and ideas from graph theory, Fourier analysis, pattern recognition, stochastic geometry. A sample problem: to determine 3-D (geometric and topological) configurations from 2-D measurements.

Background (a not atypical pure-mathematics elitist case).

Cornell B.A., emphasis on art history, no science. Ph.D. (Logic and algebra) Recursion theory on countable abelian groups, no applied course-work. “Useful”.

One summer job as a “go-for” at Boeing.

As Cornell T.A. (1975-1977), taught PL/I, sophomore differential equations.

As M.I.T. instructor (1977-1979), taught engineering mathematics (wave equation, Fourier series, Bessel functions, etc.).

The Shift from Academic to Nonacademic Employment. My one good move: I was reluctant to take applied courses but fear of not eating (or clothing or sheltering) led me to *teach* some useful courses, so some appreciation of the subjects sneaked in subconsciously. Still, leaving academia never occurred to me, and I got ready to leave a city where there were no jobs (academic) I wanted. I had almost accepted a congenial tenure-track offer when serendipity intervened. A “headhunter” (recruiting agency, hired by would-be employers) specializing in science/technology had gotten my name and passed it to Schlumberger. Schlumberger chanced a look at a mathematician; I thought I would chance a look at industry.

I found an almost hyper-active, eclectic intellectual environment where publication is encouraged but not demanded, colleagues support rather than compete, former research interests can be maintained, lifestyle may be as informal as desired, military/government overtones are absent. Ph.D.’s with ink-wet diplomas start at \$26K to \$31K. Utopian? There are major and minor caveats. Wide-ranging interest suffices, but is also absolutely necessary. Time and mental-space enough for correct solutions are not begrudged, but existence proofs without numbers are inadequate. Minimal corporate structure with research at the top means management is easily accessible to respond to new ideas and innovations, but scientists are easily accessible (and held accountable) for short-notice updates on progress or failure. Benefits are generous and so is research-related travel (even a logic conference in Australia!) However, travellers get weary, and what happened to those academic vacations? Overall: high excitement and remuneration, and high stress. I’m delighted, but it’s not for everyone.

Remarks on Shifting, in Unranked Order (*enter Polonius*).

1. Remember your Ph.D. represents a lot of learning and labor—you do know how to think. Muster all confidence and imagination: to articulate how you could play a useful (“essential” isn’t required) role in a particular company, to see how that role could be satisfying to you (else why try?). Industry and academia generally don’t realize that a mathematician *can* contribute equally to a research group, really enhancing group capabilities with mathematical ability and training.

2. Learn *something* useful (if only by teaching, or by reading *Scientific American*). Otherwise you don’t even share a common language with a prospective employer, to say nothing of credibility for claims of high qualification or motivation.

3. Try a head-hunter (check your college placement office), and also the employment sections of professional journals in computer science, public health, planning, etc.

4. *Résumé* \neq curriculum vitae. Your CV shows, fairly impersonally, what you’ve taught and where your research was and is going; those are the pertinent points for the academic employer. An industrial employer is looking for personal attributes and qualifications. Your *résumé* should show work done with enough detail to indicate what you feel you can and/or want to do. Even a stark list of positions, publications, and affiliations—highlighting “useful” credentials (an enticing mystery as to whether you’re interesting or not)—is better than a dry theorem-by-theorem, exhaustive account of your schooling and work (which removes any doubt).

POLLY MOORE

Merck Sharp and Dohme Research Laboratories

I’m the most recent graduate in this group, having finished my degree just about a year ago. Since then I have held two different nonacademic jobs, so I would like to talk about what I have had the most experience at, namely the process of job hunting.

I decided about a year before I expected to receive my doctorate that, given the current state of the academic job market and my lack of enthusiasm for research in semisimple Lie groups, I would look for a job as an industrial mathematician. Since I was then in Seattle, and enjoyed living there, I decided to see what was available in the area. At that point I discovered that the Mathematics Department was not going to be much help—the “old boy network” that can be so useful *within* academic circles doesn’t have many connections to the outside. So I began to gather my own information by visiting companies. I would get the name of someone working as a mathematician or, more often, in a technical field that used mathematics heavily, and arrange to go talk to that person. My questions were the basic ones: What does your company do? What do *you* do as part of that? What kind of mathematics gets used here? What kind of mathematics would you be interested in using, if you had someone who could do it? People were generally very helpful and often referred me to friends of theirs at other firms. The

object was to talk to someone high enough up to have some hiring influence, but still in a technical capacity; at all times avoid the Personnel Department. After about a dozen such interviews, I could narrow down my list to four that I was interested in. Then I looked at what *they* were interested in and planned a course schedule accordingly: partial differential equations, numerical analysis, Fortran. (By the way, I found these courses in the School of Engineering, not in the Department of Mathematics.) When I was ready, I went back to the places I liked for more formal job interviews (which were much easier because I'd already been there and met people), collected offers and made a decision. I ended up working for Boeing in Aerodynamics Research.

So much for rational job hunting. You also have to be willing to take advantage of unusual opportunities, which is how I got my second job. My fiancé, who is a biochemist, was interviewing at Merck, a large pharmaceutical firm, and told them he needed a job for a mathematician too. By great good luck, there turned out to be a match between my interests and their needs, and when they offered jobs to both of us, we agreed. The biggest drawback was moving to New Jersey, but those of you who have ever tried finding two jobs close together will understand that you can't ask for everything!

At any rate, I am thoroughly enjoying working for Merck. I'm part of an in-house consulting group for the research laboratories. My colleagues have backgrounds in statistics and operations research, so together we can field all kinds of questions. Here's an example of the kind of problem I get involved in: Antibiotics are typically produced by a micro-organism rather than being synthesized by a chemist. You grow the cells, feed them, let *them* produce the antibiotic, and then you harvest it. The entire process is called fermentation. It can be described by a system of coupled differential equations relating the concentrations of cells, product, and energy source (and more variables if necessary). The parameters in this model depend on quantities like temperature and pH. For most systems, the temperature which maximizes cell growth is different from the temperature which maximizes antibiotic production. So it becomes a nice problem in optimal control theory: How do you vary the temperature over the course of the fermentation in order to maximize the yield at the end? Of course, just the mathematical solution isn't enough here. You also have to consider whether the increase in yield over using a constant temperature is enough to warrant having someone in the plant constantly adjusting the temperature according to your calculations, or whether the controls on a 50,000 gallon fermentor are sensitive enough to reproduce your profile. All in all, a fascinating problem with a very useful answer.

Let me make a few general comments about job hunting in industry. First of all, there's the matter of attitude. Having an industrial job is *not* a poor second; it's not "sour grapes" because you couldn't find an academic position. If you feel that way, it's

bound to show, and it will make it harder for you to get a job and certainly harder to enjoy it. Second, it's important for you to take the initiative in job hunting. Take the responsibility for deciding what you want to do. Job hunting is hard work, but it's easier if you are in control of it. Third, be flexible about what you are willing to do, be enthusiastic about branching out. Take a good look at your interests outside of mathematics and use them to guide your choices. Last, keep in mind that industry needs mathematicians, even if they don't always realize it. When you uncover a need, don't be shy about convincing them that you can help them; you may end up with a job created just for you.

Being a mathematician in industry has a number of rewards (other than the salary, which has already been mentioned!). For instance, I really feel appreciated in my job; I feel useful. I work a solid forty hour week, but then my evenings and weekends are entirely free (and I don't feel guilty about it!). I've also found that consulting has some of the best aspects of teaching. Once a problem has been formulated and solved, it still needs to be translated into a usable form and communicated to the person who needs it. There is also a great deal to be done in increasing people's confidence in their own use of mathematics in their work—"mathematical anxiety" is hardly limited to the classroom.

The question was raised of whether I would do this all again if I had a choice? The answer is an unqualified "Yes". Being a graduate student served a definite purpose: I enjoyed it at the time, I needed to find out whether research in mathematics was what I wanted to do, and it gave me a good basis for confidence in my mathematical abilities. It was also the right decision to get a nonacademic job. For those of you contemplating such a decision, I hope my case history has illustrated that it's quite possible to make the transition and be happy about it.

CORY B. SMITH

Jet Propulsion Laboratory

I am currently completing a two-year postdoctoral research associateship at NASA-JPL, and will try to give you some background on this program and my experiences in it. At present the National Academy of Sciences, through the National Research Council, sponsors regular and senior postdoctoral appointments in sixteen Federal research organizations at over sixty locations around the country. In 1979 there were 365 NRC research associateships and research management associateship awards, and for 1980 the total is expected to rise to 420 awards.

Since the NRC research associateship program was established in 1955 the awards have been mainly in the physical, chemical and life sciences, with a small number of research opportunities in the mathematical sciences. At present the associates who have doctorates in mathematics or statistics hold eleven appointments distributed as follows:

NASA Johnson Space Center	6
National Bureau of Standards	2
Air Force Systems Command	1
NASA Ames Research Center	1
NASA Jet Propulsion Laboratory	1

At JPL I am the only mathematics Ph.D. among twenty-eight NRC research associates. On the regular JPL staff there are, of course, several more mathematics Ph.D.'s with diverse backgrounds out of about 6,000 total employees. The people I work with have degrees in physics, meteorology and engineering for the most part.

My academic studies in mathematics went from pure to applied subjects in the mid-seventies, starting with algebra, topology and geometry and progressing into combinatorics, statistics and mathematical programming. As a research assistant at the University of California, San Diego, I also had a fair amount of experience in computer programming, graphics displays, etc., which produced several job offers after graduation. However, I turned down a systems analyst position (at \$22.5K) and a nontenure academic offer (\$15K) for an NRC associateship (now \$18.5K).

In accepting this postdoctoral position at JPL I hoped to maintain some career flexibility while exploring some possible significant applications of data inversion techniques from my graduate research. The applications in atmospheric remote sensing and image processing were chosen from the available research opportunities with JPL investigators as stated in the NRC's literature for NASA at JPL, and my proposal was approved during the second of three annual reviews by the NRC (in January, April and August).

Since starting my tenure at JPL in August 1978, I have worked on a variety of problems concerning determination of aerosol and cloud composition from light scattering data. I also have consulted on deconvolution of spectral data and radioastronomical

aperture synthesis. These topics are related by their mathematical formulations in terms of first-kind Fredholm integral equations. My role has been to carry out analytical studies of certain transforms as well as to simulate numerical parameter estimation with specialized programs. This has led to several publications in scientific journals with my research adviser, if not much publishable mathematics.

The JPL environment is oriented more towards engineering technical development than theoretical or scholarly studies (which are concentrated at California Institute of Technology for the most part). A surprisingly large amount of scientific research at JPL is funded on "soft money" from government grants (NASA, NSF, DOE, NIH), and the current NASA budget has little provision for new initiatives. Many NASA facilities have reached the ceilings set on their numbers of employees already, resulting in large numbers of contract employees (who usually receive few or no benefits from the various contract companies). Thus the employment situation with NASA is not very promising right now. However, with a visiting postdoctoral appointment it can be exciting to witness NASA activities close up, and make contacts in the scientific community.

In conclusion, the postdoctoral experience at JPL has been a good bridge between the academic and nonacademic worlds for me. The stipends for the NAS/NRC research associateship programs are competitive with academic institutions, although less than many computer or electrical engineering research positions. The approval rate for postdoctoral research proposals to the NRC programs is something like one in four. A strong interest in applications and relevant physical sciences is desirable for research projects at JPL and other centers. Getting in the door as a research associate may not guarantee later employment with NASA or other agencies, but the opportunities to do "real world" research are well worth considering.

CEEP CASE STUDIES

Some Mathematicians with Nonacademic Employment

Nearly six years ago the Society's Committee on Employment and Educational Policy initiated a series of "case studies" prepared by mathematicians with nonacademic or "nontraditional" employment (nontraditional in the sense that it was neither academic teaching or research, nor in one of the traditional technical areas of industrial research and development). The most recent report in this series was published in the February 1978 *Notices*, pages 115-118.

Mathematicians interested in participating in this project either by preparing a case study of their own, or by proposing others as potential authors of such studies, are asked to notify Professor Barnet M. Weinstock, chairman of the Employment Concerns Subcommittee of CEEP. His address and telephone number are Department of Mathematics, University of North Carolina, Charlotte, North Carolina 28223: 704-597-2175.

ALFRED MAGNUS

Aerodynamic Research Group, The Boeing Company

I began to look for a job in June 1976, having almost completed my Ph.D. thesis (on representations of a semi-simple Lie group) at the Massachusetts Institute of Technology. I was primarily interested in nonacademic jobs because I did not wish my career to depend on the number of papers I published. A

letter from my future boss at Boeing to the M.I.T. Placement Service, expressing interest in a pure mathematician with a strong background in analysis, arrived within a week of the day I first began actively to look for a job. I responded by letter, received no answer, and followed up with a telephone call which resulted in an invitation to come to Seattle for an interview. I did so and was offered a position (which I accepted) a few weeks later, before I had even

completed the defense of my thesis. It was fully understood by my boss that I had no background in aerodynamics, but he felt that there was nothing essential which I could not learn on the job.

The work in Aerodynamics Research, the group I joined at Boeing, concerned the development of better numerical tools for the analysis of fluid flow about arbitrary (generally airplane-shaped) objects. Most of the basic physics has long been known. That is, one knows roughly under which conditions a particular partial differential equation or system thereof models the flow to an acceptable degree. In general, the more complex the equation, the more reliably it models the flow. On the other hand, the numerical methods for solving the more complex equations are less reliable, more expensive, and are only usable on simple configurations. Thus, for a particular differential equation, the long-range goal is to solve it more reliably and for more complex configurations.

The project to which I was assigned involved the improvement of a computer program which solved a linear hyperbolic equation (essentially the two-dimensional wave equation) which is valid for supersonic flow. The goal was to make it reliable even for highly complex configurations, and make it efficient at the same time.

The mathematics involved in this work did not consist of proving any theorems. Rather, it consisted of developing dozens of numerical algorithms, each with a narrow, special purpose, and each of which had to be implemented in computer code and tested to make sure it worked as desired. Generally, the development of these algorithms did not require any extensive knowledge of higher mathematics or even numerical analysis. Most of the algorithms were too specialized to be of interest to anyone else, and either too specialized or too simple to be worthy of publication. Even so, a lot of effort was required, and I certainly experienced a good deal of satisfaction when the final product really worked.

Probably less than one-fourth of my time has been spent on the actual process of developing algorithms. Over half my time has been spent explaining my work to other researchers and programmers. The rest of my time has been spent in acquiring background knowledge about aerodynamics and the airplane design process in general, and in reporting to Boeing managers and contract monitors (much of this work was supported by NASA) about the progress of the work.

I think that much of the work that I do closely parallels that of an academic mathematician. The time I spend explaining my work to others is very similar to time spent teaching, except that I get to talk about my own work more, and my audience is being paid to listen to me. My administrative work is probably more interesting than the academic equivalent, and a job well done yields more appreciation than it might for an academic mathematician. The main drawback is that the mathematical work I do is not of my own choosing, but I have found it sufficiently enjoyable anyway.

The general working conditions at Boeing encompass some very pleasant and some highly objectionable features. Working hours are very flexible, as long as one actually does something useful, and averages at least forty hours per week doing so. Leave without pay is given in reasonable quantities without difficulty, allowing one to supplement one's two weeks of vacation. Also, the higher salaries (my estimate from limited experience is that mathematicians in industry earn fifty percent more than mathematicians of approximately equal stature in academic jobs) actually mean that one can afford to take some time off without pay.

The worst feature of working at Boeing is the compact arrangement of desks. Aerodynamics Research is located in a room with 200 desks, 50 telephones, and mediocre sound-deadening partitions which reduce the noise level from impossible to unpleasant. Each employee has a total of 40 square feet of space. Any attempt by the supervisors in the group to obtain more space is met by the response that we only have two-thirds the population density of most Boeing facilities, and therefore should feel very happy. In fairness to other industries which hire mathematicians, Boeing does seem to be an exception, with two-person to four-person offices being more typical elsewhere.

In summary, I am satisfied with my job and do not regret leaving academic life. I am interested in my work, and am well appreciated by my employer.

MARY ELLEN CONLON

GTE Automatic Electric Laboratories

I have been working in the Systems Research Laboratory of GTE for just over four months. Specifically, my work involves teletraffic analysis and modelling of a new digital switching system being designed by GTE. So far I have developed an analytic queueing model and a simulation of a portion of that system. Most of the mathematics encountered in my work is in the areas of statistics, linear algebra, differential equations, and Laplace and z -transforms.

I received my Ph.D. in May 1979, from the Illinois Institute of Technology. My dissertation, *The generation of functions of k arguments*, and my major course work were in algebra. However, more in the applied vein, I studied probability, statistics, and partial differential equations at the graduate level. Furthermore, I completed a number of computer science courses in the field of programming languages. I believe that my experience with applied mathematics and computer science, however limited, and my abilities of written communication, as evidenced by my dissertation and the forthcoming appearance of my earlier research in the *Canadian Journal of Mathematics*, were the major factors in obtaining my present position.

In seeking an industrial position I sent a short introductory letter and resume to approximately

twenty employers interested in persons with graduate degrees in the physical sciences, although not always specifically in mathematics. I found these in major local newspapers and in the *College Placement Annual*. Almost fifty percent of the employers contacted me to ask for more information. After this was supplied, I had interviews with four firms, each of which was either a university-affiliated research institute or a part of the telephone industry. I accepted my present position after about three months.

The reward of seeing recommendations implemented in design decisions is a major advantage of industrial, as opposed to academic, employment. Also, since digital switching technology has so many facets, much of the work done at GTE is a joint effort of in-house systems, hardware, and software engineers, and expert consultants from outside the

corporation. The opportunity for interchange of ideas is greater than in many academic positions. Obviously, skill at interpersonal communication is required. Moreover, the opportunities for continuing professional education are abundant. I have already attended a seminar in distributed processing, and shall soon attend a short course in teletraffic theory. I shall even have the opportunity to teach a section of that course dealing with the statistical analysis of simulation results.

Finally, I have been asked where a woman fits in a predominantly male research laboratory. My reply is that qualified technical people of any sex are greatly needed in almost all areas related to computer technology. The relative rarity of female mathematicians and engineers is probably to the advantage of those who seek employment at this time.

Directory of Women in the Mathematical Sciences

The AMS-MAA-NCTM-SIAM Committee on Women in Mathematics has announced plans to publish a *Directory of Women in the Mathematical Sciences*. The new *Directory* will be published with financial support from the American Mathematical Society, the Mathematical Association of America, the Society for Industrial and Applied Mathematics and, possibly, other organizations. It supercedes the original *Directory of Women Mathematicians* which was published by the AMS in 1973-1974 and which was followed by several supplements. The new *Directory* will include an updating of the listings in the original *Directory* and its supplements, as well as new listings.

The questionnaire which appears on the following page will form the basis for the new *Directory*. Women who have earned a Ph.D. degree, or its equivalent, and candidates expecting to receive a Ph.D. in 1980 or 1981 should return the questionnaire. Information on women who expect to receive a Ph.D. at a later date will be kept on file.

The purpose of the *Directory* is to make it possible for employers, individuals arranging colloquia, conferences or mathematics meetings, and officers of professional organizations seeking nominees for committees to find, in summary form, the curricula vitae of women in the mathematical sciences.

In order to reduce the costs of printing the *Directory* and of updating and supplementing listings each year, the Committee has recommended that the *Directory* be published using computer printout as camera-copy. By using a computer file to store the information, the updating of listings already in the *Directory* and the inclusion of new entries are ex-

pected to be simple matters. It is planned to keep expenses at a minimum, which should permit re-issuance of the *Directory* on a frequent basis.

The Committee has designed the questionnaire for the *Directory* in such a way that entries in subsequent issues will require little updating and yet those using the *Directory* will find the information useful. Each listing will include the woman mathematical scientist's name, address, and employer or institution; position; one or two fields of mathematical interest; and titles of her two most important publications.

Women who have not received a questionnaire in the mail, but who wish to be listed in the new *Directory* should complete the questionnaire on the following page and send it directly to the Directory of Women in the Mathematical Sciences, c/o Alice T. Schafer, Department of Mathematics, Wellesley College, Wellesley, Massachusetts 02181.

Joint Committee on Women in Mathematics

Pamela Cook-Ioannidis (SIAM)
 Etta Z. Falconer (AMS)
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Directory of Women in the Mathematical Sciences
QUESTIONNAIRE FOR WOMEN PH.D'S AND PH.D. CANDIDATES

(Please type or print)

1. A. Name (last name first) _____

B. Cross listing of name (if desired) _____

2. Mailing Address (Preferred) _____

*Current Status: _____ Employed _____ Retired _____ Graduate Student _____ Unemployed
(*This information is for record keeping and will not be printed in the Directory.)

3. Name of employer or institution _____

Address of employer or institution _____

Title of position _____

4. Highest academic degree received _____

Year degree conferred _____ Institution _____

5. Fields of mathematical interest: (Write 1 for primary field; 2 for other. Only two will be printed.)

- | | |
|------------------------------|--|
| A. _____ Algebra | G. _____ Logic and foundations |
| B. _____ Analysis | H. _____ Number theory |
| C. _____ Applied mathematics | I. _____ Operations research |
| D. _____ Computer science | J. _____ Statistics and probability |
| E. _____ Functional analysis | K. _____ Topology |
| F. _____ Geometry | L. _____ Other professional interest
(Administration) |

6. Publications: Bibliographic information for two most important publications. In addition to the title, give MR number only when available; otherwise for an article use MR abbreviation for journal and give volume number.

i. _____

ii. _____

Return this form as soon as possible to
DIRECTORY OF WOMEN IN THE MATHEMATICAL SCIENCES
c/o Professor Alice T. Schafer, Department of Mathematics, Wellesley College, Wellesley, MA 02181

AMS RECIPROCIITY AGREEMENTS

Between 1922 and 1932 the American Mathematical Society concluded "reciprocity agreements" with the London Mathematical Society, the Unione Matematica Italiana, the Deutsche Mathematiker-Vereinigung, and the Greek Mathematical Society. A number of similar agreements were subsequently made with other mathematical organizations around the world. A current list appears below.

These agreements provide for reduced dues for members of these organizations who choose to join the AMS and who reside outside of the U. S. and Canada. Reciprocally, members of the AMS who reside in the U. S. or Canada may join these organizations at a reduced rate. A summary of the privileges available to AMS members who join these organizations under the terms of the reciprocity agreement is given on the following pages. Members of these organizations who join the AMS as reciprocity members enjoy all the privileges available to ordinary members of the Society. AMS dues for reciprocity members are currently \$18 per year. Each organization was asked to review and update its listing in the Spring of 1980. An asterisk (*) after the name of an organization indicates that no response to this request had been received when this issue went to press. A disc (●) before the name of an organization indicates that application forms for this organization may be obtained by writing the American Mathematical Society, P. O. Box 6248, Providence, RI 02940.

Asia

●ALLAHABAD MATHEMATICAL SOCIETY

Apply to: S. R. Sinha, Secretary, Allahabad Mathematical Society, 5, C. Y. Chintamani Road, Allahabad 211002, India.

Dues: \$10 (annual), \$100 (life); payable to K. G. Mithal, Treasurer.

Privileges: *Indian Journal of Mathematics* (three issues per year); back volumes available at 25% discount.

Officers: U. N. Singh (President), D. P. Gupta and P. Srivastava (Vice-Presidents), S. R. Sinha (Secretary), K. G. Mithal (Treasurer), S. N. Bhatt (Editor).

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Apply to: M. Dutta, Secretary, Calcutta Mathematical Society, 92, Acharya Prafulla Chandra Road, Calcutta 70000 9, India.

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Privileges: *Bulletin, News Bulletin.*

Officers: S. Duttamajumder (President), F. Harary, N. D. Sengupta, L. Debnath, P. C. Vaidya, S. K. Dutta (Vice Presidents), S. K. Chatterjea (Treasurer), M. Dutta (Secretary).

INDIAN MATHEMATICAL SOCIETY

Apply to: R.S.L. Srivastava, Hon. Secretary, IMS, Department of Mathematics, I.I.T. Kanpur, 208016, India.

Dues: \$7 (Rupees 25/-); payable to D. K. Sinha, Hon. Treasurer, IMS, Department of Mathematics, Jadavpur University, Calcutta, India.

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

Officers: U. N. Singh (President), R.S.L. Srivastava (Secretary), D. K. Sinha (Treasurer), S. Raghavan (Academic Secretary), K. G. Ramanathan (Editor of *Journal of Indian Mathematical Society*), I. S. Luther (Editor of *Mathematics Student*).

KOREAN MATHEMATICAL SOCIETY*

Apply to: Membership Committee, Korean Mathe-

matical Society, Department of Mathematics, College of Natural Sciences, Seoul National University, Seoul, 151 Korea.

Dues: W4,000 (U.S. \$8); payable to Korean Mathematical Society.

Privileges: Free receipt of *Bulletin* (two issues per year) and *Journal of the Korean Mathematical Society* (two issues per year).

Officers: Eulyong Pak (President), Taekyun Kwon (Vice-President), Yungzin Chung (Treasurer), Okkyung Yoon (Secretary).

●MATHEMATICAL SOCIETY OF JAPAN

Apply to: Mathematical Society of Japan, c/o The Toyo Bunko, 28-21, Honkomagome 2-chome, Bunkyo-ku, Tokyo 113, Japan.

Dues: \$20 (for 1980); each member will be informed how to pay the dues after joining the Society.

Privileges: *Journal of the Mathematical Society of Japan; Sugaku* (in Japanese) for \$4 additional dues.

Officers: Kiyosi Ito (President), Chieko Yashiro (Secretary).

MATHEMATICAL SOCIETY OF THE REPUBLIC OF CHINA*

Apply to: Mathematical Society of the Republic of China, P.O. Box 23-3, Taipei, Taiwan, Republic of China.

Dues: N. T. \$150 (U.S. \$2.50); payable to Mathematical Society of the Republic of China.

Privileges: *Notices* (two issues per year), *Chinese Journal of Mathematics* (two issues per year).

Officers: Neng-che Yeh (President), Huei-jan Shyr (Treasurer), Tien-wen Chen (Secretary).

●PUNJAB MATHEMATICAL SOCIETY

Apply for membership to: Abdul Majeed, Secretary, Punjab Mathematical Society, c/o Department of Mathematics, Punjab University, New Campus, Lahore (Pakistan).

Dues: Rupees 15/- per year or Rs. 150/- for life. (U.S. \$1.50 per year or U.S. \$15.00 for life); payable to Abdul Majeed.

Privileges of membership: *Society News*, *Punjab University Journal of Mathematics*, Proceedings of the Conferences, Symposia and Seminars, arranged by the Society.

Officers: B. A. Saleemi (President), Masud A. Malik, Rashid Hayat (Vice Presidents), Kh. Rashid ud Din (Treasurer), Abdul Majeed (Secretary).

SOUTHEAST ASIAN MATHEMATICAL SOCIETY

Apply to: Lee Peng Yee, Southeast Asian Mathematical Society, Nanyang University, Upper Jurong Road, Singapore 22, Republic of Singapore.

Dues: \$2.50; payable to Southeast Asian Mathematical Society.

Privileges: *Newsletter of the Southeast Asian Mathematical Society*.

Officers: Tan Wang Seng (President), Virool Boonyasombat, Irwin Tang (Vice-Presidents), Lee Seng Luan (Treasurer), Lim Chong-Keang (Secretary).

● **VIJNANA PARISHAD OF INDIA**

Apply to: H. M. Srivastava, Foreign Secretary, VPI, Department of Mathematics, University of Victoria, Victoria, British Columbia, Canada, V8W 2Y2 or R. C. Singh Chandel, Secretary, VPI, Department of Mathematics, D. V. Postgraduate College, Orai-285001, U. P., India.

Dues: \$5 (annual), \$50 (life); payable to Vijnana Parishad, c/o Department of Mathematics, D.V. Postgraduate College, Orai 285001, U.P., India.

Privileges: *Jñānabha* (an interdisciplinary mathematical journal currently published once a year); back volumes available at 25% discount.

Officers: H. M. Srivastava (Foreign Secretary and Editor), R. C. Singh Chandel (Treasurer-Secretary and Managing Editor), J. N. Kapur (Chief Advisor).

Europe

BERLINER MATHEMATISCHE GESELLSCHAFT e.V.

Apply to: D. Krüger, FB 3, Sekr. H 65 TU Berlin, Strasse des 17. Juni 135, 1000 Berlin 12, Federal Republic of Germany.

Dues: DM 12; payable to G. Preuss, Institut für Mathematik I, FU Berlin Hüttenweg 9, 1 Berlin 33, Federal Republic of Germany.

Officers: Rudolf Gorenflo (President), Hansgeorg Jeggler (Vice-President), G. Preuss (Treasurer), D. Krüger (Secretary).

DANSK MATEMATISK FORENING

Apply to: Mogens Esrom Larsen, Secretary, Dansk Matematisk Forening, Universitetsparken 5, 2100 København Ø, Denmark.

Dues: \$5; payable to Mogens Esrom Larsen, Secretary.

Privileges: *Mathematica Scandinavica* (D.kr. 85 per volume), *Nordisk Matematisk Tidsskrift* (N.kr. 63 per volume). (Members of the American Mathematical Society do not have to join Dansk Matematisk Forening to obtain the journals. Subscription orders should be sent directly to the journals:

Nordisk Matematisk Tidsskrift, Matematisk Institut, Blindern, Oslo, Norway; *Mathematica Scandinavica*, Matematisk Institut, Aarhus Universitet, 8000 Aarhus C, Denmark.)

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Apply to: Geschäftsstelle der DMV, Albertstrasse 24, 7800 Freiburg, Federal Republic of Germany.

Dues: DM 60.-; payable to Kreissparkasse, Tübingen 16269 (BLZ 641 500 00), Federal Republic of Germany or Postscheckamt: Stuttgart 18517-706 (BLZ 600 100 70), Federal Republic of Germany.

Privileges: *Mitteilungen der Deutschen Mathematiker-Vereinigung* (four issues a year), *Jahresbericht der Deutschen Mathematiker-Vereinigung* (four issues a year).

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Apply to: The Honorary Secretary, Edinburgh Mathematical Society, James Clerk Maxwell Building, Kings Buildings, Mayfield Road, Edinburgh, EH9 3JZ, Scotland.

Dues: \$4 (preferably £2 sterling); payable to the Honorary Treasurer.

Privileges: *Proceedings* at reduced rate of \$6 (preferably £3 sterling) per annum.

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Dues: DM 20; payable to J. Zierep, Institut für Störungslehre der Universität Karlsruhe, Kaiserstrasse 12, D-7500 Karlsruhe, Federal Republic of Germany. [Bank: Deutsche Bank Karlsruhe, BLZ 660 700 04, Kto. 03/65585 01, J. Zierep (Sonderkonto GAMM).]

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Apply to: Íslenzka Staerdfraedafélagid, Raunvísindastofnun Háskólans, Dunhaga 3, Reykjavík, Iceland.
Dues: \$10; payable to Íslenzka Staerdfraedafélagid.
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Apply to: London Mathematical Society, Burlington House, London W1V 0NL, England.
Dues: \$3.25 (until November 1980); payable to London Mathematical Society.
Privileges: *LMS Newsletter*. Reduced rates for the *Bulletin*, *Journal*, and *Proceedings of the LMS*; *Journal of Applied Probability*; *Mathematika*; *Mathematical Proceedings of the Cambridge Philosophical Society*; *Quarterly Journal of Mathematics*; LMS Lecture Notes; LMS Monographs. (Please write to the LMS for complete details.)
Officers: C.T.C. Wall (President), D. A. Brannan, R. Bailey (Secretaries), R. L. E. Schwanzenberger (Treasurer), S. A. Robertson (Publications Secretary), P. McMullen (Librarian).

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Dues: N.kr. 10; payable to Norsk Matematisk Forening.
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Privileges: *Internationale Mathematische Nachrichten*.
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and in its scientific sessions.

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Apply to: Sr. Secretario, Real Sociedad Matemática Española, Serrano, 123, Madrid 6, Spain.
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Privileges: *Bulletin de la Société Mathématique de Belgique* (quarterly periodical, about 500 printed pages a year).
Officers: R. Debever (President), G. Hirsch (Secretary), J. Depunt (Treasurer).

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Apply to: American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940.
Dues: \$16 or \$30 (through June 1980); payable to American Mathematical Society.
Privileges: Individuals who pay dues of \$16 are entitled to receive *Circulaire* and *Gazette*. Individuals who pay dues of \$30 are entitled to *Circulaire*, *Gazette*, *Bulletin*, and four issues of *Astérisque*.
Officers: Marcel Berger (President); I. Ekeland, M. Hervé, C. Houzel (Vice-Presidents); Lionel Bérard Bergery (Treasurer); Mrs. C. Anantharaman (Secretary).

SOCIÉTÉ MATHÉMATIQUE SUISSE

Apply to: H. Carnal, Secretary SMS, Universität Bern, Math. Statistik, Sidlerstrasse 5, CH 3012 Bern, Switzerland.
Dues: SFr. 10.- for members of the AMS residing outside Switzerland; payable to H. Carnal, Secretary SMS.

Privileges: *Commentarii Mathematici Helvetici* (reduced price).

Officers: Pierre Gabriel, Universität Zürich (President); Alain Robert, Université de Neuchâtel (Vice-President); Henri Carnal, Universität Bern (Secretary-Treasurer).

SUOMEN MATEMAATTINEN YHDISTYS

Apply to: Matti Lehtinen, Secretary, Department of Mathematics, University of Helsinki, Hallituskatu 15, SF-00100 Helsinki 10, Finland.

Dues: \$13; payable to Aatos Lahtinen, Treasurer, Suomen Matemaattinen Yhdistys, Department of Mathematics, Hallituskatu 15, SF-00100 Helsinki 10, Finland.

Privileges: *Arkhimedes*.

Officers: Olli Lehto (Chairman), Olli Martio (Vice-Chairman), Aatos Lahtinen (Treasurer), Matti Lehtinen (Secretary).

SVENSKA MATEMATIKERSAMFUNDET

Apply to: Svenska Matematikersamfundet, Matematiska Institutionen, Lunds Universitet, Box 725, 220 07 Lund 7, Sweden.

Dues: S.kr. 30; payable to Svenska Matematikersamfundet.

Officers: Lars Hörmander (President), Olof Hanner (Vice-President), Lennart Brynielsson (Treasurer), Göran Wanby (Secretary).

●UNIONE MATEMATICA ITALIANA

Apply to: Segreteria della Unione Matematica Italiana, Istituto Matematico dell'Università, Piazza Porta S. Donato, 5, 40127 Bologna, Italy.

Dues: \$12; payable to Segreteria della Unione Matematica Italiana.

Privileges: *Bollettino Unione Matematica Italiana*—Sezione A.

Officers: Carlo Pucci (President), Gianfranco Capriz (Vice-President), Salvatore Coen (Treasurer), Luigi Pepe (Secretary).

WISKUNDIG GENOOTSCHAP

Apply to: G. J. Schellekens, Mathematisch Instituut, Budapestlaan 6, 3584 CD, Utrecht, Netherlands.

Dues: Hfl. 27,50; payable to Amro Bank, Utrecht, Netherlands, Account 45.65.88.167, Penningmeester Wiskundig Genootschap.

Privileges: *Nieuw Archief Voor Wiskunde* (three issues a year containing articles and a problem section), *Mededelingen* (nine issues a year containing announcements and book reviews), *Proceedings of the Royal Academy of Sciences*—"Indagationes Mathematicae" (can be obtained at a reduced subscription rate of Hfl. 64,-).

Officers: P. C. Baayen (President), G. J. Schellekens (Treasurer), H. Bavinck (Secretary).

Latin America

●SOCIEDADE BRASILEIRA DE MATEMÁTICA

Apply to: The Secretary, Sociedade Brasileira de Matemática, Rua Luiz de Camões, 68-Centro,

20.060 Rio de Janeiro, RJ, Brazil.

Dues: \$6; payable to Sociedade Brasileira de Matemática.

Privileges: *Boletim* and *Noticiário da Sociedade Brasileira de Matemática* (each, two issues per year).

Officers: Jacob Palis, Jr. (President); Jack Schechtman (Treasurer); Paul Alexander Schweitzer (Secretary).

SOCIEDAD MATEMÁTICA MEXICANA*

Apply to: Sociedad Matemática Mexicana, Apartado Postal 70-450, Mexico 20, D.F., Mexico.

Dues: \$16; payable to Sociedad Matemática Mexicana.

Privileges: *Revista Matemática: Matemáticas y Enseñanza* (irregular), *Revista Miscelánea Matemática* (irregular), *Boletín de la Sociedad Matemática Mexicana* (two numbers per year).

Officers: Elvira Zenaida Ramos (President), Alejandro López Yañez (Vice-President), José Luis Abreu (Treasurer), Raymundo Bautista (Secretary).

UNIÓN MATEMÁTICA ARGENTINA*

Apply to: Secretary of the Unión Matemática Argentina, Casilla de Correo 3588, Buenos Aires, Argentina.

Dues: \$6; payable to Unión Matemática Argentina.

Privileges: *Revista de la Unión Matemática Argentina* (two issues per year).

Officers: Orlando E. Villamayor (President), Carlos Germán D. Gregorio (Secretary).

Middle East

●IRANIAN MATHEMATICAL SOCIETY

Apply to: Iranian Mathematical Society, P. O. Box 314-1248, Tehran, Iran.

Dues: \$10; payable to Iranian Mathematical Society.

Privileges: *Bulletin of the Iranian Mathematical Society* and reduced rate for participation in the annual Iranian Mathematics conferences.

Officers: J. Hamedanizadeh (Treasurer), A. A. Jafarian (Secretary).

ISRAEL MATHEMATICAL UNION*

Apply to: M. Rosenfeld, Treasurer, Israel Mathematical Union, Department of Mathematics, Ben Gurion University of the Negev, Beer-Sheva, Israel.

Dues: \$3; payable to Israel Mathematical Union.

Privileges: *Newsletter*; may attend and present papers at meetings.

Officers: P. A. Fuhrmann (Chairman), M. Rosenfeld (Treasurer), G. Della Riccia (Secretary).

South Pacific

●AUSTRALIAN MATHEMATICAL SOCIETY

Apply to: D. G. Hurley, Secretary, Australian Mathematical Society, Department of Mathematics, University of Western Australia, Nedlands, 6009, Australia.

Dues: \$12.50 if paid before March 31; otherwise \$15; payable to V. G. Hart, Treasurer, Department of Mathematics, University of Queensland, St. Lucia, Queensland 4067, Australia.

Privileges: Free copies of *The Gazette* and copies of

Journal Series A and B and *The Bulletin* at members rates.

Officers: J. Gani (President), D. Elliott, G. B. Preston (Vice-Presidents), V. G. Hart (Treasurer), D. G. Hurley (Secretary).

●MALAYSIAN MATHEMATICAL SOCIETY

Apply to: The Secretary, Malaysian Mathematical Society, c/o Department of Mathematics, University of Malaya, Kuala Lumpur, Malaysia.

Dues: \$10; payable to Malaysian Mathematical Society.

Privileges: *MMS Newsletter*, *Bulletin of the Malaysian Mathematical Society* (two issues per year), reduced rate for *Menemui Matematik* (three issues per year).

Officers: Keng-Teh Tan (President); Boon-Yian Ng (Vice-President); Chun-Choon Lam (Treasurer); Cho-Seng Lee (Secretary).

MATHEMATICAL SOCIETY OF THE PHILIPPINES

Apply to: Membership Committee, Mathematical Society of the Philippines, Department of Mathematics, Ateneo de Manila University, P.O. Box 154,

Manila, The Philippines.

Dues: \$3; payable to Mathematical Society of the Philippines.

Privileges: Publications and newsletters of the Mathematical Society of the Philippines.

Officers: Bienvenido F. Nebres (President).

●NEW ZEALAND MATHEMATICAL SOCIETY

Apply to: H. S. Roberts, Applied Mathematics Division, Department of Scientific & Industrial Research, Box 1335, Wellington, New Zealand.

Dues: \$NZ 6.00 (1980); payable to New Zealand Mathematical Society, Department of Mathematics, Victoria University, Private Bag, Wellington, New Zealand.

Privileges: All those of ordinary members except the right to vote; free copy of the *Newsletter of the NZMS* (3 per year); subscription to *Mathematics Chronicle* (University of Auckland) at reduced rate (currently \$NZ 4.00).

Officers: J. C. Turner (President), D. C. Joyce (Vice-President), H. S. Roberts (Treasurer), F.T.M. Schroder (Secretary).

NEWS AND ANNOUNCEMENTS

NATIONAL ACADEMY OF SCIENCES ELECTS NEW MEMBERS

The following nine mathematical scientists are among the seventy-one new members and foreign associates recently elected to the National Academy of Sciences: William Browder, Princeton University; Herman Chernoff, Massachusetts Institute of Technology; Richard M. Karp, University of California, Berkeley; Martin D. Kruskal, Princeton University; Joel L. Lebowitz, Rutgers University; Henry P. McKean, Courant Institute of Mathematical Sciences, New York University; James B. Serrin, University of Minnesota, Minneapolis; Paul Erdős, Mathematical Research Institute, Hungarian Academy of Sciences, Budapest; and Maurice V. Wilkes, Cambridge University, England.

NATIONAL ACADEMY OF ENGINEERING ELECTS NEW MEMBERS

The National Academy of Engineering recently announced the election of eighty-two persons to membership in the Academy and eight to foreign associateship. Among the new members are three in the mathematical sciences: Richard W. Hamming of the Naval Postgraduate School, Monterey, California; Louis Landweber of the University of Iowa; and John V. Wehausen of the University of California, Berkeley.

SLOAN FELLOWSHIPS AWARDED

Sloan Fellowships for Basic Research for 1980-1981 have been awarded to seventy-eight outstanding

scientists, including sixteen mathematicians. The recipients were selected on the basis of their exceptional potential to make creative contributions to scientific knowledge.

The fellowships, granted by the Alfred P. Sloan Foundation, run for two years and are in the amount of \$20,000. Candidates for fellowships are nominated by senior scientists familiar with their talents. Fellows need not pursue a specified research project and are free to shift the direction of their research at any time. The grants are administered by the Fellows' institutions.

Jürgen Moser, of New York University, Courant Institute of Mathematical Sciences, is chairman of the selection committee. S. S. Chern of the University of California, Berkeley, is the other mathematician on the eight member committee.

The mathematicians awarded Sloan Fellowships for 1980, with their affiliation, are: Jozef Dodziuk (University of Pennsylvania), Michael H. Freedman (University of California, San Diego), Robert A. Fefferman (University of Chicago), Benedict H. Gross (Princeton University), Henryk Hecht (University of Utah), Howard A. Masur (University of Illinois at Chicago Circle), Oliver A. McBryan (Cornell University), Haynes R. Miller (University of Washington), Jonathan M. Rosenberg (University of Pennsylvania), Daniel J. Rudolph (Stanford University), David J. Saltman (Yale University), Avinash Sathaye (University of Kentucky), Stephen G. Simpson (Pennsylvania State University), Chuu-Lian Terng (Princeton University), Paul C. Yang (University of Maryland), and Stephen S. T. Yau (Harvard University).

SLOAN RESEARCH FELLOWSHIPS

Nominations for candidates for Sloan Research Fellowships for 1981-1982 are due by September 15. Candidates must be members of the faculty at a college or university in the United States or Canada and must be at an early stage of their research careers. For information write:

Sloan Research Fellowships
Alfred P. Sloan Foundation
630 Fifth Avenue
New York, New York 10020

AMS POSTDOCTORAL RESEARCH FELLOWSHIPS

Three AMS Postdoctoral Research Fellowships have been awarded for 1980-1981. The recipients are Robert K. Lazarsfeld of Brown University, Thomas H. Parker of Stanford University, and Robert Sachs of the Courant Institute, New York University.

Dr. Sachs will spend his fellowship year during 1980-1981 at the Mathematics Research Center, University of Wisconsin, Madison. The other two recipients have elected to defer their fellowships to the academic year 1981-1982. Dr. Lazarsfeld will spend that year at the Institute for Advanced Study, and Dr. Parker will spend it at Harvard University.

The following persons, listed in alphabetic order, were offered a fellowship but did not accept: Dennis De Turck, William Mark Goldman, David Jerison, and David R. Morrison.

The following persons, listed in alphabetic order, received honorable mention in the competition: David Gabai, Roger S. Schlafly, Sheldon Kamienny, Peter Andrew Fejer, and Carl William Lee.

The AMS Research Fellowship Fund was established in 1973 in response to the need for funds for postdoctoral research. The fellowships are awarded to recent Ph.D.'s of any age who are citizens or permanent residents of a country in North America, and are awarded on the basis of mathematical merit. The awards are intended to support research fellows for a period of one year, and at present carry a stipend of \$15,000 each with an expense allowance of \$500. The competition was under the supervision of the Society's Committee on Postdoctoral Fellowships consisting of Benedict Gross, Robin Hartshorne, Bernard Maskit, Robert I. Soare, William P. Thurston, and Karen Uhlenbeck (chairman), assisted by Edward Nelson and Neil J. A. Sloane.

There were many strong candidates among the ninety-five applicants. The number of fellowships awarded is the maximum allowed by the generous contributions of supporters of mathematical research together with Society funds appropriated according to a matching formula. The continuation of the AMS Research Fellowship Program depends on the contributions the Society receives. It is hoped that every member of the Society will contribute to the Fund. Contributions are, of course, tax deductible. Checks should be made payable to the American Mathematical Society, clearly marked "AMS Research

Fellowship Fund" and sent to the American Mathematical Society, P. O. Box 1571, Annex Station, Providence, Rhode Island 02901.

GUGGENHEIM FELLOWSHIPS

Seventeen John Simon Guggenheim Fellowships have been awarded in mathematics and related areas for 1980. The award winners and their proposed studies are: David V. Chudnovsky (Columbia University), *Studies in classical and quantum field theories*; Gregory V. Chudnovsky (Columbia University), *Analytic methods in transcendental number theory*; Joseph W. Dauben (City University of New York, Graduate Center and Herbert H. Lehman College, and Columbia University), *The mathematics of Charles S. Peirce*; Ronald G. Douglas (State University of New York, Stony Brook), *Index theorems and operator theory*; William Fulton (Brown University), *Intersection theory in algebraic geometry*; Phillip A. Griffiths (Harvard University), *Studies in algebraic geometry and complex analysis*; Douglas R. Hofstadter (Indiana University, Bloomington), *Computer aesthetics in typeface design*; Victor L. Klee (University of Washington), *Studies in convexity, combinatorics, and computational complexity*; Ravi S. Kulkarni (Indiana University, Bloomington), *Discrete groups in geometry and topology*; R. Duncan Luce (Harvard University), *Reaction-time distribution in analyzing mental processes*; Robert M. Miura (University of British Columbia), *Studies of nonlinear diffusion equations in neurophysiology*; Seymour A. Papert (Massachusetts Institute of Technology), *The role of computers in shaping learning environments*; Charles J. Stone (University of California, Los Angeles), *Studies in statistical theory and methodology*; Moss E. Sweedler (Cornell University), *Studies in algebraic groups*; Michael J. Todd (Cornell University), *Numerical techniques for solving nonlinear equations*; Shing-Tung Yau (Stanford University, and member, Institute for Advanced Study), *The behavior of the Monge-Ampere equation*; and James A. Yorke (University of Maryland, College Park), *Studies in mathematical epidemiology and continuation techniques*.

JOHN VON NEUMANN PRIZE

David Gale, Harold W. Kuhn, and Albert W. Tucker have been awarded the 1980 John von Neumann Theory Prize by the Operations Research Society of America and The Institute of Management Sciences. The \$2,000 prize is awarded "for fundamental theoretical contributions which have stood the test of time and have had large impact on the development of operations research and management science theory".

David Gale is Professor of Mathematics, Economics and Operations Research at the University of California, Berkeley; Harold Kuhn is Professor of Mathematical Economics at Princeton University; and Albert Tucker is Professor Emeritus of Mathematics at Princeton.

The winner of the 1979 von Neumann Prize was

David Blackwell, Professor of Mathematics and Statistics at the University of California, Berkeley.

1980 PULITZER PRIZE

The 1980 "General Nonfiction" Pulitzer Prize was awarded to Douglas R. Hofstadter for his book *Gödel, Escher, Bach: An Eternal Golden Braid* published by Basic Books, Inc. (New York, 1979). Professor Hofstadter is an assistant professor of Computer Science at Indiana University, Bloomington.

HEINEMAN PRIZE FOR MATHEMATICAL PHYSICS

James G. Glimm (Rockefeller University) and Arthur M. Jaffe (Harvard University) were awarded the Dannie Heineman Prize for Mathematical Physics, endowed by the Heineman Foundation. It was bestowed at the Ceremonial Session of the joint meeting of the American Physical Society and the American Association of Physics Teachers in Chicago on January 22, 1980. The award was presented "for their joint contributions to constructive quantum field theory; in particular for their solutions of models of interacting fields in two and three space-time dimensions, thereby demonstrating the compatibility of relativistic invariance quantum mechanics, and local field theory."

MONROE MARTIN PRIZE AWARDED

The Institute for Physical Science and Technology at the University of Maryland, College Park, has announced the winner of the second Monroe Martin Prize for an outstanding paper or contribution in applied mathematics by a young research worker. It has been awarded to Marshall Slemrod of the Rensselaer Polytechnic Institute for his paper *Instability of steady shearing flows in a nonlinear viscoelastic fluid* that appeared in the *Archive for Rational Mechanics and Analysis* **68** (1978), pp. 211-225.

Dr. Slemrod delivered the Monroe Martin Lecture, based on his paper, on May 9, 1980, at the University of Maryland.

The first recipient of the Monroe Martin Prize was Neil E. Berger of the University of Illinois at Chicago Circle in 1975.

PEOPLE'S REPUBLIC OF CHINA EDUCATION & EXCHANGES

A pamphlet entitled *An Introduction to Education in the People's Republic of China* has been published by the Committee on Scholarly Communication with the People's Republic of China, the National Academy of Sciences and the National Association for Foreign Student Affairs, Washington, D.C. (January 1980). It contains an account of China's educational system, as well as information about educational exchange programs, both for scholars and for students.

This booklet was prepared by Pierre M. Perrolle of CSCPRC and Linda A. Reed of NAFSA. Copies may be obtained from the US-China Education

Clearinghouse, 1860 Nineteenth Street, N.W., Washington, D.C. 20009.

WOMEN, MINORITY AND HANDICAPPED SCIENTISTS

Under a contract from the Department of Health, Education and Welfare, the AAAS Office of Opportunities in Science (OOS) has recently begun a project to facilitate the inclusion of women, minority and handicapped scientists and other professionals on the advisory and review panels within HEW. This technical assistance project will involve four major components: (1) the solicitation of résumés from minority, women and handicapped scientists for inclusion in the NIH computerized registry; (2) workshop sessions for agency personnel having responsibility for identifying and recruiting individuals for committees on how to locate minority, women and handicapped scientists; (3) direct assistance in identifying persons for consideration for specific panels where vacancies occur during the project; and (4) the development of a guide for future use on how to identify and recruit minority, women and handicapped scientists.

The office would like to encourage women, minority and handicapped scientists who are either working or trained in the natural or social sciences (including social work, health professions and clinical fields), especially those actively involved in research, to submit their résumés. The National Institutes of Health have been involved in a direct effort to obtain résumés from minority, women and handicapped scientists. Those who have received a request directly from NIH for reviewer information, should respond to them; otherwise send all information to AAAS Office of Opportunities in Science, c/o Karen Ehrlich, Technical Assistance Project, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036; (202-467-5438).

—AAAS News Release

FULBRIGHT-HAYS OPPORTUNITIES AVAILABLE FOR 1981-1982

The Council for International Exchange of Scholars (CIES) has recently published a brochure titled *Fulbright Awards Abroad* which includes many opportunities abroad for university lecturing and advanced research in mathematics and in the physical sciences for 1981-1982. In recent years from ten to fifteen annual awards have been made to specialists in mathematics and statistics. The CIES expects to grant about 500 awards for Fulbright scholars abroad, and to assist in the administration of another 500 for scholars visiting the U.S. for lecturing and research for 1981-1982.

While most teaching and research awards are for particular disciplines, some are available with little or no restriction as to field. Some of the awards listed in the new brochure specifically in the mathematical sciences are for the following countries: Australia, Multivariate categorical data, mathematics education, computer science; Colombia (Spanish required), Functional analysis, differential equations,

numerical analysis, topology; Ireland, Lecturing and research, computer science; Israel, Operations research, computer science; Ivory Coast (French required), Analysis or algebra; Liberia, Lecturing in analysis at Cuttington University College, Suacoco; Morocco, Econometrics, statistics, mathematics, computer applications, operations research; Netherlands, Process dynamics; Nicaragua (Spanish required), Mathematics; Niger (French required), Mathematics; Norway, Plant systematics; Syria (Arabic preferred, but not required), Lecturing; Turkey, Design of statistical experiments, sampling and surveys; USSR, Lecturing, computer science, several specialties; Zambia, Mathematical statistics.

To obtain a copy of the 1981-1982 announcement, write to the Council for International Exchange of Scholars, Department N, Eleven Dupont Circle, Washington, D.C. 20036. Application forms and other information for specific country and discipline interests may be requested, after the full announcement has been examined. Completed applications are due for the American Republics, Australia, and New Zealand by June 1, 1980, and for Africa, Asia, and Europe by July 1, 1980.

COOPERATIVE RESEARCH WITH EAST EUROPE

The NSF's East European Cooperative Science program seeks to foster and support scientific and technological cooperation between the US and Bulgaria, Hungary, and Romania. The program promotes collaboration and exchange of information between scientists, engineers, scholars, and institutions of research and higher learning of the US and the cooperating countries. The Division of International Programs administers activities undertaken under this program in the US and maintains liaison with foreign agencies. The following general guidelines have been established: (1) Both the US and the foreign country must approve each project; (2) Each country will support the cost of research and other scientific activities taking place within its territory; (3) Contributions to the program by the US and the foreign country involved should be on an approximately 50-50 basis.

The program offers financial support for three types of activities: cooperative research projects, seminars, and scientific visits for planning purposes. Proposals must be submitted to NSF by American institutions, and to the appropriate foreign agency by foreign institutions. Proposals should be prepared according to standard NSF guidelines, but must also contain a section on "International Cooperation," which describes in detail the cooperative aspects of the work plan and the mutual benefits to be obtained. Proposals for joint research and seminars should be submitted at least six months before the requested starting date; for short-term visits, three months. Further information may be obtained from

the program managers of the East European Cooperative Science program, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550; (202-632-5756).
—*NSF Bulletin*

US-ITALY COOPERATIVE SCIENCE PROGRAM

Under the authority of the US-Italy Agreement for Scientific and Technical Cooperation, an inter-governmental agreement signed in 1967, the NSF provides support for scientific activities undertaken by US scientists in collaboration with Italian colleagues. Activities supported include joint research projects, seminars, and symposia; and exchanges of scientists and scientific information. US and Italian scientists wishing to undertake a joint activity under the program must submit matching proposals to NSF and to the Italian National Research Council. For further information, write or phone Ms. Marilyn Rurak, US-Italy Cooperative Science program, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550; (202-634-7930).

—*NSF Bulletin*

COMPUTER-BASED INSTRUCTION IN MATHEMATICS

A Consortium Interest Survey of those interested in or using computers or researching their use in mathematics instruction in high school and college courses is being distributed by Dr. Ronald H. Wenger, Associate Professor of Mathematics and Associate Dean of the College of Arts and Science at the University of Delaware. Please write to him for a copy of this brief survey or to tell him of your own activities. His address is: 123 Memorial Hall, University of Delaware, Newark, Delaware 19711 (302-738-2351).

REPORT ON PROBLEM SOLVING COURSES PLANNED

A subcommittee of the Mathematical Association of America's Committee on the Teaching of Undergraduate Mathematics plans a survey of problem solving courses in mathematics at the secondary and undergraduate levels under the direction of Alan Schoenfeld, who says that the job of the subcommittee is to prepare a report which 1. describes the "state of the art" in problem solving courses; 2. lists available resources for teaching problem solving (and possibly creates some such resources); and 3. makes recommendations regarding both the place of problem solving in the curriculum, and ways to teach it. The subcommittee plans to distribute a questionnaire to persons teaching problem solving courses. If you are teaching such a course, or know of someone who is, please let them know; if you have ideas as to what should be on the questionnaire, about useful resources, or about possible contributions the subcommittee might make, please notify Alan H. Schoenfeld, Mathematics Department, Hamilton College, Clinton, New York 13323.

SPECIAL MEETINGS

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

AN ANNOUNCEMENT will be published in the Notices if it contains a call for papers, and specifies the place, date, subject (when applicable), and the speakers; a second full announcement will be published only if there are changes or necessary additional information. Once an announcement has appeared, the event will be briefly noted in each issue until it has been held and a reference will be given in parentheses to the month, year and page of the issue in which the complete information appeared.

IN GENERAL, announcements of meetings held in North America carry only date, title of meeting, place of meeting, names of speakers (or sometimes a general statement on the program), deadline dates for abstracts or contributed papers, and source of further information. Meetings held outside the North American area may carry more detailed information. All communications on special meetings should be sent to the Editor of the Notices, care of the American Mathematical Society in Providence.

DEADLINES are listed on the inside front cover of each issue.

1980-1981. ACADEMIC YEAR DEVOTED TO COMMUTATIVE ALGEBRA AND ITS RELATIONS TO COMBINATORICS, SYZYGIES AND K-THEORY, The Mittag-Leffler Institute, Djursholm, Sweden. (February 1980, p. 186)

1980. SPECIAL YEAR ON FUNCTIONAL EQUATIONS AND THEIR APPLICATIONS, University of Waterloo, Ontario, Canada. (February 1980, p. 186)

Summer 1980. CONFERENCE ON THE SIMULATION OF LARGE SYSTEMS, University of Bielefeld, Federal Republic of Germany. (January 1980, p. 85)

June 1-December 20. MATHEMATISCHES FORSCHUNGSGESTALTUNG ZENTRUM OBERWOLFACH (Weekly Conferences), Federal Republic of Germany.
Information: Martin Barner, Institute Director, Albertstrasse 24, 78 Freiburg i. Br., Federal Republic of Germany.

June

1-7. Topologische Dynamik,
Chairmen: J. Auslander, M. Denker.

15-21. Algebraische K-Theorie,
Chairman: W. Scharlau.

22-28. Orders and their applications,
Chairman: K. W. Roggenkamp.

29-July 5. Unendlichdimensionale einfache Lie-Algebren,
Chairmen: H. Bass, W. Borho, V. Kac.

July

13-19. Variationsrechnung,
Chairmen: J. Frehse, W. Jäger, F. Tomi.

20-26. Konvexe Körper,
Chairmen: R. Schneider, G. M. Shepard.

27-August 2. Modulfunktionen in mehreren Variablen,
Chairmen: M. Eichler, H. Klingen.

August

3-9. Scattering theory,
Chairmen: P. Werner, C. H. Wilcox.

9-16. Approximation und Funktionalanalysis,
Chairmen: P. L. Butzer, E. Gorchich, B. Sz.-Nagy.

17-23. Partial differential equations,
Chairmen: K. Diederich, J. J. Kohn, I. Lieb.

24-30. Finite Elemente,
Chairman: J. Nitsche.

31-September 6. Komplexe Analysis,
Chairmen: H. Grauert, R. Remmert, K. Stein.

September

7-13. Topologie,
Chairmen: T. tom Dieck, K. Lamotke, C. B. Thomas.

14-20. Spezialtagung Topologie: Homotopietheorie,
Chairmen: D. Puppe, L. Smith.

21-27. Geometrie,
Chairmen: K. Leichtweiss, K. Voss.

28-October 4. Nichtlineare und rheolinerare Schwingungssysteme,
Chairman: K. Magnus.

October

5-11. Arbeitsgemeinschaft Geyer-Harder.

12-18. Risiko-Theorie,
Chairman: H. Buhlmann.

19-25. Funktionalanalysis,
Chairmen: K.-D. Bierstedt, H. König, H. H. Schaefer.

November

2-8. Analytische Zahlentheorie,
Chairmen: H.-E. Richert, W. Schwarz, E. Wirsing.

9-15. Didaktik.

16-22. Numerische Behandlung freier Randwertaufgaben,
Chairmen: J. Albrecht, L. Collatz, K.-H. Hoffmann.

23-29. p-adische Funktionentheorie und Analysis,
Chairmen: Y. Amice, L. Gerritzen.

30-December 6. Mathematische Methoden des Operations Research,
Chairmen: H. König, K. Neumann.

December

7-13. Integralgleichungsmethoden in den Ingenieurwissenschaften,
Chairmen: E. Meister, W. Wendland.

14-20. Spezialtagung Statistik: Statistische Modelle,
Chairmen: V. Kurotschka, W. Vogel.

JUNE 1980

2-6. MAA WORKSHOP ON LINEAR ALGEBRA & ITS APPLICATIONS, Salisbury State College, Salisbury, Maryland. (February 1980, p. 188)

- 2-12. FIFTH ANNUAL INTERNATIONAL CONFERENCE ON OPERATOR THEORY, Timișoara, Romania. (January 1980, p. 86)
- 2-21. CANADIAN MATHEMATICAL SOCIETY SUMMER RESEARCH WORKSHOP ON FIXED POINT THEORY AND ITS APPLICATIONS, Université de Sherbrooke, Sherbrooke, Québec, Canada. (February 1980, p. 188)
- 3-6. INTERNATIONAL CONFERENCE ON BOUNDARY AND INTERIOR LAYERS--COMPUTATIONAL AND ASYMPTOTIC METHODS, Dublin, Ireland. (January 1980, p. 86)
- 5-7. SIAM 1980 SPRING MEETING, Alexandria, Virginia. (February 1980, p. 189)
- 9-12. SYMPOSIUM ON OPERATOR ALGEBRAS AND DERIVATIONS, University of Tübingen, Federal Republic of Germany. (February 1980, p. 189)
- 9-13. MAA WORKSHOP ON STRUCTURED PROGRAMMING IN PASCAL, Salisbury State College, Salisbury, Maryland. (February 1980, p. 189)
- 9-13. ANALYTICAL AND NUMERICAL APPROACHES TO ASYMPTOTIC PROBLEMS IN ANALYSIS, Faculty of Science, University of Nijmegen, The Netherlands. (February 1980, p. 189)
- 9-13. GORDON RESEARCH CONFERENCE: THEORETICAL BIOLOGY AND BIOMATHEMATICS, Tilton School, Tilton, New Hampshire. (April 1980, p. 287)
- 10-13. SHORT COURSE ON THE HISTORY OF MATHEMATICS, Kenyon College, Gambier, Ohio. (February 1980, p. 189)
- 12-14. CONFERENCE ON GEOMETRIC FUNCTION THEORY, University of Cincinnati, Cincinnati, Ohio.
Principal Speakers: A. Baernstein, L. Brickman, P. Duren, A. Goodman, M. Heins, J. Hummel, G. Schöber, T. Suffridge.
Information: Donald Wright or David Minda, Department of Mathematical Sciences, University of Cincinnati, Cincinnati, Ohio 45221.
- 15-27. 1980 AMS SUMMER SEMINAR IN APPLIED MATHEMATICS: MATHEMATICAL ASPECTS OF PHYSIOLOGY, University of Utah, Salt Lake City, Utah. (October 1979, p. 373; November 1979, p. 462)
- 15-27. SIAM SUMMER RESEARCH CONFERENCE ON NUMERICAL AND STATISTICAL ANALYSIS, University of Delaware, Newark, Delaware. (February 1980, p. 189)
- 16-20. CONFERENCE ON JACKKNIFE AND BOOTSTRAP METHODS IN STATISTICS, Bowling Green State University, Bowling Green, Ohio.
Program: Bradley Efron (Stanford University) will give ten lectures surveying the field. A few sessions of contributed papers are also planned.
Support: Funding is expected from the National Science Foundation.
Information: Arjun K. Gupta, Department of Mathematics and Statistics, Bowling Green State University, Bowling Green, Ohio 43403.
- 16-20. WORKSHOP ON NUMERICAL METHODS FOR SYSTEM ENGINEERING PROBLEMS, University of Kentucky, Lexington, Kentucky. (February 1980, p. 189)
- 16-20. INTERNATIONAL CONFERENCE ON NONLINEAR PHENOMENA IN MATHEMATICAL SCIENCES, University of Texas, Arlington, Texas. (November 1979, p. 486)
- 16-20. SECOND INTERNATIONAL SYMPOSIUM ON INNOVATIVE NUMERICAL ANALYSIS IN APPLIED ENGINEERING SCIENCE, École Polytechnique de Montréal, Montréal, Canada. (October 1979, p. 412)
- 16-20. SECOND SYMPOSIUM ON NONSTANDARD ANALYSIS, University of Victoria, Victoria, B.C., Canada. (April 1980, p. 290)
- 16-21. FIFTH BIENNIAL MEETINGS OF THE SOUTHEAST ASIAN MATHEMATICAL SOCIETY, Hong Kong. (February 1980, p. 189)
- 19-20. FIFTH ANNUAL AAAS COLLOQUIUM ON RESEARCH AND DEVELOPMENT AND PUBLIC POLICY, Shoreham Americana Hotel, Washington, D.C. (April 1980, p. 287)
- 22-July 5. NATO-ADVANCED SUMMER INSTITUTE ON STOCHASTIC SYSTEMS: THE MATHEMATICS OF FILTERING AND IDENTIFICATION AND APPLICATIONS, Les Arcs, France. (February 1980, p. 189)
- 23-27. SHORT COURSE ON APPLICATIONS OF MATHEMATICS TO ECONOMICS AND THE MANAGERIAL SCIENCES, University of Maine, Orono, Maine.
Sponsor: The Northeast section of the Mathematical Association of America.
Principal Lecturer: William F. Lucas, Cornell University.
Topics: Topics will include equilibrium concepts, economics of information, the cooperative approach, expanding economics and import-export models and managing renewable resources.
Information: Grattan Murphy, Department of Mathematics, University of Maine, Orono, Maine 04469.
- 23-29. COLLOQUE INTERNATIONAL DU C.N.R.S. SUR LES ASPECTS STATISTIQUES ET LES ASPECTS PHYSIQUES DES PROCESSUS GAUSSIENS, Saint-Flour (Cantal), France. (April 1980, p. 287)
- 23-July 11. ÉCOLE D'ÉTÉ D'INFORMATIQUE: TRAITEMENT NUMÉRIQUE DES IMAGES ET INTELLIGENCE ARTIFICIELLE, Centre d'Études du Bréau-sans-Nappe, Ablis, France. (April 1980, p. 290)
- 23-August 4. SUMMER INSTITUTE ON MATHEMATICS, ART, & PERCEPTION, Oakland University, Rochester, Michigan.
Topics: Practicum on mathematical art; Gibson's "formless invariants" in pictorial art appreciation; geometric psychology and the resolution of the controversy surrounding Gibson's ideas on the basis of homotopy and isotopy; application of geometric psychology to pictorial art appreciation and color laws.
Speakers: Thaddeus Cowan, Margaret Hagen, William Hofmann, and Charlotte Stokes.
Information: William C. Hoffman, Department of Mathematical Sciences, Oakland University, Rochester, Michigan 48063. (313-377-3428 or -3430).
- 25-28. THIRD SUMMER SYMPOSIUM ON REAL ANALYSIS, Michigan State University. (February 1980, p. 189)
- 29-July 12. XÈME ÉCOLE D'ÉTÉ DE CALCUL DES PROBABILITÉS, Saint-Flour (Cantal), France. (April 1980, p. 287)

JULY 1980

- 7-25. 1980 SUMMER WORKSHOP ON THE GEOMETRY AND TOPOLOGY OF 2- AND 3-DIMENSIONAL MANIFOLDS AND KLEINIAN GROUPS, Bowdoin College, Brunswick, Maine.
Organizing Committee: W. Abikoff, L. Bers, A. Hatcher, I. Kra, B. Maskit, W. Thurston, J. Ward (local arrangements).
Program: In order to maximize the opportunities for specialists working in and around the subject areas of the workshop to work together, an informal format is planned. The emphasis will be placed on free-format seminars and discussion groups. The only formal lectures currently planned are a series by W. Thurston on the

existence theorem for hyperbolic structure on 3-manifolds.

Support: Participants in full attendance are eligible for partial support, but the total amount of funds is extremely limited. It is anticipated that the workshop will be supported by a grant from the National Science Foundation.

Facilities: Brunswick is located on the Maine coast. Housing accommodations and meals will be provided on the Bowdoin campus.

Information: J. E. Ward, Department of Mathematics, Bowdoin College, Brunswick, Maine 04011 (Telephone: 207-725-8731, Ext. 577).

7-31. SUMMER SEMINAR ON COMPLEX ANALYSIS, Miramare, Trieste, Italy. (November 1979, p. 486)

7-August 15. CANADIAN MATHEMATICAL SOCIETY SUMMER WORKSHOP ON SET THEORY AND SET-THEORETIC TOPOLOGY, Erindale College, University of Toronto, Canada. (April 1980, p. 288)

8-11. FIFTH CONFERENCE ON AUTOMATED DEDUCTION, Les Arcs, Savoie, France. (October 1979, p. 413)

9-11. CONFERENCE ON SPARSE MATRICES AND THEIR USES, Reading, Great Britain.

Information: Institute for Mathematics and its Applications, Maitland House, Warrior Square, Southend-on-Sea, Essex SS1 2JY, Great Britain.

9-19. ST. ANDREWS COLLOQUIUM 1980, University of St. Andrews, St. Andrews, Scotland. (February 1980, p. 190)

14-16. NONLINEAR PROGRAMMING SYMPOSIUM IV, University of Wisconsin, Madison, Wisconsin. (November 1979, p. 487)

14-19. NINTH INTERNATIONAL CONFERENCE ON GENERAL RELATIVITY AND GRAVITATION, Friedrich Schiller University, Jena, German Democratic Republic. (October 1979, p. 413)

14-25. NATO ADVANCED STUDY INSTITUTE ON STATISTICAL DISTRIBUTIONS IN SCIENTIFIC WORK, University of Trieste, Italy. (April 1980, p. 288)

15-August 1. ÉCOLE D'ÉTÉ D'ANALYSE NUMÉRIQUE: ANALYSE LINÉAIRE DES GRANDS SYSTÈMES À MATRICES CREUSES, Centre d'Études du Bréau-sans-Nappe, Ablis, France. (April 1980, p. 290)

21-25. NSF-CBMS REGIONAL CONFERENCE ON MATHEMATICAL MODELING OF THE HEARING PROCESS, Rensselaer Polytechnic Institute, Troy, New York.

Lectures: The principal lecturer is Charles R. Steele (Stanford University). The lectures will describe various linear and nonlinear mathematical models of the auditory process and their relationship to experiment and observation. This will include a discussion of models associated with simple auditory systems, such as occur in insects and reptiles, as well as those arising from the more complex mammalian systems. In addition to the principal lectures, it is anticipated that there will be a series of guest lectures on related topics, such as on modeling the semicircular canals, models for the mechanical to neural transduction process, inverse problems in cochlear mechanics, and recent experimental results.

Information: Mark Holmes or Lester Rubinfeld, Department of Mathematical Sciences, Rensselaer Polytechnic Institute, Troy, New York 12181.

28-August 1. SECOND CONFERENCE ON TOPOLOGY OF MANIFOLDS AND HOMOTOPY THEORY, University of São Paulo, São Paulo, Brazil. (November 1979, p. 487)

Program: There will be about twenty invited lectures on recent developments in the topology of

manifolds and homotopy theory, as well as special sessions for contributed fifteen-minute papers.

Invited Speakers: P. Hilton, A. Liulevicius, S. Gitler, A. Wasserman, Feder, Hitchin, P. Schweitzer, D. Randall, A. Conde, J. Daccach, D. L. Gonçalves.

Organizing Committee: E. Gomide, University of São Paulo; A. Conde, University of Campinas; D. L. Gonçalves, University of São Paulo; J. B. Pitombeira, Catholic University of Rio de Janeiro.

Information: A. Conde, IMECC-Unicamp, 13.100 Campinas, S. P., Brazil.

28-August 8. CONFERENCE ON LOW DIMENSIONAL CELL COMPLEXES AND MANIFOLDS, University of Oregon, Eugene, Oregon.

Program: An informal conference on geometric topology, homotopy theory of low-dimensional cell complexes, and related combinatorial group theory. Likely participants include W. Beckmann, R. Kirby, R. Lickorish, W. Metzler, J. Ratcliffe, D. W. Summers. Others wishing to attend or present a paper are asked to contact one of the coordinators listed below.

Support: No funds are available for travel or subsistence.

Information: M. Dyer, A. Sieradski, or J. Van Buskirk, Department of Mathematics, University of Oregon, Eugene, Oregon 97403.

28-August 9. V ESCUELA LATINOAMERICANA DE MATEMÁTICA, Mar del Plata, Argentina. (November 1979, p. 487)

AUGUST 1980

4-8. INTERNATIONAL SEMINAR ON FUNCTIONAL ANALYSIS, HOLOMORPHY AND APPROXIMATION THEORY, Universidade Federal do Rio de Janeiro, Brasil. (April 1980, p. 288)

4-8. WORKSHOP ON THE PRESENT TRENDS OF REPRESENTATION THEORY, Universidad Autónoma de Puebla, Puebla, Mexico. (April 1980, p. 288)

4-15. THIRD INTERNATIONAL CONFERENCE ON PROBABILITY IN BANACH SPACES, Tufts University, Medford, Massachusetts.

Program: The conference will begin with a series of expository survey lectures followed by research talks on the latest developments in the theory.

Lecturers: A. Bellow (Northwestern); S. Chevet (Aubière, France); S. Chobanyan (Tbilisi, USSR); R. M. Dudley (MIT); X. Fernique (Strasbourg, France); E. Giné (Barcelona, Spain); J. Hoffmann-Jørgensen (Aarhus, Denmark); J. Kuelbs (Wisconsin); V. Mandrekar (Michigan State); V. Paulauskas (Vilnius, USSR); W. Philipp (Illinois); G. Pisier (Palaiseau, France); K. Urbanik (Wrocław, Poland); V. Zolotarev (Moscow, USSR).

Organizers: Anatole Beck and Jim Kuelbs (U. of Wisconsin, Madison) and Marjorie Hahn (Tufts University).

Information: Marjorie Hahn, Department of Mathematics, Tufts University, Medford, Massachusetts 02155.

4-15. NATO ADVANCED STUDY INSTITUTE ON GENERALIZED CONCAVITY IN OPTIMIZATION AND ECONOMICS, Vancouver, Canada. (February 1980, p. 190)

4-22. CANADIAN MATHEMATICAL SOCIETY SUMMER SEMINAR IN HARMONIC ANALYSIS, McGill University, Montreal, Canada.

Program: Contributed papers in various branches of harmonic analysis with emphasis on Lie groups and application of harmonic analysis on Lie groups to number theory. Scheduled mini-courses: 4-8. Sigurdur Helgason, Harmonic analysis on symmetric spaces and Lie groups. 11-15. Eli Stein, Pseudodifferential operators. 18-22. James Arthur,

Automorphic representations and number theory.
Information: Carl Herz, Department of Mathematics,
McGill University, 805 Sherbrooke St. West, Mon-
treal, P.Q., Canada H3A 2K6.

4-22. SEMINAR ON COMPLEX MANIFOLDS: APPLICATIONS TO
ALGEBRAIC GEOMETRY AND MATHEMATICAL PHYSICS, Uni-
versity of Montreal, Montreal, Canada. (January
1980, p. 87; February 1980, p. 190)

8-16. THIRD INTERNATIONAL CONFERENCE ON REPRESENTA-
TION OF ALGEBRAS, Universidad Autónoma de Puebla,
Puebla, Mexico. (April 1980, p. 288)

10-16. FOURTH INTERNATIONAL CONGRESS ON MATHEMATI-
CAL EDUCATION, Berkeley, California. (August 1979,
p. 319)

11-15. CONFERENCE ON CONSTRUCTIVE MATHEMATICS, New
Mexico State University, Las Cruces, New Mexico.
(April 1980, p. 288)

11-15. INTERNATIONAL CONFERENCE ON CATEGORICAL AS-
PECTS OF TOPOLOGY AND ANALYSIS, Carleton Uni-
versity, Ottawa, Canada. (November 1979, p. 487)

14-28. WORKSHOP ON TOPOLOGY AND LINEAR ORDERINGS,
Texas Tech University, Lubbock, Texas.

Sponsor: Jointly sponsored by NATO and Texas Tech
University.

Program: A series of seminars on orderability,
descriptive theory in ordered spaces and metriza-
tion of ordered spaces will be presented by H.
Herrlich, A. Ostaszewski, E. Wattle. Other
participants tentatively include: H. Bennett, E.
van Douwen, R. Heath, D. Lutzer, B. Scott and L.
E. Ward. Contributed papers are welcome.

Information: H. Bennett or D. Lutzer, Mathematics
Department, Texas Tech University, Lubbock, Texas
79409, (806)-742-2566.

17-23. FIFTEENTH INTERNATIONAL CONGRESS OF THEO-
RETICAL AND APPLIED MECHANICS, Toronto, Canada.
(October 1979, p. 413)

18-22. NSF-CBMS REGIONAL CONFERENCE ON HOMOLOGY AND
DYNAMICAL SYSTEMS, Emory University, Atlanta,
Georgia.

Principal Lecturer: John Franks, Northwestern Uni-
versity.

Program: Professor Franks will deliver ten lectures
dealing with the application of the techniques of
algebraic topology to the study of smooth dynam-
ical systems. There will be additional invited
hour addresses by Charles Conley, Robert Will-
iams, Herman Gluck, and Lynn Narasimham.

Support: Limited financial support for participants
from the southeastern region is expected from the
National Science Foundation. Requests for finan-
cial support should be submitted by June 10,
1980, and include a vita and statement of re-
search interests. Late requests will be
considered as funds permit.

Information: Steve Batterson or David Ford, Depart-
ment of Mathematics, Emory University, Atlanta,
Georgia 30322.

18-22. SUMMER MEETING IN LOGIC, University of
Patras, Greece. (February 1980, p. 190)

18-22. SEVENTH AUSTRALASIAN HYDRAULICS AND FLUID
MECHANICS CONFERENCE, Brisbane, Australia. (Novem-
ber 1979, p. 487).

18-22. COMPSTAT 80: FOURTH SYMPOSIUM ON COMPUTATION-
AL STATISTICS, Edinburgh University, Scotland.
(October 1979, p. 413; April 1980, p. 289)

18-23. EIGHTEENTH SCANDINAVIAN CONGRESS OF MATHEMA-
TICIANS, Aarhus, Denmark. (February 1980, p. 190)

18-September 20. INTERNATIONAL SYMPOSIUM ON PARTIAL
DIFFERENTIAL EQUATIONS AND DIFFERENTIAL GEOMETRY,
Beijing, People's Republic of China.

Invited Speakers: M. F. Atiyah (University of Ox-
ford); E. Bombieri (Institute for Advanced
Study); R. Bott (Harvard); Y. W. Chen (University
of Massachusetts); S. Y. Cheng (Princeton and
UCLA); S. S. Chern (University of California,
Berkeley); L. Garding (University of Lund); P.
A. Griffiths (Harvard); J. J. Kohn (Princeton);
P. Lax (Courant Institute); L. Nirenberg (Courant
Institute); M. H. Protter (University of Califor-
nia, Berkeley); I. M. Singer (University of Cali-
fornia, Berkeley); F. Trèves (Rutgers); H. Wu
(University of California, Berkeley); and S. T.
Yau (Stanford).

Information: S. S. Chern, Department of Mathema-
tics, University of California, Berkeley, Cali-
fornia 94720.

24-30. LOGIC COLLOQUIUM 80 AND EUROPEAN SUMMER
MEETING OF THE ASSOCIATION FOR SYMBOLIC LOGIC,
Prague, Czechoslovakia. (February 1980, p. 190)

25-29. COLLOQUIUM ON LATTICE THEORY, József Attila
University, Szeged, Hungary.

Sponsor: J. Bolyai Mathematical Society.

Program: The Colloquium is chiefly devoted to re-
cent trends in lattice theory, but lectures on
related topics of universal algebra (e.g. primal
algebra theory and the theory of Mal'cev poly-
nomials) as well as lectures on the interactions
between lattice theory and other branches of
mathematics (e.g. computability theory, represen-
tation theory, etc.) would also be welcome.

Information: Gábor Czédli, Bolyai Institute,
Szeged, Aradi vértanúk tere 1, H-6720, Hungary.

25-29. EIGHTH AUSTRALIAN CONFERENCE ON COMBINA-
TORIAL MATHEMATICS, Deakin University, Geelong,
Victoria, Australia. (November 1979, p. 487)

25-September 7. EIGHTEENTH INTERNATIONAL SYMPOSIUM
ON FUNCTIONAL EQUATIONS, Renison College, Uni-
versity of Waterloo; Guild Inn, Scarborough, Ontario,
Canada. (January 1980, p. 87)

27-29. GEOMETRY SYMPOSIUM, Utrecht, The Nether-
lands. (February 1980, p. 190)

27-September 3. INTERNATIONAL CONFERENCE ON YOUNG
TABLEAUX AND SCHUR FUNCTORS IN ALGEBRA AND GEOME-
TRY, Torun, Poland. (February 1980, p. 190)

28-30. IV BONN WORKSHOP ON COMBINATORIAL OPTIMIZA-
TION, Institut für Ökonometrie und Operations Re-
search, University of Bonn.

Program: The workshop is devoted primarily to re-
cent research in the area of discrete and combin-
atorial optimization and related topics such as
graph theory, matroids and independence systems,
polyhedral combinatorics, analysis of combina-
torial algorithms, etc. Leading experts in these
fields will participate.

Information: Institut für Ökonometrie und Opera-
tions Research, Rheinische Friedrich-Wilhelms-
Universität Bonn, Nassestrasse 2, D-5300 Bonn 1,
Federal Republic of Germany.

SEPTEMBER 1980

1-13. INTERNATIONAL CONFERENCE ON OPERATOR ALGEBRAS
AND GROUP REPRESENTATIONS, Black Sea Coast,
Romania. (February 1980, p. 191)

9-11. THIRD IMA CONFERENCE ON CONTROL THEORY, Shef-
field, Great Britain.

Information: Institute for Mathematics and its Ap-
plications, Maitland House, Warrior Square,
Southend-on-Sea, Essex SS1 2JY, Great Britain.

15-October 3. SUMMER SCHOOL OF THE INTERNATIONAL CENTRE FOR PURE AND APPLIED MATHEMATICS: HARMONIC ANALYSIS, Nancy, France. (February 1980, p. 191)

17-19. INTEGRATED PROGRAMS FOR AEROSPACE-VEHICLE DESIGN--NATIONAL SYMPOSIUM, Denver, Colorado. (February 1980, p. 191)

22-October 3. NATO ADVANCED STUDY INSTITUTE ON SINGULARITIES IN BOUNDARY VALUE PROBLEMS, Maratea, Italy. (February 1980, p. 191)

26-27. EIGHTH ANNUAL MATHEMATICS AND STATISTICS CONFERENCE, Miami University, Oxford, Ohio. (February 1980, p. 191)

26-27. ANNUAL PI MU EPSILON STUDENT CONFERENCE (OHIO DELTA CHAPTER), Miami University, Oxford, Ohio. (February 1980, p. 191)

29-December 20, 1980. AUTUMN SCHOOL OF THE INTERNATIONAL CENTRE FOR PURE AND APPLIED MATHEMATICS: ORDINARY DIFFERENTIAL EQUATIONS AND CONTROL THEORY, Strasbourg, France. (February 1980, p. 191)

OCTOBER 1980

1-3. TWENTY-FIRST ANNUAL SYMPOSIUM ON FOUNDATIONS OF COMPUTER SCIENCE, Lake Placid, New York. (February 1980, p. 191)

2-8. CONFERENCE ON APPLICATIONS OF NUMERICAL ANALYSIS AND SPECIAL FUNCTIONS IN STATISTICS, Adult Education Center, University of Maryland.

Purpose: The purpose of the conference is to describe how existing techniques in numerical analysis and special function theory can be used to solve problems in statistics and also to uncover areas of future research.

Program: There will be twelve fifty-minute lectures given by a selection of distinguished specialists. In addition, eighteen speakers will be asked to give half-hour talks.

Principal Speakers: (Tentative). W. J. Cody (Argonne National Laboratory); J. Dennis (Rice University); W. Gautschi (Purdue University); S. Karlin (Stanford University); P. R. Krishnaiah (University of Pittsburgh); J. Lyness (Argonne National Laboratory); C. Paige (McGill University), J. L. Snell (Dartmouth College); J. H. Wilkinson (National Physical Laboratory, U.K.).

Contributed Papers: There will be sessions for fifteen-minute contributed papers. Abstracts must be received by August 15, 1980.

Information: Frank Olver, Institute for Physical Science and Technology, University of Maryland, College Park, Maryland 20742.

6-17. INTERNATIONAL FEDERATION FOR INFORMATION PROCESSING CONGRESS, Tokyo, Japan and Melbourne, Australia. (November 1979, p. 487)

13-15. SYMPOSIUM ON TRANSITION AND TURBULENCE, Mathematics Research Center, University of Wisconsin, Madison, Wisconsin. (November 1979, p. 487)

24-25. CONFERENCE ON MEASURE THEORY, Northern Illinois University, DeKalb, Illinois. (April 1980, p. 289)

NOVEMBER 1980

6-8. SIAM 1980 FALL MEETING, Houston, Texas. (April 1980, p. 289)

DECEMBER 1980

1-6. FIRST CONGRESS OF BIOMATHEMATICS, Concepcion, Chile. (April 1980, p. 289)

16-19. FOURTH CONFÉRENCE INTERNATIONALE SUR L'ANALYSE ET L'OPTIMISATION DES SYSTÈMES, Versailles, France.

Information: I.N.R.I.A. Serv. Rel. ext., Domaine de Voluceau, Rocquencourt, B.P. 105, 78150, Le Chesnay, France.

JANUARY 1981

2-8. WINTER RESEARCH INSTITUTE ON GEOMETRIC QUANTIZATION, Banff, Alberta, Canada.

Program: The aim of the Institute is to exchange information about recent results, to discuss ideas for future research, and to work on problems of common interest. There are expected to be fifteen or twenty invited speakers, as well as time for discussion and joint work.

Information: Mrs. Pat Dalgetty, Secretary, Geometric Quantization Conference, Department of Mathematics and Statistics, The University of Calgary, Calgary, Alberta, Canada T2N 1N4, (403) 284-5202.

12-February 6. TWENTY-FIRST SUMMER RESEARCH INSTITUTE OF THE AUSTRALIAN MATHEMATICAL SOCIETY, University of Tasmania, Hobart, Australia.

Program: There will be plenary morning sessions with lectures and series of lectures by invited speakers and specialist sessions during the afternoons. Some topics covered will be in algebra, combinatorics, numerical and applied mathematics.

Speakers: C. W. Curtis (Univ. of Oregon), P. J. Davis (Brown Univ., R.I.), R. Delbourgo (Univ. of Tasmania, Australia), D. Elliott (Univ. of Tasmania, Australia), G. Glauber (Univ. of Chicago), F. Hirzebruch (Univ. Bonn, Germany), I. G. MacDonald (Queen Mary College, London), G. Pilz (Linz, Austria), T. J. Rivlin (IBM, New York), N. J. A. Sloane (Bell Lab., N.J.), G. S. Watson (Princeton University), E. C. Zeeman (Univ. of Warwick, England).

Information: R. Lidl, Director, Department of Mathematics, University of Tasmania, Box 252C, GPO, Hobart, Tasmania, 7001, Australia.

LATE ENTRIES

November 14-15. FOUNDATIONS: LOGIC, LANGUAGE, AND MATHEMATICS, Graduate Center, City University of New York, New York.

Speakers: (Tentative). M. Fitting, B. Van Fraassen, N. Goodman, R. Gumb, G. Harman, H. Hiz, R. Jeffrey, H. Leblanc, E. Mendelson, J. Myhill, W. Sieg, R. Smullyan.

Sponsor: Philosophy Program of the Graduate Center of the City University of New York, and the Association for Philosophy of Science, Psychotherapy, and Ethics.

Information: Hugues Leblanc, Department of Philosophy, Temple University, Philadelphia, Pennsylvania 19122; Elliott Mendelson, Department of Mathematics, Queens College, Flushing, New York 11367; Raphael Stern, Philosophy Department, CCNY, 137 Street and Convent Avenue, New York, New York 10031.

NEW AMS PUBLICATIONS

PROCEEDINGS OF THE INTERNATIONAL CONGRESS OF MATHEMATICIANS, HELSINKI 1978*

edited by *Olli Lehto*

The Proceedings of the International Congress of Mathematicians held in Helsinki, August 15–23, 1978, are in two volumes. Volume 1 contains an account of the Congress, the list of members, presentations of the works of the Fields medallists, the plenary one-hour addresses, and the invited addresses in sections 1–5. Volume 2 contains the invited addresses in sections 6–19. A complete index is included in both volumes.

On the decision of the Fields Medals Committee, the works of the Fields medallists were presented as follows:

- N. M. Katz: *The work of Pierre Deligne*
L. Carleson: *The work of Charles Fefferman*
J. Tits: *The work of Gregori Aleksandrovitch Margulis*
I. M. James: *The work of Daniel Quillen*

The invited one-hour plenary addresses included follow:

- L. V. Ahlfors, *Quasiconformal mappings, Teichmüller spaces, and Kleinian groups*
A. P. Calderón, *Commutators, singular integrals on Lipschitz curves and applications*
A. Connes, *von Neumann algebras*
R. D. Edwards, *The topology of manifolds and cell-like maps*
D. Gorenstein, *The classification of finite simple groups*
M. Kashiwara, *Micro-local analysis*
N. N. Krasovskii, *Control under incomplete information and differential games*
R. P. Langlands, *L-functions and automorphic representations*
Ju. I. Manin, *Modular forms and number theory*
S. P. Novikov, *Linear operators and integrable Hamiltonian systems*
R. Penrose, *The complex geometry of the natural world*
W. Schmid, *Representations of semisimple Lie groups*
A. N. Shiryaev, *Absolute continuity and singularity of probability measures in functional spaces*
A. Weil, *History of mathematics: why and how*
S.-T. Yau, *The role of partial differential equations in differential geometry.*

In addition there were 120 invited forty-five-minute addresses divided into nineteen sections. The sections follow:

1. Mathematical logic and foundations of mathematics
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3. Number theory
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—From the author's preface to his 1980 revision.

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Koditz, Helmut
Koelbig, Kurt Siegfried
Kolesar, R. J.
Kollmer, Heinrich
Kolodner, Ignace I.
Komatsu, Hikosaburo
Komm, Horace
König, Heinz J.
Konrad, Michel David
Korenblum, Boris
Kottler, George F.
Kotzen, Marshall J.
Kotzig, Anton
Kovesi-Domokos, S.
Kozan, Dexter C.
Kozin, Frank
Kra, Irwin
Kramer, Earl S.
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Krause, Ralph M.
Kravitsky, Naftali
Krenz, Gary S.
Krieger, Henry A.
Kriegsman, Helen F.
- Kubert, Daniel S.
Kudo, Akio
Kuhn, William W.
Kuku, A. O.
Kunen, Kenneth
Kupferwasser, Marcelo
Kuramishi, Masatake
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Kuroda, S. T.
Kusaulo, Tapani J.
Kyuno, Shoji
- Labute, John P.
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Laha, Radha G.
Laing, Nancy
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Laplaza, Miguel L.
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Lasher, Sim
Lashof, Richard K.
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Lax, Peter D.
Lazer, Alan C.
Le Cam, L. M.
Lee, Kotik K.
Leggett, Anne M.
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Leonard, Philip A.
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- MacBeath, A. M.
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MacGillivray, Archibald D.
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Maack, John Michael
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Madsen, Ib H.
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Neeb, Donna M.
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Nelson, William
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Nevai, Paul G.
Newman, Morris
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Nishida, Takaaki
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Norton, Karl K.
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Nutt, Michael D.
Nyikos, Peter J.
- Obata, Morio
Obi, Wilson C.
- Ochiai, Takushiro
O'Connor, M. Lesley
Odlyzko, Andrew M.
Odoni, R. W. K.
Oehmke, Robert H.
Oertly, Alda F.
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Ogden, Nancy C.
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Oharu, Shinnosuke
Okayasu, Takateru
Okuyama, Akihiro
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Olum, Paul
Oman, John Arthur
Omori, Hideki
O'Neill, Barrett
Onieva, Victor M.
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Orey, Steven
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Poor, Walter A.
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Porta, Harry J.
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Powers, Neville Anthony
Preston, Christopher J.
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Protter, Murray H.
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- Robbins, Leon C., Jr.
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Robertson, Alexander P.
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Robinson, Julia B.
Rod, David L.
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Rose, Donald C.
Rosenbaum, Robert A.
Rosenberg, Jonathan M.
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Rosenthal, Jenny E.
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Rubin, Herman
Rubin, Jean E.
Rubinstein, Joachim H.
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Ryken, Charles John
Ryser, Herbert J.
- Sageev, Gershon
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Salinas, Luis C.
Samelson, Hans
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Santiago, Armando
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Schneider, Dennis M.
Schneider, Hans
Schreiber, Bert M.
Schreiner, Erik A.
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Shen, Mei-Chang
Shiffman, Max
Shih, Weisshu
Shimada, Nobuo
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Shiraiwa, Kenichi
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Shube, Beatrice
Sidney, Stuart J.
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Silvenmoinen, Risto Pekka
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Singleton, William Eugene, Jr.
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Slack, Stephen
Slater, Michael
Sloot, Thomas H.
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Smith, Martha Kathleen
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Sneddon, Ian N.
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Soni, Raj Pal	Suzuki, Haruo	Tugue, Tosiuyuki	Washington, Bruce Edwin	Willis, Paul A.
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Sons, Linda R.	Swanson, Laif	Turgeon, Jean M.	Waterhouse, William C.	Wilson, Robert L., Jr.
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Stammbach, Urs	Tanimoto, Taffee T.		Weill, Lawrence R.	Wolontis, V. M.
Stanley, Keith R.	Tao, Yoko		Weiner, Jerome H.	Wong, Sherman K.
Stanley, Richard P.	Targonski, Gyorgy I.		Weinrich, Brian E.	Wood, Craig A.
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Stark, Jeremiah M.	Tates, Robert		Weiss, David M.	Wood, Stephen S.
Starr, Norton	Teleman, Nicolae		Weiss, Paul	Woythaler, Joseph W.
Steele, Alfred T.	Tellefsen, Carl R.		Weiss, Richard M.	Wright, Robert R.
Steer, Brian F.	Temam, Roger		Weiss, William A. R.	Wu, T. C.
Steiger, William Lee	Teng, Tsing-Houa		Weissman, John	
Steinberg, Maria W.	Terry, Robert B.		Wells, David M.	Yachter, Morris
Steinberg, Robert	Tews, Melvin C.		Wendland, Wolfgang L.	Yale, I. Keith
Steinberger, Mark	Thanh-Phong, Le		Wene, Gregory P.	Yamamoto, Yutaka
Sten, Björn T. J.	Thiele, Ernst-Jochen		Wente, Henry C.	Yang, Kung-Wei
Stern, Ronald J.	Thoma, Elmar H.		Wermer, John	Yano, Kentaro
Stevens, Richard S.	Thomas, P. Emery		Wessel, W. Roy	Yaquob, Jill S.
Stoll, Wilhelm F.	Thomson, James E.		West, Donald C.	Yasuhara, Ann
Stone, Alexander P.	Thron, Wolfgang J.		West, James E.	Yeagley, John F.
Stone, David A.	Thuraisamy, Vaithilingam		Westbrook, Edwin P.	Yood, Bertram
Stone, Ellen R.	Tierney, Ann R.		White, Alvin M.	Yui, Noriko
Storey, Albert J.	Tierney, Myles		Whitehead, George W.	
Strassberg, Helen A.	Tierstein, Michael N.		Whitehead, Kathleen B.	
Straubing, Howard	Tinberg, Nalsey B.		Whitesides, Sue H.	Zaslavsky, Thomas
Strauss, Phyllis	Titani, Satoko		Whitman, Philip M.	Zaslove, Barry L.
Strauss, Walter A.	Tits, Jacques L.		Wiegand, Roger A.	Zeller, Karl
Strickland, Colin	Toll, Kathryn B.		Wiegand, Sylvia Margaret	Zemaitis, Vincent R.
Stromberg, J. O.	Torrance, Ellen M.		Wiegold, James	Zizi, Khelifa
Suchanek, Ana M.	Torres, Euclides		Wightman, Arthur S.	Zoldan, Leo W. A., Jr.
Sucheston, Louis	Torres, M.		Wilker, Peter	Zuckerberg, Hyam L.
Sullivan, Joe W., Jr.	Toshi, Iida		Wilkie, Susan Marie	Zuckerman, Gregg J.
Sun, Hugo Sui-Hwan	Tripp, John C.		Wilkins, J. Ernest Jr.	Zygmund, Antoni
Sun, Twan	Tromba, A. J.		Williams, Robert F.	
Sundaresan, Kondagunta	Trotter, Hale F.		Williamson, Charles K.	Anonymous 24

MISCELLANEOUS

Personal Items

Arnold D. Feldman of Louisiana State University has been appointed to an assistant professorship at Franklin and Marshall College.

Siegfried K. Grosser of the University of Vienna has been reelected vice-president of the Austrian Mathematical Society. He is currently also chairman of that society's Committee on Instruction.

H. E. Lacey of the University of Texas at Austin has been appointed head of the Department of Mathematics of Texas A & M University, effective August 1, 1980.

Joseph Lehner of the University of Pittsburgh, Pittsburgh, has retired with the title Professor Emeritus.

John Selden, Jr., of Bayero University, Nigeria, has been elected to the Council of the recently established research-oriented Nigerian Mathematical Society.

J. F. Traub of Carnegie-Mellon University has been appointed as Edwin Howard Armstrong Professor of Computer Science, Professor of Mathematics, and Chairman of the Computer Science Department at Columbia University.

PROMOTIONS

To Professor. Ben Gurion University of the Negev: **Jesse M. Shapiro**; Grambling State University: **Arun K. Agarwal**.

Deaths

Professor **Antonio Almeida Costa** of Lisbon University died on August 24, 1978, at the age of 75. He was a member of the Society for 20 years.

Alexandria T. Dickson of Huntsville, Alabama, died on December 26, 1979, at the age of 38. She was a member of the Society for 14 years.

Professor **Martin H. Ellis** of Northwestern University died on February 16, 1980, at the age of 30. He was a member of the Society for 6 years.

Professor **Leo Gleeson** of Monash University, Australia, died on February 19, 1979, at the age of 48. He was a member of the Society for 13 years.

Professor Emeritus **Lyman M. Kells** of the U. S. Naval Academy died on February 13, 1980, at the age of 91. He was a member of the Society for 66 years.

Professor **John B. Lennes** of Valparaiso University died on December 26, 1979, at the age of 69. He was a member of the Society for 31 years.

Professor Emeritus **William Prager** of Brown University died on March 17, 1980, at the age of 76. He was a member of the Society for 38 years.

Professor **Bhoj R. Seth** of the Indian Institute of Technology, Delhi, died on December 12, 1979. He was a member of the Society for 44 years.

Professor **David L. Williams** of Syracuse University died on March 9, 1980, at the age of 42. He was a member of the Society for 15 years.

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 labels 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 Lists). In addition, the AMS maintains records of members' honors, awards, and information on Society service; information of the

latter kind appears regularly in the 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.

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Recent Appointments

Committee members' terms of office on standing committees expire on December 31 of the year given in parentheses following their names, unless otherwise specified.

Joel E. Cohen (1983) and Garrett M. Odell (1983) have been appointed by Presidents Richard C. Di Prima and Peter D. Lax to the joint *AMS-SIAM Committee on Mathematics in the Life Sciences*. Continuing members of the committee are Jack D. Cowan (1980), Frank C. Hoppensteadt (1982), Joseph B. Keller (1983), Donald Ludwig (1982), Robert M. May (1981), George F. Oster, chairman (1980), Charles S. Peskin (1983), and Sol I. Rubirow (1981).

Two appointments made to the *AMS-SIAM Committee on Applied Mathematics* were announced on p. 204 of the February Notices. It should have been noted that the appointments were made jointly by President Richard Di Prima of SIAM and President Peter D. Lax of the AMS.

Reports of Meetings

THE MARCH MEETING IN BOULDER

The seven hundred seventy-fourth meeting of the American Mathematical Society was held at the University of Colorado in Boulder, Colorado, on Thursday through Saturday, March 27-29, 1980. The meeting was held jointly with the Association for Symbolic Logic (ASL) and the Rocky Mountain section of the Mathematical Association of America (MAA). There were 267 registrants, including 173 members of the Society.

By invitation of the Committee to Select Hour Speakers for Far Western Sectional Meetings, there were two invited one-hour addresses. ROBERT FINN of Stanford University lectured on *Capillary free surfaces*; he was introduced by Louis Auslander. DOUGLAS A. LIND of the University of Washington spoke on *Finitary ergodic theory*; Marc A. Rieffel introduced him.

By invitation of the same committee, there were three special sessions of selected papers:

Nonabelian harmonic analysis, organized by LAWRENCE W. BAGGETT and ARLAN B. RAMSAY; the speakers were Louis Auslander, Raymond C. Fabec, Eugene Gutkin, Joe W. Jenkins, Ray A. Kunze, Wesley Mitchell, Calvin C. Moore, Bent Ørsted, Richard C. Penney, Marc A. Rieffel, Keith F. Taylor, Peter C. Trombi, and V. S. Varadarajan.

Lattice theory and general algebra, organized by ALAN DAY and WALTER F. TAYLOR; the speakers were Ralph S. Freese, H. Peter Gumm, William A. Lampe, Ralph N. McKenzie, Don L. Pigozzi, Robert Willis Quackenbush, Ivan Rival, and Jonathan D. H. Smith. In addition, Kirby Baker, Bjarni Jónsson,

and Rudolf Wille organized problem sessions.

Topics in mathematical physics, organized by KARL E. GUSTAFSON and WILLIAM P. REINHARDT; the speakers were A. O. Barut, H. Baumgartel, Frank H. Brownell, Jr., Charles L. Dolph, Volker Enss, Robert K. Goodrich, Karl E. Gustafson, R. L. Hartman, Eric J. Heller, Ira W. Herbst, J. S. Howland, Robin L. Hudson, Guy Johnson, Jr., William B. Jones, Richard B. Lavine, Jean-Paul Marchand, C. William McCurdy, Richard Mercer, D. W. Noid, Peter Pfeifer, R. Ramaswamy, Alexander G. Ramm, William P. Reinhardt, Peter A. Rejto, R. D. Richtmyer, Franklin E. Schroeck, Jr., M. Seddighin, Randall B. Shirts, Israel M. Sigal, Kalyan B. Sinha, Michael P. Strand, M. Tabor, Hamid Tadjeran, Tuong Ton-That, Ricardo A. Weder, and Daoxing Xia. A proceedings volume of this special session entitled "Classical, semiclassical, and quantum mechanics in mathematics, chemistry, and physics" will be published by Plenum Press.

There were four sessions of contributed ten-minute papers, chaired by Steven E. Anacker, Stewart Baldwin, Ralph S. Freese, Darrell Hicks and Warren Page.

The MAA program included a banquet Friday evening; the dinner speaker was DOROTHY L. BERNSTEIN who spoke on *A differential equation of literary criticism*. There were several twenty-minute talks and two panel discussions. The panel discussions were titled *Transferability of college credits* and *Nontraditional uses of mathematics and computers*.

The ASL program included the following invited addresses: *Mahlo cardinals and canonical forms for models constructible from sequences of ultrafilters* by STEWART BALDWIN; *Reduced products and infinite games on many boards* by WILFRID A. HODGES; *The failure of the GCH* by MATTHEW D. FOREMAN; *The closed unbounded filter* by WILLIAM J. MITCHELL; and *Some recent theories and problems in intensionality* by RICHMOND H. THOMASON. There were also two sessions of contributed papers.

Local arrangements were well handled by Arlan B. Ramsay and David F. Rearick.

Eugene, Oregon
Kenneth A. Ross
Associate Secretary

THE APRIL MEETING IN BLOOMINGTON

The seven hundred seventy-fifth meeting of the American Mathematical Society was held at Indiana University, Bloomington, Indiana, on Friday and Saturday, April 11-12, 1980. There were 317 registrants, including 281 members of the Society.

Symposium. The meeting was preceded by a symposium on *The Mathematical Heritage of Henri Poincaré*, held Monday through Thursday, April 7-10. Support from the National Science Foundation was

received under a grant to the American Mathematical Society. The topic of the symposium was selected by the 1978 Committee to Select Hour Speakers for Western Sectional Meetings, which consisted of Paul T. Bateman, Melvin Hochster, Mark Mahowald, Karen K. Uhlenbeck, and R. O. Wells, Jr. (chairman). The Organizing Committee for the Symposium, responsible for selecting the speakers and arranging the symposium program, consisted of Felix E. Browder (chairman), William Browder, Phillip A. Griffiths, Jürgen K. Moser, Stephen Smale, and R. O. Wells, Jr. The speakers at the Symposium were J. Frank Adams, Lipman Bers, Raoul H. Bott, Haim Brezis, Felix E. Browder, William Browder, Charles Fefferman, Harry Furstenberg, Phillip A. Griffiths, Jun-Ichi Igusa, Arthur M. Jaffe, Jean Leray, John N. Mather, John Milnor, Donald S. Ornstein, Roger Penrose, David Ruelle, Wilfried Schmid, Stephen Smale, Dennis Sullivan, William P. Thurston, Alan D. Weinstein, R. O. Wells, Jr., and Shing-tung Yau.

Invited Addresses. By invitation of the Committee to Select Hour Speakers for Western Sectional Meetings there were four invited one-hour addresses on Friday and Saturday. ROBERT M. FOSSUM, University of Illinois, Urbana-Champaign, addressed the Society on the topic, *Invariant theory, representation theory, and commutative algebra—ménage à trois*. ROBERT GEROCH, University of Chicago, gave an hour talk on *Some open questions in general relativity*. PETER E. NEY, University of Wisconsin, Madison, spoke on *The regeneration method for Markov chains*. JOEL A. SMOLLER, University of Michigan, Ann Arbor, addressed the Society on the subject, *Stability and bifurcation of steady-state solutions for systems of reaction-diffusion equations*. The presiding officers at these four lectures were Timothy V. Fossum, Morton Lowengrub, Michael J. Sharpe, and Meyer Jerison.

Special Sessions. By invitation of the same committee, there were eight special sessions of selected twenty-minute papers on Friday and Saturday.

Noncommutative ring theory arranged by GORO AZUMAYA and DARRELL E. HAILE, Indiana University, Bloomington. The speakers were Maurice Auslander, John A. Beachy, Victor P. Camillo, Frank R. DeMeyer, Vlastimil Dlab, Carl Faith, Patrick Halpin, Israel N. Herstein, Yasuo Iwanaga, Bodo Pareigis, David J. Saltman, Robert L. Snider, and Stuart A. Steinberg.

Minimal surfaces arranged by JOHN E. BROTHERS and WILLIAM P. ZIEMER, Indiana University, Bloomington. The speakers were Frederick J. Almgren, Jr., Ilya Bakelman, David E. Bindschadler, Robert M. Hardt, Frank Morgan, Johannes C. C. Nitsche, Michel Pierre, Jon T. Pitts, Richard M. Schoen, Jean E. Taylor, and Neil S. Trudinger.

DeRham homotopy arranged by KUO-TSAI CHEN, University of Illinois, Urbana. The speakers were Bohumil Cenk, Victor K. A. M. Gugenheim, Richard M. Hain, Stephen Halperin, Steven E. Hurder, Richard D. Porter, Ross E. Staffeldt, James D.

Stasheff, and Georgia Triantafillou.

Commutative harmonic analysis arranged by COLIN C. GRAHAM and L. THOMAS RAMSEY, Northwestern University. The speakers were John J. Benedetto, Ron C. Blei, John J. F. Fournier, Colin C. Graham, Robert P. Kaufman, Jean-Francois Méla, Daniel M. Oberlin, Francois Parreau, L. Thomas Ramsey, Daniel G. Rider, Bertram M. Schreiber, Richard C. Vrem, Benjamin B. Wells, Gordon S. Woodward, and Misha Zafran.

Fixed point theory in algebraic topology arranged by BENJAMIN R. HALPERN, Indiana University, Bloomington. The speakers were Mónica Clapp de Prieto, Edward R. Fadell, Mark F. Feshbach, Gilles Fournier, Ross Geoghegan, Benjamin R. Halpern, William D. Homer, Sufian Y. Husseini, Jan W. Jaworowski, Richard P. Jerrard, Boju Jiang, Ronald J. Knill, Sławomir Kwasik, Roger D. Nussbaum, Jingyal Pak, Carlos Prieto, Nancy E. Rallis, Billy E. Rhoades, Helga H. Schirmer, Gen-Hua Shi, and Friedrich Wille.

Diffusion and local time arranged by FRANK B. KNIGHT, University of Illinois, Urbana. The speakers were David Y. Burman, Donald Geman, J. Michael Harrison, Yuji Kasahara, Frank B. Knight, Michael J. Sharpe, John B. Walsh, and Jon A. Wellner.

Integral equations and their applications in scattering and diffraction theory, mathematical physics, and nonlinear network theory arranged by ALEXANDER G. RAMM, University of Michigan, Ann Arbor. The speakers were Melvyn S. Berger, Brian De Facio, Eugene Gutkin, Richard C. MacCamy, Roger G. Newton, Alexander G. Ramm, Irwin W. Sandberg, Michael E. Taylor, and Harold Widom.

Lie algebras arranged by MARIA J. WONENBURGER, Indiana University, Bloomington. The speakers were Stephen Berman, James W. Cannon, Alex J. Feingold, James I. Lepowsky, Robert V. Moody, and Robert Lee Wilson.

There were also four sessions of contributed papers for which Ronald L. Graham, Marjorie Frost McCracken, Joanna B. Mitro, and Georgia Triantafillou served as presiding officers. Of the fourteen contributed papers listed in the program of the meeting, one was withdrawn, so that thirteen ten-minute papers were actually presented.

John Ewing coordinated the local arrangements, and contributed greatly to the success of the meeting.

Paul T. Bateman
Urbana, Illinois Associate Secretary

Council Meeting

The Council met on 10 April 1980 at 5:10 p.m. in the Forum Room of the Ramada Inn in Bloomington, Indiana with President Peter D. Lax in the chair.

The Council passed the following resolution:

The Council of the American Mathematical Society expresses its concern over the treatment of our fellow mathematical scientist Vaclav Benda, now serving a four-year prison term in Czechoslovakia. This sentence seems from press accounts to be

purely in punishment for his publications critical of the government. We would hope that his conviction can be reconsidered, or at the very least that clemency can be shown.

The following resolution was approved:

The Council of the American Mathematical Society has been informed that a public hearing is planned in the case of Dr. José Luis Massera. We welcome the prospect that, after so many years of imprisonment and isolation, Dr. Massera may at last have a chance to present a defense in open court.

We repeat our conviction, which we have communicated to you before, that the interests of justice would be best served by the immediate unconditional release of this distinguished scientist. If he comes before a judicial hearing, we feel strong concern in the case as his colleagues in mathematics, as you surely appreciate; we appeal to you therefore to authorize a delegation sent by this Society to attend the hearing.

The Council made nominations for offices in the election of 1980. Candidates for contested positions are listed on p. 340, with some relevant information. Candidates for uncontested positions are as follows:

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Mathematics of Computation (two positions)

James H. Bramble Morris Newman

Proceedings

Thomas H. Brylawski

Committee to Monitor Problems in Communication (two positions)

Lynn A. Steen Karl H. Hofmann

The Council authorized a plan for the issuance of a second ballot to members who claim not to have received a ballot in the annual election. The procedural details will be published in the **Notices**.

The Council has been considering the requirement for a monitored work load or a personal activity report (the current terminology for "Time and Effort Reports") promulgated by the Office of

Management and Budget, effective October 1, 1979. The Council passed the following resolution.

The Council of the American Mathematical Society calls for suspension of the requirement for a monitored work load or a personal activity report (as defined in Circular No. A-21 from the Office of Management and Budget) from individual members of the professional staff participating in research under grant support, because such reports are incompatible with academic life and work and admit no meaningful compliance. The Council further reaffirms that teaching and research are inseparable and that accounting procedures in universities must recognize and accommodate their unitary character.

The Council of Scientific Society Presidents has taken a position opposed to this form of reporting and the Council endorsed the efforts of CSSP. Interested persons may wish to read a Letter to the Editor of *Science* (p. 207, 14 March 1980).

An Editorial Committee for the series *Proceedings of Symposia in Applied Mathematics* was authorized. President Lax has appointed

Stephen Childress

Stephen H. Crandall

Ronald L. Graham, Chairman

to be the Committee. The series is a natural locus for the publication of lecture notes from the short courses that have been a recent feature of Society meetings.

The meeting adjourned at 11:55 p.m., having recessed from 6:30 to 8:15.

Bethlehem, Pennsylvania Everett Pitcher
Secretary

THE APRIL MEETING IN PHILADELPHIA

The seven hundred seventy-sixth meeting of the American Mathematical Society was held at the Benjamin Franklin Hotel in Philadelphia, Pennsylvania, on Thursday, April 17, and Friday, April 18, 1980. There were 307 registrants, including 252 members of the Society.

The period April 15-16 was devoted to a Symposium on Mathematical Psychology and Psychophysiology. Support was received through a grant from the National Science Foundation to the American Mathematical Society. The topic was selected by the AMS-SIAM Committee on Applied Mathematics, whose members were D. J. Benney, R. Brockett, F. C. Hoppensteadt (chairman), S. K. Mitter, and M. Schultz. The members of the Organizing Committee were W. K. Estes, Stephen Grossberg (chairman), R. Duncan Luce, M. Frank Norman, H. Simon, and George Sperling. The speakers were Gail Carpenter, Walter Freeman, Stuart A. Geman, Norma Graham, Stephen Grossberg, Geoffrey J. Iverson, David Krantz, R. Duncan Luce, Louis Narens, David Noreen, M. Frank Norman, George Sperling, Christopher von der Malsburg, and Dirk Vorberg.

Invited Addresses. By invitation of the Committee to Select Hour Speakers for Eastern Sectional Meetings, there were four invited one-hour addresses: F. THOMAS FARRELL of the University of Michigan, Ann Arbor, who spoke Thursday afternoon on *Aspherical manifolds*; TROELS JORGENSEN of the University of Minnesota, Minneapolis, who spoke Friday afternoon on *Degenerate and doubly degenerate Kleinian groups*; NANCY KOPELL, Northeastern University, who spoke Thursday morning on *Reaction-diffusion equations, horseshoes, and a perturbed central force problem*; and GEORGE LUSZTIG of Massachusetts Institute of Technology, who spoke Friday morning on *The Hecke algebra of the affine Weyl group*. These four speakers were introduced respectively by Frank A. Raymond, Clifford J. Earle, Jr., Jane P. Gilman, and Wen-Ch'ing Winnie Li.

Special Sessions. By invitation of the same committee, there were eleven sessions of selected twenty-minute papers on Thursday and Friday. The topics of the special sessions, their organizers, and the list of speakers are:

Unsolved problems in biological and chemical modelling, GAIL CARPENTER, Northeastern University. The speakers were Martin Feinberg, Morton E. Gurtin, Lea F. Murphy, and Charles S. Peskin.

Fréchet spaces and spaces of holomorphic functions, ED DUBINSKY of Clarkson College of Technology, and BORIS MITYAGIN of Ohio State University. The speakers were Heikki Apiola, Steven F. Bellenot, Andreas Benndorf, Carlos A. Berenstein, Edward Bierstone, Thomas Bloom, Edward Dubinsky, Boris Korenblum, Boris Mityagin, Esa Nilimarkka, Zafer Nurlu, M. S. Ramanujan, Walter Rudin, Gerald W. Schwarz, Joel H. Shapiro, B. A. Taylor, Daoxing Xia, and William Zame.

Infinite groups, JOAN L. DYER of CUNY Herbert H. Lehman College, and TEKLA LEWIN of Syracuse University. The speakers were S. Bachmuth, A. M. Brunner, Leo P. Comerford, Jr., Verena Huber-Dyson, Edna K. Grossman, Narain D. Gupta, A. I. Lichtman, R. C. Lyndon, James McCool, D. S. Passman, John G. Ratcliffe, F. C. Y. Tang, and Marvin D. Tretkoff.

Relation of the fundamental group to manifold theory, F. T. FARRELL of the University of Michigan, Ann Arbor, and W.-C. HSIANG of Princeton University. The speakers were Robert Brooks, Kenneth S. Brown, Frank Connolly, Lowell E. Jones, John W. Morgan, William Pardon, Frank Quinn, Frank Raymond, Andrew A. Ranicki, and Howard D. Rees.

Differential geometry, C. C. HSIUNG of Lehigh University. The speakers were Thomas F. Banchoff, Eugenio Calabi, Jeff Cheeger, Dennis DeTurck, Vladislav V. Goldberg, Chaohao Gu, Joseph J. Kohn, Tilla K. Milnor, Katsumi Nomizu, V. I. Oliker, Karen K. Uhlenbeck, Nolan R. Wallach, and Yan-Lin Yu.

Modular forms and L-functions, DALE H. HUSEMOLLER of Haverford College. The speakers were Avner D. Ash, Joe P. Buhler, Benedict H. Gross, Michael Harris, Wen-Ch'ing Winnie Li, Jon Rogawski, David Rohrlich, and Y. S. Tai.

Kleinian groups, LINDA KEEN, CUNY Graduate School and University Center. The speakers were Clifford J. Earle, Frederick P. Gardiner, Jane Gilman, Linda Keen, Irwin Kra, J. Peter Matelsky, Robert F. Riley, and Scott A. Wolpert.

Differential equations in plasticity and nonlinear elasticity, DAVID R. OWEN of Carnegie-Mellon University. The speakers were Stuart S. Antman, John M. Ball, Barry Bernstein, Jack Buhite, Constantine Dafermos, J. Ernest Dunn, Robert F. Gordon, Robert Muncaster, Paolo Podio-Guidugli, Scott Spector, Gilbert Strang, and Wan-Lee Yin.

Number theory, MARK SHEINGORN of CUNY Bernard M. Baruch College. The speakers were George E. Andrews, David M. Bressoud, Sarvadaman Chowla, Joseph B. Dennin, Larry J. Goldstein, Martin L. Karel, Marvin I. Knopp, Joseph Lehner, and L. A. Parson.

Commutative algebra, WOLMER VASCONCELOS of Rutgers University. The speakers were Edward D. Davis, Anthony V. Geramita, William J. Heinzer, Melvin Hochster, Andrew R. Kustin, Gerson Levin, Paolo Maroscia, Matthew Miller, Judith D. Sally, Avinash Sathaye, Jan R. Stroocker, Lucien Szpiro, Charles A. Weibel, and Roger Wiegand.

Probability theory, ROBERTA S. WENOCUR of Drexel University, and J. HOROWITZ, University of Massachusetts, Amherst. The speakers were Simeon Berman, Erhan Çinlar, R. M. Dudley, Kenneth J. Hochberg, Joseph Horowitz, Joseph D. Petrocelli, David Pollard, N. U. Prabhu, V. Ramaswami, L. A. Shepp, J. Michael Steele, Lawrence D. Stone, S. R. S. Varadhan, Roberta S. Wenocur, and Stephen J. Wolfe.

There were four sessions for contributed ten-minute papers on Friday. The Chairmen for these sessions were William E. Kirwan III, Howard Kleiman, John Schmeelk, and William F. Trench.

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by Joseph A. Wolf

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Here the author classifies the parabolic subgroups of real and complex semisimple Lie groups, in which the nilradical has square integrable representations. In a few cases—corresponding to hermitian symmetric spaces of non-tube type—there is no semi-invariant polynomial on the nilradical. In all other cases Wolf computes semi-invariants in the universal enveloping algebra of the nilradical and writes out explicit Fourier inversion formulae.

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Pisa, February 1980.

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AUGUST 1980

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on Symbolic Mathematical Computation-Computer Algebra, August 16-17
MUST BE RECEIVED IN PROVIDENCE NO LATER THAN JULY 3, 1980

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*See previous page for definitions of student and unemployed.

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