

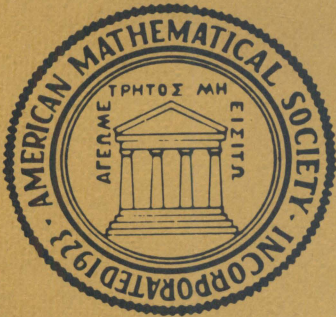
NOTICES AMER. MATH. SOC.

Volume 27, Number 7

November 1980

Notices

of the
American Mathematical Society



November 1980, Issue 205
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CALENDAR OF AMS MEETINGS

THIS CALENDAR lists all meetings which have been approved by the Council prior to the date this issue of the *Notices* was sent to 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
783	January 7-11, 1981 (87th Annual Meeting)	San Francisco, California	OCTOBER 22	January
784	March 20-21, 1981	Notre Dame, Indiana	JANUARY 19	February
785	April 23-25, 1981	Reno, Nevada	FEBRUARY 24	April
786	May 15-16, 1981	Pittsburgh, Pennsylvania	MARCH 2	April
787	June 19-20, 1981	Portland, Oregon	APRIL 20	June
788	August 17-21, 1981 (85th Summer Meeting)	Pittsburgh, Pennsylvania	JUNE 1	August
	November 6-7	Austin, Texas		
	January 13-17, 1982 (88th Annual Meeting)	Cincinnati, Ohio		
	January 9-13, 1985 (91st Annual Meeting)	Anaheim, California		
	January 21-25, 1987 (93rd Annual Meeting)	San Antonio, Texas		

ADDITIONAL DEADLINES	JANUARY ISSUE	FEBRUARY ISSUE
Advertising	November 14	January 27
News and Special Meetings	October 22	January 12

OTHER EVENTS SPONSORED BY THE SOCIETY

January 5-6, AMS Short Course. Cryptology in Revolution: Mathematics and Models, San Francisco, California, This issue, p. 587

January 8, Symposium on Some Mathematical Questions in Biology, Toronto, Ontario, Canada, This issue, p. 598

June 29-July 11, AMS-SIAM Summer Seminar on Fluid-Dynamical Problems in Astrophysics and Geophysics, This issue, p. 600

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Notices

of the American Mathematical Society

Volume 27, Number 7, November 1980

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Knoxville, November 14-15, 1980, University of Tennessee

Program for the 782nd Meeting

The seven hundred eighty-second meeting of the American Mathematical Society will be held at the University of Tennessee, Knoxville, from noon Friday to 5:00 p.m. Saturday, November 14 and 15, 1980. All sessions will be held in the University Center, Cumberland Avenue and Stadium Drive.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Southeastern Sectional Meetings there will be three invited one-hour addresses. The speakers and titles of their talks are:

FRANK QUINN, Virginia Polytechnic Institute and State University, *The topological characterization of manifolds.*

DAVID G. SCHAEFFER, Duke University, *Qualitative analysis of the Taylor problem in a finite cylinder by singularity theory.*

DON ZAGIER, University of Maryland and Universität Bonn, *Special values of L series attached to modular forms.*

Special Sessions

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

Free boundary problems, LAWRENCE C. EVANS, University of Maryland, College Park. The speakers will be Roger R. Alexander, Ioannis Athanasopoulos, John R. Cannon, Colin W. Cryer, Emmanuele DiBenedetto, Lawrence C. Evans, Robert R. Jensen, Bruce Turkington, R. E. White, and David George Wilson.

Geometric topology, STEVEN C. FERRY, University of Kentucky. The speakers will be J. W. Cannon, Thomas A. Chapman, F. T. Farrell, Wu-Chung Hsiang, Larry S. Husch, Shin'ichi Kinoshita, George Kozłowski, Louis Montejano, Gerard A. Venema, John J. Walsh, and David C. Wilson.

Number theory, CARL POMERANCE, University of Georgia. The speakers are Krishnaswami Alladi, Richard F. Arenstorf, Joel V. Brawley, Jr., E. Rodney Canfield, Harold G. Diamond, John D. Fulton, Joseph L. Gerver, Robert Gold, J. S. Hsia, Robert M. McConnell, Randy Tuler, Jan Turk, Theresa P. Vaughan, and Samuel S. Wagstaff, Jr.

Contributed Papers

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

Registration

The registration desk will be in Room 239 of the University Center, and will be open from 10:00 a.m. to 4:00 p.m. on Friday, November 14, and from 8:30 a.m. to noon on Saturday, November 15. The

registration fees for the meeting will be \$5 for non-members, \$3 for members of the American Mathematical Society, and \$1 for students or unemployed persons.

Accommodations

Although accommodations are available at several local motels within walking distance of the meeting, blocks of rooms have been set aside at the following locations. Participants should make their own reservations directly with the motels, and identify themselves as participants in the AMS meeting. The deadline for reservations was October 15, 1980.

Sheraton Campus Inn (0.3 mile)
1706 Cumberland Avenue, S.W.
Telephone: 615-524-4681
Single \$22 Double \$27
\$6 per additional person

University Travel Inn (0.4 mile)
1700 Clinch Avenue, S.W.
Telephone: 615-546-5974
Single \$19 plus tax—U.T. Student Rates
Double \$26 plus tax
\$5 per additional person

Holiday Inn (1 mile)
621 Dale Avenue
Telephone: 615-525-5371
Single \$22 Double \$29
\$4 per additional person

Holiday Inn (1 mile)
Downtown Chapman Highway
Telephone: 615-573-1921
Single \$25 Double \$34
\$4 per additional person

Hyatt Regency Knoxville (1.5 miles)
500 E. Hill Avenue
Telephone: 615-637-1234
Single \$41 Double \$41

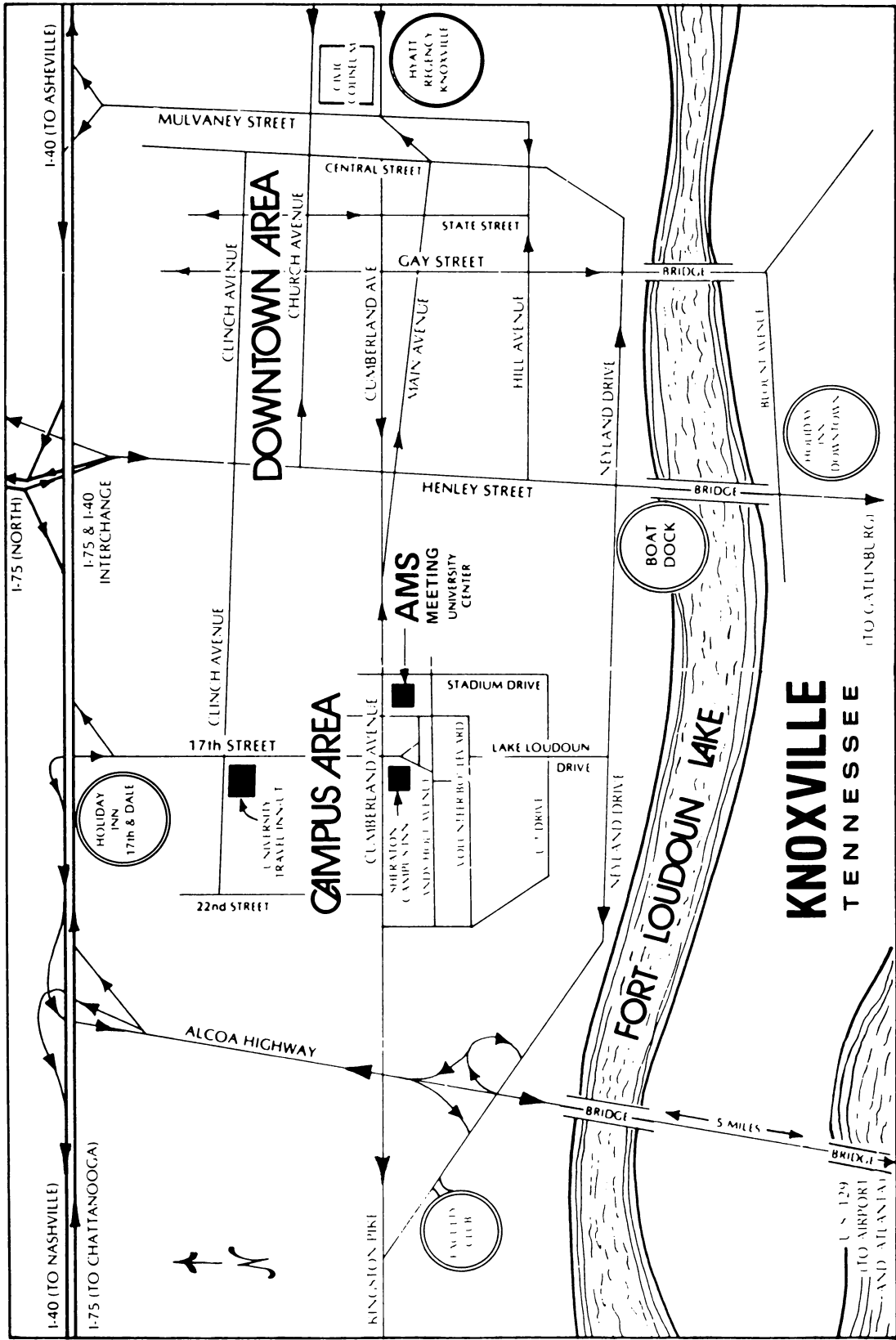
Weather

The average mean temperature during the month of November is 60.9°F. The average rainfall for the month of November is 2.67 inches, and the probable percent of sunshine is 60%.

Food Service and Entertainment

Food service is available in the University Center and in each motel listed. Numerous fast food places are located adjacent to the campus on Cumberland Avenue. A list of restaurants and their locations will be available at the registration desk. Coffee will be available in Room 220 of the University Center.

A beer party is planned for Friday evening.



KNOXVILLE TENNESSEE

Travel

Knoxville is located in eastern Tennessee and is served by a major airport, as well as Greyhound and Trailway bus lines. Limousine service is available from the airport to the University campus and costs \$7 per person. Knoxville is accessible by automobile

via Interstates I-40 and I-75; exits to the University are clearly marked. Parking facilities on campus will be arranged.

Emergency Messages

Messages may be left at the office of the Department of Mathematics: 615-974-2462.

PRESENTERS OF PAPERS

Following each name is the number corresponding to the speaker's position on the program

• Invited one-hour lecturers

*Alexander, R. 28	*Cryer, C. W. 29
*Alladi, K. 34	Davis, S. W. 60
Anderson, D. F. 46	*Diamond, H. G. 35
*Arenstorff, R. F. 12	*Di Benedetto, E. 25
Arnold, J. T. 47	*Evans, L. C. 26
*Athanasopoulos, I. 27	Evans, T. 64
Aull, C. E. 57	*Farrell, F. T. 21
Benz, S. L. 41	Francel, M. A. 65
Betounes, D. E. 40	*Fulton, J. D. 54
Blackmore, D. 42	Gerlach, W. P. 37
*Brawley, J. V. 16	*Gerver, J. L. 55
Brewer, J. 51	Gilmer, R. 49
*Canfield, E. R. 33	*Gold, R. 15
*Cannon, J. R. 7	Gruenhagen, G. 59
*Cannon, J. W. 4	*Hsia, J. S. 13
Carmichael, R. D. 39	*Hsiang, W. C. 20
*Chapman, T. A. 19	*Husch, L. S. 5

* Special session speakers

Jamison-Waldner, R. E. 62	*Quinn, F. 1
*Jensen, R. R. 11	Rajagopalan, M. 56
Johnson, G. A. 48	*Schaeffer, D. G. 18
Jones, J., Jr. 67	Shaw, J. K. 36
Kaneko, H. 44	Spikes, P. W. 43
*Kinoshita, S. 23	*Tuler, R. 14
*Kozłowski, G. 6	*Turk, J. 32
Kreimer, H. F. 63	*Turkington, B. 10
Lang, J. 50	*Vaughan, T. P. 31
Lewis, W. 61	*Venema, G. A. 3
*McConnel, R. M. 30	*Wagstaff, S. S., Jr. 53
Mobley, E. C. 52	*Walsh, J. J. 24
Mollin, R. A. 66	*White, R. E. 9
*Montejano, L. 22	*Wilson, D. C. 2
Parker, G. E. 38	*Wilson, D. G. 8
Phelps, J. K. 58	*Zagier, D. 17
Pleasant, J. C. 45	

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 November 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, 12:30 P. M.

Invited Address, Shiloh Room

12:30- 1:30 (1) *The topological characterization of manifolds*. Professor FRANK QUINN, Virginia Polytechnic Institute and State University (782-G5)

FRIDAY, 1:45 P. M.

Special Session on Geometric Topology. I, Room 223

- 1:45- 2:05 (2) *Mappings with 1-dimensional absolute neighborhood retract fibers*. Professor JOHN J. WALSH and Professor DAVID C. WILSON*, University of Florida (782-G2)
- 2:10- 2:30 (3) *Approximating topological embeddings of 3-cells*. Preliminary report. GERARD A. VENEMA, Calvin College (782-G11)
- 2:35- 2:55 (4) *The growth of fundamental groups*. Preliminary report. Professor J. W. CANNON, University of Wisconsin, Madison (782-G16)
- 3:00- 3:20 (5) *Embedding continua up to shape*. II. Professor L. S. HUSCH, University of Tennessee, Knoxville (782-G1)
- 3:25- 3:45 (6) *Remarks on the cell-like mapping problem*. Preliminary report. Professor GEORGE KOZŁOWSKI, Auburn University, Auburn (782-G13)

FRIDAY, 1:45 P. M.

Special Session on Free Boundary Problems. I, Room 224

- 1:45- 2:05 (7) *The one phase Stefan problem subject to the specification of energy*. Professor JOHN R. CANNON*, University of Texas, Austin, and Professor JOHN VAN DER HOEK, University of Adelaide, Australia (782-B2)
- 2:10- 2:30 (8) *Composition of solidified binary alloy from a simple solidification model*. Preliminary report. D. G. WILSON*, Union Carbide Corporation, Oak Ridge, ANDREW LACEY, University of Oxford, England, and A. D. SOLOMON, Union Carbide Corporation, Oak Ridge (782-B4)

- 2:35- 2:55 (9) *Numerical solution of the Stefan problem with other nonlinear terms.* R. E. WHITE, North Carolina State University and Michigan State University (782-C2)
- 3:00- 3:20 (10) *Vortex rings: existence and asymptotic estimates.* Professor AVNER FRIEDMAN and Professor BRUCE TURKINGTON*, Northwestern University (782-C1)
- 3:25- 3:45 (11) *The nature of the seepage face.* Professor L. CAFFARELLI, University of Minnesota, Minneapolis, Professor ROBERT R. JENSEN*, University of Kentucky, and Professor D. KINDERLEHRER, University of Minnesota, Minneapolis (782-B8)

FRIDAY, 1:45 P. M.

Special Session on Number Theory. I, Room 225

- 1:45- 2:05 (12) *Distribution of integral points on ellipsoids.* Preliminary report. R. F. ARENSTORF, Vanderbilt University (782-A15)
- 2:10- 2:30 (13) *Sums of integer squares in number fields.* Professor J. S. HSIA, Ohio State University, Columbus (782-A7)
- 2:35- 2:55 (14) *A new class of arithmetic sums.* Professor RANDY TULER, University of Georgia (782-A1)
- 3:00- 3:20 (15) *Cyclotomic units and Coates-Wiles series.* Professor ROBERT GOLD, Ohio State University (782-A5)
- 3:25- 3:45 (16) *Counting matrices by Drazin index.* Professor JOEL V. BRAWLEY, Clemson University (782-A11)

FRIDAY, 4:00 P. M.

Invited Address, Shiloh Room

- 4:00- 5:00 (17) *Special values of L series attached to modular forms.* Professor DON ZAGIER, University of Maryland, College Park

SATURDAY, 8:30 A. M.

Invited Address, Shiloh Room

- 8:30- 9:30 (18) *Qualitative analysis of the Taylor problem in a finite cylinder by singularity theory.* Professor DAVID G. SCHAEFFER, Duke University (782-B9)

SATURDAY, 9:45 A. M.

Special Session on Geometric Topology. II, Room 223

- 9:45-10:05 (19) *Constructing approximate fibrations.* T. A. CHAPMAN* and STEVE FERRY, University of Kentucky (782-G14)
- 10:10-10:30 (20) *A structure set analogue of Chapman-Ferry-Quinn theory.* Professor F. T. FARRELL, University of Michigan, Ann Arbor, and Professor W. C. HSIANG*, Princeton University (782-G15)
- 10:35-10:55 (21) *The Whitehead group of poly-(finite or cyclic) groups.* F. T. FARRELL*, University of Michigan, Ann Arbor, and W. C. HSIANG, Princeton University (782-A18)
- 11:00-11:20 (22) *β -homotopy equivalences have α -cross sections.* LUIS MONTEJANO, Institute for Advanced Study (80T-G85)
- 11:25-11:45 (23) *On the decomposition of arc-and-ball pairs.* Preliminary report. Professor SHIN'ICHI KINOSHITA, Florida State University (782-G6)
- 11:50-12:10 (24) *Examples of cell-like maps which are not shape equivalences.* ROBERT J. DAVERMAN and JOHN J. WALSH*, University of Tennessee, Knoxville (782-G3)

SATURDAY, 9:45 A. M.

Special Session on Free Boundary Problems. II, Room 224

- 9:45-10:05 (25) *Pseudo parabolic equation and free-boundary problems.* Preliminary report. E. DI BENEDETTO* and R. E. SHOWALTER, University of Texas, Austin (782-B7)
- 10:10-10:30 (26) *Regularity of the solution to the one-dimensional fast chemical reaction problem.* Preliminary report. Professor LAWRENCE C. EVANS, University of Maryland, College Park (782-B1)
- 10:35-10:55 (27) *Regularity of the solution of an evolution problem with inequalities on the boundary.* Preliminary report. IOANNIS ATHANASOPOULOS, University of Kentucky (782-B6)

- 11:00-11:20 (28) *A discontinuous nonlinear eigenvalue problem involving a free boundary.* ROGER ALEXANDER, Rensselaer Polytechnic Institute (782-B3)
- 11:25-11:45 (29) *Proofs of convexity of free boundaries using the maximum principle.* Professor COLIN W. CRYER, University of Wisconsin, Madison (782-C4)

SATURDAY, 9:45 A. M.

Special Session on Number Theory. II, Room 225

- 9:45-10:05 (30) *Characterization and enumeration of subfields of $F_q[x]/(M)$.* Professor ROBERT M. MCCONNELL, University of Tennessee, Knoxville (782-A6)
- 10:10-10:30 (31) *Computational methods for algebraic number fields.* Preliminary report. Dr. THERESA P. VAUGHAN, University of North Carolina, Greensboro (782-A21)
- 10:35-10:55 (32) *Powers and almost powers.* Dr. JAN TURK, University of Michigan, Ann Arbor (782-A16) (Introduced by D. J. Lewis)
- 11:00-11:20 (33) *On a problem of Oppenheim concerning "Factorisatio Numerorum."* Dr. E. R. CANFIELD*, University of Georgia, Dr. P. ERDÖS, Mathematical Institute of the Hungarian Academy of Sciences, Hungary, and Dr. C. POMERANCE, University of Georgia (782-A19)
- 11:25-11:45 (34) *The Moebius function and integers with restricted prime factors.* Professor KRISHNASWAMI ALLADI, University of Michigan, Ann Arbor (782-A8)
- 11:50-12:10 (35) *A kind of harmonic analysis of $|\zeta(it)|^2/t$.* Professor HAROLD G. DIAMOND, University of Illinois, Urbana-Champaign (782-A4)

SATURDAY, 9:45 A. M.

Session on Analysis. Room 227

- 9:45- 9:55 (36) *Arguments of complex solutions of Hamiltonian systems.* Preliminary report. Dr. J. K. SHAW, Virginia Polytechnic Institute and State University (782-B5)
- 10:00-10:10 (37) *Connected envelopes of locally compact abelian groups.* Preliminary report. WALTER P. GERLACH, Centre College of Kentucky (782-B10)
- 10:15-10:25 (38) *A continuous integral equation arising from a stochastic matrix problem.* Preliminary report. TERRY J. WALTERS and G. EDGAR PARKER*, Pan American University (782-B11)
- 10:30-10:40 (39) *Growth of H^p functions in tubes.* Preliminary report. Professor RICHARD D. CARMICHAEL* and Professor STEPHEN P. RICHTERS, Wake Forest University (782-B12)
- 10:45-10:55 (40) *Mackey topologies for certain Köthe spaces.* Preliminary report. Dr. DAVID E. BETOUNES, University of Southern Mississippi (782-B13)
- 11:00-11:10 (41) *Parameter estimation for retarded functional equations in a reproducing kernel Hilbert space.* Preliminary report. STEPHEN L. BENZ*, Professor JAMES RENEKE, and Professor ROBERT FENNELL, Clemson University (782-B14)
- 11:15-11:25 (42) *On a theorem of Lê and Ramanujan.* Professor DENIS BLACKMORE, New Jersey Institute of Technology (782-B15)
- 11:30-11:40 (43) *Asymptotic behavior of the solutions of a higher order differential equation with deviating argument.* Professor JOHN R. GRAEF and Professor PAUL W. SPIKES*, Mississippi State University, and Professor MYRON K. GRAMMATIKOPOULOS, University of Ioannina, Greece (782-B16)
- 11:45-11:55 (44) *Schauder decomposition and its application.* Preliminary report. Dr. HIDEAKI KANEKO* and Dr. PETER Z. DAFFER, Louisiana Tech University (782-B17)
- 12:00-12:10 (45) *A uniqueness result concerning Prony's method for fitting linear combinations of exponentials.* Dr. JAMES C. PLEASANT*, East Tennessee State University, and JOSEPH M. GARBER, Tennessee Eastman Company, Kingsport (782-C3)

SATURDAY, 9:45 A. M.

Session on Algebra. I, Room 235

- 9:45- 9:55 (46) *The Picard group of a graded domain.* Professor DAVID F. ANDERSON, University of Tennessee, Knoxville (782-A2)
- 10:00-10:10 (47) *Power series rings over Krull domains.* Preliminary report. Dr. JIMMY T. ARNOLD, Virginia Polytechnic Institute and State University (782-A9)

- 10:15-10:25 (48) *Partitioned matrices satisfying certain null space properties.* Preliminary report. GREGERY A. JOHNSON, Auburn University (782-A14) (Introduced by Dr. Ben Fitzpatrick)
- 10:30-10:40 (49) *Ideals contracted from a Noetherian ring.* Preliminary report. Professor ROBERT GILMER*, Florida State University, and Professor WILLIAM HEINZER, Purdue University (782-A17)
- 10:45-10:55 (50) *Further results on the divisor class group of affine surfaces in A^3 over a field k of characteristic $p > 0$.* JEFFREY LANG, Purdue University (782-A20)
- 11:00-11:10 (51) *Constructing projective algebras.* Preliminary report. Professor JAMES BREWER* and Professor ANDREW KUSTIN, University of Kansas (782-A22)
- 11:15-11:25 (52) *A note on the extendability of geometric nets.* Preliminary report. EVERETT C. MOBLEY, Emory University, Atlanta (782-A24)

SATURDAY, 1:30 P. M.

Special Session on Number Theory, III, Room 225

- 1:30- 1:50 (53) *Recursion formulas for the Bernoulli numbers.* Preliminary report. Professor SAMUEL S. WAGSTAFF, Jr., University of Illinois, Urbana-Champaign (782-A3)
- 1:55- 2:15 (54) *Fibonacci numbers which are primes.* Preliminary report. Professor JOHN D. FULTON, Clemson University (782-A13)
- 2:20- 2:40 (55) *Irregular sets of integers generated by the greedy algorithm.* Preliminary report. Dr. JOSEPH L. GERVER, University of Georgia, Athens (782-A12)

SATURDAY, 1:30 P. M.

Session on Topology, Room 227

- 1:30 1:40 (56) *Embedding the free group $F(x)$ into $F(\beta x)$.* Professor TEMPLE H. FAY, University of Southern Mississippi, Professor M. RAJAGOPALAN*, University of Iowa, and Professor BARBARA V. SMITH-THOMAS, University of Alabama, Birmingham (782-G7)
- 1:45- 1:55 (57) *Various types of embeddings.* Preliminary report. C. E. AULL, Virginia Polytechnic Institute and State University (782-G4)
- 2:00- 2:10 (58) *More on a weaker form of countable dense homogeneity.* JUDY KENNEDY PHELPS, Auburn University, Auburn (782-G8)
- 2:15- 2:25 (59) *Sup-characterization of stratifiable spaces.* C. R. BORGES, University of California, Davis, and GARY GRUENHAGE*, Auburn University, Auburn (782-G9)
- 2:30- 2:40 (60) *Covering properties of strict p -spaces,* Preliminary report. Dr. S. W. DAVIS, Miami University, Oxford (782-G10)
- 2:45- 2:55 (61) *Stable homeomorphisms, Galois spaces, and related properties in homogeneous continua.* Dr. WAYNE LEWIS*, Texas Tech University, and Dr. JUDY KENNEDY PHELPS, Auburn University, Auburn (782-G12)
- 3:00- 3:10 (62) *A finitary aspect of Helly's intersection theorem.* Preliminary report. Dr. R. E. JAMISON-WALDNER, Clemson University (782-D1)

SATURDAY, 1:30 P. M.

Session on Algebra, II, Room 235

- 1:30- 1:40 (63) *Filtered complexes and exact couples.* Preliminary report. Professor H. F. KREIMER, Florida State University (782-A23)
- 1:45- 1:55 (64) *Some connections between Steiner systems and self-conjugate sets of $m.o.l.s.$* Professor TREVOR EVANS* and MARGARET A. FRANCEL, Emory University, Atlanta (782-A25)
- 2:00- 2:10 (65) *Conjugates of sets of mutually orthogonal latin squares.* MARGARET A. FRANCEL, Emory University, Atlanta (782-A26)
- 2:15- 2:25 (66) *Subgroups of simple algebras.* Dr. R. A. MOLLIN, University of Lethbridge (782-A27)
- 2:30- 2:40 (67) *Common solutions of sets of linear matrix equations and applications.* Preliminary report. Dr. J. JONES, JR.,* Air Force Institute of Technology, and Lt. MARK KRUELLE, Air Force Flight Dynamics Laboratory (782-A28)

New Orleans, Louisiana

Frank T. Birtel
Associate Secretary

SAN FRANCISCO MEETINGS, January 7-11, 1981

Second Announcement

The January 1981 Joint Mathematics Meetings, including the 87th Annual Meeting of the AMS, the 1981 annual meeting of the Association for Symbolic Logic, and the 64th annual meeting of the Mathematical Association of America, will be held January 7-11 (Wednesday-Sunday), 1981, in San Francisco, California. The meetings will be preceded by the AMS Short Course on January 5-6 (Monday-Tuesday), 1981.

The members of the Local Arrangements Committee are Donald J. Albers, Lenore Blum, William G. Chinn (chairman), Morris W. Hirsch, T. Y. Lam, William J. LeVeque (ex officio), Yiannis N. Moschovakis, Robert Osserman, Kenneth R. Rebman (publicity director), David P. Roselle (ex officio), and Kenneth A. Ross (ex officio).

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DEADLINES

Abstracts for consideration for special sessions	Expired
Abstracts, contributed papers	Expired
Employment Register	November 7
Preregistration and Housing	November 7
Preregistration cancellations (50% refund)	January 4

87TH ANNUAL MEETING OF THE AMS January 7-10, 1981

Fifty-fourth Josiah Willard Gibbs Lecture. The 1981 Gibbs Lecture will be presented at 8:30 p.m. on Wednesday, January 7, by CATHLEEN S. MORAWETZ of the Courant Institute of Mathematical Sciences. Professor Morawetz will speak on *The Mathematical approach to the sonic barrier*.

Colloquium Lectures. There will be one series of four Colloquium Lectures presented by MARK KAC of Rockefeller University. The title of the lecture series is *Some mathematical problems suggested by questions in physics*. The lectures will be given at 1:00 p.m. daily, Wednesday through Saturday, January 7-10.

Retiring Presidential Address. PETER D. LAX of the Courant Institute of Mathematical Sciences will speak at 10:45 a.m. on Thursday, January 8, on *The influence of computing on mathematics*.

1981 Oswald Veblen Prize in Geometry. The ninth award of the Veblen Prize will be made at 4:00 p.m. on Thursday, January 8.

AMS Invited Addresses

By invitation of the Program Committee, there will be eight invited one-hour addresses. The speakers, some of the titles, and the times of their talks are as follows:

SHMUEL AGMON, Hebrew University, Israel, and the University of Virginia, *How do eigenfunctions decay - some recent results*, 3:30 p.m. Friday.

GREGORY V. CHUDNOVSKY, Columbia University, *An explicit solution of classical and quantum field theory models and parallel arithmetical problems: A unified approach*, 2:15 p.m. Thursday.

R. KEITH DENNIS, Cornell University, *Stabilization in algebraic K-theory*, 2:15 p.m. Wednesday.

FEZA GÜRSEY, Yale University, *Quaternion functions and the solution of gauge field equations*, 2:15 p.m. Friday.

JAMES E. HUMPHREYS, University of Massachusetts, Amherst, *Some problems in the cohomology of algebraic groups*, 9:30 a.m. Thursday.

DENNIS SULLIVAN, University of Colorado, 10:30 a.m. Wednesday.

MASAMICHI TAKESAKI, University of California, Los Angeles, *Report on von Neumann algebras*, 2:15 p.m. Saturday.

MICHELE VERGNE, Massachusetts Institute of Technology, *Some geometrical aspects of representations of Lie groups*, 3:30 p.m. Wednesday.

Additions to First Announcement of San Francisco Meetings

The following changes have been made since the San Francisco meeting was first announced in the October Notices. These changes have not been made in the text of the announcement in this issue.

AMS Panel to Discuss the Translation of Mat. Sbornik. In conformity with a resolution of the Council of August 19, 1980, there will be a panel discussion at 4:30 p.m. on Wednesday, January 7, 1981, on questions concerning the Society's translation of Mat. Sbornik. Panel members will be Anatole Beck, Ronald G. Douglas, Mark Kac, Calvin C. Moore (moderator), and Richard S. Palais. The Council of August 22, 1979 passed a resolution deploring the discrimination against Jewish authors in Mat. Sbornik as evidenced by the very sharp decline in the number of papers by Jewish authors during the past several years. The president, at the request of the Council and then of the Trustees, has twice inquired into the situation without receiving a response. The contract for translation is a responsibility of the Trustees according to Article II, Sections 2 and 3 of the by-laws. The Trustees are aware of the Council resolution and of a recommendation by the Council that in the absence of a response the Society seek to renegotiate the contract for the purpose of dropping the translation of Mat. Sbornik. The panel discussion has been established in order to inform the members about ramifications of the problem.

AMS Invited Addresses. The title of Dennis Sullivan's talk is *Geometry of limit sets of Kleinian groups*.

AMS Special Sessions. More speakers have been added to several of the special sessions, as follows:
Graph theory. Charles M. Grinstead, Renu Laskar, and Thomas W. Tucker.

Homotopy theory. M. G. Barratt, John Harper, David Copeland Johnson, Stewart B. Priddy, Douglas C. Ravenel, Clarence W. Wilkerson, and E. Bruce Williams.

Ordered fields and real algebraic geometry. William A. Adkins.

Qualitative theory of differential equations. Calvin D. Ahlbrandt, Shair Ahmad, Walter Allegretto, Moses Boudourides, Lynn H. Erbe, John R. Graef, Grant B. Gustafson, Philip Hartman, Don B. Hinton, Alan Jeffrey, Gary D. Jones, Woo Jong Kim, Takasi Kusano, Alan C. Lazer, Sung J. Lee, Roger T. Lewis, James S. Muldowney, Allan C. Peterson, Binyamin Schwarz, Willie E. Taylor, Jr., William F. Trench, and Norio Yoshida.

Elliptic systems in the plane. A. Kadir Aziz, M. S. Baouendi, Freddy Brackx, R. Delanghe, Paul R. Garabedian, Robert P. Gilbert, Gerard N. Hile,

George Chia-Chu Hsiao, Carlos E. Kenig, Murray H. Protter, Jane M. Sloss, and François Treves.

Mathematical physics. Thomas Spencer.

The full name of J. Avron who will speak in the special session on *Mathematical Physics* is Joseph Avron.

Number theory. A. O. L. Atkin, Harvey Cohn, Jean-Marie DeKoninck, Daniel J. Madden, Kevin Snow McCurley, E. G. Straus, and Audrey A. Terras.

Topics in complex variables. Peter Jones.

Operator algebras and K-theory. Wu-Chung Hsiang.

Differential geometry and global analysis. Robert B. Gardner, Peter B. Gilkey, Samuel I. Goldberg, Howard A. Osborn, and Jaak Vilms.

The speakers in the CEEP panel discussion on *Maintaining vitality in graduate programs in the 1980s*, scheduled for 7:30 p.m. on Thursday, are: Edward A. Connors, department head at the University of Massachusetts, Amherst; Frank T. Birtel, provost at Tulane University; John W. Jewett of Oklahoma State University; and Srinivasa S. R. Varadhan, director-elect, Courant Institute of Mathematical Sciences. Donald C. Rung will serve as moderator.

The subject of the MAA Minicourse is *Topics in Data Analysis*. The Minicourse will be held from 6:30 to 9:00 p.m. on Friday, January 9, and from 7:00 to 9:30 p.m. on Saturday, January 10.

Child Care. Arrangements for child care in hotel rooms may be made by calling Childcare Switchboard at 415-282-7858 from 10:30 a.m. to 4:30 p.m., Monday through Friday, and between 5:00 p.m. and 7:30 p.m. Wednesday evening. Special arrangements must be made prior to the weekend for weekend service. If arrangements are desired to leave children during the day for child care, call the Toy Center at 415-285-7223 and ask for "Ish." Their address is 3164 24th Street.

Entertainment. If sufficient interest is shown in advance, the local chapter of the Oceanic Society will organize whale watches of grey whales migrating south. The trip will take about four hours, leaving the pier at approximately 10:00 a.m. At this time, rates are still subject to negotiation, but they are estimated to be \$40 (in any event less than \$50) per person. Included will be a preparatory briefing offered by the Oceanic Society at its headquarters in Fort Mason, the day prior to departure. Participants are urged to have on hand adequate food, warm clothing (including possibly down jackets,

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wool socks, hats, gloves, and/or boots). Also highly recommended is a good supply of seasickness pills, since rough seas may be encountered. In order that the Oceanic Society might have an estimate of the number of boats required, and of the most popular day for this outing, interested participants are requested to complete the coupon on page 598 of this issue and return it to William G. Chinn, 539 29th Avenue, San Francisco, California 94121 as soon as possible.

On Friday, January 9, the Local Arrangements Committee plans to hold a cocktail party and dance in the Continental Ballroom of the Hilton, from 9:00 p.m. to 12:30 a.m. Tickets will be approximately \$5, and should be purchased at the Transparencies section of the meetings registration desk before 4:00 p.m. on Friday.

Local Information. The following corrections apply to the travel instructions given in the October issue:

To Golden Gate Park, deYoung Museum, or Asian Art Museum: Go one block north to Geary.

Take #38 bus on Geary heading west. Get off at 8th Avenue and Fulton Street (the bus will be traveling west on Fulton), take the pedestrian underpass leading directly to the museums.

To California Palace of Legion of Honor (French paintings, Rodin sculptures): Take #38 bus on Geary heading west. Get off at 33rd Avenue. Transfer to #18 going direct to the Legion (operates Saturday and Sunday only). On weekdays when there is no shuttle service to the Legion, take the #2 bus going west on Sutter Street, get off at 34th Avenue, and walk up the hill through Lincoln Park. Admission same as deYoung Museum.

To Fisherman's Wharf and Cannery: One block east to Powell, south to Market for cable car (queue in front of Woolworth's), or catch cable car on Powell at any intersection (going north).

To Chinatown: Walk east on O'Farrell Street to Grant Avenue, turn left and follow Grant into Chinatown, four blocks north. Or, walk to Powell, board cable car, get off at California Street. Walk down the hill two blocks to Grant, or transfer to the California Street cable car.

Special Sessions

In consultation with the Program Committee, seventeen sessions of selected papers are scheduled. Sessions followed by an asterisk (*) will be restricted to Wednesday and to Thursday morning. Sessions followed by a black dot (●) will be restricted to Thursday afternoon, Friday afternoon, and Saturday afternoon.

Classification of finite simple groups (●), organized by MICHAEL ASCHBACHER of the California Institute of Technology, DAVID GOLDSCHMIDT of the University of California, Berkeley, and DANIEL GORENSTEIN of Rutgers University. A partial list of speakers is Michael Aschbacher, David Goldschmidt, Daniel Gorenstein, Robert Louis Griess, Jr., Geoffrey Mason, Gary M. Seitz, and Ronald M. Solomon.

Graph theory (●), organized by GARY CHARTRAND and ARTHUR T. WHITE of Western Michigan University. The list of known speakers is Stefan Andrus Burr, A. Keewatin Dewdney, Richard A. Duke, Vance Faber, Joseph A. Gallian, Mark Goldberg, Branko Grünbaum, Joan P. Hutchinson, Paul C. Kainen, Hudson V. E. Kronk, Linda Lesniak-Foster, Bennet Manvel, Zevi Miller, Torrence D. Parsons, Viera Krnanova Proulx, Richard Delose Ringeisen, Cecil C. Rousseau, Janet Simpson, Saul Stahl, Charles Suffel, William T. Trotter, Jr., and Curtiss E. Wall.

Homotopy theory (●), organized by FREDERICK R. COHEN of the University of Kentucky. A partial

list of speakers is Donald W. Anderson, Ralph Cohen, James P. Lin, Mark Mahowald, J. Peter May, Haynes R. Miller, Joseph Neisendorfer, Paul S. Selick, and Victor P. Snaith.

L_1 and related metric spaces (●), organized by M. DEZA and RONALD L. GRAHAM of Bell Laboratories in Murray Hill, New Jersey. The list of speakers includes R. Alexander, P. Assouad, D. Avis, Eiichi Bannai, Persi W. Diaconis, Edward R. Howorka, Ivo G. Rosenberg, W. C. Thompson, Stanislaw M. Ulam, and Hans S. Witsenhausen.

Ordered fields and real algebraic geometry (*), organized by DONALD W. DUBOIS of the University of New Mexico. The list of speakers will include Carlos Andradas, Gregory W. Brumfiel, Charles N. Delzell, Andreas W. M. Dress, Gustave A. Efrogymson, Victor Espino, Robert Gilmer, Melvin Henriksen, John R. Isbell, Jonathan L. Merzel, Joe L. Mott, Jack E. Ohm, Albrecht Pfister, Tomas Recio, Alex Rosenberg, Heinz-Werner Schulting, Niels C. Schwartz, Daniel B. Shapiro, A. Tognoli, T. M. Viswanathan, and Roger P. Ware.

Quadratic form theory (●), organized by RICHARD S. ELMAN of the University of California, Los Angeles. The list of speakers is Lawrence Berman, Ronald P. Brown, Craig M. Cordes, Thomas C. Craven, Andrew G. Earnest, Robert Fitzgerald, Alexander J. Hahn, J. S. Hsia, Bill Jacobs, Donald G. James, Jerrold L. Kleinstejn, David B. Leep, Murray Marshall, Bernard R. McDonald, Takashi Ono, Arnold K. Pizer, Paul Ponomarev, Olga Taussky-Todd, and Joseph L. Yucas.

Cryptology in Revolution: Mathematics and Models

January 5–6, 1981

The American Mathematical Society, in conjunction with its eighty-seventh annual meeting, will present a one and one-half day short course entitled *Cryptology in Revolution: Mathematics and Models* on Monday afternoon, January 5, and all day Tuesday, January 6, in the San Francisco Hilton. The program is under the direction of Richard J. Lipton of the Department of Computer Science at Princeton University.

Cryptology is rapidly changing. Ever since the invention of asymmetric cryptosystems, public cryptology has changed in fundamental ways. There now are "unbreakable" cryptosystems. Applications range from data bases to legal contracts; electronics fund transfers to the U. S. census.

Cryptology depends for its success on several areas of mathematics. It draws mostly on classic number theory and computational complexity. However, other branches such as aspects of ergodic theory, information theory, and combinatorics also play fundamental roles.

The aim of this short course is to present a survey of the nature and scope of the research in public cryptology. In addition to the basic technical ideas, there will also be a discussion of the role of public research in this area.

A basic knowledge of elementary number theory including congruences, Euler's theorem, primitive roots, factorization, greatest common divisors, etc., will be presumed. For general information about the subject of the course, participants may consult *A new kind of cipher that would take millions of years to break*, by Martin Gardner in the August 1977 issue of *Scientific American*, pages 120–124, and *Cryptology in transition* by Abraham Lempel (Department of Electrical Engineering, Technion-Israel Institute of Technology, Haifa, Israel) in *ACM Computing Surveys* (special issue on cryptology), December 1979, pages 285–303.

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, Robert J. Thompson, Hans Schneider, and William P.

Zierner. 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, Barbara L. Osofsky, and Phillip D. Straffin, Jr.

The short course is open to all who wish to participate upon payment of the registration fee. There are reduced fees for students and unemployed individuals. Please refer to the section entitled INFORMATION FOR PARTICIPANTS for details.

PROGRAM

The program will consist of six lectures of seventy-five minutes each. The names of the speakers are listed below with the titles of their lectures. Synopses of these talks may be found on pages 516 and 524 of the October 1980 issue of the *Notices*.

Monday, January 5, 2:00–4:45 p.m.

A short history of public cryptology. George Davida, Department of Electrical Engineering, University of Wisconsin, Milwaukee, and Department of Information and Computer Sciences, Georgia Institute of Technology.

Asymmetric cryptosystems. David P. Dobkin, Department of Computer Science, University of Arizona

Tuesday, January 6, 9:00 a.m.—5:00 p.m.

How safe are cryptosystems? Richard J. Lipton, Department of Electrical Engineering and Computer Science, Princeton University

How secure are data bases? David P. Dobkin.

Cryptographic protocol. Richard A. DeMillo, Department of Information and Computer Sciences, Georgia Institute of Technology.

Access control structures. Michael A. Harrison, Department of Electrical Engineering and Computer Science, University of California, Berkeley.

General discussion: What is the future of public work in cryptography?

HALMOS SYMPOSIUM AND BANQUET

Friends of Paul R. Halmos have arranged a symposium and banquet in his honor, to be held January 6, 1981 in Berkeley and San Francisco. Names of speakers are given on page 549 of the October 1980 *Notices*. Tickets for the banquet are \$22 per person; checks should be received by December 15, 1980 by Eric Nordgren, Department of Mathematics, University of New Hampshire, Durham, New Hampshire. 03824.

Qualitative theory of differential equations (*), organized by GARRET J. ETGEN of the University of Houston, and KURT KREITH of the University of California, Davis. A related "warm up" meeting is scheduled to be held at the Davis campus of the University of California prior to the San Francisco meeting.

Elliptic systems in the plane (●), organized by ROBERT P. GILBERT of the University of Delaware.

Geometric structures on manifolds (●), organized by MORRIS W. HIRSCH of the University of California, Berkeley. A partial list of speakers is David Fried, William Mark Goldman, Troels Jorgenson, Steven P. Kerckhoff, and Shoshichi Kobayashi.

Mathematical physics (*), organized by JOEL L. LEBOWITZ of Rutgers University. A partial list of speakers is Michael Aizenman, J. Avron, Jean Bricmont, Russel Caflisch, Mitchell Feigenbaum, Sheldon Goldstein, Charles M. Newman, Barry Simon, Isadore M. Singer, Leonard Susskind, and M. John Westwater.

Low dimensional topology (*), organized by S. J. LOMONACO, Jr., who is visiting at the University of Oregon, while on leave from SUNY, Albany. A partial list of speakers is Andrew Cassen, Micheal Dyer, Michael Freedman, Lee Neuwirth, Dale Rolfsen, Martin Scharlemann, and Dennis Sjerve.

Number theory (*), organized by MELVYN B. NATHANSON and DON REDMOND of Southern Illinois University, Carbondale. The list of known speakers is Tom M. Apostol, Richard T. Bumby, David V. Chudnovsky, Thomas W. Cusick, P. D. T. A. Elliott, Paul Erdős, Dorian Goldfeld, Larry J. Goldstein, Ronald L. Graham, Douglas A. Hensley, Neil B. Hindman, James G. Huard, Melvyn B. Nathanson, Don Redmond, and Sanford L. Segal.

History of contemporary mathematics (Wednesday), organized by ROY RYDEN and HANK TROPP of Humboldt State University. Fifty-minute talks will be given by Garrett Birkhoff, Felix E. Browder, Hugh L. Montgomery, Stephen Smale, Harold M. Stark, and John Todd.

History of mathematics (Thursday morning and Friday afternoon), organized by ARTHUR SCHLISSEL of the CUNY, John Jay College of Criminal Justice. A tentative list of speakers includes Paul T. Bateman, George P. Dantzig, J. Dieudonné, Lars Gårding, Herman Goldstein, Frank C. Hoppensteadt, Mark Kac, Kurt Kreith, Jerzy Neyman, Clifford A. Truesdell III, and Wolfgang R. Wasow.

Topics in complex variables (*), organized by GLENN E. SCHOBBER of Indiana University. The preliminary list of speakers includes Albert Baernstein II, James E. Brennan, Louis Brickman, David Drasin, Peter L. Duren, Carl H. FitzGerald, Wolfgang H. Fuchs, Frederick W. Gehring, Walter Hengartner, William E. Kirwan II, Boris Korenblum, Thomas H. MacGregor, Lee A. Rubel, Allen L. Shields, Stephen Smale, David A. Stegenga, Ted J. Suffridge, Stefan E. Warschawski, and Jang-Mei Gloria Wu.

Operator algebras and K-theory (*), organized by CLAUDE L. SCHOCHET of Wayne State University. A preliminary list of speakers is William B. Arveson, Paul F. Baum, Bruce E. Blackadar, Joel

Cohen, Edward George Effros, D. Handelman, Jerry Kaminker, Calvin C. Moore, H. Moscovici, William L. Paschke, Jonathan M. Rosenberg, and Norberto Salinas. There will be a problem session led by Effros.

Differential geometry and global analysis (●), organized by ALEXANDER P. STONE of the University of New Mexico.

Most of the papers to be presented at these special sessions will be by invitation; however, anyone contributing an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these sessions should indicate this clearly on the abstract and should submit it by *October 8, 1980, two weeks earlier than the normal deadline for contributed papers*, in order that it may be considered for inclusion.

Contributed Paper Sessions

There will be sessions for contributed papers Wednesday morning and afternoon, Thursday morning and afternoon, Friday afternoon, and Saturday afternoon. 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 AMS, P. O. Box 6248, Providence, Rhode Island 02940, so as to arrive by the abstract deadline of October 22, 1980. Members are reminded that a typing charge of \$7 is imposed for retyping abstracts that are not in camera-ready form. Late papers will be accepted for presentation at the meeting, but will not be listed in the printed program.

Audio-Visual Equipment

Rooms where special sessions and contributed paper sessions will be held will be equipped with an overhead projector and screen. *Blackboards will not be available.*

Committee on Employment and Educational Policy (CEEP)

A meeting of department heads is being planned for 7:30 p.m. on Thursday, January 8, which will include a panel discussion on *Maintaining vitality in graduate programs in the 1980's*. This panel discussion is being organized by Edward A. Connors of the University of Massachusetts, Amherst, and Donald C. Rung of Pennsylvania State University. The names of the panel members will be announced in the November Notices.

Council Meeting

The Council of the Society will meet at 2:00 p.m. on Tuesday, January 6, in Continental Parlors 1 and 2 at the Hilton.

Business Meeting

The Business Meeting of the Society will take place at 5:00 p.m. on Thursday, January 8, in the Continental Ballroom at the San Francisco Hilton. 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

Committee on the Agenda for Business Meetings

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

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

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

The committee consists of Everett Pitcher (chairman), Marian B. Pour-El, David A. Sanchez, Barnet M. Weinstock, and Guido L. Weiss.

In order that a motion for the Business Meeting of January 8, 1981, 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 December 5, 1980.

Everett Pitcher, Secretary

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, 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 annual meeting on January 9–11, Friday–Sunday. Sessions on Friday and Saturday, January 9–10, will be held jointly with the National Council of Teachers of Mathematics. The business meeting of the MAA will take place at 10:00 a.m. on Sunday, January 11.

The MAA is also planning a Minicourse; details will be available at a later date.

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

The Association for Symbolic Logic (ASL) will hold its 1981 annual meeting on Friday and Saturday, January 9–10.

The Association for Women in Mathematics (AWM) will sponsor a panel discussion at 11:00 a.m. on Friday, January 9. The panel will be immediately followed by the AWM Business Meeting. The second annual AWM Emmy Noether Lecture will be given by Olga Taussky-Todd at 9:00 a.m. on Friday.

The Conference Board of the Mathematical Sciences (CBMS) will sponsor a day-long symposium on "Energy research and the mathematical sciences" at 9:00 a.m. on Friday, January 9. The CBMS Council will meet on Saturday, January 10, from 9:00 a.m. to 4:00 p.m.

The Mathematicians Action Group (MAG) will sponsor a panel discussion at 7:00 p.m. on Friday,

January 9. The panel discussion will be immediately followed by the MAG Business Meeting.

OTHER EVENTS OF INTEREST

Employment Register. The Employment Register provides opportunities for mathematical scientists seeking professional employment to meet employers who have positions to be filled. Résumés prepared by both employers and applicants are posted on bulletin boards where they may be examined. Employers and applicants submit lists indicating their preferences for those they wish to interview. A computer program assigns the appointments, matching the requests to the extent possible. Interviews are scheduled at fifteen-minute intervals.

The annual Employment Register at the San Francisco meeting will be held in the Imperial Ballroom of the San Francisco Hilton Hotel on Thursday, Friday, and Saturday, January 8, 9, and 10. A short (optional) orientation session will be conducted by the AMS-MAA-SIAM Committee on Employment Opportunities at 9:00 a.m. on Thursday, January 8. The purpose of this session is to familiarize participants with the operation of the Register and with registration procedures. Registration for the Employment Register will begin at 9:30 a.m. on Thursday, and interviews will begin at 9:30 a.m. on Friday. No interviews will be scheduled for *Thursday*. Interview request forms must be turned in to the code clerk before 4:00 p.m. on Thursday and Friday for interviews to be scheduled on Friday and Saturday, respectively.

Provisions have been made for scheduling interviews in half-day modules. This allows for four half-days of interviews: Friday a.m. and p.m., and Saturday a.m. and p.m. (There will be no interviews scheduled for *Thursday*.)

On Saturday afternoon, an "employers' choice" session has been scheduled. For this session interviews will be scheduled with applicants requested by employers. Applicants do not submit interview request forms for this session. Requests for interviews must be submitted by the employers on Friday prior to the deadline of 4:00 p.m. in order to receive a schedule for Saturday afternoon.

Interview schedules will be distributed to both applicants and employers on Friday and Saturday between 8:45 a.m. and 9:00 a.m.

Applicants should be aware of the fact that interviews arranged by the Employment Register are only an initial contact with employers, and hiring decisions are not always made immediately after the interviews.

All participants in the Employment Register are required to register for the Joint Mathematics Meetings. For applicants there is no additional fee for participation in the Employment Register. There are no provisions made for posting the résumés of applicants who do not attend the Employment Register. For employers, additional fees for participating in the Employment Register are \$10 if paid at the time of preregistration, or \$15 if paid at the meeting. Employers who do not plan to attend the Employment Register but wish to display literature 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 November 7.

Lists of preregistered employers and applicants will be distributed in San Francisco free of charge to those who preregistered. Other participants may obtain copies of the printed lists at the meeting for \$1 each.

The Employment Register is sponsored by the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics.

The Society and Association also sponsor the bimonthly publication, *Employment Information in the Mathematical Sciences*, for which subscription order forms may be found in the August 1980 issue of the Notices.

Exhibits. The book and educational media exhibits will be located in the Hilton Plaza of the San Francisco Hilton from Wednesday, January 7, through Saturday, January 10. The exhibits will be open from 1:00 p.m. to 5:00 p.m. on Wednesday; from 9:00 a.m. to 5:00 p.m. on Thursday and Friday; and from 9:00 a.m. to noon on Saturday. All participants are encouraged to visit the exhibits during the meeting.

Book Sales. Books published by the AMS and MAA will be sold for cash prices somewhat below the usual prices when these same books are sold by mail. These discounts will be available only to registered participants wearing the official meeting badge. The book sales will be located in the Tower Lobby of the San Francisco Hilton, and will be open

the same days and hours as the Joint Mathematics Meetings registration desk.

National Science Foundation (NSF). NSF staff members will be available in the exhibit area to provide counsel and information on NSF programs of interest to mathematicians from 9:00 a.m. to 5:00 p.m., Thursday through Saturday, January 8–10.

William G. Rosen, head of the Mathematical Sciences Section of NSF, will give a talk on *How the Mathematical Sciences Section at the National Science Foundation Works* at 9:30 a.m. on Saturday, January 10.

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 was tested on a small scale at the Ann Arbor meeting this past August, and met with moderate success.

At the Joint Books and Journals display in the Hilton Plaza of the Hilton, 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 is 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 (as many of either per page as one wishes), and the lists made up on 8.5 inch by 11 inch pages.

Please include the information below:

Books Offered: Name, address, telephone, will or will not be at the meeting. Author, title, publisher, year of publication, condition of book (for example, slightly used, annotated lightly or heavily, like new). Price or books 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, and 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, R. I. 02940. Make checks payable to the AMS. If you have questions, call Phoebe Murdock, 401-272-9500, extension 237.

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		
MONDAY, January 5	CRYPTOLOGY IN REVOLUTION: MATHEMATICS AND MODELS	
9:00 a.m. - 4:00 p.m.	REGISTRATION	
2:00 p.m. - 3:15 p.m.	A short history of public cryptology George Davida	
3:30 p.m. - 4:45 p.m.	Asymmetric cryptosystems David P. Dobkin	
TUESDAY, January 6		
9:00 a.m. - 10:15 a.m.	How safe are cryptosystems? Richard J. Lipton	
10:30 a.m. - 11:45 a.m.	How secure are data bases? David P. Dobkin	
1:30 p.m. - 2:45 p.m.	Cryptographic protocol Richard A. DeMillo	
3:00 p.m. - 4:15 p.m.	Access control structures Michael A. Harrison	
4:15 p.m. - 5:00 p.m.	General discussion: What is the future of public work in cryptography?	
JOINT MATHEMATICS MEETINGS		
TUESDAY, January 6	American Mathematical Society	Mathematical Association of America
4:00 p.m. - 8:00 p.m.	REGISTRATION	
4:00 p.m. - 8:00 p.m.	AMS BOOK SALE	MAA BOOK SALE
2:00 p.m. - 10:00 p.m.	Council Meeting	
WEDNESDAY, January 7	AMS	MAA
8:00 a.m. - 5:00 p.m.	REGISTRATION	
8:00 a.m. - 5:00 p.m.	AMS BOOK SALE	MAA BOOK SALE
10:30 a.m. - 11:30 a.m.	INVITED ADDRESS Geometry of limit sets of Kleinian groups Dennis Sullivan	
morning	Special Sessions Sessions for Contributed Papers	
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE I Some mathematical problems suggested by questions in physics Mark Kac	
afternoon	Special Sessions Sessions for Contributed Papers	
1:00 p.m. - 5:00 p.m.	EXHIBITS	
2:15 p.m. - 3:15 p.m.	INVITED ADDRESS Stabilization in algebraic K-theory R. Keith Dennis	
3:30 p.m. - 4:30 p.m.	INVITED ADDRESS Some geometrical aspects of representations of Lie groups Michele Vergne	
4:30 p.m. - 6:00 p.m.	PANEL DISCUSSION: The Translation of Mat. Sbornik Anatole Beck Ronald G. Douglas Mark Kac Calvin C. Moore (moderator) Richard S. Palais	

**INFORMATION FOR PARTICIPANTS
REGISTRATION**

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

JOINT MATHEMATICS MEETINGS

Member of AMS, ASL, MAA, NCTM	\$42
Nonmember	65
Student/Unemployed	11

AMS SHORT COURSE

Student/Unemployed	\$10
All Other Participants	30

MAA MINICOURSE

All Participants	\$15
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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, and be prepared to show their meeting badge, if so requested.

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

Registration Dates and Locations. Registration for the AMS Short Course will begin at 9:00 a.m. on Monday, January 5. Registration for the Joint Mathematics Meetings and the MAA Minicourse will begin at 4:00 p.m. on Tuesday, January 6. The registration desks will be open during the following hours:

JOINT MATHEMATICS MEETINGS

MAA MINICOURSE

Tower Lobby, San Francisco Hilton

Tuesday, January 6	4:00 p.m. — 8:00 p.m.
Wednesday, January 7	8:00 a.m. — 5:00 p.m.
Thursday, January 8	} 8:00 a.m. — 4:00 p.m.
Friday, January 9	
Saturday, January 10	

ASSISTANCE AND INFORMATION DESK

Outside Continental Ballroom, San Francisco Hilton

Sunday, January 11	8:30 a.m. — 12:30 p.m.
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AMS SHORT COURSE

Outside Continental Parlor 6, San Francisco Hilton

Monday, January 5	9:00 a.m. — 4:00 p.m.
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Please note that the Joint Mathematics Meetings registration desk WILL NOT BE OPEN on Sunday, January 11, and the 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 outside the Continental Ballroom 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 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 and Complaints. A log for registering participants' comments or complaints about the meeting is kept at the Transparencies section of the registration desk. All participants are encouraged to use this method of helping to improve future meetings. Comments on all phases of the meeting are welcome. If a written reply is desired, participants should furnish their name and address.

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

Lost and Found. See the meeting cashier.

Mail. All mail and telegrams for persons attending the meetings should be addressed to the participant, c/o Joint Mathematics Meetings, Suite 260, San Francisco Convention & Visitors Bureau, 1390 Market Street, San Francisco, California 94102. Mail and telegrams so addressed may be picked up at the mailbox in the registration area during the hours the registration desk is open. U. S. mail not picked up will be forwarded after the meeting to the mailing address given on the participant's registration record.

Local Information. This section of the desk will be staffed by members of the Local Arrangements Committee and other volunteers from the San Francisco mathematical community.

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

TIMETABLE

WEDNESDAY, January 7	American Mathematical Society	Mathematical Association of America
8:30 p.m. - 9:30 p.m.	JOSIAH WILLARD GIBBS LECTURE The mathematical approach to the sonic barrier Cathleen S. Morawetz	
THURSDAY, January 8	AMS	MAA
8:00 a.m. - 4:00 p.m.		REGISTRATION
8:00 a.m. - 4:00 p.m. morning	AMS BOOK SALE Special Sessions Sessions for Contributed Papers	MAA BOOK SALE
9:00 a.m. - 9:30 a.m.	EMPLOYMENT REGISTER	ORIENTATION SESSION
9:00 a.m. - 4:00 p.m.		MAA - Board of Governors Meeting
9:00 a.m. - 5:00 p.m.		EXHIBITS
9:30 a.m. - 10:30 a.m.	INVITED ADDRESS Some problems in the cohomology of algebraic groups James E. Humphreys	
9:30 a.m. - 4:00 p.m.	EMPLOYMENT REGISTER REGISTRATION	
10:45 a.m. - 11:45 a.m. afternoon	RETIRING PRESIDENTIAL ADDRESS The influence of computing on mathematics Peter D. Lax Special Sessions Sessions for Contributed Papers	
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE II Some mathematical problems suggested by questions in physics Mark Kac	
2:15 p.m. - 3:15 p.m.	INVITED ADDRESS An explicit solution of classical and quantum field theory models and parallel arithmetical problems: A unified approach Gregory V. Chudnovsky	
4:00 p.m. - 5:00 p.m.	PRIZE SESSION	
5:00 p.m. - 6:00 p.m.	BUSINESS MEETING	
7:00 p.m. - 10:00 p.m.		MAA - Film Program
7:30 p.m. - 9:30 p.m.	Committee on Employment and Educational Policy - Meeting of Department Heads: Maintaining vitality in graduate programs in the 1980's	
FRIDAY, January 9	AMS	Other Organizations
8:00 a.m. - 4:00 p.m.		REGISTRATION
8:00 a.m. - 4:00 p.m.	AMS BOOK SALE	MAA BOOK SALE
9:00 a.m. - 10:35 a.m.		Association for Symbolic Logic Contributed Paper Session
9:00 a.m. - 5:00 p.m.		EXHIBITS
9:00 a.m. - 10:00 a.m.		Association for Women in Mathematics Emmy Noether Lecture Olga Taussky-Todd
9:00 a.m. - 11:50 a.m.		MAA and National Council of Teachers of Mathematics - JOINT SESSIONS
9:00 a.m.		INVITED ADDRESS The differing ideals of Dedekind and Kronecker Harold Edwards
10:00 a.m.		INVITED ADDRESS Agenda for action: Progress and problems Max A. Sobel, President NCTM

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 January 6 through January 10, 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 appear in the January issue of the **Notices**.

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.

HOTEL ACCOMODATIONS

The rates listed below are subject to a 9.75 percent city hotel tax. All hotels listed are in San Francisco, the number after the name of the hotel is the number it carries on the map.

Participants should be aware that triple and quad rooms in the Hilton contain two double beds only. In all cases "single" refers to one person in one bed; "double" refers to two persons in one bed; "twin" refers to two persons in two single beds; and "twin double" refers to two persons in two double beds. A rollaway cot for an extra person can be added to double or twin rooms only.

The San Francisco Hilton and Tower (5)

Headquarters Hotel
333 O'Farrell Street 94102
Telephone: 415-771-1400

Singles — main building	\$48, \$58, \$68
Singles — tower	\$68, \$78, \$88, \$98
Doubles — main building	\$63, \$73, \$83
Doubles — tower	\$83, \$93, \$103, \$113
Twins — main building	\$63, \$73, \$83
Twins — tower	\$83, \$93, \$103, \$113
Double doubles — main building	\$63, \$73, \$83
Double doubles — tower	\$83, \$93, \$103, \$113
Triples — main building	\$78, \$88, \$98
Triples — tower	\$98, \$108, \$118, \$128
Quads — main building	\$93, \$103, \$113
Quads — tower	\$113, \$123, \$133, \$143
Suites — main building	\$176 — \$296
Suites — tower	\$190 — \$323

Bellevue Hotel (1)

505 Geary Street and Taylor 94102
Telephone: 415-474-3600

Singles	\$50, \$55, \$60, \$65
Doubles	\$60, \$65, \$70, \$75
Twins	\$60, \$65, \$70, \$75
Triples	\$70, \$75, \$80, \$85
Suites	\$90 — \$150

Commodore Hotel (2)

825 Sutter Street at Jones 94109
Telephone: 415-885-2464

Singles	\$36, \$40	Twins	\$44, \$48
Doubles	\$40, \$44	Triples	\$48, \$52, \$56
		Quads	\$48, \$52, \$60

El Cortez Hotel (3)

550 Geary Street 94102
Telephone: 415-775-5000

Singles	\$34	Triples	\$48, \$50
Doubles	\$40	Quads	\$55
Twins	\$42		

Handlery Motor Inn (4)

260 O'Farrell Street 94102
Telephone: 415-986-2526

Singles	\$50, \$52, \$54, \$56, \$58, \$60, \$62, \$64, \$65
Doubles	\$60, \$62, \$64, \$66, \$68, \$70, \$72, \$74, \$75
Twins	\$60, \$62, \$64, \$66, \$68, \$70, \$72, \$74, \$75
Twin Doubles	\$60, \$62, \$64, \$66, \$68, \$70, \$72, \$74, \$75
Triples	\$70, \$72, \$74, \$76, \$78, \$80, \$82, \$84, \$85
Quads	\$80, \$82, \$84, \$86, \$88, \$90, \$92, \$94, \$95
Suites	\$100 — \$200

Holiday Inn — Union Square (6)

480 Sutter Street at Powell 94108
Telephone: 415-398-8900

Singles	\$55	Triples	\$75
Doubles	\$70	Quads	\$80
Twin Doubles	\$70	Suites	\$85 — \$450

Hotel Yerba Buena (11)

55 Fifth Street 94103
Telephone: 415-543-3130

NB: Special rate and accommodation for students only

Single \$16; Twin \$22 (Bathroom down the hall)

Manx Hotel (7)

225 Powell Street at Union Square 94102
Telephone: 415-421-7070

Singles	\$38, \$39, \$40, \$41, \$42, \$43, \$44
Doubles	\$42, \$43, \$44, \$45, \$46
Twins	\$44, \$45, \$46, \$47, \$48
Triples	\$47, \$48, \$49, \$50, \$51, \$52, \$53
Quads	\$54, \$55, \$56, \$57, \$58

Sir Francis Drake Hotel (8)

450 Powell Street at Sutter 94101
Telephone: 415-392-7755

Singles	\$49, \$69, \$79
Doubles	\$59, \$79, \$89
Twins	\$59, \$79, \$89
Triples	\$71, \$91, \$101
Suites	\$175 — \$215

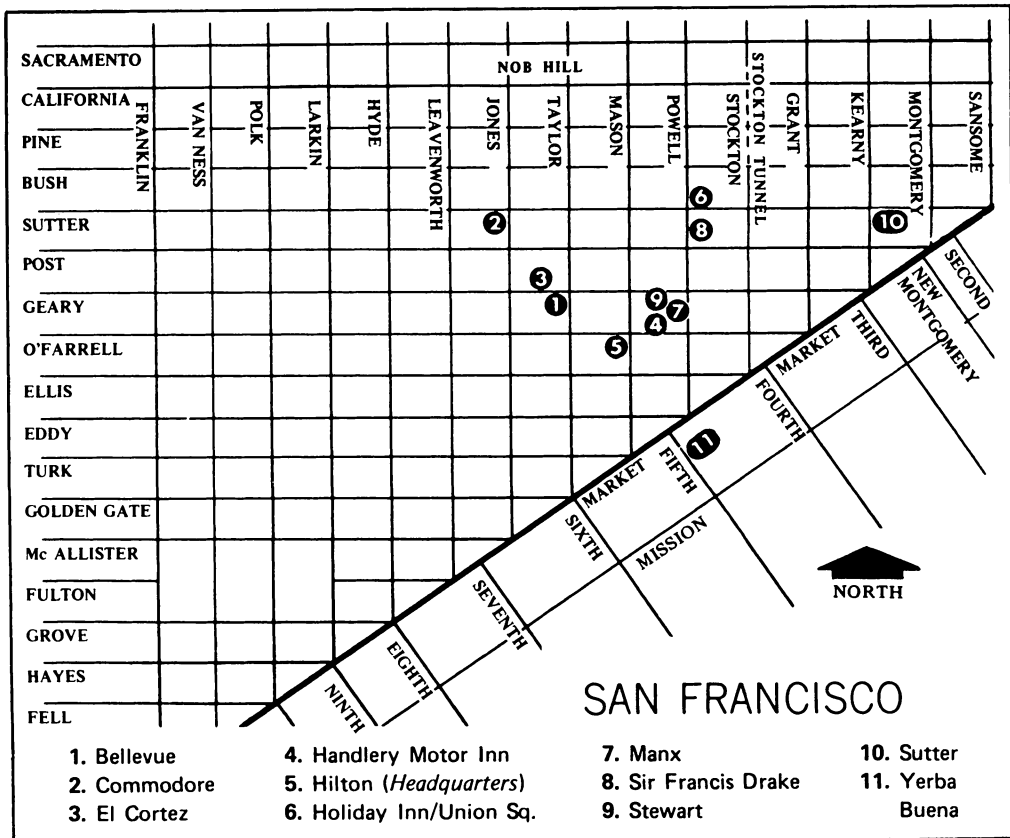
Stewart Hotel (9)

351 Geary Street 94102
Telephone: 415-781-7800

Singles	\$37, \$39, \$41, \$43, \$45, \$47, \$49, \$51, \$53
Doubles	\$43, \$45, \$47, \$49, \$51, \$53, \$55, \$57, \$59, \$61
Twins	\$45, \$47, \$49, \$51, \$53, \$55, \$57, \$59, \$61, \$63
Triples	\$59, \$61, \$63, \$65, \$67, \$69, \$71
Quads	\$67, \$69, \$71, \$73, \$75, \$77, \$79
Suites	\$60 — \$100

TIMETABLE

FRIDAY, January 9	American Mathematical Society	Other Organizations
11:00 a.m.		INVITED ADDRESS Contact measures in integral geometry William J. Firey
9:00 a.m. - 5:00 p.m.		Conference Board of the Mathematical Sciences - Symposium on Energy Research and the Mathematical Sciences
9:30 a.m. - 5:30 p.m.		EMPLOYMENT REGISTER INTERVIEWS
10:45 a.m. - 11:45 a.m.		ASL - Invited Lecture The degrees of unsolvability: Global results Richard A. Shore
11:00 a.m. - 12:30 p.m.		AWM - Panel Discussion and Business Meeting
noon - 12:50 p.m.		MAA - Invited Address Applications from UMAP Ross Finney
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE III Some mathematical problems suggested by questions in physics Mark Kac	
afternoon	Special Sessions Sessions for Contributed Papers	
2:00 p.m. - 4:00 p.m.		Rocky Mountain Mathematics Consortium Board of Directors Meeting
2:15 p.m. - 3:15 p.m.	INVITED ADDRESS Quaternion functions and the solution of gauge field equations Feza Gürsey	ASL - Invited Lecture Borel sets in products of Polish spaces A. Louveau
3:30 p.m. - 4:30 p.m.	INVITED ADDRESS How do eigenfunctions decay—some recent results Shmuel Agmon	
3:30 p.m. - 5:30 p.m.		ASL - Contributed Paper Sessions
6:30 p.m. - 9:00 p.m.		MAA - Minicourse Topics in data analysis
7:00 p.m. - 9:30 p.m.		Mathematicians Action Group Panel Discussion and Business Meeting
8:00 p.m.		ASL - Council Meeting
9:00 p.m. - 12:30 a.m.		COCKTAIL PARTY/DANCE
SATURDAY, January 10	AMS	Other Organizations
8:00 a.m. - 4:00 p.m.		REGISTRATION
8:00 a.m. - 4:00 p.m.	AMS BOOK SALE	MAA BOOK SALE
9:00 a.m. - noon		EXHIBITS
9:00 a.m. - 4:00 p.m.		CBMS - Council Meeting
9:15 a.m. - 10:45 a.m.		MAA and NCTM - JOINT SESSION Panel Discussion: Gifted students Local programs for gifted high school students Jean J. Pederson (moderator) Student science training projects Edmund J. Deaton Problem competitions Lyle Fisher Project MEGSSS (Mathematics education for gifted secondary school students) Joel Schneider General Discussion
9:30 a.m. - 10:30 a.m.		How the Mathematical Sciences Section at the National Science Foundation Works William G. Rosen
9:30 a.m. - 5:30 p.m.		EMPLOYMENT REGISTER INTERVIEWS
9:35 a.m. - 10:35 a.m.		ASL - Invited Lecture Some applications of Radin forcing H. Woodin



Sutter Hotel (10)

191 Sutter Street 94104
 Telephone: 415-781-3060

Single	\$42	Twin	\$48
Double	\$48	Triple	\$56

MISCELLANEOUS INFORMATION

Child Care. Members who require childcare service can call the Childcare Switchboard at 415-282-7858. These sitters will sit in hotel rooms with children. Those requiring a daycare type of facility for drop-ins can call the Toy Center at 415-285-7223 and ask for "Ish."

Entertainment. The Local Arrangements Committee is planning a cocktail party and dance for Friday evening, January 9. Further details will be available at a later date.

Local Information. Many of San Francisco's attractions are easy to reach from the Hilton; directions are given below. From these focal points, one might be able to strike out to other points along the route by referring to local maps.

To Golden Gate Park, deYoung Museum, or Asian Art Museum: Go one block north to Geary. Take #38 bus on Geary heading west. (Ask for transfer on boarding.) Transfer to #10 bus on Tenth Avenue heading south (board bus on northwest corner); bus stops in front of deYoung Museum.

(Adults \$1.50, youths age 17 or under \$1, seniors age 65 and over 50 cents, children age 5 or under free.)

To Academy of Sciences and Morrison Planetarium in Golden Gate Park: Use same directions as above.

To California Palace of Legion of Honor (French paintings, Rodin sculptures): Take #38 bus on Geary heading west. Get off at 33rd Avenue. Walk one block north to Clement; long path up to Legion of Honor. Admission same as deYoung Museum.

To Bay Area Rapid Transit (BART) to Berkeley, Oakland, etc.: One block east to Powell; continue south to Market Street, down Hallidie Plaza to BART.

To Fisherman's Wharf and Cannery: One block east to Powell, south to Market for cable car (queue in front of Woolworth's).

To Ghirardelli Square: One block north to Geary. Take #38 bus heading west. Transfer at Geary and Polk on #19 heading north. Get off at Polk and North Point Street in front of Ghirardelli Square.

To Pier 39: Follow directions for Ghirardelli Square, but continue to end of line.

To Chinatown: One block east to Powell; south to Market Street for cable car; transfer on Clay Street downhill.

Parking. Free indoor parking is provided by the Hilton for guests occupying rooms on the fifth through eleventh floors. Participants should check the appropriate box on the housing form if free parking is desired. Participants not staying in the

TIMETABLE

SATURDAY, January 10	American Mathematical Society	Other Organizations
10:45 a.m. - 11:45 a.m.		ASL - Invited Lecture Profinite model theory Angus McIntyre
11:00 a.m. - 11:50 a.m.		MAA and NCTM - JOINT SESSION INVITED ADDRESS The new Soviet challenge in mathematics and science education and manpower training Izaak Wirszup
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURE IV Some mathematical problems suggested by questions in physics Mark Kac	
afternoon	Special Sessions Sessions for Contributed Papers	
2:15 p.m. - 3:15 p.m.	INVITED ADDRESS Report on von Neumann algebras Masamichi Takesaki	ASL - Invited Lecture Spaces satisfying the Baire category theorem Kenneth Kunen
3:30 p.m. - 5:30 p.m.		ASL - Contributed Paper Sessions
7:00 p.m. - 9:30 p.m.		MAA - Minicourse Topics in data analysis
7:00 p.m. - 10:00 p.m.		MAA - Film Program
SUNDAY, January 11		MAA
8:30 a.m. - 12:30 p.m.	ASSISTANCE AND INFORMATION DESK	
9:00 a.m. - 9:50 a.m.		MAA - INVITED ADDRESS Curvature Robert Osserman
10:00 a.m. - 10:50 a.m.		MAA - BUSINESS MEETING
11:00 a.m. - 11:50 a.m.		MAA - INVITED ADDRESS Patterns of problem solving Moshe F. Rubinstein
afternoon		MAA - SESSION What is complexity?

Hilton will find several public parking garages in the area. The closest is the one beneath the Hilton, where the present rate is \$6.25 per day.

Travel. In January, San Francisco is on Pacific Standard Time. There is regular airline service to San Francisco International Airport by several major airline carriers.

Participants should be aware that there are many special air fares available to San Francisco which are less expensive than the ordinary economy class fares. Most require that one make reservations and pay for the ticket at least 30 days in advance, but these fares apply to a limited number of seats on each aircraft only. These special fare seats go on a first-come, first-served basis, and so participants should make their reservations and purchase their tickets as early as possible.

San Francisco International Airport is approximately 15 miles from the city center, and the trip takes between 30 and 45 minutes. The airport bus presently costs \$2.55, and stops at the downtown terminal just across the street from the Hilton. Taxi

fare into the city is considerably higher — approximately \$20. All major car rental agencies have desks at the airport.

The main railroad depot in Oakland is served by Amtrak. Shuttle busses transport passengers between the depot in Oakland and the Trans-Bay Terminal at First and Mission Streets in San Francisco.

San Francisco can be reached by auto on I-80 from the east; on I-5, US-101, and US-99 from the north and south.

Weather. During the month of January, San Francisco's average maximum temperature is 55F. and the minimum is 45F. There is a likelihood of encountering some rain, so that rain coats, umbrellas, and rubbers or overshoes may prove useful. For clothing, medium weight wool suits or dresses are recommended.

Kenneth A. Ross
Associate Secretary

Mathematics Department
Room 121 - 1984 Mathematics Road
University of British Columbia
Vancouver, B. C., CANADA V6T 1Y4

1981 SYMPOSIUM

Some Mathematical Questions in Biology

Toronto, Ontario, Canada, January 8, 1981

The fifteenth annual symposium on Some Mathematical Questions in Biology will be held on January 8, 1981, in the Quebec Room of the Royal York Hotel, Toronto, Ontario, Canada, in conjunction with the annual meeting of the American Association for the Advancement of Science. It will be cosponsored by the American Mathematical Society, the Society for Industrial and Applied Mathematics, and Section A of the American Association for the Advancement of Science. Details regarding registration and local arrangements were announced in the 12 September 1980 issue of *Science*.

The program is being arranged by an organizing committee, whose members are Stephen Childress (chairman), Jack D. Cowan, F. C. Hoppensteadt, Joseph B. Keller, Donald Ludwig, Robert M. May, George F. Oster, Charles S. Peskin, and Sol I. Rubinow.

There will be two half-day sessions, each including three one-hour speakers. The focus of the symposium will be on several areas of biomechanics as well as mathematical models arising in developmental biology.

PROGRAM

Chairman: STEPHEN CHILDRESS, Courant Institute of Mathematical Sciences, New York University

9:00 a.m. *Some mathematical questions in biology.*

Presiding: JEROME K. PERCUS, Courant Institute of Mathematical Sciences, New York

The generation of spatial sequences of structures during development of higher organisms.

HANS MEINHARDT, Max-Planck-Institut für Virusforschung, Durchwahl, Germany

Control of ovulation number in a model of ovarian follicular maturation. H. MICHAEL

LACKER, Courant Institute of Mathematical Sciences and New York University Medical School, New York

Modeling of cell and tissue movements in the developing embryo. STEPHEN CHILDRESS,

Courant Institute of Mathematical Sciences, New York

1:30 p.m. *Some mathematical questions in biology.*

Presiding: JEROME K. PERCUS

Feeding currents and particle capture by copepods. MIMI KOEHL, University of California, Berkeley

Particle motion through pores and near boundaries in biological flows. SHELDON WEINBAUM, The City College of the City University of New York

Human locomotion utilizing a computer analysis of various model linkages. SIMON MOCHON, Massachusetts Institute of Technology

JANUARY 1981 SAN FRANCISCO MEETINGS WHALE WATCH

To: William G. Chinn

(See "Entertainment," page 585 for further details.)

539-29th Avenue

San Francisco, California 94121

YES, I am interested in the Whale Watch! Number of persons in my party: _____

Day of week preferred (please give first, second, and third choices):

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

1/5

1/6

1/7

1/8

1/9

1/10

Name: _____

Notre Dame, March 20–21, 1981, University of Notre Dame

First Announcement of the 784th Meeting

The seven hundred eighty-fourth meeting of the American Mathematical Society will be held at the University of Notre Dame, Notre Dame, Indiana on March 20–21, 1981. Notre Dame is located less than 100 miles east of Chicago on the Indiana Toll Road. All sessions of the meeting will be held in the Notre Dame Center for Continuing Education.

Invited Addresses. By invitation of the 1980 Committee to Select Hour Speakers for Western Sectional Meetings, there will be four invited one-hour addresses. The speakers, times, and titles of their talks are as follows:

DANIEL M. BURNS, JR., University of Michigan, Ann Arbor, 11:00 a.m. Friday; *Interplay of geometry and analysis in the study of the complex Monge-Ampère equation.*

HAROLD G. DIAMOND, University of Illinois at Urbana-Champaign, 1:45 p.m. Friday; title to be announced.

PHILIP C. KUTZKO, University of Iowa, 11:00 a.m. Saturday; *Super-cuspidal representations as induced representations; some history and applications.*

ROBERT J. ZIMMER, University of Chicago, 1:45 p.m. Saturday; *Ergodic theory and geometry of leaves of foliations.*

All four hour talks will be held in the Auditorium of the Notre Dame Center for Continuing Education.

Special Sessions. By invitation of the same committee, there will be four sessions of selected twenty-

minute papers. The topics of these special sessions and the names of their organizers are:

Analytic number theory, KRISHNASWAMI ALLADI, University of Michigan, Ann Arbor.

Algebraic topology, WILLIAM G. DWYER, University of Notre Dame.

Harmonic analysis on semi-simple Lie groups, PAUL J. SALLY, JR., University of Chicago.

Several complex variables, WILHELM F. STOLL, University of Notre Dame.

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 December 29, 1980, three weeks before the normal deadline for contributed papers.

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 abstract deadline of January 19, 1981.

Detailed information concerning travel, accommodations, and registration will be published in the January issue of the *Notices*. Housing will be available at the Morris Inn, which is located across the street from the Center for Continuing Education.

Ann Arbor, Michigan

Paul T. Bateman
Associate Secretary

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.

January 1981 Meeting in San Francisco

Deadline: Expired

Michael Aschbacher, David Goldschmidt and Daniel Gorenstein

Classification of finite simple groups

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

Ordered fields and real algebraic geometry

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

Morris W. Hirsch

Geometric structures on manifolds

Joel L. Lebowitz

Mathematical physics

S. J. Lomonaco, Jr.

Low dimensional topology

Melvyn B. Nathanson and Don Redmond

Number theory

Roy Ryden and Hank Tropp

History of contemporary mathematics

Arthur Schlissel

History of mathematics

Glenn E. Schober

Topics in complex variables

Claude A. Schochet

Operator algebras and K-theory

Alexander P. Stone

Differential geometry and global analysis

March 1981 Meeting at Notre Dame, Indiana

Deadline: December 29

Krishnaswami Alladi

Analytic number theory

William G. Dwyer

Algebraic topology

Paul J. Sally, Jr.

Harmonic analysis on semisimple Lie groups

Wilhelm F. Stoll

Several complex variables

Invited Speakers at AMS Meetings

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

San Francisco, California, January 1981

Shmuel Agmon

Gregory V. Chudnovsky

Roger Keith Dennis

Feza Gürsey

James E. Humphreys

Mark Kac

(Colloquium Lectures)

Peter D. Lax (Retiring
Presidential Address)

Cathleen S. Morawetz
(Gibbs Lecture)

Dennis Sullivan

Masamichi Takesaki

Michele Vergne

Notre Dame, Indiana, March 1981

Daniel M. Burns, Jr.

Harold G. Diamond

Philip C. Kutzko

Robert J. Zimmer

1981 SUMMER SEMINAR IN APPLIED MATHEMATICS Fluid-Dynamical Problems in Astrophysics and Geophysics

June 29–July 11, 1981

The thirteenth AMS-SIAM Summer Seminar in Applied Mathematics will be held June 29–July 11, 1981. The location of the seminar has not been determined yet; it will be announced in the next issue of the *Notices*. The seminar will be sponsored jointly by the American Mathematical Society and the Society for Industrial and Applied Mathematics, and it is anticipated that it will be supported by a grant from a federal agency. The topic *Fluid-Dynamical Problems in Astrophysics and Geophysics* was selected by the AMS-SIAM Committee on Applied Mathematics whose members are Roger Brockett, John Dennis, Frank C. Hoppensteadt (chairman), Norman Lebovitz, and Sanjoy K. Mitter. The members of the organizing committee are Victor Barcilon, University of Chicago; Richard DiPrima, Rensselaer Polytechnic Institute; Peter Goldreich, California Institute of Technology; Norman Lebovitz (chairman), University of Chicago; Joseph Pedlosky, Woods Hole Oceanographic Institute; and Alar Toomre, Massachusetts Institute of Technology.

The seminar will focus on fluid-dynamical problems that are relevant to a scientific understanding of

physical phenomena taking place in the contexts of stars, planets, oceans, and atmospheres, and with mathematical techniques and analysis appropriate to these problems. The format of the seminar purposely mixes together scientists applying certain areas of mathematics with mathematicians expert in those areas.

Individuals may apply for admission to the seminar. Application blanks for admission and/or financial assistance can be obtained from the Meeting Arrangements Department, American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940. The application deadline is March 15, 1981. An applicant will be asked to indicate his or her scientific background and interest, and should have completed at least one year of graduate school. A graduate student's application must be accompanied by a letter from his or her faculty advisor concerning his or her ability and promise. Those who wish to apply for a grant-in-aid should so indicate; however, funds available to the seminar are limited and so individuals who can obtain support from other sources should do so.

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.

227. Christopher C. White (Department of Mathematics, Castleton State College, Castleton, VT 05735). Is anything known on the question raised twenty years ago in Hoffman and Singer's 1960 Acta paper *Maximal algebras of continuous functions* (Acta Mathematica 103 (1960), 217–241, especially page 222): Let X be a compact set in the complex plane with these properties: (i) X has no interior, (ii) X does not separate the plane, (iii) X is not connected, (iv) X has positive Lebesgue measure at each of its points. Let A_X be the algebra of all continuous functions on the Riemann sphere S which are analytic on $S - X$. Is A_X a maximal subalgebra of $C(X)$?

228. Doug Widin and Arnold Feldman (Department of Mathematics and Astronomy, Franklin and Marshall College, Lancaster, PA 17604). We are interested in references to properties and interpretations of trinary multiplications of 3-dimensional arrays. For example, let (X_{ijk}) represent an s by s by s array whose i, j, k entry is X_{ijk} . Then if $A = (A_{ijk})$, $B = (B_{ijk})$, and $C = (C_{ijk})$, define the product $ABC = (\sum_{1 \leq l, m, n \leq s} A_{ilm} B_{mjn} C_{nlk})$. This multiplication has some interesting properties: (1) Let $I = (D_{ijk})$ where

$D_{ijk} = 1$ if $i = j = k$ and $D_{ijk} = 0$ otherwise. Then $III = I$, but it is not true that $IBI = B$ for all arrays B . (2) Let $J = (E_{ijk})$, where $E_{ijk} = 1/\sqrt{s}$ if $i = k$ and $E_{ijk} = 0$ otherwise. Then $JBJ = B$, but $AJJ \neq A$ and $JJC \neq C$. Clearly this multiplication is not a satisfactory analog to the multiplication of matrices corresponding to composition of linear mappings. Do there exist useful trinary multiplications of 3-dimensional arrays analogous to the standard binary multiplication of matrices?

229. Nicholas Tzanakis (8, Solomou Str., Iraklion, Crete). I have proved by elementary means the following: THEOREM. Let us say that a nonempty set A is a " c_k -set" if it is a subset of R^k and both A and $R^k - A$ are convex sets. Then (i) A is a c_1 -set iff A is either a line or an open or closed half-line; (ii) A is a c_2 -set iff A is either a plane, or $A = P \cup C$, where P is an open half-plane and C is a subset of the boundary of P , which is either the empty set or a c_1 -set; (iii) A is a c_3 -set iff A is either the whole three-dimensional space, or $A = P \cup C$, where P is an open half-space and C is a subset of the boundary of P , which is either the empty set or a c_2 -set. Is this theorem found anywhere in the literature?

SELECTED TABLES IN MATHEMATICAL STATISTICS

THE DISTRIBUTION OF THE SIZE OF THE MAXIMUM CLUSTER OF POINTS ON A LINE

by Norman D. Neff and Joseph I. Naus

Researchers in many fields deal with the clustering of events in time and space. The probabilities of large clusters under various models are tools of the natural, physical and social sciences. The present book provides probabilities for the size of the largest cluster of random points on the line. Tables of exact values and functional forms are given. A wide variety of applications is given.

Those who will benefit from this volume are researchers who seek to investigate unusual clustering. These include quality control experts investigating

clusters of defectives, communications engineers who design system capacity to accommodate clusters, and experts in epidemiology, traffic control, ecology and many other fields who study the clustering of events in time and space. Just as experts in these and other fields use the binomial, Poisson, negative binomial and other distributions, the present tables are an important addition to statistical, technical and scientific libraries.

Volume 6, vii + 207 pages (hard cover)
List price \$12.80, institutional member \$9.60,
individual member \$6.40
ISBN 0-8218-1906-2; LC 74-6283
Publication date: June 1980
To order, please specify TABLES/6 N

Prepayment is required for all American Mathematical Society publications.

Send for the book(s) above to: AMS, P.O. Box 1571, Annex Station, Providence, RI 02901.

First Report

The following pages contain a first report on the 1980 AMS Survey. Included in this report are data on faculty members in four-year colleges and universities, a report on the 1980 survey of new doctorates, a report on the 1980 nonacademic salary survey, and a list of names and thesis titles of members of the 1979-1980 Ph.D. class.

The Annual AMS Survey is conducted in two parts. Questionnaires were distributed in May to all departments in the mathematical sciences in colleges and universities in the United States and Canada, and later to the recipients of doctoral degrees granted by these departments between July 1979 and June 1980, inclusive. This report is based on the information collected from these questionnaires. A second round of questionnaires was distributed in Septem-

ber; these are concerned with data on fall enrollments, class size, teaching loads and faculty mobility. These data will be reported in the February or April 1981 issue of the **Notices**.

This Survey is the twenty-fourth in an annual series begun in 1957 by the Society's Committee on the Economic Status of Teachers. The present Survey is under the direction of the Committee on Employment and Educational Policy (CEEP), whose members are Lida K. Barrett (chairman), Arthur P. Mattuck, Donald C. Rung, Hans Schneider, Robert J. Thompson and William P. Ziemer. The questionnaires were devised by CEEP's Data Subcommittee consisting of Lida K. Barrett, Lincoln K. Durst, Wendell H. Fleming, Arthur P. Mattuck, and Donald C. Rung (chairman).

Faculty Salaries, Tenure, Women

The questionnaires sent to departments in the mathematical sciences asked for information on salaries and tenure. Departments submitted a minimum, median, and maximum salary figure for each of four academic ranks, for staff members both with and without doctorates. Annual salaries of full-time faculty members for the academic year of 9 or 10 months were sought. The 1980 questionnaire requested information for both the years 1979-1980 and 1980-1981. The sample in this survey is thus the same for both years and is different from the sample used in the Twenty-Third Salary Survey in 1979. In the salary tables on the following pages the numbers in parentheses give the range of the middle fifty percent of salaries reported. The figures outside the parentheses represent the minimum and maximum salary listed by any reporting institution. In some categories relatively few departments reported and, because significant figures were not available, salaries are not listed.

The information reported this year on the number of faculty members is based on returns from 867 departments in the mathematical sciences, 164 of which did not contain usable salary information.

For these reports, the departments are divided

into groups according to the highest degree offered in the mathematical sciences. The doctorate-granting departments are in six groups as follows:

Group I and **Group II** include the leading departments of mathematics in the U.S. according to the findings of the American Council on Education in 1969*, in which departments were ranked according to the quality of their graduate faculty.

Group I is composed of the 27 departments ranked highest.

Group II is made up of the other 38 leading departments listed in that report.

Group III contains all other U.S. departments of mathematics.

Group IV includes U.S. departments of statistics, biostatistics and biometrics.

Group V includes all other U.S. departments in the mathematical sciences.

Group VI consists of all doctorate-granting departments in the mathematical sciences in Canadian universities.

Although Canadian doctorate-granting departments are grouped separately, those granting bachelor and master degrees are included with U.S. departments, as in previous reports.

*The findings were published in *A Rating of Graduate Programs* by Kenneth D. Roose and Charles J. Andersen, American Council on Education, Washington, D.C., 1969, 115 pp. The information on mathematics was reprinted in the February 1971 issue of the *Notices*, pages 338-340.

TABLE 1: TOTAL FACULTY REPORTED FOR FOUR-YEAR COLLEGES AND UNIVERSITIES

	1979—1980				1980—1981			
	FACULTY		WOMEN		FACULTY		WOMEN	
	Total	With Tenure	Total	With Tenure	Total	With Tenure	Total	With Tenure
WITHOUT DOCTORATE								
Instructor/Lecturer	654	86	315	42	643	84	312	36
Assistant Professor	675	525	160	124	634	492	149	113
Associate Professor	559	529	73	69	560	532	75	70
Professor	<u>153</u>	<u>151</u>	<u>14</u>	<u>14</u>	<u>163</u>	<u>161</u>	<u>14</u>	<u>14</u>
	2041	1291	562	249	2000	1269	550	233
WITH DOCTORATE								
Instructor/Lecturer	254	8	43	1	220	8	41	0
Assistant Professor	2193	311	273	34	2178	291	287	33
Associate Professor	3025	2779	182	159	3034	2762	200	176
Professor	<u>3583</u>	<u>3523</u>	<u>150</u>	<u>148</u>	<u>3693</u>	<u>3639</u>	<u>154</u>	<u>152</u>
	9055	6621	648	342	9125	6700	682	361

NUMBER OF FACULTY MEMBERS REPORTED

The figures in Table 1 for the number of faculty members with doctorates, and among them those with tenure, show relative increases this year less than half as large as those reported last year. For women, however, the percentage increases in both these categories are larger than last year's; of the tenured doctorate-holding faculty members reported, the number of women now exceeds 5% of the total and is increasing more rapidly than the size of the group as a whole.

The figures in Table 2 break out tenure percentages for several groups of departments. These figures are comparable to last year's figures (October Notices, page 383) which indicated a sharp drop in the growth of tenure percentages compared to prior years.

TABLE 2: PERCENT OF DOCTORATE FACULTY WITH TENURE

	Fall 1979	Fall 1980
Groups I, II, III	74.1%	76.3%
Groups IV, V	64.7%	64.0%
Group VI	89.2%	89.8%
Masters and Bachelors	72.9%	71.7%

Response Rates. Response rates among the various classes of departments vary widely, thus

making it difficult to draw firm conclusions about the sizes of the faculty groups studied. Because the questionnaires request data for two years in a row, however, it is possible to estimate relative changes from one year to the next with somewhat more confidence. This year's response rates are given in Table 3. As in past years, the greatest rates of response are in Groups I, II, and III, which have a combined response rate of 77%. For these departments an independent count (cf. February 1980 Notices, page 173, Table 3) indicates that the number of faculty members reported constitutes just under 76% of the total. Corresponding counts are not available this year for the other groups.

TABLE 3: RESPONSE RATES

<i>U. S. Departments</i>								
Group	I	II	III	IV	V	M	B	
% Response	74	82	76	57	37	51	44	
<i>Canadian Departments</i>								
Group	VI	M	B					
% Response	44	42	50					

Faculty Salaries

SIZE OF FACULTY 1980-1981

	1979-1980		1980-1981	
	FACULTY	WOMEN	FACULTY	WOMEN
	With Tenure	Without Tenure	With Tenure	Without Tenure
Total	2	0	2	0

DOCTORATE GRANTING DEPARTMENTS. Group I

(20 of 27 reporting)

WITHOUT DOCTORATE	1979-1980		1980-1981	
	FACULTY	WOMEN	FACULTY	WOMEN
	With Tenure	Without Tenure	With Tenure	Without Tenure
Instructor/Lecturer	2	0	2	0
WITH DOCTORATE	71	7	44	5
Instructor/Lecturer	159	4	150	2
Assistant Professor	163	156	152	11
Associate Professor	569	568	549	12
Professor	962	730	899	46

DOCTORATE GRANTING DEPARTMENTS. Group II

(31 of 38 reporting)

WITHOUT DOCTORATE	1979-1980		1980-1981	
	FACULTY	WOMEN	FACULTY	WOMEN
	With Tenure	Without Tenure	With Tenure	Without Tenure
Instructor/Lecturer	42	9	45	6
Assistant Professor	8	5	8	1
Associate Professor	1	0	0	0
WITH DOCTORATE	51	15	53	12
Instructor/Lecturer	74	2	59	2
Assistant Professor	240	9	224	9
Associate Professor	382	363	391	369
Professor	532	523	542	541
Total	1228	897	1216	921

DOCTORATE GRANTING DEPARTMENTS. Group III

(66 of 87 reporting)

WITHOUT DOCTORATE	1979-1980		1980-1981	
	FACULTY	WOMEN	FACULTY	WOMEN
	With Tenure	Without Tenure	With Tenure	Without Tenure
Instructor/Lecturer	83	9	89	9
Assistant Professor	52	51	49	47
Associate Professor	48	48	46	46
Professor	11	11	13	13
WITH DOCTORATE	194	119	197	115
Instructor/Lecturer	56	0	47	0
Assistant Professor	384	55	361	48
Associate Professor	562	529	564	532
Professor	639	627	665	655
Total	1641	1211	1637	1235

SALARIES

(in hundreds of dollars)

	1979-1980			1980-1981		
	Minimum	Median	Maximum	Minimum	Median	Maximum
WITHOUT DOCTORATE	---	---	---	---	---	---
Instructor/Lecturer	---	---	---	---	---	---
WITH DOCTORATE	145(151-170)	(163-183)	(180-200)215	160(174-190)	(178-203)	(195-225)235
Instructor/Lecturer	177(188-210)	(210-238)	(225-278)299	185(201-232)	(237-261)	(251-288)340
Assistant Professor	211(235-273)	(298-365)	(438-479)513	230(262-300)	(332-408)	(478-530)560
Associate Professor	---	---	---	---	---	---
Professor	115(120-190)	(125-190)	(135-195)220	120(137-206)	(142-206)	(155-206)223
WITH DOCTORATE	110(120-154)	(125-156)	(130-166)230	130(137-177)	(142-177)	(149-206)259
Instructor/Lecturer	85(148-168)	(160-185)	(181-210)277	119(160-184)	(176-200)	(198-224)240
Assistant Professor	164(107-212)	(215-233)	(234-281)300	183(206-230)	(235-257)	(257-288)330
Associate Professor	160(225-262)	(283-330)	(398-460)537	160(250-281)	(312-367)	(422-490)572
Professor	---	---	---	---	---	---
WITH DOCTORATE	95(107-143)	(110-153)	(110-174)235	98(115-164)	(120-166)	(129-189)245
Instructor/Lecturer	122(153-187)	(156-188)	(166-192)226	135(158-202)	(170-204)	(191-209)240
Assistant Professor	137(202-237)	(209-245)	(210-245)271	145(210-251)	(226-267)	(231-270)301
Associate Professor	---	---	---	---	---	---
Professor	---	---	---	---	---	---
WITH DOCTORATE	96(105-145)	(107-142)	(107-150)167	105(118-155)	(118-157)	(118-161)200
Instructor/Lecturer	130(152-170)	(163-183)	(180-203)250	136(165-185)	(179-195)	(190-222)259
Assistant Professor	153(189-210)	(210-231)	(235-269)301	165(199-227)	(223-250)	(249-292)322
Associate Professor	182(225-260)	(263-318)	(305-402)509	194(245-280)	(284-340)	(328-443)555
Professor	---	---	---	---	---	---

DOCTORATE GRANTING DEPARTMENTS. Group IV (38 of 67 reporting)

<u>WITHOUT DOCTORATE</u>																					
Instructor/Lecturer	21	1	7	0	0	21	1	7	0	---	---	---	---	---	---	---	---	---	---	---	---
Assistant Professor	3	1	1	0	0	3	1	1	0	---	---	---	---	---	---	---	---	---	---	---	---
Associate Professor	1	1	1	1	1	1	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---
Professor	<u>3</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>3</u>	<u>3</u>	<u>0</u>	<u>0</u>	---	---	---	---	---	---	---	---	---	---	---	---
	28	6	9	1	1	28	6	9	1	---	---	---	---	---	---	---	---	---	---	---	---
<u>WITH DOCTORATE</u>																					
Instructor/Lecturer	7	0	1	0	0	6	0	1	0	---	---	---	---	---	---	---	---	---	---	---	---
Assistant Professor	149	5	18	2	147	8	19	1	1	---	---	---	---	---	---	---	---	---	---	---	---
Associate Professor	110	98	3	2	112	96	3	1	1	---	---	---	---	---	---	---	---	---	---	---	---
Professor	<u>228</u>	<u>227</u>	<u>7</u>	<u>7</u>	<u>241</u>	<u>240</u>	<u>9</u>	<u>9</u>	<u>9</u>	---	---	---	---	---	---	---	---	---	---	---	---
	494	330	29	11	506	344	32	11	11	---	---	---	---	---	---	---	---	---	---	---	---

DOCTORATE GRANTING DEPARTMENTS. Group V (47 of 127 reporting)

<u>WITHOUT DOCTORATE</u>																					
Instructor/Lecturer	18	0	9	0	0	16	0	10	0	---	---	---	---	---	---	---	---	---	---	---	---
Assistant Professor	3	1	1	0	0	0	0	0	0	---	---	---	---	---	---	---	---	---	---	---	---
Associate Professor	0	0	0	0	0	0	0	0	0	---	---	---	---	---	---	---	---	---	---	---	---
Professor	<u>7</u>	<u>7</u>	<u>0</u>	<u>0</u>	<u>6</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>0</u>	---	---	---	---	---	---	---	---	---	---	---	---
	28	8	10	0	0	22	6	10	0	---	---	---	---	---	---	---	---	---	---	---	---
<u>WITH DOCTORATE</u>																					
Instructor/Lecturer	9	0	4	1	14	0	7	0	0	---	---	---	---	---	---	---	---	---	---	---	---
Assistant Professor	169	5	21	1	186	4	22	1	1	---	---	---	---	---	---	---	---	---	---	---	---
Associate Professor	129	102	3	2	137	106	5	4	4	---	---	---	---	---	---	---	---	---	---	---	---
Professor	<u>242</u>	<u>238</u>	<u>7</u>	<u>7</u>	<u>246</u>	<u>243</u>	<u>6</u>	<u>6</u>	<u>6</u>	---	---	---	---	---	---	---	---	---	---	---	---
	549	345	35	11	563	353	40	11	11	---	---	---	---	---	---	---	---	---	---	---	---

DOCTORATE GRANTING DEPARTMENTS. Group VI (16 of 36 reporting)

<u>WITHOUT DOCTORATE</u>																					
Instructor/Lecturer	2	0	0	0	0	5	0	1	0	---	---	---	---	---	---	---	---	---	---	---	---
Assistant Professor	11	11	6	6	11	11	6	6	6	---	---	---	---	---	---	---	---	---	---	---	---
Associate Professor	8	8	1	1	8	8	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---
Professor	<u>7</u>	<u>7</u>	<u>0</u>	<u>0</u>	<u>7</u>	<u>7</u>	<u>0</u>	<u>0</u>	<u>0</u>	---	---	---	---	---	---	---	---	---	---	---	---
	28	26	7	7	31	26	8	7	7	---	---	---	---	---	---	---	---	---	---	---	---
<u>WITH DOCTORATE</u>																					
Instructor/Lecturer	1	0	0	0	1	0	0	0	0	---	---	---	---	---	---	---	---	---	---	---	---
Assistant Professor	57	20	2	0	55	19	3	0	0	---	---	---	---	---	---	---	---	---	---	---	---
Associate Professor	159	158	6	5	151	151	5	5	5	---	---	---	---	---	---	---	---	---	---	---	---
Professor	<u>146</u>	<u>146</u>	<u>2</u>	<u>2</u>	<u>158</u>	<u>158</u>	<u>2</u>	<u>2</u>	<u>2</u>	---	---	---	---	---	---	---	---	---	---	---	---
	363	324	10	7	365	328	10	7	7	---	---	---	---	---	---	---	---	---	---	---	---

SIZE OF FACULTY

1979-1980 1980-1981

FACULTY	WOMEN		WOMEN	
	With Tenure	Total	With Tenure	Total
Instructor/Lecturer	18	129	38	112
Assistant Professor	62	253	234	61
Associate Professor	37	233	242	39
Professor	6	55	55	6
	123	579	569	218

SALARIES

(in hundreds of dollars)

1979-1980 1980-1981

	1979-1980		1980-1981		1979-1980		1980-1981	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
MASTER DEGREE GRANTING DEPARTMENTS								
(179 of 352 reporting including 8 of 19 Canadian Departments)								
WITHOUT DOCTORATE								
Instructor/Lecturer	18	1	9	0	28	0	10	0
Assistant Professor	77	14	14	13	534	85	13	13
Associate Professor	69	917	63	906	846	74	70	70
Professor	47	754	45	794	784	49	47	47
	202	1749	202	2262	1763	218	130	130
WITH DOCTORATE								
Instructor/Lecturer	18	1	9	0	28	0	10	0
Assistant Professor	77	14	14	13	534	85	13	13
Associate Professor	69	917	63	906	846	74	70	70
Professor	47	754	45	794	784	49	47	47
	202	1749	202	2262	1763	218	130	130
BACHELOR DEGREE GRANTING DEPARTMENTS								
(470 of 1064 reporting including 16 of 32 Canadian Departments)								
WITHOUT DOCTORATE								
Instructor/Lecturer	28	102	12	245	30	109	11	80
Assistant Professor	68	315	40	304	193	64	36	95
Associate Professor	30	268	26	262	235	30	25	110
Professor	8	70	8	79	77	8	8	151
	208	884	208	880	535	211	80	164
WITH DOCTORATE								
Instructor/Lecturer	18	3	3	21	4	4	0	117
Assistant Professor	73	509	8	521	66	85	8	125
Associate Professor	48	603	48	618	510	59	47	125
Professor	43	473	43	497	469	43	43	125
	183	1603	183	1657	1049	191	98	1657

Salary Survey for New Recipients of Doctorates

The figures for 1980 in this article were compiled from questionnaires sent to individuals who received a doctorate in the mathematical sciences during the 1979-1980 academic year from universities in the United States and Canada. This year no attempt was made to obtain information from individuals who were reported to have left the U. S. or Canada.

Questionnaires requesting information on salaries and professional experience were distributed to 781 recipients of degrees using addresses provided by the departments which granted the degrees. Of these, 3 were returned by the postal service as undeliverable and could not be forwarded. There were 455 individuals who returned forms between late June and early September. The tables below are based on the responses from 422 of these individuals (368 men and 54 women). Data from 33 responses were not used in the compilation of the tables below; forms with insufficient data, or from individuals who had indicated they had part-time employment, were not yet employed, or were not seeking employment were considered unusable. In addition, one individual not included in the tables below is a second-year resident in psychiatry and another accepted a position as a

senior systems analyst in a dental school.

Readers should be warned that the data in this report are obtained from a self-selected sample and inferences from them may not be representative of the population. More comprehensive information on the number, the sex—minority group status—citizenship, and the employment status of the recipients of new doctorates granted last year in the mathematical sciences in the U. S. and Canada may be found on the pages which follow.

KEY TO TABLES BELOW

Salaries are listed in hundreds of dollars. Years listed refer to the academic year ending in the listed year. M and F are Male and Female respectively. One year experience means that the persons had experience limited to one year or less in the same position or a position similar to the one reported; some persons receiving a doctorate had been employed in their present position for several years. (X + Y) means there are X men and Y women in the 1980 sample. Quartile figures are given only in cases where the number of responses is large enough to make them meaningful.

NINE-MONTH SALARIES

Year Min. Q₁ Median Q₃ Max.

TEACHING OR TEACHING AND RESEARCH (198 + 28)

1976	85	124	133	145	245
1977	72	130	140	150	328
1978	92	135	145	159	211
1979	100	145	157	170	234
1980	105	155	171	185	250
1976M	93	125	134	145	245
1976F	85	120	125	145	168
1977M	72	130	140	150	328
1977F	72	120	135	148	170
1978M	100	135	145	160	211
1978F	92	131	145	151	195
1979M	100	145	158	170	234
1979F	115	145	152	171	200
1980M	120	155	171	185	250
1980F	105	151	164	198	210
One year experience (164 + 16)					
1980M	120	155	170	184	242
1980F	105	148	158	168	200

RESEARCH (5 + 0)

1976	70		80		180
1977	80		86		160
1978	120		-		125
1979	110		132		160
1980	125		137		180
1976M	70		80		180
1976F	-		-		-
1977M	80		-		160
1977F	-		86		-
1978M	120		-		125
1978F	-		-		-
1979M	110		132		160
1979F	-		-		-
1980M	125		137		180
1980F	-		-		-
One year experience (5 + 0)					
1980M	125		137		180
1980F	-		-		-

TWELVE-MONTH SALARIES

Year Min. Median Max.

TEACHING OR TEACHING AND RESEARCH (39 + 5)

1976	100	155	270
1977	111	170	260
1978	101	185	290
1979	120	195	240
1980	143	195	350
1976M	100	150	270
1976F	100	174	240
1977M	111	170	260
1977F	125	-	182
1978M	101	180	290
1978F	187	195	223
1979M	120	188	240
1979F	210	233	240
1980M	143	190	350
1980F	147	200	220
One year experience (28 + 4)			
1980M	143	190	282
1980F	147	180	220

RESEARCH (20 + 5)

1976	90	130	210
1977	100	156	250
1978	100	185	248
1979	100	174	271
1980	120	180	321
1976M	90	121	210
1976F	-	195	-
1977M	100	139	210
1977F	190	222	250
1978M	100	187	248
1978F	-	180	-
1979M	100	174	271
1979F	-	-	-
1980M	120	180	321
1980F	178	200	264
One year experience (18 + 3)			
1980M	120	175	267
1980F	178	180	200

Year Min. Median Max.

GOVERNMENT (18 + 4)

1976	115	194	270
1977	105	187	330
1978	170	220	320
1979	180	243	357
1980	156	244	501
1976M	118	194	270
1976F	115	194	200
1977M	105	192	330
1977F	115	182	204
1978M	170	220	320
1978F	170	200	250
1979M	180	254	357
1979F	190	231	256
1980M	156	230	501
1980F	205	247	280
One year experience (14 + 4)			
1980M	156	208	296
1980F	205	247	280

BUSINESS AND INDUSTRY (88 + 12)

1976	120	205	400
1977	100	210	380
1978	145	240	387
1979	140	254	380
1980	190	284	400
1976M	120	206	400
1976F	185	-	200
1977M	100	216	380
1977F	130	195	220
1978M	145	246	387
1978F	180	210	251
1979M	140	251	380
1979F	200	255	350
1980M	190	284	400
1980F	218	283	345
One year experience (66 + 10)			
1980M	190	280	343
1980F	218	264	345

Report on the 1980 Survey of New Doctorates

by Donald C. Rung

This report concerns new doctorates in the mathematical sciences. It includes the employment status of recipients of 1979-1980 doctorates in the mathematical sciences, and a breakdown according to their sex, minority group, and citizenship. In addition, trends in the number of doctoral degrees in the mathematical sciences are reported for each group of departments as defined by the 1969 American Council on Education survey (described on page 602).

The job market for new mathematical science doctorates continued to be good in 1980. By mid-summer only 4.7% reported that they were not employed although seeking employment. As observed in previous reports in this series most of this group do find employment by the end of the summer. (A second report on the employment status of 1979-1980 doctorates is planned for the February or April 1981 issue of the Notices.)

The number of new mathematical sciences doctorates reported for 1979-1980 decreased only slightly from the total reported at this time last

year—down from 890 to 858. Whether a plateau has been reached remains to be seen.

Employment Status of New Doctorates, 1979-1980. Table 1 shows the employment status, by type of employer and field of degree, of 858 recipients of doctoral degrees conferred by mathematical sciences departments in the U.S. and Canada between July 1, 1979 and June 30, 1980. These 858 individuals are listed, with their thesis titles, in this issue of the Notices.

In rows 1 through 5, the recipients are counted who accepted appointments in U.S. doctorate-granting mathematical sciences departments (Groups I-V as defined on page 602). In the next 2 rows, the figures represent those accepting appointments in U.S. mathematical sciences departments granting masters and bachelors degrees only. The information was obtained from the departments granting the degrees and from questionnaires subsequently completed by about 52% of the recipients themselves.

Among those 1979-1980 new doctorates em-

TABLE 1
1979-1980 EMPLOYMENT STATUS OF NEW DOCTORATES IN THE MATHEMATICAL SCIENCES

Type of Employer	PURE MATHEMATICS					Statistics	Computer Science	Operations Research	Applied Mathematics	Mathematics Education	Other	Total
	Algebra and Number Theory	Analysis and Functional Analysis	Geometry and Topology	Logic	Probability							
Group I	12	22	14	2	1	2	0	0	3	0	5	61
Group II	16	5	13	1	5	3	0	0	5	1	3	52
Group III	9	13	6	5	2	11	1	0	9	0	0	56
Group IV	0	0	1	0	2	17	0	1	0	0	0	21
Group V	0	0	0	0	1	2	21	7	2	0	3	36
Masters	11	7	8	3	1	13	7	1	5	2	7	65
Bachelors	21	17	11	0	1	3	4	2	8	6	10	83
Two-year College or High School	8	1	0	0	0	0	0	0	1	1	2	13
Other Academic Departments	1	3	1	1	3	21	5	9	2	1	4	51
Research Institutes	6	2	5	0	2	4	1	2	3	0	3	28
Government	2	2	3	0	2	11	1	3	6	0	2	32
Business and Industry	9	14	10	6	4	31	23	25	17	0	11	150
Canada, Academic	3	3	1	0	1	0	11	2	2	0	2	25
Canada, Nonacademic	0	0	2	1	1	0	1	2	3	0	1	11
Foreign, Academic	7	10	3	3	1	6	2	9	8	1	4	54
Foreign, Nonacademic	3	6	1	0	0	9	4	1	1	0	4	29
Not seeking employ.	1	1	2	0	0	2	1	1	2	0	0	10
Not yet employed	2	4	4	4	2	6	2	2	9	1	4	40
Unknown	4	8	6	1	1	4	6	3	4	0	4	41
Total	115	118	91	27	30	145	90	70	90	13	69	858

ployed in the U. S. about 60% took positions in university or college mathematical sciences departments, the same percentage as last year. About 29% took positions in government, business, and industry, while the remaining 11% are in two-year colleges, high schools, other academic departments, or research institutes. These figures are virtually identical with those reported last year.

Table 1 shows as "not yet employed" about 4.7% of the 1979-1980 new doctorates (this excludes those whose employment status is unknown, and those now in Canada or other foreign countries). The data in Table 1 were in many instances obtained in early summer of 1980 and do not reflect subsequent hiring during the summer; an update of Table 1 is planned for the February or April 1981 Notices. A similar update last year revealed that nearly all new 1978-1979 doctorates not yet employed by early summer subsequently found positions by Fall 1979. (See the Notices, October 1979, p. 388, and February 1980, p. 171. Only eleven individuals included in Table 1 were reported as having taken part-time employment.

Sex, Race, and Citizenship of New Doctorates, 1979-1980. Table 2 below represents a breakdown according to sex, racial/ethnic group, and citizenship of these 858 new doctorates. The information summarized in Table 2 was obtained from department

heads and in some cases from recipients themselves.

Table 2 shows that 12.7% of the 1979-1980 doctorates are women. This is a decrease from the 13.7 percentage reported a year ago. Table 2 shows thirty-five new doctorates who are both U. S. citizens and members of a minority group, a decrease of four from last year; as in previous years this represents only a small percentage of the total.

Analysis of the 1979-1980 employment forms for the new U. S. doctorates indicates that 8% of those employed by Groups I, II, and III departments are women, as compared to a 10% figure last year. (This percentage is just under 10% if Groups IV and V departments are included.) Among new doctorates employed by bachelors and masters degree-granting departments 18% are women, while among those employed by government, business, and industry 15% are women. Among the 40 individuals shown in Table 1 as not yet employed five are women.

Trends in the Number of New Doctorates. The downward trend observed since 1971 in the number of new mathematical sciences doctorates from Groups I-III universities seems to have abated during 1979-1980. Table 3 gives the number of doctorates granted during 1977-1978, 1978-1979, and 1979-1980 by those departments in Groups I, II, and III *which reported in all three years*. The number of such departments is indicated in parentheses.

TABLE 2: SEX, RACE, AND CITIZENSHIP OF NEW DOCTORATES
July 1, 1979—June 30, 1980

U.S. DEGREES	MEN					WOMEN					TOTAL
	CITIZENSHIP					CITIZENSHIP					
	U.S.	Canada	Other	Not Known	Total Men	U.S.	Canada	Other	Not Known	Total Women	
RACIAL/ETHNIC GROUP											
Asian, Pacific Islander	11	1	85	3	100	4		10		14	114
Black	11		3		14	5				5	19
American Indian, Eskimo, Aleut	2				2						2
Mexican American, Chicano, Puerto Rican	1		2		3	1				1	4
None of those above	425	10	89	1	525	73		9		82	607
Unknown	41		2	1	44	4		2		6	50
Total Number	491	11	181	5	688	87		21		108	796

CANADIAN DEGREES	MEN					WOMEN					TOTAL
	CITIZENSHIP					CITIZENSHIP					
	U.S.	Canada	Other	Not Known	Total Men	U.S.	Canada	Other	Not Known	Total Women	
RACIAL/ETHNIC GROUP											
Asian, Pacific Islander		3	4		7						7
Black			2		2						2
American Indian, Eskimo, Aleut											
Mexican American, Chicano, Puerto Rican											
None of those above	2	25	12		39			1		1	40
Unknown	1	11	1		13						13
Total Number	3	39	19		61			1		1	62

TABLE 3: NUMBER OF NEW MATHEMATICAL SCIENCES DOCTORATES REPORTED

	<u>1977-1978</u>	<u>1978-1979</u>	<u>1979-1980</u>
Group I (23 depts.)	205	216	228
Group II (34 depts.)	146	128	118
Group III (74 depts.)	<u>158</u>	<u>123</u>	<u>132</u>
Total	509	467	478

Table 3 shows a modest 2.6% increase among these departments from 1978-1979 to 1979-1980. However, Group II departments continued to decrease while Groups I and III showed an upturn.

The decline in the number of new doctorates continued in the departments reporting in Groups IV, V, and VI. Table 4 compares the number of doctorates granted during 1977-1978, 1978-1979, and 1979-1980 in those Groups IV, V, and VI departments which reported in all three years.

In Table 4 the decline for the statistics-related departments in Group IV is perhaps caused by the excellent employment prospects for statisticians. Possibly more statistics students are opting for a relatively well-paying job after the masters degree. Table 4 also indicates a drop for the computer science, operations research, and other applied departments in Group V, although returns from those departments are somewhat fragmentary.

TABLE 4: NUMBER OF NEW DOCTORATES

	<u>1977-1978</u>	<u>1978-1979</u>	<u>1979-1980</u>
Group IV (44 depts.)	133	109	99
Group V (32 depts.)	109	117	115
Group VI (22 depts.)	<u>69</u>	<u>66</u>	<u>54</u>
Total	311	292	268

Report on the 1980 AMS Nonacademic Salary Survey

by Robert J. Thompson

The AMS Nonacademic Salary Survey was designed for individuals with a doctorate in the mathematical sciences who had full-time nonacademic employment in the U.S., and who were citizens or permanent residents of the U.S. At the instigation of the Society's Committee on Employment and Educational Policy, the 1980 AMS dues notice contained several questions to be used for constructing a list of such people; in this manner, 635 individuals were identified. The Mathematical Association of America graciously provided a list of MAA members

with doctorates and nonacademic employment; from this list 540 additional people were identified, but their citizenship and full-time employment status were not known.

In March, 1980, questionnaires were mailed to these 1,175 individuals; 608 were returned, and all but 9 of them were usable. Respondents were asked to provide information that was accurate as of March 1, 1980. (The questionnaire is reproduced on p. 612.) There are certainly a number of people in the intended group who were not sent the questionnaire. Statisticians and computer scientists, for example, are certainly under-represented. How many

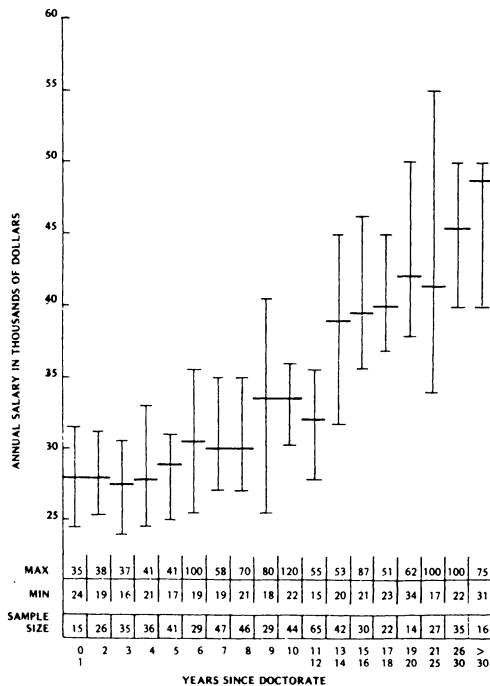


FIGURE 1

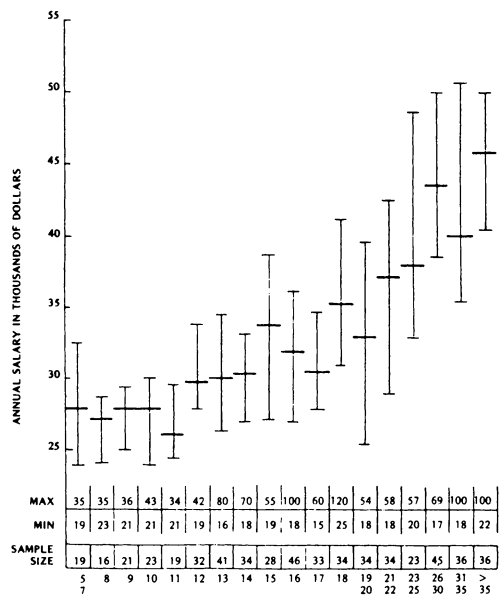


FIGURE 2

Since 1957 the American Mathematical Society has conducted an annual survey of faculty salaries. In addition, new recipients of the doctorate are surveyed annually for a study that includes both academic and non-academic salaries. The results of the most recent of those two salary surveys appear in this issue of the Notices. Those surveys were made under the direction of the Society's Committee on Employment and Educational Policy (CEEP), whose members in 1980 are Lida K. Barrett (chairman), Arthur P. Mattuck, Donald C. Rung, Hans Schneider, Robert J. Thompson and William P. Ziemer. Because of the growing importance of the employment of mathematicians outside traditional academic areas, CEEP decided in 1977 to conduct a salary survey of non-academically employed Ph.D.'s. The results of that survey appeared in the August 1978 Notices, pages 307-310. The committee is grateful to members of the AMS staff, especially Peggy Reynolds, for the efficiency with which the 1980 survey was conducted and for the preliminary organization of the data.

people were missed, and how they would have affected the results reported here are not known. One comparison with another survey can be made. The AMS survey of new doctorates referred to above reported that for males accepting jobs in business and industry in 1980 the minimum twelve-month salary was \$19,000; the first quartile (Q_1), the median, the third quartile (Q_3) and the maximum were \$25,000, \$28,000, \$30,600 and \$34,300, respectively. For the survey reported here, the corresponding numbers are \$24,000, \$24,000, \$28,000, \$33,500 and \$35,000.

In Figures 1 to 8 of this report the heavy horizontal lines designate median salaries; the lighter horizontal lines mark the first and third quartiles: thus the vertical lines joining them represent the range of the middle fifty percent of the salaries reported. Figure 1 displays salaries as a function of years since receipt of doctorate. This measure of experience was used in the report of the 1977 non-academic salary survey and is used almost exclusively in this report, so comparisons can be easily made. For example, the median salary for people who have had the doctorate for a year or less is about 27% higher for the 1980 survey than the corresponding median for the 1977 survey (about 2½ years earlier). For more experienced people, however, the percentage increase in median salaries was substantially

smaller. A weighted average of median salaries for the total survey population shows an increase of only about 12%.

Figure 2 shows salaries as a function of years since bachelors degree. That is a measure of experience which is often used in salary reports. To the extent that experience is correlated with salary, it was thought that perhaps years since bachelors degree might be a more appropriate measure of experience than years since doctorate. Comparison of Figures 1 and 2 does not reveal any significant advantage of one over the other, so years since doctorate is used throughout the rest of this report.

Figure 3 is based on the salaries of the 46 female respondents and the 542 males. (Eleven respondents did not answer Question 4.)

Survey respondents were asked whether or not they had supervisory responsibilities. Figure 4 is based on the salaries of those who answered yes to that question. There was a similar figure in the report of the 1977 survey, but for that survey respondents were not asked explicitly if they were

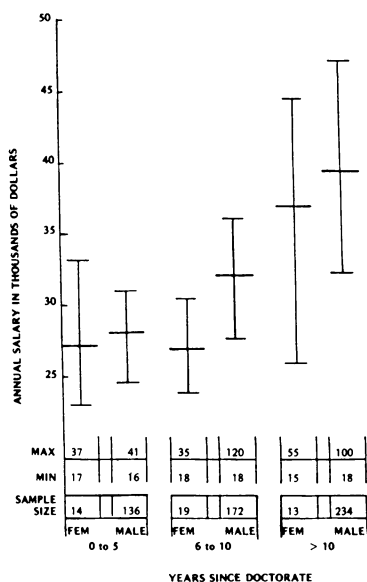


FIGURE 3

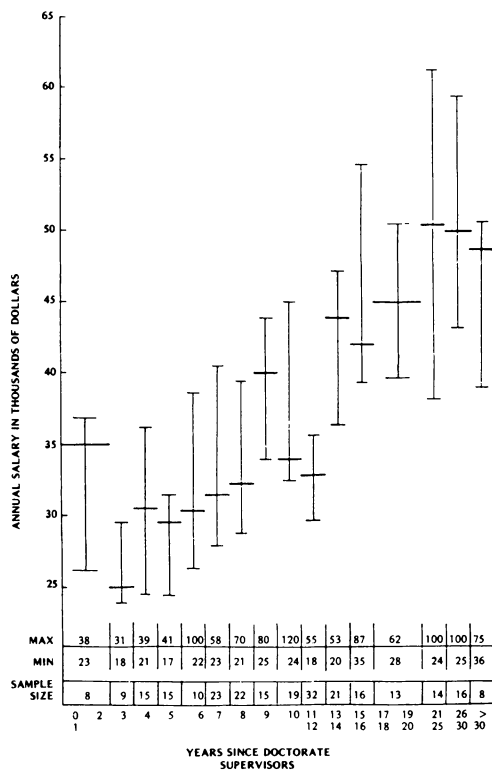


FIGURE 4

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

NONACADEMIC DOCTORAL SALARY QUESTIONNAIRE

Answers to the questions below will be kept confidential. Published summaries will not permit identification of individuals or employers.

The information requested below should be accurate as of March 1, 1980.

This questionnaire is addressed to individuals who have a doctorate in the mathematical sciences, who have full-time nonacademic employment in the U.S. and who are citizens or permanent residents of the U.S. If you are not in this category, please do not return this questionnaire.

1. Employer _____ City _____ State _____
2. Type of employer: Business or industry Federal government State or local government
 None of these (Explain): _____
3. Do you have management responsibilities—that is, are you a supervisor, group leader, section head, etc.? Yes No
4. Female Male
5. Twelve month salary: \$ _____
6. Number of years since receipt of: bachelors degree _____ doctoral degree _____
7. Number of years of nonacademic professional experience since receipt of: bachelors degree _____ doctoral degree _____
8. Field of doctoral thesis: Probability theory Other pure mathematics Statistics
 Operations research Computer science Other applied mathematics
 None of these (Explain): _____
9. How do you spend your time at work? (Total should equal 100%)

_____ % Supervising others or administration	_____ % Computer programming	_____ % Applied research
_____ % Consulting or problem solving	_____ % Basic research	_____ % Other (Explain): _____

supervisors. An arbitrary decision was made that people who reported that they spent at least 30% of their time supervising others would be classified as supervisors. That distinction should be kept in mind in comparing the 1980 and 1977 results.

There are a significant number of mathematicians employed by institutions that receive essentially all of their funding from the federal government, but are not run directly by the government—such as Los Alamos National Laboratory and The Center for Naval Analyses. Employees at these institutions are not under Civil Service, and they were included in

the category business/industry in the report of the 1977 survey. For this report they are in a separate category. Figure 5 is based on the salaries of respondents in that category. There is no adequate short description that applies to all of these institutions, but for this report they are designated as Federal Contract Research Centers. Figures 6 and 7 are based, respectively, on the 357 respondents employed in business/industry and the 131 respondents employed by the federal government. Eighteen individuals were employed by state or local governments.

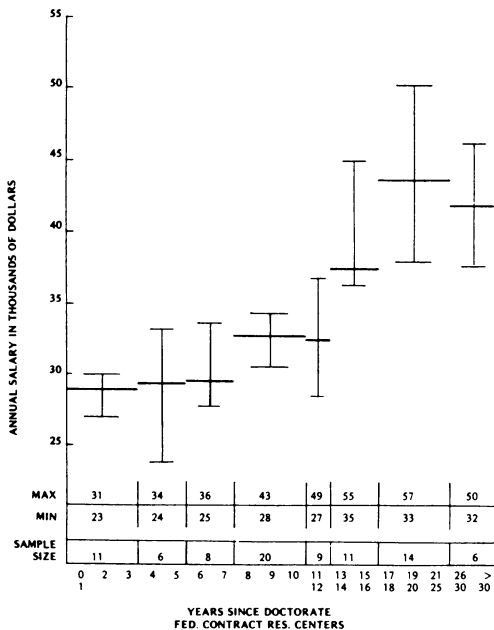


FIGURE 5

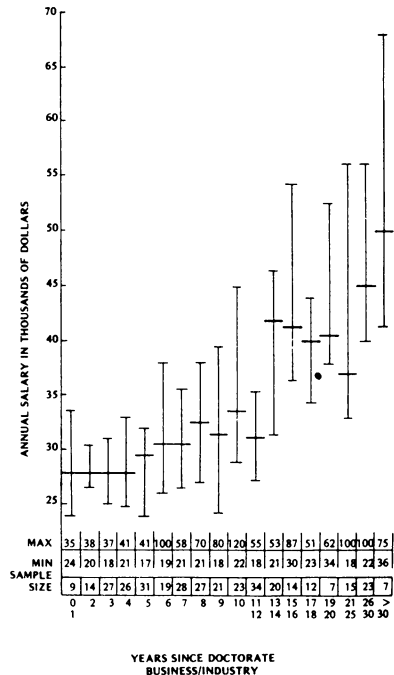


FIGURE 6

For this group the median salary was \$22,000; Q₁ was \$19,000 and Q₃ was \$30,000—essentially no change from 1977.

For business/industry—the largest group of respondents—those living in California and the Northeast were separated from the rest of the group. The results are displayed in Figure 8. Here Northeast refers to the Eastern Seaboard from the Boston metropolitan area to the Washington metropolitan area.

Respondents were asked to select from among several general areas the one which best described their field of doctoral thesis. The results were: Pure Mathematics 63%, Probability 5%, Statistics 5%, Operations Research 2%, Computer Science 5%, and Other Applied Mathematics 20%.

Respondents were asked to report the percentage of their time at work spent in each of the activities listed below. (A category "other" was included, and the total was supposed to be 100%.) The table shows for each activity what percent of the respondents reported it as their maximum. For example, seven percent of the respondents reported that they spend at least as much time on basic research as they spend on other activities. The totals in each column are over 100% because there were many ties.

	Total Sample	Business/ Industry	Fed. Contract Res. Centers	Federal Government
Supervising Others or Administration	20%	19%	16%	34%
Consulting or Problem Solving	44%	49%	41%	32%
Computer Programming	21%	24%	16%	14%
Applied Research	19%	14%	30%	26%
Basic Research	7%	5%	14%	4%

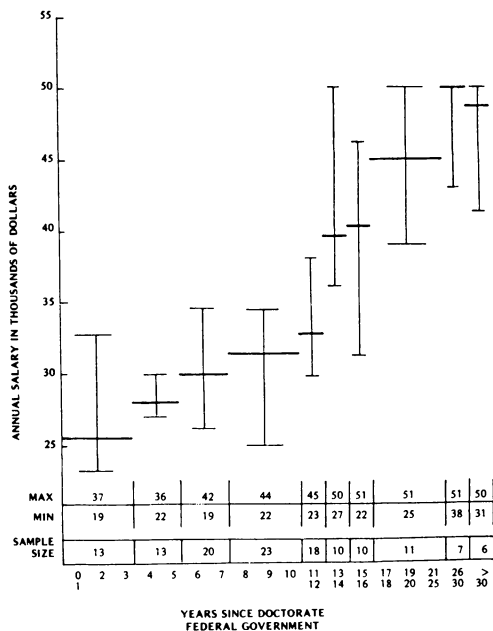


FIGURE 7

Finally, the following table shows how many people reported that they spent no time in research.

	Total Sample	Business/ Industry	Fed. Contract Res. Centers	Federal Government
No Applied Research	44%	52%	32%	39%
No Basic Research	72%	81%	68%	66%
No Research of Either Type	42%	47%	24%	33%

EDITOR'S NOTE: The Employment Concerns Subcommittee of the Society's Committee on Employment and Educational Policy (CEEP) felt that graduate students in mathematics and their advisors would find useful a list of organizations where Ph.D. mathematicians have found nonacademic employment. The list below contains the names of organizations that have employed Ph.D. mathematicians; it is not a directory of employers seeking mathematicians, and should not be used as such. (Those seeking nonacademic or academic employment should consult *Employment Information in the Mathematical Sciences*, which is published jointly by the AMS and the MAA six times each year. University and college placement offices also have information on nonacademic employers.)

The list on nonacademic employers below contains, with few exceptions, those organizations which were mentioned as the employer of at least two people who responded to the nonacademic salary survey reported above. This list does not include the names of a substantial number of employers of one of the respondents to the survey; among these organizations are insurance companies, state, county

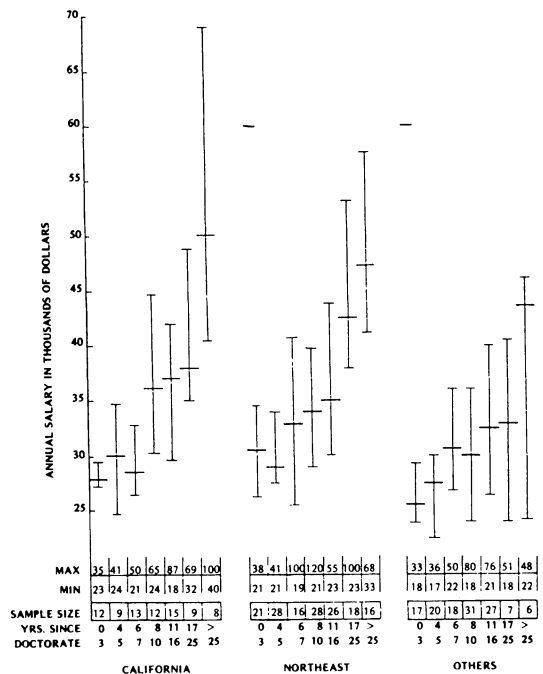


FIGURE 8

and city governments, medical centers, and small consulting firms. Anyone considering nonacademic employment should be aware that others have found jobs in such places.

BUSINESS AND INDUSTRY

Aerospace Corp., El Segundo, CA
Amoco Production Co., Tulsa, OK
Analytic Sciences Co., Reading, MA
ANSER (Analytic Services Inc.), Arlington, VA
Argonne National Laboratory, Argonne, IL
ARINC Research Corp., Annapolis, MD
AT&T, Bedminster, Morris Plains, NJ; New York, NY
Babcock and Willcox, Barberton, OH; Lynchburg, VA
Battelle Memorial Institute, Columbus, OH; Richland, WA
Bell Laboratories, Holmdel, Murray Hill, Piscataway, South Plainfield, Whippany, NJ
Boeing, Seattle, WA
Center for Naval Analyses, Alexandria, VA
Computer Sciences Corp., El Segundo, San Diego, CA; Washington, DC
Control Data Corp., Minneapolis, St. Paul, MN; New York, NY
Daniel H. Wagner Associates, Paoli, PA
Educational Testing Service, Princeton, NJ
EG&G Idaho Inc., Idaho Falls, ID
EXXON Production Research Co., Houston, TX
Ford Motor Co., Dearborn, MI
General Electric Co., Schenectady, NY; Cincinnati, OH; Philadelphia, PA
General Motors, Detroit, Warren, MI
Grumann Aerospace Corp., Bethpage, NY
GTE, Mountain View, CA; Northlake, IL; Needham, MA
Hewlett-Packard, Cupertino, CA; Corvallis, OR
Honeywell, Inc., Billerica, MA; Minneapolis, MN; Silverdale, WA
Hughes Aircraft, Culver City, El Segundo, Fullerton, Los Angeles, CA; Denver, CO
IBM Corp., Los Angeles, Palo Alto, San Jose, CA; Boulder, CO; Chicago, IL; Rockville, MD; Armonk, Endicott, Mount Kisco, Poughkeepsie, Yorktown Heights, NY
ITT Research Institute, Annapolis, MD
Institute for Defense Analyses, Princeton, NJ; Arlington, VA
Jet Propulsion Laboratory, Pasadena, CA
Ketron, Inc., Wayne, PA; Arlington, VA
Lawrence Livermore National Laboratory, Livermore, CA
Lockheed, Sunnyvale, CA; Plainfield, NJ
Los Alamos National Scientific Laboratory, Los Alamos, NM

Martin Marietta Corp., Denver, CO
Mathtech, Princeton, NJ; Arlington, VA
McDonnell-Douglas, Huntington Beach, CA; Houston, TX
MIT Lincoln Laboratory, Lexington, MA
Mitre Corp., Colorado Springs, CO; Bedford, MA; McLean, VA
Motorola Inc., Phoenix, Tempe, AZ; Schaumburg, IL
NCR Corp., Wichita, KS; St. Paul, MN; West Columbia, SC
R & D Associates, Los Angeles, Marina Del Rey, CA
RCA Corp., Princeton, NJ
Raytheon Co., Bedford, Sudbury, MA
Rockland Research Institute, Orangeburg, NY
Sandia National Laboratories, Livermore, CA; Albuquerque, NM
Science Applications, Inc., Ft. Walton Beach, FL; Albuquerque, NM; McLean, VA
Scientific Systems Inc., Cambridge, MA
Sperry Univac, Irvine, CA; Washington, DC; Roseville, MN
SRI International, Menlo Park, CA
System Development Corp., Santa Monica, CA
System Planning Corp., Arlington, VA
TASC, Reading, MA
TRW, Los Angeles, Redondo Beach, Sunnyvale, CA; McLean, VA
Union Carbide Corp., Oak Ridge, TN; Charleston, WV
Vought Corp., Dallas, TX
Westinghouse, Pittsburgh, West Mifflin, PA
Xerox, Palo Alto, CA

GOVERNMENT

Defense Mapping Agency
Department of Agriculture
Department of Commerce
Department of Defense
Department of Energy
Department of Transportation
ICASE (NASA)
National Security Agency
National Bureau of Standards
National Institutes of Health
National Oceanographic & Atmospheric Administration
Naval Research Laboratory
Naval Surface Weapons Center
Naval Weapons Center
Office of Naval Research
U. S. Air Force
U. S. Army
U. S. Navy
Veterans Administration

NEWS FROM THE NSF
(Reported in the *NSF Bulletin*)

**PRESIDENT CARTER ANNOUNCES
NATIONAL SCIENCE BOARD NOMINEES**

On June 20, 1980, President Carter announced his intention to nominate the following seven individuals for membership on the National Science Board for six-year terms expiring May 10, 1986.

Renominee: Donald B. Rice, Jr., President, The Rand Corporation, Santa Monica, California.

New Nominees: Peter T. Flawn, President, University of Texas at Austin; Mary L. Good, Boyd Professor of Materials Science, Louisiana State University, Baton Rouge; Peter D. Lax, Director, Courant Institute of Mathematical Sciences, New York University; Homer A. Neal, Dean of Research and Graduate Development and Professor of Physics, Indiana University; Mary Jane Osborn, Professor of Microbiology, University of Connecticut Health Center; and Stuart A. Rice, Frank P. Hixon Distinguished Service Professor of Chemistry, The James Franck Institute, University of Chicago.

The terms of the following Board Members expired May 10, 1980; Jewel Plummer Cobb, Norman Hackerman, W. N. Hubbard, Jr., Saunders Mac Lane, Grover E. Murray, L. Donald Shields, and James H. Zumberge.

—NSF *Bulletin*

**1981 ALAN T. WATERMAN AWARD
NOMINATIONS SOUGHT**

The deadline for receipt of nominations for the 1981 Alan T. Waterman Award is December 3, 1980. The Award, presented annually to an outstanding young scientist, mathematician or engineer, will be announced and presented in May 1981. For further information, and/or a copy of the guidelines for submission, contact Mrs. Lois Hamaty, Office of Planning and Resources Management, National Science Foundation, 1800 G Street, N.W., Washington, DC 20550; (202-357-9471).

—NSF *Bulletin*

**NATIONAL SCIENCE BOARD
ELECTS CHAIRMAN, VICE CHAIRMAN**

At its Thirtieth Annual (216th) meeting the National Science Board elected Lewis M. Branscomb, Vice President and Chief Scientist, International Business Machines, Inc., as its new Chairman; and Herbert D. Doan, Chairman, Doan Resources Corporation, Midland, Michigan, as Vice Chairman. The two terms expire May 1982.

—NSF *Bulletin*

**U. S. SCIENTIFIC COOPERATION
WITH WEST GERMANY, BELGIUM**

Programs which foster and support cooperation between scientists of the U. S. and the Federal Republic of Germany and between those of the U. S. and Belgium were described recently in the *NSF Bulletin*.

Federal Republic of Germany. The counterpart sponsoring organizations are NSF (West European Regional Programs) and the German Research Association (DFG). Eligible activities include joint research projects, binational workshops or seminars, and short-term research visits. A small number of sabbatical travel awards are also available.

All proposed activities must be reviewed and approved by NSF and DFG. The annual deadline for joint research projects is November 1. Applications for workshops and seminars and short-term research visits will be considered throughout the year. Sabbatical travel applications must be received at NSF by May 11, 1981, for fall-semester travel, and by August 1, 1981, for the spring semester.

Belgium. The sponsoring organizations are NSF (U. S.-Belgium Program) and the Belgian National Fund for Scientific Research. Activities eligible for support include individual visits, exchange of scientific personnel, joint seminars and workshops, and cooperative research.

Proposals or letters of interest for either program should be submitted only after consulting the respective program guidelines, which are available from the NSF Programs cited at the Division of International Programs, NSF, 1800 G Street, N.W., Washington, DC 20550 (202-357-7554).

NSF PROGRAM REPORTS

NSF Program Reports are a part of the continuing process of review and evaluation of NSF programs. They present appraisal of the program content, management, organizational and other major trends, and reveal problems that require the attention of senior management.

Accompanied by charts, photographs, and diagrams, the following reports of interest to **Notices** readers are now available from the U. S. Government Printing Office, Washington, DC 20402:

Computer Science, April 1980 (NSF 80-34). Presented by the Directorate for Mathematical and Physical Sciences. Request stock number 038-000-00443-3. Price is \$2.

Electrical, Computer, and Systems Engineering, March 1980 (NSF 80-27). Presented by the Directorate for Engineering and Applied Science. Request stock number 038-000-00439-5. Price is \$2.50.

Mathematical Sciences, June 1980 (NSF 80-56). Presented by the Directorate for Mathematical and Physical Sciences. Request stock number 038-000-00449-2. Price is \$2.25.

—NSF *Bulletin*

(NSF News continued on p. 637.)

Doctorates Conferred in 1979 - 1980

The annual AMS list of doctoral degrees in the mathematical sciences and related subjects reports 858 degrees conferred between July 1, 1979, and June 30, 1980 by 216 departments in 141 universities in the United States and Canada. Each entry contains the name of the recipient and the thesis title. The numbers in parentheses following the names of universities have the following meanings: the first number is the number of degrees listed for that university; the next seven numbers are the number of degrees in the categories of 1. Pure mathematics (i.e., algebra, number theory, analysis, functional analysis, geometry, topology, logic, or probability); 2. Statistics; 3. Computer science; 4. Operations research; 5. Applied mathematics; 6. Mathematics education; 7. Other.

ALABAMA

Auburn University
(3;3,0,0,0,0,0,0)

MATHEMATICS

Brandley, Michael Duri, *Vector fields which generate flows to suit most initial-point-destination-point pairs.*

Fuller, Luther Bush, *Trees and proto-metrisable spaces.*

Lane, Keith Whiteside, *On the Borel class of the space of probability measures.*

University of Alabama, Tuscaloosa
(5;1,2,0,2,0,0,0)

APPLIED STATISTICS

Liu, Wallace C., *Minimum bias estimation and experimental design for the response surface slope.*

Takacs, Helen C., *Estimating components of variance for the completely random model.*

MATHEMATICS

Chen, Pin Chung E., *Stochastic multiple objective programming problems.*

Fenceroy, Emma Rose, *Functional representations of reflexive operator algebras.*

Natarajan, Balakrish R., *Eigensets of monotone processes.*

ARIZONA

Arizona State University
(1;0,0,0,1,0,0,0)

MATHEMATICS

Winter, Jeffrey Lynn, *A class of number and location optimization problems, with applications in inventory and catalog problems.*

University of Arizona
(2;0,0,0,0,1,0,1)

MATHEMATICS

Forest, Mark Gregory, *Multiphase averaging of periodic solution equations.*

Thompson, Donald Mark, *Design constructibility: strongly regular graphs and block designs.*

ARKANSAS

University of Arkansas
(2;2,0,0,0,0,0,0)

MATHEMATICS

Wiley, Joe A., *Bitopological spaces.*

Wu, Hueytsen James, *Vector lattice representations and related Stone-Weierstrass theorems.*

CALIFORNIA

California Institute of Technology
(5;0,1,0,0,2,0,2)

APPLIED MATHEMATICS

McLean, John Weidman, I. *The fingering problem in flow through porous media.*

II. *The kinetic equation for Hamiltonian systems.*

Perossi, David Joseph, I. *Seismic ray-tracing in piecewise homogeneous media.*

II. *Analysis of optimal step size selection in homotopy and continuation methods.*

MATHEMATICS

Anstee, Richard Paul, I. *Moore type graphs.* II. *Properties of (0,1)-matrices with forbidden configurations.* III. *Properties of (0,1)-matrices with prescribed row and column sums.*

Calderbank, Arthur Robert, *Algebraic coding theory.*

Huffman, Michael David, *Efficient approximate solutions to the Kiefer-Weiss problem.*

Stanford University
(21;7,4,0,10,0,0,0)

MATHEMATICS

Chen, Jin-Tsu, *On the existence of capillary free surfaces in the absence of gravity.*

Davis, Ronald Edward, *New jump conditions for state constrained optimal control problems.*

Davis, Thomas Rowlands, *Saturation properties of a Bernstein approximation on N -dimensional balls.*

Delsell, Charles Neal, *A constructive, continuous solution to Hilbert's 17th problem, and other results in semialgebraic geometry.*

Kubelka, Richard Preston, *The transfer and Steenrod squares.*

Mok, Ngaiming, *The Serre problem on Riemann surfaces.*

Trudinger, Peter Lawrence, *The inverse scattering problem for a perturbed wave equation.*

Wright, Christopher Glen, *Computing the Wall groups L^h for 2-hyperbolic groups.*

OPERATIONS RESEARCH

Condap, Robert James, *Market penetration of energy supply technologies.*

Djang, Arthur, *Algorithmic equivalence in quadratic programming.*

Fleming, Randall Elliott, *Coherent system repair models.*

Fossett, Lawrence Duane, *Simulating generalized semi-Markov processes.*

Fourer, Robert Harold, *Solving staircase-structured linear programs by adaptation of the simplex method.*

Freund, Robert Michael, *Variable-dimension complexes with applications.*

McCord, Richard Kenneth, *Minimization with one linear equality constraint and bounds on the variables.*

Pollens, Lynne Janet, *The staircase and related structures in integer programming.*

Rosenberg, Eric, *Globally convergent algorithms for convex programming with applications to geometric programming.*

STATISTICS

Bell, Robert Michael, *An adaptive method of choosing the scale parameter for M -estimators.*

Duan, Naihua, *Significance test for prior distributions: the modified efficient score test and its asymptotic theory.*

Foo, Chen-Hui, *Probability modeling and estimation for hourly variation of air pollution concentrations.*

Samiei, Mahmood S., *Tests of symmetry and confidence regions for treatment effects in paired comparison models.*

University of California, Berkeley
(41;32,0,1,0,7,1,0)

MATHEMATICS

Andersen, Niels Toft, *Compact perturbations of reflexive algebras.*

Austin, Beverly Marilyn, *Complexity and J class structure of finite semigroups.*

Avitsour, Daniel, *Weak mixing in C^* -dynamical systems.*

Balas, Andrew Joseph, *Hermitian surfaces with constant holomorphic sectional curvature.*

Bar-David, Tsvi Israel, *The A -stability of exponentially fitted linear multi-step methods exact on periodic functions.*

Bravo, Jaime Ricardo, *Relations between $\text{lat } T$, $\text{lat } T^{-1}$ and $\text{lat } T^2$, and operators with compact imaginary parts.*

Cirincione, Ross Joseph, *A mathematical study of the non-relativistic limit in quantum mechanics.*

- Davis, Glenn Hamilton, *Null-cobordism of some codimension-1 C^∞ foliations.*
- Ennis, Christopher James, *Sufficient conditions for smoothing co-dimension one foliations.*
- Erkip, Albert K., *The nth order elliptic boundary value problem on non-compact domains.*
- Fenimore, Charles Paine, *Analysis of algorithms for advection in discontinuous flows.*
- Gerber, Marlies, *Topics in ergodic theory.*
- Giller, Cole A., *Some three and four dimensional correlates to Conway's knot theory.*
- Goldman, William Mark, *Discontinuous groups and the Euler class.*
- Harman, Jonathan William, *Chains of higher level orderings.*
- Hart, David Charles, *On the smoothness of generators for flows and foliations.*
- Hickerson, Dean Robert, *Splittings of finite groups.*
- Hull, Richard Baxter, *Containment between intersection families of linear and reset languages.*
- Jewell, Angelyn, *Rational maps of the Riemann sphere.*
- Kumjian, Alexander Anthony, *On localization and simple C^* -algebras.*
- Lin, Shao-Shiung, *Theoretical study of a reaction-diffusion model for flame propagation in a gas.*
- Livingston, Charles, *The knotting of surfaces in 4-spaces.*
- Lugo, Gabriel Guillermo, *Structure of twistor and H-spaces.*
- McCurdy, Allan Charles, *Accurate computation of divided differences.*
- Mersel, Jonathan Lee, *Quadratic forms over fields with finitely many orderings.*
- Murio, Diego Antonio, *Numerical methods for inverse transient heat conduction problems.*
- Nitao, John Jun, *The mathematical analysis of the thermal-hydraulic network equations which occur in nuclear reactor safety codes.*
- Pestien, Victor Charles, Jr., *Stopping-time-indexed convergence and measurable gambling.*
- Radin, Lon Berk, *Adding closed cofinal sequences to large cardinals.*
- Ratiu, Tudor Stefan, *Euler-Poisson equations on Lie algebras.*
- Richman, David Ross, *Some properties of matrices and their transposes, with emphasis on fields of characteristic two.*
- Schlafly, Roger Sherwood, *Universal connections and a characteristic class for euclidean space.*
- Smith, Stuart Preston, *Contributions to the eigenvalue problem for the Laplacian.*
- Sohrab, Houshang Haghighat, *The C^* -algebra of the N-dimensional harmonic oscillator.*
- Squier, Craig Cecil, *On the homological algebra of Artin groups.*
- Stowe, Dennis Clark, *Stable orbits of differentiable group actions.*
- Wei, Shihshu Walter, *Minimality, stability and Plateau problem.*
- Weisser, Daniel P., *Elliptic fixed points of the Hilbert modular group and class numbers of imaginary abelian number fields.*
- Williams, Dana Peter, *The primitive ideal space of transformation group C^* -algebras and covariance algebras.*
- Williams, Daniel Arthur, III, *On a global parametrization of the Helmholtz operator bounded between certain weighted Sobolev spaces.*

SCIENCE AND MATHEMATICS EDUCATION

Ross, Peter, *Student difficulties in solving calculus word problems.*

University of California, Davis
(3;1,0,0,0,1,0,1)

MATHEMATICS

Clarke, Judith Lorraine, *A study of commutative cancellative idempotent-free semigroups.*

Hayes, David Frank, *Long paths in graphs imply the existence of long circuits.*

Jasiulek, Joachim Norbert, *Continuous linear programming; theory and computation.*

University of California, Irvine
(2;2,0,0,0,0,0,0)

MATHEMATICS

Jacoby, Carol Cook, *The classification in L_∞^ω of groups with partial decomposition bases.*

Smith, Raymond Frederick, *Operators on p-adic Banach spaces.*

University of California, Los Angeles
(17;6,0,2,4,2,0,3)

MATHEMATICS

Beaver, John Bradley, *Biharmonic functions on Riemannian manifolds.*

Becker, Howard Starr, *Some applications of ordinal games.*

Fitzgerald, Robert William, *Quadratic forms under function field extensions.*

Kosaki, Hideki, *Canonical L^p -spaces associated with an arbitrary abstract von Neumann algebra.*

Oxford, Stephen Charles, *The Hamiltonian of the quantized non-linear Schrödinger equation.*

Trace, Bruce Stewart, Jr., *Handlebody decompositions of four-dimensional manifolds.*

Urwin, Ross William, *Geometric quantization and the cohomology of Lie algebras.*

SYSTEM SCIENCE

Aryaneshad, Mir-Bahador-Qoli, *Replacement and correction models with imperfect information.*

Azoury, Katy, *Dynamic inventory problem with unknown demand distribution.*

Berman, Arie, *Adaptation of set-defining notation to the specification of formal languages.*

Bose, Samirsh, *Two-dimensional smoothing of a vector Laplacian random field with application to geodesy.*

Cutler, Melvin, *A formal program model for discrete event simulation and its use in the verification and validation of system models and implementations.*

Haney, Richard, *The application of non-linear programming to the optimization of multistep methods for the numerical solution of ordinary differential equations.*

Haruki, Kasuhito, *Monetary and fiscal policy effects in a dynamic macroeconomic model.*

Louie, Ming Yiu, *Access-control schemes for real-time and store-and-forward multiple-access communication channels.*

Ross, Alan, *Stability and stabilizability of infinite dimensional linear systems via Liapunov's direct method.*

Tai, Tin Choi, *Parameter estimation of the human respiratory system.*

University of California, Riverside
(4;3,0,0,0,1,0,0)

MATHEMATICS

Bunch, Henry Forrest, *Representations of a distributive topological lattice of finite breadth.*

Okon, James Sidney, *Asymptotic prime divisors and filtrations.*

Terlinden, David Mills, *Two spectral problems for operators generating differential equations.*

Wareham, Arlan Keith, *Product functors and related structures in the category of networks and flow-morphisms.*

University of California, San Diego
(5;4,1,0,0,0,0,0)

MATHEMATICS

Atkinson, Bruce Walker, *The general theory of processes for Markov families of σ -fields.*

Border, James Samuel, *Nonlinear Hardy spaces and electrical power transfer.*

Deyo, Roderic Carleton, *Universal trace classes.*

Sarraille, John Joseph, *PI rings with low Krull dimension and the structure of incidence algebras of graphs.*

Strait, Stewart Charles, *A quadratic measure of deviation of spectral estimates.*

University of California, Santa Cruz
(3;2,0,0,0,0,0,1)

MATHEMATICS

Langer, Joel Cosgrove, *On a variational problem involving curvatures of immersed surfaces.*

McClurg, Phillip, *Classification of F_1 -pairs in Chevalley groups over fields of even order.*

Roach, Michael Dean, *Energy-momentum surfaces from left-invariant metrics on Lie groups.*

University of Southern California
(2;1,0,0,0,1,0,0)

MATHEMATICS

Craig, Susanne Louise, *Strong trichotomies and the splitting index for linear differential systems.*

Milman, Mark, *Feedback control of hereditary systems governed by linear operator equations.*

COLORADO

Colorado State University
(1;0,1,0,0,0,0)

STATISTICS

Iyer, Hariharan K., *E-optimal balanced designs of the $2^m \times 3^n$ series.*

University of Colorado
(7;5,0,0,0,2,0,0)

MATHEMATICS

Baldwin, Stewart L., *Mahlo cardinals and canonical forms for sequences of ultrafilters.*

Barge, Marcy Mason, *A qualitative analysis of Tikitake equations.*

Pickett, James Wildon, *Isometries, approximate isometries, and measure.*

Hopponen, Jerry D., *Generalized inverses of matrices over local rings.*

Johnson, Kenneth Richard, *Reciprocity and multiplicativity in a class of arithmetic functions.*

Mitchell, Wesley Edward, *Multiplier representations of the two-dimensional lattice group.*

Tadjean, Hamid, *Boundary approximation and time step control in iterative improvement for the numerical solution of partial differential equations.*

University of Denver
(1;1,0,0,0,0,0,0)

MATHEMATICS AND COMPUTER SCIENCE

Zerbe, Julia E., *Generalized measure theory.*

University of Northern Colorado
(8;1,3,0,0,1,1,0)

MATHEMATICS

Barlow, Richard Lee, *An investigation of two aspects of the Bell-Doksum normal scores test.*

Fairbanks, Paul, *Polya's property W, disconjugacy, and the conjugate point function.*

Manfred, Ernest John, *A multiple regression approach to placement in mathematics at the United States Coast Guard Academy.*

Vick, Donald M., *The mathematics curriculum in two-year colleges.*

STATISTICS AND RESEARCH METHODS

Crouch, William H., *Legal and extralegal factors affecting court dispositions of felony offenses.*

Swank, Paul Russell, *Hierarchical cluster analysis for educational research.*

CONNECTICUT

University of Connecticut
(2;2,0,0,0,0,0,0)

MATHEMATICS

Chung, Jae Muung, *The injective hull of torsion free abelian groups.*

Riley, John Henry, Jr., *Subalgebras of H^∞ and the corona property.*

Wesleyan University
(1;1,0,0,0,0,0,0)

MATHEMATICS

Turner, Philip Harold, *Aspects of convexity in billiard ball dynamical systems.*

Yale University
(12;10,2,0,0,0,0,0)

MATHEMATICS

Arnon, Jonathan Dan, *The special representation and modular representations of affine Chevalley groups.*

Bergelson, Robert Joel, *An adelic Euler-Maclaurin formula for imaginary quadratic fields and the index of the Stickelberger ideal of order k on $C^k(N)$.*

Cossec, Francois Roland, *Projective models of Enriques surfaces and Reye congruences.*

Frenkel, Igor B., *Orbital theory for affine Lie algebras.*

Kersey, Donald Thomas, *The index of modular units.*

Little, John B., *Translation manifolds and the converse of Abel's theorem.*

Sawka, John Martin, *Odd primary Steenrod operations in spectral sequences.*

Silver, Daniel S., *Finding stable-boundaries for open five-dimensional manifolds.*

Traldi, Lorenzo, *On the determinantal ideals of link modules and a generalization of Torres' second relations.*

Yu, Jing, *A cuspidal class number formula for the modular curves $X_1(N)$.*

STATISTICS

Spencer, Bruce D., *Benefit-cost analysis of data used to allocate funds: general revenue sharing.*

Wong, Manshek Anthony, *Hybrid clustering.*

DELAWARE

University of Delaware
(3;1,0,0,0,2,0,0)

MATHEMATICAL SCIENCES

Buchanan, James Landrum, *The Hilbert and Riemann-Hilbert problem for systems of Pascali type.*

Foulkes, John Barrett, *Set-valued functions and convexity.*

Jordan, Kirk Edmond, *A numerical treatment of singularly perturbed boundary and initial-boundary value problems.*

DISTRICT OF COLUMBIA

American University
(3;0,3,0,0,0,0,0)

MATHEMATICS, STATISTICS AND COMPUTER SCIENCE

Berman, Nancy Greene, *Testing the equality of the means of two normal distributions when the samples are truncated.*

Rinaman, William C., *Adaptive procedures in analysis of variance.*

Smith, William, *Approximation of the distribution function and moment of the one-sample two-sided Kolmogorov-Smirnov statistic.*

George Washington University
(4;0,0,0,4,0,0,0)

OPERATIONS RESEARCH

Rappoport, Harold Kalman, *An optimization technique for a multi-time-period spares provisioning problem.*

Shayan, Mohammad Ebrahim, *A methodology for comparing algorithms and a method of computing math order directional derivatives based on factorable programming.*

Smith, Wray Jackson, *Sample size and timing decisions for repeated socioeconomic surveys.*

Wong, Man-Yuen, *Improvement of kernel estimates of the failure rate function by using the generalized jackknife and sinc function.*

FLORIDA

Florida State University
(11;3,6,0,1,1,0,0)

MATHEMATICS

Malik, Saroj, *A study of strong S-domains and Prüfer v-multiplication domains.*

Morrison, Tim, *Induced spaces of derivations in the p-adic Galois theory.*

Schreur, Barbara, *On the production of long-period comets by stellar perturbations of the Oort comet cloud.*

STATISTICS

Barker, Lawrence Edward, *Extremal problems in large deviations and Bayesian nonparametric failure rate estimation.*

Cheng, Errguang Philip, *On nonparametric estimation of density and regression functions.*

Cheng, Kuang Fu, *Contributions to asymptotic theory for statistics as functionals of the empirical density function.*

Cooper, Paul G., *Two-way cluster analysis for nominal data.*

Fagerstrom, Richard M., Jr., *A comparative study of some bioassay methods.*

Hannum, Robert Charlton, Jr., *Contributions to Bayesian nonparametric statistics.*

Wu, Ke-Tsai, *The stability of continuous programming.*

Zinsmeister, Alan, *Continuous time Markov independent particle systems with continuous time input.*

University of Florida
(6;3,3,0,0,0,0,0)

MATHEMATICS

Boyles, Stephanie Marion, *A counterexample to the bounded orbit conjecture.*

Winslow, Alicia Browner, *Compacta in the Stone-Čech remainder of R^n .*

Winslow, David G., *Periodic homeomorphisms on $S^2 \times (0, 1)$ and R^3 .*

STATISTICS

Lou, William C., *A comparison of methods for combining tests of significance.*

Ondrasik, John Anthony, *Population density estimation using transect sampling.*

Yun, Sang un, *Estimation of parameters for the models with normal and exponential distributions used in life testing problems.*

University of Miami
(1;1,0,0,0,0,0)

MATHEMATICS

Sumner, John Sanford, *Generalized addition sets.*

University of South Florida
(2;1,1,0,0,0,0)

MATHEMATICS

Lachance, Michael A., *Extremal problems for constrained polynomials and univalent functions.*

Weng, Chen-Ming, *Nonparametric quasi-Bayesian estimation of reliability and prior distribution.*

GEORGIA

Emory University
(1;0,0,0,0,0,1)

MATHEMATICS

Jacobson, Michael Scott, *On various extensions of Ramsey theory.*

University of Georgia
(11;3,4,0,0,1,3,0)

MATHEMATICS

Alif, Metod, *Geometric classification of simplicial structures on topological manifolds.*

Kuhn, Stephen Walter, *On the modular representation ring of $Z_4 \times Z_2$.*

Malakian, Kourken, *Linear and nonlinear stochastic operators.*

Whitaker, Genevieve Gaither, *Two-step solvable Lie algebras and the isomorphism problem.*

MATHEMATICS EDUCATION

Corbitt, Mary Kay, *Validation of two constructs of attitude toward school mathematics.*

Ehr, Carolyn Kathryn, *Cognitive style and information selection during the solution of mathematics word problems.*

Spikes, Willie Curtis, *On a model for children's learning of addition and subtraction.*

STATISTICS AND COMPUTER SCIENCE

Lu, Hsin-Hsien Hank, *A unit stratification sample design using rotational sampling.*

Pickett, John R., *Selecting all populations better than a control.*

Tsai, Li-Yueh Denise, *Estimation on the truncated gamma distribution.*

Tsai, Paul-Jeih, *Interval estimation, ranking and selection procedures.*

IDAHO

Idaho State University
(2;1,0,0,0,0,1,0)

MATHEMATICS

Haertel, Raymond Delbert, *Cones of matrices and linear transformations.*

Johnson, Jack Van, *Mathematics skills for home and work.*

ILLINOIS

Illinois Institute of Technology
(1;0,0,1,0,0,0,0)

COMPUTER SCIENCE

Wojciechowski, Witold, *Multiple-valued combinational logic design using theorem proving.*

Illinois State University
(1;1,0,0,0,0,0,0)

MATHEMATICS

Chao, Kenneth, *An algorithm module for abstract algebra.*

Northwestern University
(14;1,0,7,3,0,0,3)

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Devor, Charles C., *A simulation study of attribute-based locking mechanisms for relational data bases.*

Mekly, Leon J., *A systems approach to software design representation.*

Nakajima, Kazuo, *On multiprocessor non-preemptive scheduling with discrete starting times.*

Naqvi, Shamim A., *Performing inferences over recursive databases.*

Veroff, Robert Louis, *Automatic transformations in the inference process.*

Yang, Chen-Chau, *An approach to software architecture design and specification.*

Yasnoff, William Alan, *Error measures for scene segmentation in automated cytology.*

INDUSTRIAL ENGINEERING AND MANAGEMENT SCIENCES

Fang, Shu-Cherng, *Generalized complementarity, variational inequality and fixed point problems: theory and applications.*

Kirsch, Kenneth C., *Management policies for scheduling patients in an emergency room: a computer simulation approach.*

Libman, Ardwin S., *Procurement of evaluation systems: a case study of the parametric factor evaluation approach to source selection.*

Osekici, Suleyman, *Optimal control of storage models with Markov additive inputs.*

Sauter, Vicki Lynn, *Information use in decision-making: three case studies focusing upon the use of criteria in the decision-making process.*

Venta, Enrique R., *Production-location decisions.*

MATHEMATICS

Hurley, Michael G., *Attractors: persistence, and density of their basins.*

Southern Illinois University, Carbondale
(2;1,0,0,0,0,0,1)

MATHEMATICS

Becker, Leigh Carl, *Stability considerations for Volterra integrodifferential equations.*

VanHaagen, Antonius Johannes, *Finite signed measures on function spaces.*

University of Chicago
(1;0,1,0,0,0,0,0)

STATISTICS

Heller, Barbara Ruth, *Special functions and the characterization of probability distributions by constant regression of polynomial statistics on the mean.*

University of Illinois, Chicago
(5;1,2,0,1,1,0,0)

MATHEMATICS

Filar, Jerzy Andrzej, *Algorithms for solving some undecounted stochastic games.*

Foody, Walter M., *Properties, construction, and application of BIB designs with repeated blocks.*

Lucas, Richard John, *Eigenvalue bounds and stability of conservative fluid and plasma flows.*

Magda, Constantine Gregory, *On E-optimal block designs and Schur optimality.*

Thulin, Frederick Adolph, III, *Undecidability of some natural differential fields.*

University of Illinois, Urbana-Champaign
(15;13,0,0,0,1,1,0)

EDUCATION

Timraz, Kadria Ali, *An application-oriented approach to matrices as unifiers of some mathematical topics in high school mathematics.*

MATHEMATICS

Bonvallet, Robert, *The martingale problem for the dynamic gas model.*

Fry, Michael D., *Lifting automorphisms to stem extensions of a finite group.*

Fry, Robert Marvin, *Characteristic surfaces in non-orientable 3-manifolds.*

Geitz, Robert Frederick, *The Pettis integral.*

Hafner, James Lee, *On the average order of the divisor function, lattice point functions, and other arithmetical functions.*

Hurder, Steven Edmond, *Dual homotopy invariants of G-foliations.*

Karney, Dennis F., *Duality and approximation in semi-infinite programming.*

Lockhart, Robert Bruce, *Fredholm properties of a class of elliptic operators on non-compact manifolds.*

McKenty, Geoffrey Evan, *Independent sets in graphs and the partition problem.*

Moore, Vardeman G., *Recursive function theory in groups and semigroups.*

Perkins, Edwin Arend, *A non-standard approach to Brownian local time.*

Rawsthorne, Daniel A., *Improvements in the small sieve estimate of Selberg by iteration.*

Sunseri, Richard Frank, *Zeros of P-adic and L-functions and densities relating to Bernoulli numbers.*

Vasak, Janet Trzcinski, *Periodic Bernoulli numbers and polynomials.*

INDIANA

Indiana University
(2;1,1,0,0,0,0,0)

MATHEMATICS

Chiang, Ching-Yuan, *Some rank order tests in linear regression.*

Johns, Ronald Alan, *Trace monotonicity, convexity, and stable potentials.*

Purdue University
(22;0,4,5,9,4,0,0)

COMPUTER SCIENCES

Balbo, Gianfranco, *Approximate methods in computer performance evaluation.*

Boisvert, Ronald Fernand, *High order finite difference techniques for elliptic boundary value problems.*

Dennis, Thomas Donald, *A capability architecture.*

Hevner, Alan Raymond, *Query processing on a distributed database system.*

Miller, James Ross, *Computer graphics in macromolecular crystallography.*

INDUSTRIAL ENGINEERING

Akileswaran, Vaidyanathan, *Optimality analysis of heuristic decision rules in water resource planning.*

Azadivar, Farhad, *Optimization of stochastic systems through simulation using stochastic approximation method.*

Evans, Gerald W., *Optimal generation planning for electric utilities.*

Hiatt, William H., *A group theoretic approach to parametric integer programming.*

Philipson, Roland Henry, *An algorithm for the optimization of a multiple-spindle automatic bar machine.*

Preklas, David Michael, *A unifying theory of algorithms for discrete optimization problems.*

Sadagopan, Sowmyanarayanan, *Multiple criteria mathematical programming—a unified interactive approach.*

Sneider, Richard Mark, *A methodology for optimal assembly line balancing.*

Wilson, James R., *Variance reduction techniques for the simulation of queuing networks.*

MATHEMATICS

Dickerson, Charles Everett, *Solutions to the Liouville equation by stationary phase in infinitely many dimensions.*

Etheridge, William L., *Conformally symmetric Riemannian manifolds.*

Medhin, Negash Gabre, *Necessary conditions for optimal control problem with bounded state by penalty method.*

Woolford, Samuel Whitefield, II, *On a storage model.*

STATISTICS

Albert, James Harry, *Robust Bayes estimation.*

Hsiao, Ping, *Some contributions to gamma-minimax and empirical Bayes selection procedures.*

Hwang, Jiunn Tsion, *Improving upon inadmissible estimators in discrete exponential families.*

Sundheim, Richard Allen, *Asymptotically optimal multiparameter sequential Bayes regional estimation procedures.*

University of Notre Dame
(4;4,0,0,0,0,0,0)

MATHEMATICS

Erdman-Snow, Joanne, *Complex solvmanifolds of dimension two and three.*

Ormsby, Ellen, *Holomorphic maps of fibered spaces.*

Smiley, Leonard, *Dependence theorems for meromorphic maps.*

Snow, Dennis, *Pseudoconcave homogeneous manifolds.*

IOWA

Iowa State University
(17;0,8,7,0,2,0,0)

COMPUTER SCIENCE

Allan, Stephen John, *The reduction of data dependencies in high level programs.*

Boysen, John Peter, *Factors affecting computer program comprehension.*

Brown, Walter E., *Toward an optimizing compiler for a very high level language.*

Henry, Sallie M., *An information flow methodology as a basis for the design and evaluation of operating systems.*

Roeder, Robert D., *Type determination in an optimizing compiler for APL.*

Thoreson, Sharilyn A., *A study of memory references in a data flow environment.*

Wittneben, Walter James, *Design and evaluation of a reference string sampling method.*

MATHEMATICS

Skar, Sherwin James, *Stability of power systems and other systems of second order differential equations.*

Strasburger, Martin James, *Families of stiffly stable Adams type linear multistep formulas.*

STATISTICS

Bhattacharyay, Biswanath, *Estimation for varying parameter stochastic difference equations.*

Dahm, Paul Frederick, *Estimation of the parameters of the multivariate linear errors in variables model.*

Ebrahimi, Nader, *Some topics in reliability theory.*

Kackar, Raghu Nath, *Variance approximations for estimators of fixed and random effects in mixed linear models.*

Parsian, Ahmad, *Admissible and minimax multiparameter estimation in exponential families.*

Sallas, William Michael, *Recursive mixed model estimation.*

Scott, Mark, *Characterizations of strong ergodicity for continuous time Markov chains.*

Werner, Neil, *Probabilistic and statistical aspects of random stopping.*

University of Iowa
(6;2,4,0,0,0,0,0)

MATHEMATICS

Pizarro-Geraldo, Antonio, *Similarity classes in the ring of 3×3 matrices over a complete discrete valuation ring.*

Taghva, Sidkasem, *Topics in model completeness of direct powers and direct products of theories.*

STATISTICS

Kepner, James Lee, *Tests using the null hypothesis of bivariate symmetry.*

Lin, Lawrence I-Kuei, *The effect of non-normality on multiple group discrimination and estimation of the logistic risk function when data are heavy tailed with clumping at zero.*

Pendergast, Jane Frances, *Robust estimation in growth curve models.*

Soliman, Zeinab Selim, *Two sample location and scale tests for distributions with the same finite interval of support.*

KANSAS

Kansas State University
(4;1,2,1,0,0,0,0)

MATHEMATICS

Shad, Saeed Ahmed, *Characterizations of geometries related to polar spaces.*

Wittekind, Glen W., *Collocation methods for elliptic partial differential equations.*

STATISTICS

Marasinghe, Mervyn G., *Testing subhypotheses in the multiplicative interaction model.*

Mira, Seham Ismail, *Interaction in two-way covariance models with one observation per cell.*

University of Kansas
(2;2,0,0,0,0,0,0)

MATHEMATICS

Atkins, David Lee, *Automorphisms of power series rings.*

Watkins, John, *Power series over von Neumann regular rings.*

KENTUCKY

University of Kentucky
(8;2,4,0,0,1,0,1)

MATHEMATICS

Badawi, Faris, *Structures and algorithms in stochastic realization theory and the smoothing problem.*

Patterson, James C., III, *(x, y) -divisible envelopes over commutative rings.*

Saylor, Annie Victoria, *Extrapolation, deferred correction, and defect correction of discrete-time Galerkin methods for linear parabolic problems.*

Yanik, Harry Joe, *Projective algebras.*

STATISTICS

Bemis, Kerry G., *Ban estimation and asymptotic chi-square for the constraint equation model.*

Craig, Robert James, *The simplex search in statistical optimization problems.*

Jordan, David Charles, *On the use of prior information for prediction.*

Schwartz, Jeffrey H., *Optimal allocation of resources to reduce product or process variability; a comparison of some designs to estimate the allocation parameters and the variance components.*

LOUISIANA

Louisiana State University, Baton Rouge
(2;2,0,0,0,0,0,0)

MATHEMATICS

Anderson, Mary Jorgensen, *Convergence theorems for linear evolution equations.*

Michael, Mark, *Sigma-compact subsets of hyperspaces.*

Tulane University
(1;1,0,0,0,0,0)

MATHEMATICS

Przygocki, Antoni, *Schur indices of characters of $Sp(4, q)$.*

University of Southwestern Louisiana
(1;1,0,0,0,0,0)

MATHEMATICS AND STATISTICS

Norwood, Frederick, *One-relator knots.*

MARYLAND

Johns Hopkins University
(7;4,1,0,2,0,0,0)

BIostatISTICS

White, Billy G., *A case of ethical designs for controlled clinical trials.*

MATHEMATICAL SCIENCES

Levy, Yonatan Aharon, *Inventory systems with independent stochastic lead-times.*

McKinney, Jacqueline, *Optimal multi-product scheduling on one machine over a finite horizon.*

MATHEMATICS

Chan, Kenneth, *Applications of the bar and cobar spectral sequences to the Brown-Peterson spectrum.*

Kotlarsky, Mark, *The structure of projective modules.*

Meuser, Diane Mae, *On the rationality of certain generating functions and related local zeta functions.*

Ramaroson, Francois, *Elliptic curves with conductors a square of a prime.*

University of Maryland, College Park
(11;6,0,0,0,5,0,0)

MATHEMATICS

Alligood, Kathleen, *Homological indices and homotopy continuation.*

Cipra, Barry, *Theta functions and cusp forms of weight $3/2$.*

Evans, Ward Rees, *Spectral analysis of continuous pseudo-measures.*

Kahn, Steven Marshall, *Characteristic number obstructions to fibering structured manifolds over surfaces and low-dimensional spheres.*

Kenney, Charles S., *Greenhill's problem for non-linearly elastic rods.*

Losier, Daniel William, *Numerical solution of linear difference equations.*

Mansfield, Arthur W., *Newton and damped schemes for the solutions of singular bifurcation equations.*

Ng, Hock, *On the classification of unitary cobordism classes which have representatives that admit semifree C^∞ compact Lie group actions preserving SACX structure.*

Picardello, Angelo, *Locally compact unimodular groups with completely reducible regular representation.*

Rodriguez-Acosta, Jesus, *A generalized alternative method for boundary value problems with large nonlinearities.*

Vogelius, Michael, *A dimensional reduction approach to the solution of partial differential equations.*

MASSACHUSETTS

Boston University
(6;0,5,1,0,0,0,0)

MATHEMATICS

Anderson, Jennifer Jane, *A comparison of smooth empirical Bayes estimators.*

Buonocristiani, John, *Probability on fussy sets.*

Cupples, L. Adrienne, *Using screening data to estimate a disease natural history which is changing in time.*

Deitel, Harvey, *Structured software development.*

Finberg, Naomi, *A proposed solution to the Behrens-Fisher problem.*

Sibley, Thomas Quinton, *The theory of finitely additive probability using nonstandard analysis.*

Harvard University
(17;3,1,6,0,5,0,2)

APPLIED SCIENCES

Anderson, Gary, *The transportation problem: an application of linear programming techniques to urban economic modelling.*

Casanova, Marco A., *The concurrency control problem for database systems.*

Cohen, Norman Howard, *Source-to-source improvement of recursive programs.*

Dayal, Umeshwar, *Schema-mapping problems in database systems.*

Goodman, Nathan, *The power of semi-joins in distributed database query processing.*

Karakashian, Ohannes, *Galerkin methods for some nonlinear equations in hydrodynamics.*

Noiseux, Claude F., *Resonance in open harbors.*

Ploedereder, Erhard O. J., *A semantic model for the analysis and verification of programs in general, higher-level languages.*

Roberts, Eric Stenius, *Software techniques for practical multi-processors.*

Semmelman, Jacques, *Mathematical theory of nonstationary slip flow for homogeneous, viscous, incompressible fluids.*

Stein, Joel, *Hopf algebra structures on tensor products of Z -modules.*

BIostatISTICS

Berkey, Catherine S. Grooms, *Three longitudinal growth models for preschool children: comparison and application.*

Levenstein, Marcia Joanne, *Alternative regression methods in the presence of multicollinear regressors.*

MATHEMATICS

Jamshidian, Farshid, *Integral geometry of plane complexes.*

Monash, Curt Alfred, *Stochastic games: the minmax theorem.*

Morrison, David Robert, *Semistable degenerations of Enriques' and hyperelliptic surfaces.*

Tu, Loring W., *Variation of Hodge structure and the local Torelli problem.*

Massachusetts Institute of Technology
(24;13,1,1,0,2,0,7)

MATHEMATICS

Abbott, John Steele, III, *Long-short wave interactions and associated instabilities.*

Anick, David Jay, *A counterexample to a conjecture of Serre.*

Bell, Steven Robert, *Applications of the Bergman projector in the theory of functions of several complex variables.*

Boas, Harold Philip, *Kernel functions related to projections onto spaces of holomorphic functions.*

Branson, Thomas Patrick, *Quasi-invariance, special solutions, and Banach manifold geometry.*

Chaiken, Seth David, *Matrix tree theorems and degree sequence realization by strongly 2-connected digraphs.*

Dorer, David John, *Initial segments in ordinal recursion theory.*

Duflot, Jeanne, *Equivariant cohomology and smooth P -toral actions.*

Durst, Mark Joseph, *Donsker classes, Vapnik-Chervonenkis classes, and chi-squared tests of fit with random cells.*

Edelman, Paul Henry, *The zeta polynomial of a partially ordered set.*

Gillicke, Laurence Steven, *Iterative ellipsoidal trimming.*

Griffor, Edward Ronald, *E-recursively enumerable degrees.*

Grimson, William Eric Leifur, *Computing shape using a theory of human stereo vision.*

Kupershmidt, Boris Abram, *Geometry of jet bundles and the structure of Lagrangian and Hamiltonian formalisms.*

Levin, Leonid A., *A general notion of independence of mathematical objects. Its applications to some problems of probability theory, mathematical logic and algorithm theory.*

Mendoza, Gerardo Alvaro, *Symbol calculus associated with intersecting Lagrangians.*

Murty, Maruti Ram Pedaprolu, *Artin's conjecture and non-abelian sieves.*

Ocone, Daniel Leonard, *Topics in nonlinear filtering theory.*

Paneits, Stephen Mark, *Causal structures in Lie groups and applications to stability of differential equations.*

Peskin, Barbara Rose, *Quotient singularities in characteristic p .*

Pincus, Steven Michael, *Strong laws of large numbers for products of random matrices.*

Saks, Michael Esra, *Duality properties of finite set systems.*

Shearer, James Berghem, *Some problems in combinatorics.*

Winston, Kenneth James, *Asymptotic analysis of lattices and tournament score vectors.*

Northeastern University
(1;1,0,0,0,0,0,0)

MATHEMATICS

Bush, James Preston, *On 2-designs with the symmetric difference property.*

**University of Massachusetts,
Amherst**

(4;0,0,4,0,0,0)

COMPUTER AND INFORMATION SCIENCE

Maulucci, Ruth Anne, *Kinetics and optimality in quadruped locomotion.*

Nagin, Paul Alexander, *Studies in image segmentation algorithms based on histogram clustering and relaxation.*

Singer, Andrew Jay, *Formal methods and human factors in the design of interactive languages.*

Woods, John Lowe, *Path selection for symbolic execution systems.*

MICHIGAN

Michigan State University

(5;3,2,0,0,0,0)

MATHEMATICS

Daepf, Ulrich, *Saturations of an analytic ring over an algebraically closed field.*

Evans, Alan, *On the homology of local Cohen-Macaulay rings.*

Naik-Nimbalkar, Uttara, *Bochner property in Banach spaces.*

STATISTICS AND PROBABILITY

Chow, Shin-Sun, *On structure preserving groups of latin squares and their applications to statistics.*

Vandersanden, Alfred, *Some results for the weighted empirical process concerning the law of the iterated logarithm and weak convergence.*

University of Michigan, Ann Arbor

(15;11,0,0,0,0,4)

MATHEMATICS

Brown, Johnny Earl, *Linear extremal problems in the class of univalent functions.*

Ephron, Mark Steven, *Indicators of products and surjective convolution maps.*

Exoo, Geoffrey Allen, *Extremal adjacency graphs.*

Gonek, Steven Mark, *Analytic properties of zeta and L-functions.*

Hagwood, Robert Charles, *A nonlinear renewal theorem for discrete random variables.*

Hsu, Derbiau Frank, *Cyclic neofields and combinatorial designs.*

Kabell, Jerald Allan, *Intersection graphs: structure and invariants.*

Morton, Richard Patrick, *The 2-class group of a quadratic number field and the Pell equation $x^2 - \Delta y^2 = -1$.*

Plotnick, Steven Paul, *Knots, automorphisms, and homology 4-spheres.*

Riets, Kenneth Paul, *Completeness of constant-coefficient connections on R^n .*

Rosen, Ned Ira, *Weakly Ramsey ultrafilters and P-points.*

Simen, David Charles, *R^k actions on manifolds.*

Simon, Burton E., *Equivalent Markov-renewal processes.*

Squires, William Allan, *Interpolation theory for spaces of entire functions with growth conditions.*

Swartwout, Donald Eugene, *Abstract data structures and queries: toward mathematical analysis in logical-level data-base design.*

Wayne State University

(1;0,0,0,0,0,1)

MATHEMATICS

Arlinghaus, William Charles, *The structure of minimal graphs with given abelian automorphism group.*

Western Michigan University

(1;0,0,0,0,0,1)

MATHEMATICS

Burns, David Peter, *Uniform factorization of graphs.*

MINNESOTA

University of Minnesota, Minneapolis

(15;10,1,0,0,0,4)

BIOMETRY

Burau, Keith, *Geometric features of the vectorcardiogram and diagnostic classification.*

Korets, Maria Marton, *Effects of censoring on parametric estimation in parametric survival analysis.*

Parvin, Curtis, *Evaluation of analysis techniques in evoked responses research.*

Willard, Christopher, *A systems framework for management of clinical research data.*

MATHEMATICS

Gutierrez, Angel, *A priori L^p -estimates for the solution of the Navier equations of elasticity.*

Hewitt, James Allen, *A characterization of component type finite groups which contain the centralizer of an involution with an $SP(2m, q)$ 2-component.*

Hummel, Robert Alexander, *Variational inequalities for the hodograph method in fluid mechanics.*

Kleven, Donald John, *A characterization of the regular simplex by its minimal volume for a fixed width.*

Kranakis, Evangelos Kostantinou, *Recursive analogues of large cardinals.*

Lastufka, William Stanley, *Tight topological immersions of surfaces in euclidean space.*

Marver, James Milton, *Gelfand-Segal representations of a full Hilbert algebra.*

Marx, Lawrence Joel, *Cohen-Macaulay rings with monomial gradings.*

Scissors, Richard Howard, *Multiparameter Levy processes.*

Wong, Dominic Hing Yuen, *Controllability for non-linear differential equations in infinite dimensional spaces.*

STATISTICS

Johnson, Wesley Orin, *A Bayesian method of detecting influential subsets of data in prediction.*

MISSISSIPPI

University of Mississippi

(1;1,0,0,0,0,0)

MATHEMATICS

Buchanan, Virginia M., *Variations on pseudonormality in Moore spaces.*

MISSOURI

St. Louis University

(2;0,0,0,0,1,1)

MATHEMATICS

Baumeier, Joel Bernard, *Polybores: basic polynomial theory without alphabetical notation.*

Buss, Robert Raymond, *Newton's use of Hudde's rule in his development of the calculus.*

University of Missouri, Columbia

(8;1,5,1,0,1,0)

MATHEMATICS

Kochhar, Ram P., *Scattering from a porous sphere.*

Kuo, Ren-Tai, *Vector measurable functions via Stonian spaces.*

Nolting, David Jerome, *Linear multistep methods with near-optimal stability.*

STATISTICS

Fairbanks, Kenneth Brian, *Estimation of an exponential parameter from life test data.*

Kelly, Robert Patrick, *Identification problems in the exponential family.*

Khedr, Magdy Sayed, *Statistical inference on the log-zero-Poisson distribution.*

Stith, Marion Joseph, *Scatter diagrams for data analysis using a characterization property.*

Weier, Dennis R., *On tests of independence with life testing applications.*

University of Missouri, Kansas City

(1;0,0,0,0,1,0)

MATHEMATICS

Ting, Bing-Yuan, *Evaluation of integrals whose integrands are oscillatory and singular.*

Washington University

(8;3,0,0,0,2,0,3)

MATHEMATICS

Chiu, Bo-Yuan, *Classes of non-commutative rings with Dedekind-domain-like properties and modules over non-commutative valuation rings.*

Foged, Leslie Owen, *Weak bases for topological spaces.*

Hemler, Michael Lee, *The molecular theory of $H^p, q, s(\mathbb{H}^n)$.*

**SYSTEMS SCIENCE AND APPLIED
MATHEMATICS**

Prasad, Krishna V., *Decision and control operation of the large interconnected power system in emergencies.*

Schlereth, Eugene Paul, *On the Korteweg-De Vries equation: a nonlinear transformation and an allied equation.*

Singh, Jagjit, *Normal operating state control of the electric power system.*

Whang, Keh-wen, *Control of power systems in emergencies.*

Wirth, Patricia Ellen, *A unified theory of linear diffusion in multilayered materials.*

MONTANA

Montana State University
(1;0,1,0,0,0,0,0)

MATHEMATICAL SCIENCES

Hinkins, Susan, *Using incomplete multivariate data to simultaneously estimate the means.*

University of Montana
(2;1,0,0,1,0,0,0)

MATHEMATICS

Caton, Gerald Lee, *Qualitative analysis of the class of nonlinear initial value problems arising in the field of pharmacokinetics.*

Helfman, Richard, *Assignment problem: heuristic approach.*

NEBRASKA

University of Nebraska
(5;2,2,1,0,0,0,0)

MATHEMATICS AND STATISTICS

Carroll, John Lester, *A study of closed queueing networks with population size constraints.*

Chang, Kun Soo, *Scale-invariant measurability in function spaces.*

Pakala, Jagannadham V., *Commutative torsion theories.*

Smith, Norman L., *Inequalities for functions of order statistics under an additive and a multiplicative model.*

Wetzell, David E., *Allocation of observations in ranking and selection problems via majorization and other related inequalities.*

NEW HAMPSHIRE

Dartmouth College
(3;2,0,0,0,0,0,1)

MATHEMATICS

Belding, David French, *Jackson queueing networks with denumerably many stations.*

Devlin, Denis Campau, *Some partition theorems and ultrafilters on ω .*

Shull, Ernest Randy, *Collineations of projective planes of order 10.*

University of New Hampshire
(1;0,0,0,0,0,1,0)

MATHEMATICS AND COMPUTER SCIENCE

DeVecchi, James Martin, *The construction of a logical-empirical structure of knowledge for differential calculus using a theoretical framework based upon learning hierarchy theory and order theory.*

NEW JERSEY

Princeton University
(13;11,2,0,0,0,0,0)

MATHEMATICS

Anderson, Greg William, *Theta functions and holomorphic differential forms on compact quotients of bounded symmetric domains.*

Beals, Robert Michael, *L^p boundedness of certain Fourier integral operators.*

Chess, Daniel S., *Structure theorems for diffeomorphisms.*

DeMeo, Roy Edward, *Cobordisms of non-boundary links.*

Dummit, David Steven, *The structure of Galois modules in Z_p -extensions.*

Gabai, David, *Foliations and genera of links.*

Jerison, David Saul, *The Dirichlet problem for the Kohn Laplacian on the Heisenberg group.*

Kohn, Robert Vita, *New estimates for deformations in terms of their strain.*

Nicas, Andrew John, *Induction theorems for groups of homotopy manifold structures.*

Rogawski, Jonathan David, *Applications of the building to orbital integrals.*

STATISTICS

Kafadar, Karen, *Robust confidence intervals for the one-and-two sample problems.*

Silverberg, Arthur Richard, *Statistical models for Q -permutations.*

Stroup, Donna Fox, *Stopping rules for stochastic approximation procedures.*

Rutgers University, New Brunswick
(11;7,2,0,0,0,0,2)

MATHEMATICS

Andrilli, Stephen Francis, *On the uniqueness of O'Nan's sporadic simple group.*

Davis, Stephen Lloyd, *Two odd standard form problems.*

Deloff, Edward Donald, *Naturally reductive metrics and metrics with volume preserving geodesic symmetries on NC algebras.*

Ko, Chen-Shung, *Broadcasting, graph homomorphism and chord intersection.*

Mladineo, Regina Hunter, *A Grassmanian for piecewise linear topology.*

Robbin, Ira L., *Orthogonal invariant distributions in complex dimension.*

Tutinas, Bernadette Romualda, *Characterizations of Thompson's sporadic simple group by the centralizer of an element of order three.*

Watnick, Richard Mark, *Recursive and constructive linear orderings.*

Weiss, Michael C., *Relatively diophantine predicates and existentially complete models for arithmetic.*

STATISTICS

Fernholz, Luisa Turrin, *Topics in mathematical statistics and probability theory.*

Wang, Yu-Chung Jeff, *Analysis of ordered and partially ordered categorical data.*

NEW MEXICO

University of New Mexico
(4;1,1,0,0,2,0,0)

MATHEMATICS AND STATISTICS

Barefoot, Curtis A., *Extremal maximal uniquely Hamiltonian graphs.*

Chandler, Leon, *Separation of variables by the symmetry method for second order linear partial differential equations.*

Davis, George James, *Numerical solution of a quadratic matrix equation.*

Huang, Tsung-Dow Tony, *Double stochastic integrals.*

NEW YORK

Adelphi University
(4;1,0,0,0,2,0,1)

MATHEMATICS

Bouscher, Meyer, *A study of magnetogravity waves.*

Chen, Chun-Kuen, *A density problem in combinatorics.*

Kunoff, Sharon M., *Asymptotic analysis of certain ordinary linear differential equations with special emphasis on the equation $x^n y^{(n)}(x) - x^m y(x) = 0$.*

Winn, John A., *Asymptotic bounds for classical Ramsey numbers.*

CUNY, Graduate Center
(5;3,0,0,0,0,0,2)

MATHEMATICS

Aulicino, Daniel Joseph, *Units, admissible oriented parallelepipeds, and bases.*

Gorin, Allen, *On the volume of tubes.*

Mawyer, Farley, *Units in parameterized p -adic number fields.*

Sullivan, Frances, *Wreath products of Lie algebras.*

Wisniewski, Helena Stasia, *Rate of approach to minima and sinks.*

Clarkson College of Technology
(2;0,1,0,0,1,0,0)

MATHEMATICS AND COMPUTER SCIENCE

Kodama, Yuji, *Perturbation and stability problems associated with nonlinear evolution equations.*

Nelligan, John D., *Petroleum resources analysis in geologically homogeneous regions.*

Columbia University
(8;6,1,0,0,0,0,1)

MATHEMATICAL STATISTICS

Du Preez, Johannes Petrus, *Occupation densities and continuity of locally Gaussian processes.*

Karatzas, Ioannis, *A free boundary problem in stochastic optimal control.*

Wei, Ching-Zong, *Limit theorems of weighted sums with applications to regression and time series models.*

MATHEMATICS

Borror, Jeffrey Alan, *On the asymptotic analysis of Griffith's period mapping.*

Joshi, Ragini L., *Generalizations of Eisenstein's logarithm.*

Rose, Julian, *Relatively invariant distributions.*

Sit, Cho Wei, *Topological quotients of graphs.*

Valenza, Robert Joseph, *Variations on dimension subgroups.*

Cornell University
(29;10,2,7,9,1,0,0)

BIOMETRICS

Chang, Suk-Hwan, *An alternative model for determining the optimal fertilizer level on rice.*

Henderson, Harold V., *Dispersion, patterned and structured matrices: vec operators and related topics.*

COMPUTER SCIENCE

- Bates, Joseph Louis, *A logic for correct program development.*
- Brassard, Gilles, *Relativized cryptography.*
- Fortune, Steven Jonathan, *Topics in computational complexity.*
- Furst, Merrick Lee, *A subexponential algorithm for trivalent graph isomorphism.*
- Hauer, Carl Howard, *Specification and verification of communication in parallel systems.*
- Siegel, Morris Mitchell, *Proving properties of SNOBOL4 patterns.*
- Wyllie, James Christopher, *The complexity of parallel computations.*

MATHEMATICS

- Beckmann, William Henry, *Completely aspherical 2-complexes.*
- Bell, John Bruce, *The noncharacteristic Cauchy problem for time dependent equations.*
- Freeland, Mark Steven, *Abstract Witt rings: signatures of arbitrary level.*
- Hsiao, Cheng-Tan, *The stochastic time evolution of Gaussian interacting systems.*
- Hutton, James Edward, *Recurrence and transience of two-dimensional linear birth and death processes.*
- Meister, James Elliot, *On supercuspidal representations of the metaplectic group.*
- Moss, Kenneth Norman, *Homology of the special linear group of the ring of integers localized away from a prime.*
- Sevilla, Alicia Norma, *On continuous Galois cohomology.*
- Sipe, Patricia Lilaine, *Roots of the canonical bundle of the universal Teichmüller curve.*
- Veljan, Darko, *Euler manifolds and Stiefel-Whitney homology classes.*
- Wagner, Catherine Mary, *On Martin's conjecture.*

OPERATIONS RESEARCH AND INDUSTRIAL ENGINEERING

- Awoniyi, Samuel, *A piecewise-linear homotopy algorithm for computing zeros of certain point-to-set mappings.*
- Carmody, David, *Control limit rules and their optimality in Markov decision processes.*
- Diegert, Carl, *The probability of survival of redundant systems under a static load.*
- Hsu, Wen-Lian, *Efficient algorithms for some packing and covering problems on graphs.*
- Kannan, Ravindran, *The size of numbers in the analysis of certain algorithms.*
- Rosenfeld, Philip, *Scheduling policies for a machine with load dependent service rates.*
- Snell, Mark, *The application of regression methods to the initial transient problem in computer simulations.*
- Tierney, Luke-Jon, *Limit theorems for the failure time of bundles of fibers under unequal load sharing.*
- Wong, Thomas, *The structure of stationary point processes, with applications to palm processes and renewal processes.*

New York University
(3;2,0,0,0,0,1)

MATHEMATICS EDUCATION

- De Vincenzo, Mary Ann, *Investigation of the relation between elementary algebra students' errors in arithmetic and algebra in selected types of problems.*
- Gottschall, Carl, *An examination and evaluation of the historical importance of the innovative contributions to formal logic by Augustus De Morgan (1806-1871).*
- Rosenfeld, Rochelle Susan, *Celestial maps and globes and star catalogues of the sixteenth and early seventeenth centuries.*

New York University, Courant Institute
(15;7,0,6,0,1,0,1)

COMPUTER SCIENCE

- Deak, Edith Gail, *The transformational approach to the development and verification of programs in a very high level language.*
- Fisher, Joseph A., *The optimization of horizontal microcode within and beyond basic blocks: an application of processor scheduling with resources.*
- Goldberg, Allen T., *On the complexity of the satisfiability problem.*
- Loerinc, Beatrice Margaret, *Computing chromatic polynomials for special families of graphs.*
- Meyer, Jeanine, *An implementation for GYVE: a language for concurrent processing.*
- Stolfo, Salvatore Joseph, Jr., *Automatic discovery of heuristics for nondeterministic programs from sample execution traces.*

MATHEMATICS

- Belbruno, Edward A., *A new regularization of the restricted three-body problem with an application.*
- Byrnes, Raymond Albert, Jr., *The complete spectral relation between square matrices.*
- Dalcher, Amnon, *Estimation in a stochastic model of neural activity.*
- Greene, Robert R., *Constructive solution and characterization of the inverse scattering problem for the one-dimensional acoustic wave equation.*
- Koppel, Moshe, *Bases of recursively enumerable relations.*
- Majda, George, *Dynamically filtered linear multi-step methods and the computation of smooth solutions of oscillatory stiff ordinary differential equations.*
- McKissick, Burnell T., *Generation of non-linear semi-groups and Brownian motion.*
- Sylvester, John, *A generalization of the Leray-Schauder index formula and an existence theorem for the Lichnerowicz equation.*
- Weiss, John, *A class of compressible partial differential equations related to the incompressible Navier-Stokes equation.*

Rensselaer Polytechnic Institute
(6;0,2,0,1,3,0,0)

MATHEMATICAL SCIENCES

- Brannan, James Richard, *A mathematical model of spatially localized neural systems.*

Davis, Stephen F., *An adaptive grid finite element method for initial-boundary value problems.*

Hamilton, Kenneth George, *Analysis of acoustic variations in the ocean produced by combined environmental effects.*

OPERATIONS RESEARCH AND STATISTICS

- Aquino, Rodolfo, *Contributions to the unified treatment of nonlife insurance problems.*
- Delaney, Nancy Jo K., *Robust procedures for the multivariate normal distribution.*
- Obata, Takashi, *Algorithms for the quadratic assignment problem.*

SUNY at Albany
(4;4,0,0,0,0,0)

MATHEMATICS AND STATISTICS

- De Sousa, Geraldo Soares, *Spaces formed by special atoms.*
- Leary, Francis Christian, *The functions χ and χ_n in generalized summability.*
- Pearce, Kent, *Support points and extreme points for several classes of analytic functions.*
- Roby, Donald, *On certain maps between Schwarz-Bruhat spaces.*

SUNY at Binghamton
(2;1,1,0,0,0,0)

MATHEMATICAL SCIENCES

- Coppola, Alan Joseph, *On p -adic transformation groups.*
- Russo, Ralph P., *A stochastic approximation procedure using quantile curves.*

SUNY at Buffalo
(6;3,0,2,0,1,0,0)

COMPUTER SCIENCE

- Manthey, Michael J., *Real-time sound synthesis—a software microcosm.*
- Riccardi, Gregory A., *The independence of control structures in abstract programming systems.*

MATHEMATICS

- Barbanel, Julius B., *Results on supercompact cardinals.*
- Hu, Shou-Chen, *The initial value problem for a non-linear infinite string.*
- Lin, Ferng-Ching, *Algebraic properties of fields with exponential maps.*
- Rosenthal, Kimmo Ilari, *Aspects of étendue.*

SUNY at Stony Brook
(13;6,0,3,1,3,0,0)

APPLIED MATHEMATICS AND STATISTICS

- Cheng, Wei Min, *Numerical methods for solving partial differential equations with inadequate data.*
- Sexton, Thomas Raymond, *The single vehicle many to many routing and scheduling problem.*
- Shraga, Yosefa, *Parameter estimation from inadequate data.*
- Song, Chipin, *Numerical solution of two point boundary value differential equations.*

COMPUTER SCIENCE

- Kamin, Samuel Noah, *The semantics of encapsulated data types.*

Mahjoub, Ahmed, *Analysis of response time in real-time systems.*

Subrahmanyam, Pasupathi Ananta, *Towards a theory of program synthesis: automating implementations of abstract data types.*

MATHEMATICS

Eisenberg, Frank, *Spectrum of the random walk on the fundamental group.*

Gallo, Daniel, *Uniformization of hyperelliptic surfaces.*

Kaplan, Gail, *On quasi-triangularity of commuting pairs of operators.*

Lue, Ping-Chang, *Asymptotic expansion of the trace of the heat kernel on generalized surfaces of revolution.*

O'Hare, Scott, *Spectral invariance for normal operators under trace class perturbations.*

Taylor, Richard, *On the subalgebras of continuous functions lying between $A(D^n)$ and $C(T^n)$.*

Syracuse University

(3;0,0,1,0,1,0,1)

COMPUTER AND INFORMATION SCIENCE

Murray, Neil Vincent, *Linear and almost-linear methods for the unification of first order expressions.*

MATHEMATICS

Andrianoff, Steven Keith, *A modification of Nystrom's method for approximating the eigenvalues and eigenvectors of an integral operator.*

Schatz, James Robert, *On the coset leaders of Reed-Muller codes.*

University of Rochester

(13;3,2,5,0,3,0,0)

COMPUTER SCIENCE

Gertner, Ilya, *Performance evaluation of communicating processes.*

Lantz, Keith Allen, *Uniform interfaces for distributed systems.*

Rashid, Richard, *LIGHTS: a system for interpretation of moving light displays.*

Shapiro, Jonathan Edward, *A very high level language and optimized implementation design for relational databases.*

Williams, Graeme John, *Program checking.*

MATHEMATICS

Cox, David Charles, *Sharp inequalities for probability distributions.*

Ellis, C. Lane, *Rice type theorems for Π_2 sets.*

King, Walter Paul, *Dual structures in JBW-algebras.*

Nogueira, Arnaldo, *Asymptotic solutions of quantum stochastic differential equations.*

Roy, Dev Kumar, *Linear orders from recursively enumerable preorders.*

Varilly, Joseph, *Dilations of dynamical evolutions.*

STATISTICS

Begun, Janet M., *Estimation of relative risk in a proportional hazards model.*

Kester, Nancy, *Diagnosing and fitting concurrent and related models for two-way and higher-way layouts.*

NORTH CAROLINA

Duke University

(9;5,0,4,0,0,0,0)

COMPUTER SCIENCE

Nau, Dana S., *Quality of play versus depth of search in game playing.*

Sigmon, Timothy Miller, *Performance-oriented design models for computer systems.*

Smith, Douglas Robert, *On the computational complexity of branch and bound search strategies.*

von Mayrhauser, Anneliese Katharine, *Performance-oriented design of interactive computer systems.*

MATHEMATICS

Clote, Peter, *A recursion theoretic analysis of certain generalizations of Ramsey's theorem and of the Gale-Stewart theorem.*

Holder, Ernest Jeffrey, *On the existence, scattering, blow up, and decay of solutions to systems of nonlinear Schrödinger equations.*

Johnson, Samuel Bishop, *A Heyting algebra bestiary: separating examples in non-standard logic.*

Norman, Paul Dennis, *A monotone method for a system on nonlinear parabolic differential equations.*

Smith, Lance Christopher, *The resolvent for the Laplacian on a smooth bounded plane domain.*

North Carolina State University,

Raleigh

(7;0,2,0,2,1,0,2)

MATHEMATICS

Paulling, John Moultrie B., *Criticality estimates for neutron transport in a slab with partially reflecting boundary conditions.*

OPERATIONS RESEARCH

Ghoneim, Hussein, *Optimal control of arrivals to a network of two queues in series.*

Venkatesan, Meyappan, *Production-inventory with equipment replacement.*

STATISTICS

Corral, Ada Ray, *Repeatability of spatial configurations defined by interaction matrices.*

Gellatly, Colin, *Incorporating futures prices in commodity models: the U.S. broiler sector.*

Ramachandran, Viswanath, *The economics of farm tractorization in India.*

Souza, Geraldo de Silva E., *Statistical inference in nonlinear models: a pseudo likelihood approach.*

University of North Carolina, Chapel Hill

(7;0,3,1,3,0,0,0)

BIOSTATISTICS

DeLong, Elizabeth Ray, *Estimation of general parameters using progressively truncated U-statistics.*

Makuc, Diane M., *An analysis of two complex surveys to evaluate dental health status changes in North Carolina.*

Verter, Ivan Joel, *Early decision and the use of simple linear rank statistics for accumulating survival data.*

COMPUTER SCIENCE

Frank, Geoffrey Alson, *Virtual memory systems for closed applicative language interpreters.*

OPERATIONS RESEARCH AND SYSTEMS ANALYSIS

Adlakha, Veena Gupta, *Starting and stopping rules for data collection in queuing simulations.*

Kastner, George, *A cost-effectiveness study of infection surveillance and control programs in U.S. hospitals.*

Schultz, Carl Richard, *(s, S) inventory policies for a wholesale warehouse inventory system.*

OHIO

Bowling Green State University

(1;0,1,0,0,0,0,0)

MATHEMATICS AND STATISTICS

Kellermeier, John H., *The empirical characteristic function and large sample hypothesis testing.*

Case Western Reserve University

(5;0,0,0,5,0,0,0)

OPERATIONS RESEARCH

Chaudhuri, Asok, *Analytical modelling for planning and budgeting: application of mathematical programming in a zero base approach.*

Duraiswamy, Nallaiya, *A management game for production-inventory decisions under inflationary conditions.*

Javad, Shahriar, *Multi-echelon inventory systems in health care delivery organizations.*

Kovacevic, Antonio, *Selection of secondary keys and indices for a database.*

Quotah, Mohammed, *Mathematical models for food demand in Saudi Arabia.*

Kent State University

(6;5,0,0,0,1,0,0)

MATHEMATICS

Benander, Alan Charles, *Projective concepts in torsion theories.*

Benander, Barbara Ann, *Torsion theory and modules of finite length.*

DeFranza, James, *Nörlund methods of summability that map the space of absolutely convergent.*

Haase, Nickolette, *On semiprime ideals in Noetherian rings.*

Krishna, Lala, *Asymptotic rates of convergence for the symmetric successive over-relaxation (SSOR) method.*

Rhee, WanSoo, *Studies on the rate of convergence in the central limit theorem.*

Ohio State University

(9;3,0,0,0,1,0,5)

MATHEMATICS

Al-Jarrah, Radwan A., *Error estimates for Gauss-Jacobi quadrature formula and Padé approximants of Stieltjes series.*

Egawa, Yoshimi, *Standard components of type M_{24} and $+ (8.2)$.*

Dinitz, Jeffrey H., *Lower bounds for the number of pairwise orthogonal symmetric latin squares.*

Games, Richard Alan, *The packing problem for finite projective geometries.*

Huffman, William P., III, *A mathematical model for the relativistic dynamics of a system of particles.*

Leonard, Douglas A., *Semi-biplanes and semi-symmetric designs.*

Roth, Robert Lyle, Jr., *Hall triple systems and commutative Moufang exponent 3 loops.*

Valentini, Robert Charles, *Weierstrass points and automorphisms of algebraic function fields.*

Weiss, Alfred R., *The least prime ideal with prescribed decomposition behavior.*

Ohio University
(1;1,0,0,0,0,0)

MATHEMATICS

Grabner, Gary Clem, *A study of topological spaces having bases of subfinite rank and related topics.*

OKLAHOMA

Oklahoma State University
(8;6,1,0,1,0,0)

MATHEMATICS

Bell, Joan Elisabeth Palsmeier, *The development of normal functions.*

Fariabi, Said, *Sturmian theory for nonself-adjoint systems and a class of N th order equations.*

Greenhaw, Richard Morton, Jr., *Cut techniques in integer linear programming.*

Murdock, Stephen R., *A recent counterexample in Banach space theory.*

Salazar, Jorge Antonio, *Sturmian theory and periodic solutions of differential systems.*

Sedory, Stephen Andrew, *Divisibility in 3-manifold groups.*

Ward, Phillip Ray, *Fiberings of spheres by spheres.*

STATISTICS

Chi, Albert Yu-Ming, *The Bayesian analysis of structural change in linear models.*

University of Oklahoma
(3;2,0,0,0,1,0)

MATHEMATICS

Curley, Robert Dean, *The effect of varying proportions of positive and negative instances on student misinterpretation of statistical hypothesis testing.*

Moore, Jeanna Beth, *Classification of the normal subgroups of $GL_n(R)$.*

Tan, Richard Beng-Tok, *Brauer groups of H -dimodule algebras and truncated power series Hopf algebras.*

OREGON

Oregon State University
(3;2,1,0,0,0,0)

MATHEMATICS

Kim, Jong-Chul, *Embeddings of Lorentzian manifolds by solutions of the d'Alembertian equations.*

Lodwick, Weldon Alexander, *Two numerical methods for the solutions of optimal control problems with computed error bounds using the maximum principle of Pontryagin.*

STATISTICS

Targ, Suey-Huey, *Estimation of the population total when the sample is taken from a list containing an unknown amount of duplication.*

University of Oregon
(5;4,0,0,0,1,0,0)

MATHEMATICS

Alvis, Dean Leland, *Duality and its applications to the character theory of finite Lie groups.*

Alward, Herbert Lewis, *Standard subgroups of type $0^-(8, 2)$.*

Erickson, Roger P., *Dissections of finite groups and their associated covering groups, projectors and normalizers.*

Vahidi-Asl, Mohammad Quassem, *First-passage percolation on the simple cubic lattice.*

Zwick, Daniel Steven, *Weak Tchebysheff spaces and generalized convex functions.*

PENNSYLVANIA

Carnegie-Mellon University
(3;0,1,0,0,2,0,0)

MATHEMATICS

Murphy, Lea Frances, *Minimization of work and stress in linear viscoelasticity.*

Yatomi, Chikayoshi, *On the dynamic energy release rate in elastic crack propagation.*

STATISTICS

Pei, Gabriel, *Asymptotic distributions of M -estimators in non-standard cases.*

Pennsylvania State University
(7;5,2,0,0,0,0,0)

MATHEMATICS

Chein, Joseph E. Z., *An odd perfect number has at least 8 prime factors.*

Herring, John Roy, *The Jacobi equation for left invariant metrics on Lie groups.*

Kadell, Kevin, *Generalizations of basic hypergeometric series.*

Lang, Sheau-Dong, *Linear independence of some cyclotomic units.*

STATISTICS

Cheng, Kuo-Sheuan, *On weighted least squares rank estimates.*

King, Terry Lee, *Sample size determinations for some reliability problems.*

Shoemaker, Lewis Howard, *Robust estimates and tests for the one-sample scale model with applications to variance component models.*

Temple University
(6;3,3,0,0,0,0,0)

MATHEMATICS

Ayoub, Ayoub, *On the fundamental units of prime cyclotomic fields.*

Burns, John Buchanan, *Interpolation by monotone cubic splines.*

van Rossum, Marijke, *Artin's conjecture.*

STATISTICS

Christie, Theodore J., Jr., *The use of run lengths in patient allocation schemes for clinical trials.*

McAllister, Paul R., *Experiment wise error rates for dependent F -tests in two way non orthogonal ANOVA without interactions.*

Shanmugam, Ramalingam, *On probability distributions involving the Stirling numbers.*

University of Pennsylvania
(4;4,0,0,0,0,0,0)

MATHEMATICS

DeBaun, David Richard, *L^2 -cohomology of non-compact surfaces.*

DeTurck, Dennis M., *Existence of metrics with prescribed Ricci tensors: local theory.*

Schack, Samuel D., *On the deformation of an algebra homomorphism.*

Schmidt, Frank Whitney, *On integer sequences not containing arithmetic progressions.*

University of Pittsburgh
(4;2,2,0,0,0,0,0)

MATHEMATICS AND STATISTICS

Gee, Fannie Ruth, *A characterization of a class of Lagrangian groups.*

Griffith, William S., *Multistate reliability models and some extensions on a univariate shock model.*

Ismail, Mohammad, *Generalizations of compactness and cardinal invariance of spaces.*

Tan, Suan-Boon, *Maximum likelihood estimation in autoregressive processes with missing observations.*

RHODE ISLAND

Brown University
(17;12,1,0,0,3,0,1)

APPLIED MATHEMATICS

Bates, Richard Michael, *The probability measure of hyperspheres in a Gaussian Hilbert space via stochastic integrals.*

Belbas, Stavros Apostol, *Stability of infinite dimensional stochastic systems.*

Bienenstock, Elie Lucien, *A theory of development of neuronal selectivity.*

Chow, Yun-shyong, *Estimation of conformal mappings.*

Lyons, William Kimbel, *The single conservation law of discontinuous media.*

Massatt, Paul Darrell, *Properties of condensing maps and dissipative systems.*

Michaud, Marion Catharine, *Numerical simulation of reservoirs.*

Mirie, Rida Mostafa, *Collisions of solitary waves.*

Rosen, Irwin Gary, *A discrete approximation framework for hereditary systems.*

Turyn, Lawrence, *Sturm-Liouville problems with several parameters.*

Zamani Kashani, Nader Gholi, *Kernel function approach to the least squares finite element method.*

MATHEMATICS

Anderson, Stephen Lynn, *Green's functions, Jensen measures, and bounded point evaluations.*

Damiano, David Burritt, *Webs, abelian equations, and characteristic classes.*

Hansen, Johan P., *A connectedness theorem for flagmanifolds and Grassmannians and singularities of morphisms to P^m .*

Lasarsfeld, Robert Kendall, *Branched coverings of projective space.*

McNertney, Louise V., *One-parameter families of surfaces with constant curvature in Lorentz 3-space.*

Mitchell, Kevin John, *Foldings and crimpings of algebraic varieties.*

University of Rhode Island
(1;0,0,0,0,1,0,0)

MATHEMATICS

Levasseur, Kenneth Maurice, *Best approximation with respect to two objectives.*

SOUTH CAROLINA

Clemson University
(3;0,2,0,0,0,0,1)

MATHEMATICAL SCIENCES

Allan, Robert Boyd, *On domination and some related topics in graph theory.*

Fiskeaux, Charles David, *Tukey smoothers as preprocessors for obtaining robust estimates of ARMA parameters.*

Hill, Hoke Smith, Jr., *A Monte Carlo study of AR(1) estimators under several performance criteria.*

TENNESSEE

Memphis State University
(4;3,1,0,0,0,0,0)

MATHEMATICAL SCIENCES

Cheng, Song-Chow, *Variance component testing of unbalanced nested designs under normal and non-normal universes.*

Parrott, Mary E., *Convergence of solutions of functional differential equations with infinite delay.*

Powers, R. Glenn, *Some results concerning i th Ramsey numbers.*

Robinson, James E., *Banach space shift operators.*

University of Tennessee
(3;3,0,0,0,0,0,0)

MATHEMATICS

Cripps, Alfred, *Green's theories and coextensions.*

Lewis, Ruth Ann, *P -adic number systems for error-free computation.*

Preston, Donald Kriss, *A study of product decompositions of topological manifolds.*

Vanderbilt University
(2;2,0,0,0,0,0,0)

MATHEMATICS

Dean, Arnold Andrew, *Stability of compactness of resolvents and of strongly continuous semigroups.*

Johnston, Katherine Gay, *Congruence lattices of Rees matrix semigroups.*

TEXAS

North Texas State University
(1;1,0,0,0,0,0,0)

MATHEMATICS

Simrin, Harry S., *Measurable selection theorems for partitions of Polish spaces into G_δ equivalence classes.*

Rice University
(3;1,2,0,0,0,0,0)

MATHEMATICAL SCIENCES

Nesames, Donna Marie, *Some results for estimating bivariate densities using kernel, orthogonal series and penalized likelihood procedures.*

Smith, Melvyn Lee, *Survivorship models for sexually transmissible diseases.*

MATHEMATICS

Farris, Mark Kelling, *Egorov's theorem for a diffractive boundary problem.*

Southern Methodist University
(6;0,3,1,2,0,0,0)

COMPUTER SCIENCE

Heller, Robert Wayne, *A statement oriented dataflow processor.*

OPERATIONS RESEARCH

Helgason, Richard Vernon, *A Lagrangian relaxation approach to the generalized fixed charge multicommodity problem.*

Kim, Sung Shick, *M/M/S queueing system where customers demand multiple server use.*

STATISTICS

Chou, Youn-Min, *Some screening procedures based on data from a singly truncated bivariate normal distribution.*

Haas, Roy W., *Selection procedures using several screening variables under two-sided specification limits.*

Hua, Tsushung Augustin, *Extensions of inference procedures for biased estimators.*

Texas A and M University
(7;2,5,0,0,0,0,0)

MATHEMATICS

Su, Lo-Yung, *Best local approximation.*

Zeller, Mike, *Centralizer near rings on infinite groups.*

STATISTICS

Bowen, William Michael, *Maximum likelihood estimation for the "Law of the Minimum".*

Dunn, Charles Leslie, *Combinatoric classification of multivariate normal observation vectors.*

Eubank, Randall Lester, *A density-quantile function approach to choosing order statistics for the estimation of location and scale parameters.*

Guy, Paul William, *A small sample theory for post stratification.*

LaRiccia, Vincent N., *A family of minimum quantile distance estimators.*

University of Houston
(4;3,1,0,0,0,0,0)

MATHEMATICS

Basu, Rekha, *Effect of model specification in pattern classification.*

Graham, George Erwin, *Manifolds with generalized boundary and differentiable semigroups.*

Neha, Robert M., *Generalized reduced omology and duality.*

Perez, Dorothy Brewerton, *Closure operations on multiplicative lattices.*

University of Texas, Arlington
(3;0,1,0,0,2,0,0)

MATHEMATICS

Cheng, Wen-Hsiu, *Computational methods of system identification and parameter estimation.*

Hallmark, James Carl, *Parameter estimation in compartmental systems.*

Radhakrishna, Atur V., *The application of generalized group inverse to discrete finite Markov chains.*

University of Texas, Austin
(4;3,0,0,0,1,0,0)

MATHEMATICS

DiBenedetto, Emmanuele, *Implicit degenerate evolution equations in Hilbert spaces.*

Hunt, Walker Eugene, *Unique periodic solutions of a class of differential equations and composite solutions of a system of partial differential equations.*

Krause, Gary Alan, *Smooth group actions of prime order and fixed point sets.*

Whittington, Keith Edwin, *Prime divisors and the altitude formula.*

UTAH

University of Utah
(4;3,0,0,0,0,0,1)

MATHEMATICS

Herron, Gary Joseph, *Triangular and multistided patch schemes.*

Montejano Peimbert, Luis, *β -homotopy equivalences have α -cross sections.*

Morley, David John, *On the convergence of a Newton-like method in the approximation of closed convex surfaces.*

Ward, Michael Bryce, *Solvability of factorizable groups.*

VIRGINIA

University of Virginia
(6;4,0,0,2,0,0,0)

APPLIED MATHEMATICS AND COMPUTER SCIENCE

Carpenter, William Alfred, *A probabilistic assessment of highway air quality impacts.*

Kim, Kwang Woong, *Vector criterion Markov decision processes.*

MATHEMATICS

Hardin, Clyde Durham, Jr., *L_p isometries and stable processes.*

Newhart, Donald William, *Information sets in quadratic residue codes.*

Steelman, John Henry, *Cobordism of manifolds with two structures.*

Voas, Charles Howard, *Toeplitz operators and univalent functions.*

Virginia Polytechnic Institute and State University
(5;0,4,0,0,1,0,0)

MATHEMATICS

Shoukry, Haseem, *A study of twisting type N gravitational fields satisfying the vacuum Einstein equations.*

STATISTICS

Binkley, Doris Ann, *The performance of Huber's M -estimators of regression coefficients in designed experiments under some non-standard conditions.*

Deaton, Michael Lee, *The causal analysis of multiple time series: a frequency domain approach using group delay.*

Guyton, Deborah A., *A random parameter approach to modeling and forecasting time series.*

Wu, Huan-Ter, *Modified principal components in regression.*

WASHINGTON

University of Washington
(22;9,7,5,0,0,0,1)

BIOMATHEMATICS

Butler, William John, *Classification procedures for polychotomous predictor variables on orthogonal functions.*

Friedlander, Lindy Jo, *A study of the statistical properties of ratio variables.*

Lathrop, Mark Gregory, *The reliability of pedigrees and the statistical analysis of polygenic data.*

McDonald, John William, *Estimating the number of occurrences under partial ascertainment.*

McFarland, Bentson Hayes, *Estimation and testing in the missing problem.*

Roberson, Paula Karen, *Distributional and robustness problems in time-space disease clustering.*

Schreiner, Donald Edmond, Jr., *Generalized rank tests for use with right censored data under general Lehmann models.*

COMPUTER SCIENCE

Frank, Paul Douglass, *Bounded nondeterminism and the parallel parsing of context-free languages.*

Jette, Chistina L., *Design directed program improvements.*

Lewis, Brian Thomas, *Sequential control structure abstractions for programming languages.*

Peterson, Gary Lynn, *The complexity of parallel algorithms.*

MATHEMATICS

Cameron, Edna Jane, *The number of functions defining complex analytic sets.*

Berman, Francine D., *Syntactic and semantic structure in propositional dynamic logic.*

Cox, Dennis Dean, *Normalized Brownian motion on Banach spaces.*

Fitspatrick, Simon Peter, *The differentiability of distance functions and the GSP in Banach spaces.*

Heaton, John Patrick, *Steenrod operations on manifolds.*

Huynh, Hung Thiet, *Regularity and boundary value problems for a class of hypoelliptic second order operators.*

Klein, Vivian Susan, *Behavior of holomorphic functions at generating submanifolds of the boundary.*

Kroon, John David, *Equisingularity and the Nash blowing-up process.*

Meaney, Christopher, *Localization and uniqueness of spherical harmonic expansions.*

O'Halloran, Joyce, *Weyl modules and the cohomology of the special linear group.*

Skrien, Dale John, *Interval graphs, chronological orderings and related matters.*

Washington State University
(3;0,1,0,0,1,1,0)

MATHEMATICS

Johnson, Kenneth Allen, *The evolution of the line integral.*

Notestine, Ronald Douglas, *A nonlinear stability analysis of the solidification of a pure substance.*

Woo, Jung-Soo, *Jackknife estimates of right-tail probabilities in small samples from a gamma distribution.*

WISCONSIN

University of Wisconsin, Madison
(27;16,6,0,0,3,2,0)

MATHEMATICS

Arratia, Richard Alejandra, *Coalescing Brownian motions on the line.*

Compton, Kevin Jay, *Applications of logic to finite combinatorics.*

Garity, Dennis Joseph, *General position properties of homology manifolds.*

Haslach, Henry Wehrman, Jr., *Two homological techniques: the A_∞ -theory and free resolutions for RPT complexes.*

Jones, Christopher K.R.T., *Spherically symmetric waves of a reaction-diffusion equation.*

Kalman, Daniel S., *Processes of reading mathematical exposition.*

Kane, Jonathan Michael, *Unitarily invariant subalgebras of $C(S_{2n-1})$.*

Kierstead, David Philip, *Syntax and semantics in higher-type recursion theory.*

Lee, George Su-An, *Some combinatorial results on Stone spaces.*

Lin, Kun-Chou, *Contributions to peristaltic transport problems.*

Moak, Daniel S., *The q -gamma functions and q -Laguerre polynomials.*

Moeckel, Richard Barry, *Orbits near triple collision in the three-body problem.*

Nestlerode, William Gary, *L^2 estimates for singular integrals and maximal functions associated with highly monotone curves.*

Painter, Jeffrey Farrar, *Connection at close quarters to generalized turning points.*

Parker, Jeffrey Daniels, *4-dimensional G -manifolds with 3-dimensional orbits.*

Reid, Russell MacKay, *Some controllability and stabilizability properties of linear water waves.*

Ross, Jeffrey A., *Some problems in combinatorial matrix theory.*

Tonnessen, Lowell Hovden, *Measurement of the levels of attainment by college mathematics students of the concept "variable".*

Vance, James Thomas, Jr., *L^p -boundedness of the multiple Hilbert transform along a surface.*

Weinberg, David A., *Singular integral operators associated to approximately homogeneous curves.*

Yuster, Thomas R., *Orbit sizes under automorphism actions in finite groups.*

STATISTICS

Bailey, Steven P., *Studies in inferential techniques for model building.*

Chen, Evan Eva, *Bayes sequential estimation procedures for life testing problems.*

Fortney, William Gordon, *Bayesian inference in random coefficient linear models.*

Grupe, Michael R., *Hidden periodic autoregressive-moving average models in time series data.*

Hsieh, Fang-Yuh, *Multistate survival analysis.*

Langeland, Thore, *Tests for dependence in multivariate observations.*

University of Wisconsin, Milwaukee
(1;1,0,0,0,0,0,0)

MATHEMATICAL SCIENCES

Kosler, Karl Andrew, *V-rings, QI -rings and strongly prime modules.*

WYOMING

University of Wyoming
(4;1,3,0,0,0,0,0)

MATHEMATICS

Simoson, Andrew James, *Decomposability and dual optimization Banach spaces.*

STATISTICS

Chen, Elisabeth Y., *Statistical distribution of wave heights and periods for hurricane waves.*

Mardekian, Jack, *Parallel flats fractions for the 3^k factorial.*

Um, Jung-Koog, *Parallel flats search designs for the 3^n factorial.*

CANADA

Carleton University
(1;0,0,0,1,0,0,0)

MATHEMATICS AND STATISTICS

Cheng, Shuen-Fong, *Optimal management of renewable resources, especially in fisheries.*

Dalhousie University
(2;2,0,0,0,0,0,0)

MATHEMATICS

Ong, Sing-Cheong, *Operator algebras and invariant operator ranges.*

Rai, Rajandra Komal, *Orthogonal completions of reduced and semiprime rings.*

McGill University
(2;2,0,0,0,0,0,0)

MATHEMATICS

Rowley, Brian, *Spectral analysis of operator polynomials.*

Singman, David Howard, *Exceptional sets in a product of harmonic spaces and applications.*

McMaster University
(3;3,0,0,0,0,0)

MATHEMATICAL SCIENCES

Bradley, John Scott, *Weighted norm inequalities and homogeneous spaces.*

Royle, John C., *Prime ideals in rings satisfying polynomial identities.*

Tiller, John Albert, *Continuous lattices and convexity theory.*

Memorial University of Newfoundland
(1;1,0,0,0,0,0)

MATHEMATICS AND STATISTICS

Morgan, Christopher C. A., *F-fibrations and groups of gauge transformations.*

Queen's University
(1;0,0,0,1,0,0)

MATHEMATICS AND STATISTICS

Cartledge, John C., *Measures of information for continuous time estimation problems.*

Simon Fraser University
(3;2,0,0,0,0,1)

MATHEMATICS

Cooper, Glen Russell, *First-order model theory.*

Dukarm, James, *Algebraic and locally algebraic functors.*

Varma, Badri, *Some decomposition problems for complete graphs.*

Université de Montréal
(3;2,0,0,0,1,0,0)

MATHÉMATIQUES ET STATISTIQUE

Birta, Alain, *Nouveaux invariants pour les groupes abéliens sans torsion de rang deux et applications à divers problèmes de structures.*

Gauthier, Claude, *Sur les équations invariantes sous le groupe de de Sitter.*

Gauthier, Gilles, *La théorie des rétractés approximatifs et le théorème des points fixes de Lefschetz.*

University of Alberta
(5;2,0,3,0,0,0,0)

COMPUTING SCIENCE

Achugbue, James O., *The complexity of some deterministic scheduling problems.*

Isloor, Sreekanth S., *Consistency aspects of distributed databases.*

Willoner, Robert G., *On the design of a parallel arithmetic unit.*

MATHEMATICS

Chapin, Jared, *Extension of the Berry-Esseen estimate to converging sequences of absorbed random walks.*

Hardy, George, *On the Schnirelmann density of the k -free and (k, r) -free integers.*

University of British Columbia
(1;0,0,1,0,0,0,0)

COMPUTER SCIENCE

Rowat, Peter Forbes, *Representing spatial experience and solving spatial problems in a simulated robot environment.*

University of Toronto
(12;3,0,4,5,0,0,0)

COMPUTER SCIENCE

Chang, Ernest Jen-Hao, *Decentralized algorithms in distributed systems.*

Colbourn, Charles Joseph, *The complexity of graph isomorphism and related problems.*

Tripathi, Satish Kumar, *On approximate solution techniques for queueing network models of computer systems.*

Tsotsos, John Konstantine, *A framework for visual motion understanding.*

INDUSTRIAL ENGINEERING

Buie, Randolph Neil, *Continuous programming.*

Jenkins, Alan Lawrence, *Optimal location of facilities for recycling municipal solid waste in southern Ontario.*

Lieberman, Robert William, *Scheduling under interference constraints.*

Shanthikumar, Jeyaveerasingam George, *Approximate queueing models of dynamic job shops.*

Thomas, Sidney Fitz-Ralph, *A theory of semantics and possible inference with application to decision analysis.*

MATHEMATICS

Chan, Beda S. C., *Similarity and unicellularity of triangular operators.*

Davies, Peter C., *Small Baire spaces and σ -dense partial orders.*

Moore, Eric J. H., *Localization and an extended Brown representability theorem in a homotopy category.*

University of Waterloo
(20;1,1,9,0,2,0,7)

APPLIED MATHEMATICS

Boyle, Michael James, *Unitary group approach to the many-electron correlation problem.*

Jerrard, Robert James, *Green function theory of virtual surface states.*

COMBINATORICS AND OPTIMIZATION

Ball, Andrew Harvie, *The construction of comma-free codes with odd word length.*

Carter, Michael Walter, *Integer quadratic programming: a continuous approach.*

Coleman, Thomas Frederick, *A superlinearly convergent penalty function method.*

Koch, Etan, *Ramifications of matching theory.*

Lins, Sostenes Luis Soares, *Graphs of maps.*

Simeone, Bruno, *Quadratic 0-1 programming, Boolean functions and graphs.*

COMPUTER SCIENCE

Carey, Thomas Todd, *Reachability in restricted classes of Petri nets.*

Cargill, Thomas Alan, *A view of source text for diversely configurable software.*

de Carvalho, Carlos Alberto Picanco, *On the analysis of programs with equations and binary relations.*

Livesey, Norman John, *Run-time control in a transaction-oriented operating system.*

Peacock, John Kent, *Distributed simulation using a network of processors.*

Ramires Inurrigarro, Raul Javier, *Efficient algorithms for selecting efficient data storage structures.*

Santoro, Nicola, *Efficient abstract implementations for relational data structures.*

Suwanda, Hendra, *Implicit data structures for the dictionary problem.*

Thérien, Denis, *Classification of regular languages by congruences.*

PURE MATHEMATICS

Ralston, Chiu-Taen, *A characterization of n -dimensional Lie geometry.*

STATISTICS

Goulden, Ian Peter, *Combinatorial decompositions in the theory of algebraic enumeration.*

Wild, Christopher, *Problems in estimation with matched data.*

University of Western Ontario
(7;1,0,0,0,3,0,3)

APPLIED MATHEMATICS

Camiletti, Sauro Elio, *Incompressible flow in a divided channel.*

Dewey, Raymond James, *Some aspects of non-stationary turbulent dispersion.*

Forsyth, Peter Allan, Jr., *Techniques for the solution of electrochemical machining and electroforming.*

Ramadurai, Kumbakonam S., *Inequalities and bounds for nucleon-nucleon scattering.*

Robinson, John Llewelyn, *High energy low P_T single inclusive meson-proton scattering.*

Tailor, Anilkumav Bhukhanbhai, *Equilibrium and linear stability analysis of a class of solutions of a thin ring model for a stationary field electron ring accelerator.*

MATHEMATICS

Roberts, Kenneth Lee, *Strong Cesàro summability factors for integrals.*

University of Windsor
(1;0,1,0,0,0,0,0)

MATHEMATICS

Wong, Kai Sang, *Optimization problems in statistics.*

Erratum

CORRECTION: On line 4 of the Editor's Note, these Notices, vol. 27, p. 533, insert "and mathematical" between "sonal" and "reasons."

G. Hochschild.

LETTERS TO THE EDITOR

Berufsverbot

A letter by A. Dress, U. Pieper-Seier and U. Knauer, on the subject of the case of H. E. Gross, was published in the *Notices* (January 1980, pages 76-78). In an answering letter to the editors from W. Heise, H. Karzel, H. J. Kroll and K. Sörensen (*Notices*, June 1980, pages 346-347), the facts presented in the first letter were disputed and Dress, Pieper-Seier and Knauer were strongly attacked. I wish to take issue with the authors of this answering letter.

These authors say of the first letter: "The diction and content of this letter is qualified to defame Germany (Federal Republic), especially in the eyes of our American colleagues." I know Dress personally, and I know that members of his family sacrificed their lives in the Nazi Period in their struggle for a better Germany. This is a part of the experiences that leads Dress to speak out again and again for the respect of the rights guaranteed by our constitution. Anyone who knows him knows that he would not slander our country. It is hardly possible, in any case, to take a criticism of an injustice as a "defamation" of Germany.

The authors of the answering letter are particularly incensed by the use of the word "Berufsverbot." Here is some background which explains this use:

Applicants to official positions in Germany are, in many cases, as in the case of Gross, rejected if they hold views or have engaged in activities that are thought to be "extremist" or "communist." They are screened by the "Verfassungsschutz" (literally constitution-protection-agency), normally by a search of files that typically contain, for example, information on the participation of a subject in demonstrations against the Vietnam war, his distribution or writing of leaflets, his travel in East Germany, his membership and activities in the (legal) German communist party or pacifist or radical democratic organizations, as well as his previous candidacies, backed by leftist student organizations, for student parliaments, etc. It is estimated that some one million applicants for official positions have been so screened; the number is this large because about 20% of employed West Germans, including all university teachers and most scientists, are in positions that are official in the above sense. (It must be said that the individual states in the Federal Republic that are governed by the more liberal "Social Democrats" have recently tried to reduce this massive screening.)

These routine screenings have, in at least 4,000 cases, lead to an interrogatory interview with the applicant on the materials in his file which have been found objectionable. It is impossible here to go further into this practice; I refer the reader to the interview with Dress in *Nature* (Vol. 282, December 1979).

Since there are no private universities in Germany, a scientist who has been denied a position

on political grounds cannot, in most cases, practise his profession. This situation is referred to by opponents of this system as a "Berufsverbot" (literally "forbidding-of-profession"). Official usage, however, does not allow the use of the word "Berufsverbot" in political cases. A particularly comical case of this terminological confusion is described in a report in the liberal paper *Frankfurter Rundschau*, in which it is reported that the Minister of Science in Lower Saxony, E. Pestel, who happens also to be the responsible minister in the case of Gross, "sharply rebuked" a university for an official use of the word "Berufsverbot" in the political context, and ordered an investigation into how this had happened.

The authors of the answering letter claim that there is no Berufsverbot on political grounds, and that Dress and the other authors of the first letter use the term to "defame"; I think that the weight this assertion should be given is clear from the above.

The description and justification of the practice of (political) Berufsverbot in the letter of Heise, Karzel, Kroll and Sörensen is a fabric of half-truths. For reasons of space I cannot go into each of them, but perhaps an example will suffice to show how the "American colleagues" are misled, and by whom. They write: "No DKP (German communist party) member dares to exhaust all the legal stages of appeal to our Supreme Court because they (sic) know that the Communist Party of Germany and all its successors have been officially declared to be illegal."

The facts are as follows: Article 21 (2) of our constitution, says: "Parties which, according to their goals or to the behaviour of their members, tend to injure or destroy the fundamental free democratic order, or to threaten the existence of Germany, are contrary to the constitution (verfassungswidrig). The Supreme Court (Bundesverfassungsgericht) has the power to declare a party contrary to the constitution." (Parties that have been so declared, and only such parties, are illegal.) The "Communist Party in Germany" (KPD) was declared illegal in this way in 1956. In 1968 a new communist party, the "German Communist Party" (DKP) was founded. This party is to this day legal; it takes part in elections and has representatives in some of the German city councils. In particular, it has not been declared contrary to the constitution. However, in a decision in 1975, the Supreme Court called the DKP "hostile to the constitution" (verfassungseindlich). This expression does not occur in the constitution, and does not carry the same legal connotation as "contrary to the constitution."

The Court's decisions on Berufsverbot are quite varied. It often happens that a Berufsverbot that has been challenged is struck down by the court. The state then usually appeals its case, and a higher court often, though not always, reverses the lower court's decision.

The case of H. E. Gross followed just this course.

I know Gross personally, and value the work that he has done on the position of mathematics in society and its implications for mathematical training. I can assure the reader that every word of the letter of Dress, Pieper-Seier and Knauer is true. The Committee on the Human Rights of Mathematicians was not misled in this case. I would like to thank all of the mathematicians who have lent Gross their support in this matter.

E. Brieskorn
Mathematisches Institut
Universität Bonn

In the January 1980 *Notices*, pages 76–78, you printed a letter “The case of Horst Eckart Gross” by Professor Dress and associates. While I was preparing the following commentary, I received the June issue which on pages 346–347 contains a rejoinder by Professor Heise and associates.

I am very concerned over this issue, particularly since those of our colleagues who remember the lawlessness and terror of Nazi Germany may, from a distorted representation of facts, obtain the impression of a new lawlessness and oppression coming up in today’s West Germany.

In the following, I shall under (1) collect some general information concerning the procedures of admission to the West German civil service. Under (2) I shall connect this with the case of Mr. Gross, and under (3) and (4) I shall compare these facts with the allegations made in Mr. Dress’ letter.

1. (a) There are, to begin with, indeed “Berufsverbote,” viz. legally binding interdictions to pursue a particular profession or trade. But they exist only in those professions for which there are particular procedures for admission, exercised by *professional chambers*—admission to the bar and admission for practice as a physician. What is referred to in Mr. Dress’ letter is not at all of this kind; it concerns the employment in the civil service or as a public employee.

(b) As stated by German law (Grundgesetz, Bundesbeamten-gesetz, Beamten-gesetze der Länder), a prerequisite for employment in the civil service is the active support of the constitutional principles. As developed by the federal constitutional court (Bundesverfassungsgericht), these include in particular (i) the sovereignty of parliament, (ii) the responsibility of the government to the parliament, (iii) the principle of several factions and political parties, including the right to form and operate an opposition, (iv) the division of powers (legislative, executive, judicative), (v) the independence of the courts. The prerequisites for the simpler public employment do not demand the particular loyalty expected from a civil servant but, as defined by courts, preclude activities explicitly aiming at the abandonment of the above principles.—I should add that the formulation of such prerequisites is *not* a relict of times authoritarian or feudalist, but that it was worked out with particular care after the

last war in order to prevent the erosion of democracy from within, as it had taken place during the years of the Weimar republic leading to the rise of Nazism.

(c) In West Germany the position of a school teacher in public schools, as well as that of a university professor, belongs to the civil service. This is in marked distinction to the situation in the U.S., and it certainly is debatable which of these two arrangements is preferable. As employment in the civil service here implies absolute job security, together with various other benefits, the professional organizations have been keen not to have this situation changed. Until the early seventies, the loyalty prerequisites connected with the privileges of the civil service were not considered a burden. Since then a small number of communist teachers and an even smaller number of communist university assistants have been refused employment in the civil service or as public employees, and communist propaganda, directed by East Germany, has in this connection coined the phrase “Berufsverbot.” This is definitely misleading in the case of school teachers since they can look for employment in private schools, and it is at least partly misleading in the case of university personnel. In the particular case of pure mathematicians a different situation could indeed arise since there is one mathematical research institute outside the public domain, viz. the Max-Planck-Institut at Bonn which was established only recently. Still, in the case of Mr. Gross no mathematical career seems to be in danger of disruption since he is not working in mathematical research but, as Mr. Dress’ letter makes only partly clear, in the kind of sociology-cum-statistics which is applied in various private companies working on background research for advertising and opinion polls.

(d) There is no ‘political police’ in the West German federal republic nor in any of its states. What Mr. Dress’ letter refers to under that name are the “Bundesamt” (federal) and the “Landesämter” (statewise) “für Verfassungsschutz.” These are chartered agencies, organized within the ministries of the interior of the federal and state governments and completely separate from the police force. Their purpose is the gathering by observation of information concerning extremist activities aiming at an overthrow of the constitutional order. They fundamentally differ from law enforcement agencies in that they have *no* executive power at all: they cannot search premises or persons, cannot detain or arrest, and cannot force anyone to grant an interview. Obviously, those restrictions were put upon them precisely in order to avoid the recreation of a powerful political police as it had existed under the Nazi rule. Information gathered by these agencies can, under narrowly defined circumstances, be called upon by other government agencies, and it can, if so warranted, be handed to the public prosecutor who then, if he decides to prosecute, will have to employ the services of the normal police force and the standard means of law enforcement.

(e) In the state of Niedersachsen, which is

responsible for the university at Oldenburg, the loyalty prerequisites for an appointment in the civil service are examined according to the following procedure. If an applicant has been chosen for appointment upon his professional and personal qualifications, the respective agency responsible for the appointment notifies the ministry of the interior. The ministry then has the files of the Landesamt für Verfassungsschutz examined as to whether there are facts on record casting doubts upon the applicant's loyalty. This is an inspection of records only, without additional interviews; facts must be usable in court so that hearsay or unproven suspicions are excluded. If nothing is on record, the appointment will be made effective.

If, however, a record containing detrimental facts does exist, an interministerial commission of five members examines the case; it is not bound by any directives and may decide that the materials on record do not justify serious doubts, in which case the applicant is to be appointed. If its decision is different, the commission will ask the applicant for an interview, informing him in advance of the facts considered as speaking against him; for this interview, the applicant may be accompanied by a lawyer of his choice. Based upon this interview, the commission produces a written recommendation on whether or not to appoint the applicant. If the government agency responsible for the appointment, or the minister of the interior, or the prime minister, is in disagreement with the recommendation, the case is brought before a cabinet meeting where the final decision is made.

This describes the process by which the executive branch comes to its decision. If it turns out to be negative, the applicant now has access to the courts, where after approaching the first court he may go at least one step further to an appeals court. If no previous rulings for analogous situations exist, the case will go on to the respective supreme courts, the Bundesverwaltungsgericht, the Bundesarbeitsgericht or, even, the Bundesverfassungsgericht.

2. Concerning the particular case of Mr. Gross, I wrote to Professor Pestel, the minister responsible for the executive decision. On May 17th I received his answer, stating that the procedure described above had been followed and that Mr. Gross had been interviewed by the interministerial commission. The following are direct translations from his letter, referring to Mr. Gross:

"In view of his political activities, it could not be assumed from the outset that he consistently subscribed to the democratic principles in the sense of the federal constitution. Here the doubts concerning his constitutional loyalty are based essentially on his identification with the aims of the DKP, but not on his membership in the "Freundschaftsgesellschaft BRD-Kuba e.V." which, by the way, is considered to be under communist influence. In the course of the interview it had to be observed that Mr. Gross either could not or would not disassociate himself from the anti-constitutional aims of the "Deutsche Kommunistische Partei" (DKP). The DKP openly subscribes to the aims of Marxism-Leninism, supports the dictatorship of the proletariat and, for instance, considers as exemplary the situation

in the Soviet Union and in the DDR where critics of the regime are suffering severe persecution."

"There does not exist a declaration or an oath in which the applicant would have promised his support of the constitution in a future position in the civil service or as a public employee in Niedersachsen. Such a declaration is required only after an appointment has been made."

I should add that, according to information given to me by an Oldenburg mathematician, Mr. Gross actually did take his case to the courts, and that, in the course of this procedure, the appeals court recently upheld the government's refusal to appoint him.

3. From what has been said above, it follows that Mr. Dress' use of the term "Berufsverbot" is, to say the least, quite misleading, and his consistent use of this word cannot be viewed as anything but a conscious propagandistic effort. Mr. Dress' use of the name "political police," meaning the Ämter für Verfassungsschutz, is without any base whatsoever; he thereby creates an association of thought which borders on the libelous.

Likewise, the "resolution passed by the Council of the University of Oldenburg" and quoted by Mr. Dress, makes use of the same terminology; it claims that unconstitutional methods ("by the political police") had been used against Mr. Gross and that his non-appointment was based on a generally unconstitutional practice ("of Berufsverbote"). As for the case of Mr. Gross, claims about particular unconstitutional methods are nowhere specified. As for the general practice of vetting applicants for civil service appointments, it follows from what was said above that it is not only in accordance with the constitution, but is explicitly founded on its requirements, together with those of the positive law. Finally, the Ämter für Verfassungsschutz were created by specific federal and state laws which define narrow limits within which they must operate.

Mr. Dress is quite correct when he observes that the refusal of appointment may not necessarily be based on criminal acts committed or on federal laws violated by the applicant. But neither is the applicant being prosecuted, nor are his civil rights in any way restricted. What *is* the case—and this Mr. Dress suppresses—is that the applicant wants to have a position as a civil servant or as a public employee and that the employer, viz. the government, then indeed discriminates against applicants subscribing to an organization with explicitly anti-constitutional aims. And it is quite incorrect if Professor Bers, in his commentary to Mr. Dress' letter, surmises that this discrimination comes about because the applicant is "being suspected" of disloyalty and "refusing

Readers who wish to respond to letters published in this issue are urged to do so prior to January 20, 1981. Responses received by that date may be edited to reduce repetition and will be considered for publication in the April 1981 issue. A second round of rejoinders to these responses will then be scheduled for possible publication in the August 1981 issue. After publication of the second set of responses, the committee hopes that readers will find some new topics to discuss in these pages.

to answer certain questions pertaining to lawful political affiliation." The fact is that the applicant has to be *provably* disloyal, where *proof* is defined by verifiable criteria like that of membership in the DKP. I have described under (1) the elaborate precautions taken in order to assure that in the first place the executive decision be based on such proofs; the courts then will examine and may revise the executive decision. I should also add that just recently several suits of rejected applicants did reach the respective supreme courts which then *confirmed* these criteria of proof (and, in the cases under debate, did uphold the refusal of their application by the executive).

That the aims of the DKP explicitly contradict the constitutional principles as listed under (1b) can be read freely in the DKP's own literature. That such words are not just rhetorical is shown by the reality of communist rule as it may be inspected in various countries, beginning with the Soviet Union and ending, for the time being, with Afghanistan. And as for the lawfulness of political affiliation with the DKP, there simply are more shades to grey than just black and white. The West German federal government and the state governments have considered it neither necessary nor expedient to file a suit with the Bundesverfassungsgericht, asking that the DKP be declared unconstitutional—though there can be no doubt that such a suit would be successful, particularly since the DKP's direct predecessor, the KPD, was declared unconstitutional as long ago as 1955. But obviously the adoption of such a liberal policy in no way implies that the government itself, in the form of its civil service, must be opened up to these groups whose very aim is the forceful and irreversible abandonment of government by democratic principles.

4. It follows that the possibility to refuse applicants for the civil service, as well as the procedure used to ascertain whether or not such a refusal should be made, rests firmly upon the constitution and the positive law. While there can be no doubt as to the legality of the situation, one still may ask whether the strict execution of the law is actually required: every prosecutor and every government may, after all, choose *not* to apply the full force of its laws for reasons of expediency. And is this not, one may ask, just the case of a maverick, an eccentric, who shouts aloud at Sather Gate, but does so without any actual consequence?

However, Mr. Dress' letter makes it perfectly plain that Mr. Gross is in no way an isolated eccentric; he is associated with the thoroughly organized DKP and is the admittedly active secretary of a communist front organization. I cannot possibly present here a detailed description of the considerable influence which, over the last couple of years, communist groups have acquired first in the so-called intellectual and now also in the political life of West Germany. But a quite telling example can be found in Mr. Dress' letter itself, viz. the "resolution of the Council of the University of Oldenburg," a high-ranking body of the university's administration. The

libelous character of its *content* I have already pointed out (e.g. "this Berufsverbot case shows perhaps more clearly than any previous case the unconstitutional methods used by the political police"), but it is just as much the *form* of this document which by its very phrasing exactly conforms to the communist propaganda line. For it is a characteristic communist phrase, known no doubt to many readers of the *Notices* and used in translations into various languages, to speak of "work towards peace and friendship among the peoples of the world" when what is meant is communist propaganda, subversion or plain military intervention. And so the council's resolution reads: "It is especially shocking that work towards peace and friendship is deemed to be unconstitutional."

Here is an example of how an important university body (which, as an institution of self-administration, has a legal position comparable to that of a town council) has, at least in this case, fallen under the domination of activists who now are managing to spread communist propaganda *from within*, and with the very voice of, a democratic institution. Of course, while no longer the only maverick, it still is only a university council—but this is by no means the only nor the gravest example. And it is the existence of situations like this one which seems to leave no choice but the full application of the law if the democratic institutions—and in particular their executive arm, the civil service—shall not be subverted by a massive influx of forces determined to abandon them.

Such a policy may well cause hardship to idealistic young persons who have been made to believe the lie that there is a constitutional right to work for the overthrow of the constitution. But if anyone is to be blamed here, it cannot be the guardian of the constitution or the executive of its institutions. This blame must go to those who, partly in naivité and partly in cool calculation, set up those young persons as the victims upon the altar of their hoped-for revolution and who then do not refrain from using them as martyrs in order to attract more supporters. It is with sadness that I see how the moral sensitivity of Mr. Dress and his associates seems also to have been misused for such infamous purposes.

Walter Felscher
Mathematisches Institut
Universität Tübingen

Research Institutes

I believe that much of the discussion of the proposed NSF Mathematics Research Institute has been unrealistic—1980 is very different from 1965 after all—and ignores the most successful recent examples of mathematically-oriented institutes.

In 1959–1961 I worked at Lincoln Laboratory of MIT. It had a relatively large number of mathematicians and what one might call 'mathematical engineers', and they contributed seminal work in

computer science and system theory. Another institution that played a very creative role in the science of the day was the Research Institute for Advanced Study (RIAS) in Baltimore. It was started by the Martin Company under the benevolent dictatorship of Solomon Lefschetz. (I believe Lefschetz himself was past seventy: surely this clinches his record as the greatest mathematical leader since Felix Klein!) It was considerably smaller than Lincoln, filling a converted private mansion in the suburbs of Baltimore. The mathematical part was a group of mathematicians and engineers of about a dozen, centered around ordinary differential equations and system-control theory.

RIAS was spectacularly successful: In addition to the well-known Kalman-Bucy work, it nurtured the pioneering work in system theory by Florentine, Kushner and Wonham. I am sure that more came out of that place in a few short years than has ever been accomplished in the expensive Gaullist laboratories implanted in Europe in recent years. Their reward was to be abandoned: Many of them moved to Brown, Kalman to Stanford, but they lost momentum and never recaptured that magic spark.

Perhaps RIAS will merit a footnote someday when a historian writes about the decline of American science and technology. In particular, General Motors please note that the concepts surrounding the Kalman-Bucy filter are basic to any serious attempt at industrial automation. This confirms the theory that we seem to be blindly following the path of industrial stupidity pioneered by England.

I think that the greatest accomplishment of RIAS was to stimulate people trained as engineers to put the extra effort into mastering the difficult mathematical tools they need to do the most creative work. Similarly people trained as mathematicians (Bucy, Hale, Hermes, LaSalle) were inspired to get out of the mathematician's rut and make contributions that have been really useful, while doing very creative

mathematics. I am sure that an isomorphic institution will be re-invented some day, probably in Japan. (In fact, there was a little-known effort there in 'mathematical engineering' in the 1950s called RAAG. They also did innovative work, inspired by the American electrical engineer Gabriel Kron, that was far ahead of its time.)

I came to Boston in 1973 to work in physics, but transferred my interest to the small group at Harvard and MIT who were doing serious work on the mathematical problems of system-control theory. (Most engineers are quite content to exploit the work done at RIAS and Lincoln twenty years ago.) Momentum has built up again, and for the first time since RIAS, there is now a critical mass of people working on the main issues. However, it is all very fragile—only two members of the group have tenure and the administration at both Harvard and MIT is even less sympathetic than that of Martin twenty years ago. Perhaps it is time to try again—we have no Lefschetz, alas, but times are changing and the need is clearly there.

Robert Hermann
Brookline, MA

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.

NEWS AND ANNOUNCEMENTS

NSF ANNOUNCES POSTDOCTORAL PROGRAM FOR MATHEMATICIANS

The National Science Foundation has announced it will award about thirty fellowships for postdoctoral research in the mathematical sciences. The fellowships, for periods of one or two years, will carry a yearly stipend of \$20,000 for full-time research. Awards will be announced by March, 1981.

The competition will be open to U.S. citizens or nationals who have earned their doctorate degrees after January 1975. Selection will be based mainly on ability of the applicants, likely impact on their future scientific development, and the scientific quality of the research likely to emerge.

These fellowships are distinct from and in addition to other NSF postdoctoral fellowships previously announced [see page 544 of the October 1980 Notices].

Details and application procedures can be found in the *Mathematical Sciences Postdoctoral Research Fellowships 1981 Announcement* which will be distributed to U.S. colleges and universities and is available from the NSF Publications Office, Washington, D.C. 20550.

The closing date for applications is January 3, 1981.

—NSF News Release

Editor's Note: The item above supplements the earlier announcement printed on page 540 of the October 1980 Notices.

AMS RESEARCH FELLOWSHIPS

Invitation for Applications

AMS Research Fellowship Awards are made in February each year; the application deadline is the previous December 31. For awards made in 1980 the stipend was \$15,000 plus an allowance of \$500. The stipend for 1980-1981 is yet to be determined by the Trustees of the Society, but will be at least \$17,000 (including a portion exempt from income tax).

These postdoctoral fellowships support research in mathematics during the academic year, and are open to individuals who have recently received the Ph.D. degree, regardless of age, and who are citizens or permanent residents of a country in North America. Recipients of the fellowships may not hold another grant or salaried position concurrently with the Research Fellowship. It should be noted, however, that these fellowships are more flexible than many others, including NSF postdoctoral fellowships. AMS Research Fellowships may be held at any institution the Fellow selects, or at more than one in succession, and there is flexibility in the choice of time interval(s) in which the Fellow may draw funds.

For further information and application forms, write to Dr. William J. LeVeque, Executive Director, American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940.

AMS RESEARCH FELLOWSHIP FUND

Request for Contributions

The AMS Research Fellowship Fund was established in 1973. From this fund AMS Research Fellowships are awarded annually to individuals who have received the Ph.D. degree, who show unusual promise in mathematical research, and who are citizens or permanent residents of a country in North America.

Twenty-three Research Fellowships have been awarded including three granted for 1980-1981 (see the announcement in the June 1980 Notices, p. 363). The number of fellowships awarded depends, of course, on the contributions the Society receives. The Society itself contributes a minimum of \$9,000 to the Fund each year, matching one-half the funds in excess of \$18,000 raised from other sources, up to a total contribution by the Society of \$20,000. It is hoped that every member of the Society will contribute to the Fund.

Contributions to the AMS Research Fellowship Fund are 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.

NSF ANNOUNCES COMPETITION FOR FOUR FELLOWSHIP PROGRAMS

The National Science Foundation (NSF) plans to award, subject to availability of funds, approximately 550 fellowships in the spring of 1981 for advanced study to help meet the continuing national need for qualified scientific personnel. Included are 400 NSF Graduate Fellowships, 50 NSF Minority Graduate Fellowships, 50 NSF Postdoctoral Fellowships, and 50 NATO Postdoctoral Fellowships. Application materials now are available for all four programs.

Competition for the fellowship awards is open to qualified citizens and nationals of the United States. Awards are made on the basis of merit in all fields of science, including interdisciplinary and multi-disciplinary areas. Excluded are awards in clinical, law, education or business fields; history or social work; study leading to medical, dental, or public health degrees; or study in joint Ph.D.-professional degree programs. Also excluded are training and residency programs leading to certification in clinical fields.

—NSF News Release

Note: The Graduate Fellowships, Minority Graduate Fellowships and Postdoctoral Fellowships were described in detail in the October 1980 Notices, pp. 544-545. Details of the NATO Fellowship competition appear below.

NATO POSTDOCTORAL FELLOWSHIPS ANNOUNCED BY NSF

North Atlantic Treaty Organization (NATO) Postdoctoral Fellowships are awarded for advanced study outside the U. S. in a country that is either a member of or cooperating with NATO. These fellowships were established by NATO to advance science and technology and to promote closer collaboration among NATO nations. Each member country administers these fellowships for its own nationals; NSF administers this NATO-funded program in the U. S. at the request of the Department of State. The fellowships provide a stipend of \$1,150 per month with periods of tenure up to twelve months. Limited travel support and a monthly allowance of \$75 per dependent, up to a maximum of three, are available.

The application deadline is November 3, 1980, and awards will be announced in late February 1981.

For copies of the announcement (SE 81-17) and application materials, contact NATO Fellowship Program Office, Division of Scientific Personnel Improvement, National Science Foundation, Washington, D.C. 20550; (telephone 202-282-7154).

POSTDOCTORAL SCIENCE RESEARCH PROGRAMS OF THE N.R.C.

The National Research Council has announced its 1981 Research Associateship Programs for postdoctoral work in the sciences to be conducted in sixteen federal research institutions with laboratories located throughout the United States. The programs

provide postdoctoral scientists and engineers of unusual promise and ability with opportunities for research on problems largely of their own choosing yet compatible with the research interests of the supporting laboratory. Initiated in 1954, the Associateship Programs have enhanced the career development of over 3,500 scientists ranging from recent Ph.D.'s to distinguished senior scientists.

Four hundred or more full-time Associateships will be awarded on a competitive basis in 1981 for research in chemistry, engineering, and mathematics, and in the earth, environmental, physical, space, and life sciences. Most of the programs are open to both U.S. and non-U.S. nationals, and to both recent Ph.D.'s and senior investigators.

Awards are made for a year with possible extensions through a second year; senior applicants may request shorter tenures. Stipends range from \$20,500 a year (approximating GS 11, Step 1 salaries) for recent Ph.D.'s to approximately \$40,000 a year for Senior Associates. Allowances are made for relocation and for limited professional travel during tenure. The federal laboratory provides the Associate programmatic support including facilities, support services, and necessary equipment.

Applications to the Research Council must be postmarked no later than January 15, 1981. Awards will be announced in April.

Information on specific research opportunities and federal laboratories, as well as application materials, may be obtained from the Associateship Office, JH 610-D3, 2101 Constitution Avenue, N.W., Washington, D.C. 20418; 202-389-6554.

—NRC Press Release

STUDY WILL EVALUATE RESEARCH-DOCTORATE PROGRAMS

A new study which will evaluate research-doctorate programs in U.S. universities has been launched by the Conference Board of Associated Research Councils (CBARC).

The study will examine graduate programs in the physical and biological sciences, mathematics, engineering, the social sciences, and the humanities. It will include in its sample, programs that produce approximately ninety percent of the nation's Ph.D.'s in each of thirty-one selected fields within these areas. The study will be concerned with the preparation of students for careers in research. The study plan is designed to provide a better informed and more representative sample of evaluators than was employed in past studies. In addition to peer evaluations, programs will be compared on measures of the achievements of their faculty and of their recent graduates.

The study will be guided by a committee appointed by the Conference Board. Co-chairmen are Gardner Lindzey, Director of the Center for Advanced Study in the Behavioral Sciences, Stanford, California, and Lyle V. Jones, Professor of Psychology and Director of the L. L. Thurstone Psychometric Laboratory at the University of North Carolina,

Chapel Hill. Among members of the committee are Saunders Mac Lane, University of Chicago, and Lincoln Moses, Stanford University.

Funding for the study is provided by the Andrew W. Mellon Foundation, the Ford Foundation, the National Science Foundation, and the National Institutes of Health. Study headquarters are located in the Commission on Human Resources of the National Research Council.

The Conference Board of Associated Research Councils was organized in 1944 and is made up of representatives of the American Council of Learned Societies, American Council on Education, National Research Council, and Social Science Research Council.

—News Release, CBARC

ARTHUR SARD

Arthur Sard, recently at the University of California, San Diego, died in Binningen, Switzerland on August 31, 1980 at the age of 71. He was a member of the Society for 43 years. He taught at Queens College in Flushing, New York, 1936-1971; during the war he was a leading member of the Applied Mathematics Group at Columbia. He is noted for Sard's theorem (*Bull. Amer. Math. Soc.* **48** (1942), 883-890)—that the set of critical values of a suitably smooth function has measure zero, a result well-known in differential topology and game theory.

NARIAKI KOSE

A Memorial Fund is being established in commemoration of Nariaki Kose, a graduate student at the University of California, Berkeley, who died in a mountaineering accident in July 1980. The fund will provide an annual prize to a graduate student in mathematics for quality teaching.

Those who wish to contribute to the memorial fund should make their checks payable to the Regents of the University of California, mark them "For the Nariaki Kose Memorial Fund," and mail them to the Department of Mathematics, University of California, Berkeley, California 94720; Attention: Colleen Quigley.

RUFUS BOWEN LECTURES

The University of California, Berkeley, has established the Rufus Bowen Lectures, to honor the memory of Rufus Bowen. Dennis Sullivan, of the Institut des Hautes Études Scientifiques, Paris, will give the first series of three lectures during the week of January 12-16, 1981, in Berkeley on topics in the Theory of Kleinian Groups and Ergodic Theory.

Donations to the Rufus Bowen Memorial Fund may be sent to the Department of Mathematics, University of California, Berkeley, California 94720.

ISRAEL HALPERIN PRIZE AWARDED

The Israel Halperin Prize is awarded every five years for outstanding work in operator theory or operator algebras by a member of the Canadian

mathematical community who has recently obtained a doctorate. The first recipient of this prize is Man-duen Choi of the University of Toronto who was given the award at the Canadian Operator Symposium in May 1980.

ASSOCIATE DIRECTOR JOINS MAA STAFF

The Mathematical Association of America (MAA) announced the appointment on September 1, 1980 of Dr. Marcia P. Sward to the newly created position of Associate Director.

Until September 1, 1980, Dr. Sward was Associate Professor of Mathematics and Chairman of the Department of Mathematics at Trinity College, Washington, D.C. She has served since 1978 as a member of the MAA Committee on Placement Examinations.

Dr. Sward received a Bachelor of Arts degree from Vassar College in 1961 and a Ph.D. in mathematics from the University of Illinois in 1967. She has been a member of the faculty of Trinity since 1968. During 1979 she served as a University Fellow at the National Highway Traffic Safety Administration of the Department of Transportation. She lives in Chevy Chase, Maryland, with her husband, Gilbert, who is a Professor of Mathematics at Montgomery College, Rockville, and their two children.

Dr. Sward will assist the MAA Executive Director in the general administration of the Washington Headquarters and have specific responsibility for the Association's publication program. She will serve as editor of the newsletter which the Association plans to begin publishing in 1981.

LADY DAVIS FELLOWSHIP TRUST

The deadline for receipt in Jerusalem of completed application forms for the Lady Davis Graduate, Postdoctoral and Professorial Fellowships in 1981-1982 has been advanced to December 1, 1980. The Lady Davis Fellowship Trust provides both fellowships for study or research at graduate or postdoctoral levels, and support for visiting professorships at the Hebrew University of Jerusalem and the Technion-Israel Institute of Technology, Haifa.

Lady Davis Fellows are selected on the basis of demonstrated excellence in their studies, promise of distinction in their chosen fields of specialization and qualities of mind, intellect and character. The fellowships are tenable for a period of one year. They may be renewed for a second year, and in special circumstances extended for a third year. They are intended to defray travel and tuition fees and to meet reasonable living expenses.

The Lady Davis Visiting Professorships, for periods of from one trimester (or semester) to a full academic year, are intended for candidates with the rank of Full or Associate Professor at their own institutions. These grants include a professorial salary and cost of travel.

Application forms can be obtained from the Lady Davis Fellowship Trust, P.O. Box 1255, Jerusalem, Israel.

(NSF News continued from p. 615.)

LARGER INSTITUTIONS' NSF GRANTS CAN AID SMALL COLLEGE FACULTY MEMBERS

The NSF is providing an opportunity for faculty members at small institutions to arrange work with an investigator at another institution who holds or is applying for an NSF research grant. The NSF grantee may request supplemental funding to cover additional costs. If supplemental funds are required, the NSF grantee should submit to NSF a brief proposal, including a description of the proposed research, budget, and biographical sketch of the small college faculty member. Individuals at smaller colleges should make their own arrangements with investigators at larger universities or laboratories. NSF does not act as intermediary. Further information is available from the National Science Foundation, 1800 G Street, N.W., Washington, DC 20550; Attention: Cecilia Spearing, Mathematical and Physical Sciences (202-357-7943); Roland Radloff, Biological, Behavioral, and Social Sciences (202-357-9880); or Albert Bridgewater, Astronomical, Atmospheric, Earth, and Ocean Sciences (202-357-7615).

MINORITY RESEARCH INITIATION

The Minority Research Initiation (MRI) program (formerly the Research Initiation in Minority Institutions RIMI-program) provides support for full-time minority faculty individuals who are nationals of the United States and who wish to establish quality research efforts on their campuses. Individual minority scientists eligible to submit proposals are those who have full-time status at U.S. colleges or universities with academic programs in the sciences and engineering. No specific deadlines or target dates apply to proposals submitted under the MRI program.

The MRI program announcement NSF 80-42 may be requested from Roosevelt Calbert, Office of Planning and Resources Management (202-357-7350), National Science Foundation, 1800 G Street, N.W., Washington, DC 20550. Specific program inquiries should be directed to the NSF program director who has responsibility for research support matters in the proposer's field of interest.

—NSF *Bulletin*

E. D. BERGMANN MEMORIAL RESEARCH GRANTS

U.S.-Israel Binational Science Foundation

The Professor E. D. Bergmann Memorial Research Grants for Young Scientists are special awards made annually to two outstanding young scientists, one in the U.S. and one in Israel. The grants, awarded on the basis of cooperative research proposals, cover the cost of up to two years of research conducted at an Israeli institution. Scientists who have completed their doctorates within five years prior to application may apply. Applications should reach the Israel

Binational Science Foundation office in Jerusalem, Israel, by November 1; the awards will be announced April 1, 1981.

Eligible research areas are agriculture, health sciences, life sciences, physics, chemistry, mathematical sciences, atmospheric and earth sciences, oceanography and limnology, materials research, environmental research, energy research, biomedical engineering, economics, sociology, anthropology, and social and developmental psychology.

Information and application forms may be requested from the U.S.-Israel Binational Science Foundation, Division of International Programs, National Science Foundation, 1800 G Street, N.W., Washington, DC 20550 (202-357-7613).

—NSF *Bulletin*

NSF SCIENCE EDUCATION PROJECTS TRANSFERRED TO DEPARTMENT OF EDUCATION

NSF projects aimed at improving science instruction in kindergarten through the fourth grade which were funded under NSF's Pre-College Teacher Development in Science program have been transferred to the newly established Department of Education. The transfer involves thirty-nine newly funded projects, including sixteen summer workshops and twenty-three seminars scheduled for the 1980-1981 academic year. Since its inception four years ago, the NSF program has been directed toward improving science instruction in kindergarten through the 12th grade by offering teachers an opportunity for continuing education in the subject matter of science and in strategies for teaching science.

NSF will continue to support projects aimed at improving the science competency of teachers in grades five through twelve in mathematics and the natural and social sciences.

Deadline for receipt of proposals, usually initiated by colleges and universities was October 1, 1980.

SCIENCE EDUCATION DEVELOPMENT AND RESEARCH

Guidelines for the preparation of proposals for the Division of Science Education Development and Research are available from the NSF upon request. For information on the Research in Science Education program, request SE 80-55 from Rita Peterson (202-282-7745). For information on the Development in Science Education program, request SE 80-50 from Alexander Barton (202-282-7910).

A preliminary proposal is required in every case, and it may be submitted at any time during the year. To start a project in the summer of 1981, however, applicants should have sent in the preliminary proposal during September or early October 1980. For starts coinciding with the academic year 1981-1982, submissions should be made sometime in October, November, or December 1980.

For further information, request the brochure SE 80-56 from the National Science Foundation, 1800 G Street, N.W., Washington, DC 20550.

MISCELLANEOUS

Personal Items

Fredric Ancel of the University of Texas has been appointed to an assistant professorship at the University of Oklahoma.

Thomas W. Hungerford of the University of Washington has been appointed professor and chairman of the Department of Mathematics at Cleveland State University.

Dalton R. Hunkins of Saint Bonaventure University has been appointed chairman of the Department of Mathematics.

S. C. Kothari of Southern Illinois University has been appointed to a visiting assistant professorship at the University of Oklahoma.

Richard Kubelka of Stanford University has been appointed to a visiting assistant professorship at the University of Oklahoma.

Paul Massatt of Brown University has been appointed to an assistant professorship at the University of Oklahoma.

William Ray of Iowa State University has been appointed to an assistant professorship at the University of Oklahoma.

John Sawka of Yale University has been appointed to an assistant professorship at the University of Santa Clara.

Gerald F. Smith of Lehigh University has been appointed acting director of the Center for the Application of Mathematics at that institution.

Jerzy Szulga of Wrocław University, Poland, has been appointed Research Fellow in Mathematics at Cleveland State University.

Jeanne Tamaki of Tulane University has been appointed to an assistant professorship at the University of Santa Clara.

PROMOTIONS

To Professor. Long Island University: **Robert A. Melter**; University of Oklahoma: **David Kay**.

To Associate Professor. Knox College: **Dennis M. Schneider**.

Deaths

Professor **Aldo Andreotti** of the Scuola Normale Superiore, Pisa, Italy, died on February 21, 1980 at the age of 55. He was a member of the Society for 22 years.

James S. Elston of Winter Park, Florida, died on April 14, 1980 at the age of 91. He was a member of the Society for 54 years.

Professor **Carl H. Rasmussen** of the University of Michigan, Dearborn, died on August 15, 1979 at the age of 33. He was a member of the Society for 3 years.

Arthur Sard of Binningen, Switzerland, died on August 31, 1980. (See page 636.)

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)

June 1-December 20. MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH (Weekly Conferences), Federal Republic of Germany. (June 1980, p. 366)

September 1980-March 1981. NSF CHAUTAUQUA SHORT COURSES FOR NONACADEMIC SCIENTISTS AND ENGINEERS, Polytechnic Institute of New York; Oregon Graduate Center. (October 1980, p. 546)

NOVEMBER 1980

6-8. SIAM 1980 FALL MEETING, Houston, Texas. (April 1980, p. 289)

14-15. FOUNDATIONS: LOGIC, LANGUAGE, AND MATHEMATICS, Graduate Center, City University of New York, New York. (June 1980, p. 370)

DECEMBER 1980

1-6. FIRST CONGRESS OF BIOMATHEMATICS, Concepcion, Chile. (April 1980, p. 289)

1-12. CONFERENCE ON INTERACTIVE GRAPHICAL MAN-MACHINE COMMUNICATION, Nantes, France. (August 1980, p. 452)

8-13. WORKSHOP ON NONLINEAR EQUATIONS, Mexico City, Mexico. (October 1980, p. 547)

12-14. ANNUAL MEETING OF THE CANADIAN MATHEMATICAL SOCIETY, Vancouver, B.C., Canada. (October 1980, p. 547)

15-19. NSF-CBMS REGIONAL CONFERENCE ON HARMONIC MAPS, Tulane University, New Orleans, Louisiana.
Principal Lecturer: James Eells, University of Warwick, England.

Program: Professor Eells will deliver one morning and one afternoon lecture on each of the five days of the conference. Approximately half of the lectures will be devoted to the existence theory and half to the qualitative theory of harmonic maps.

Support: While most funds will have been committed by the time of publication of this announcement, late requests from the Middle South region will be considered as funds permit. Requests should be accompanied by a statement of mathematical background and research interests.

Information: Ronald J. Knill, Department of Mathematics, Tulane University, New Orleans, Louisiana 70118.

16-19. FOURTH CONFERENCE INTERNATIONALE SUR L'ANALYSE ET L'OPTIMISATION DES SYSTEMES, Versailles, France. (June 1980, p. 370)

Sponsor: Institut National de Recherche en Informatique et en Automatique; cosponsored by Association Française pour la Cybernétique Économique et Technique; Institute of Electrical and Electronics Engineers, Inc.; International Federation of Automatic Control; Institut de Recherches de la Sidérurgie Française.

Program: Large scale systems; multivariable systems; economic systems; multidimensional systems and applications to image processing; distributed parameter systems, theory and applications; games, theory and applications; stochastic dynamical systems; applications of microprocessors to control; modelling of oil fields; algebraic and geometric system theory; adaptive systems.

Information: Secrétariat de la Conférence, Service des Relations Extérieures, Institut National de Recherche en Informatique et en Automatique, Domaine de Voluceau, Rocquencourt, 78150 Le Chesnay, France.

JANUARY 1981

2-8. WINTER RESEARCH INSTITUTE ON GEOMETRIC QUANTIZATION, Banff, Alberta, Canada. (June 1980, p. 370)

3-8. ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Toronto, Canada.

Information: AAAS Meetings Office, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036.

5-8. THIRD CARIBBEAN CONFERENCE ON COMBINATORICS AND COMPUTING, University of the West Indies, Barbados. (August 1980, p. 452)

6. SYMPOSIUM ON OPERATOR THEORY AND BANQUET IN HONOR OF PAUL R. HALMOS, University of California, Berkeley, California. (October 1980, p. 549)

7-15. INTERNATIONAL CONFERENCE ON ALGEBRAIC GEOMETRY, La Rábida University, Sevilla, Spain.

Topics: Algebraic methods in the theory of singularities; topological aspects; desingularization.

Program: The conference will be devoted particularly, but not exclusively, to singularities of algebraic varieties and analytic spaces. There will be lectures by invited speakers. There will be seminar sessions on different topics, and participants are invited to present their work.

Call for Papers: Papers must be submitted by December 15, 1980, to the address below.

Information: Tomás Sánchez, Facultad de Ciencias, Sección de Matemáticas, Prado de la Magdalena, Valladolid, Spain.

10-11. DIFFERENTIAL EQUATIONS AND APPLICATIONS TO ECOLOGY EPIDEMICS AND POPULATION PROBLEMS, Harvey Mudd College, Claremont, California.

Organizing Committee: J. A. Yorke, K. L. Cooke, and S. N. Busenberg.

Program: There will be papers on the dynamics of differential equations as well as on models in biomathematics and population biology. Proceedings will be published by Academic Press. A related CBMS Conference with J. A. Yorke as principal lecturer will be held in Claremont during the week of January 12.

Information: Stavros N. Busenberg, Department of Mathematics, Harvey Mudd College, Claremont, California 91711.

12-16. NSF REGIONAL CONFERENCE ON GLOBAL TOPOLOGICAL METHODS IN APPLIED MATHEMATICS, Pomona College, Claremont, California.

Principal Lecturer: James A. Yorke.

Program: James Yorke will deliver ten expository lectures on the following topics: The numerical solution of systems of equations: Homotopy continuation methods that work "with probability one"; Hopf bifurcation and the global continuation of periodic solutions of differential equations depending on a parameter; Global aspects of the analysis of gonorrhoea and measles outbreaks in the United States; Chaos and ergodic behavior in simple dynamical processes. One-hour lectures on related themes will be given by John Guckenheimer, Herbert Keller and Paul Rabinowicz. A related research conference will be held in Claremont on the weekend preceding this conference (see January 10-11).

Support: A limited amount of financial support is available through an NSF-CBMS conference grant.

Information: Kenneth L. Cooke, Mathematics Department, Pomona College, Claremont, California 91711.

12-February 6. TWENTY-FIRST SUMMER RESEARCH INSTITUTE OF THE AUSTRALIAN MATHEMATICAL SOCIETY, University of Tasmania, Hobart, Australia. (June 1980, p. 370)

FEBRUARY 1981

8-12. CONFERENCE ON ALGEBRA AND GEOMETRY, Kuwait University, Kuwait. (August 1980, p. 453)

25-28. NONLINEAR PROBLEMS IN SCIENCE, Rice University, Houston, Texas. (October 1980, p. 547)

MARCH 1981

2-5. TWELFTH SOUTHEASTERN CONFERENCE ON COMBINATORICS, GRAPH THEORY, AND COMPUTING, Pleasant Hall, Louisiana State University, Baton Rouge, Louisiana. Louisiana. (October 1980, p. 547)

2-6. NONLINEAR PROBLEMS: PRESENT AND FUTURE, Center for Nonlinear Studies, Los Alamos Scientific Laboratory, University of California.

Program: Survey lectures by C. Bardos, P. Fife, J. Krumhansl, M. Rosenbluth, I. Singer. Opportunities for invited speakers, contributed talks and discussion panels on the themes of the survey lectures: models of turbulence; new methods in nonlinear analysis; nonlinear waves in reaction-diffusion systems; nonlinear phenomena in plasmas.

Information: Participation open to all interested scientists. For further information and pre-registration contact the Organizing Committee (A. R. Bishop, D. K. Campbell, B. Nicolaenko), Center for Nonlinear Studies, Los Alamos Scientific Laboratory, University of California, P. O. Box 1663, MS 457, Los Alamos, New Mexico 87545.

12-13. COMPUTER SCIENCE AND STATISTICS: THE THIRTEENTH SYMPOSIUM ON THE INTERFACE, Pittsburgh Hilton, Gateway Center, Pittsburgh, Pennsylvania. (August 1980, p. 453)

16-20. INTERNATIONAL CONFERENCE ON CONVEXITY AND GRAPH THEORY, University of Haifa; Ben Gurion Uni-

versity of the Negev, Israel. (October 1980, p. 547)

18-20. FOURTEENTH ANNUAL SIMULATION SYMPOSIUM, Tampa, Florida. (August 1980, p. 453)

25-27. CONFERENCE ON INFORMATION SCIENCES AND SYSTEMS, Baltimore, Maryland.

Call for Papers: Authors are invited to submit papers describing new advances, applications, and ideas in the fields of computer science, communication theory, system and control theory. Two kinds of papers are solicited. (1) Regular papers requiring approximately thirty minutes for presentation; these will be reproduced in full (up to six pages) in the Conference Proceedings. (2) Short papers suitable for presentation in fifteen minutes or less; one page summaries of these papers will be published in the Proceedings. (One Proceedings page is approximately 2 standard double-spaced pages.)

Instruction for Authors: A "regular" or "short" designation, title, and summary are to be submitted by January 16, 1981. Summaries should be of sufficient detail and length to permit careful reviewing. Authors will be notified of acceptance by February 16, 1981. Instructions for the preparation of accepted papers for the Proceedings will be sent to each author. All manuscripts are to be submitted to 1981 CISS, Department of Electrical Engineering, The Johns Hopkins University, Baltimore, Maryland 21218.

Information: Gerard G. L. Meyer and Wilson J. Rugh, Program Directors, Electrical Engineering Department, The Johns Hopkins University, Baltimore, Maryland 21218.

26-28. INTERNATIONAL CONFERENCE ON SPECTRAL THEORY OF DIFFERENTIAL OPERATORS, University of Alabama in Birmingham, Birmingham, Alabama. (October 1980, p. 547)

APRIL 1981

6-8. ENVIRONMENTRICS '81, Washington, D.C. (August 1980, p. 453)

8-10. 2e CONFÉRENCE INTERNATIONALE SUR LES SYSTÈMES INFORMATIQUES RÉPARTIS, Paris, France. (August 1980, p. 453)

21-24. SECOND SOUTHEAST ASIAN CONFERENCE ON MATHEMATICAL EDUCATION, Department of Mathematics, University of Malaya, Kuala Lumpur, Malaysia. (October 1980, p. 548)

23-26. RECENT ADVANCES IN NON-COMMUTATIVE RING THEORY: A GEORGE H. HUDSON SYMPOSIUM, State University of New York, Plattsburgh, New York. (October 1980, p. 548)

30-May 1. TWELFTH ANNUAL PITTSBURGH CONFERENCE ON MODELING AND SIMULATION, University of Pittsburgh, Pittsburgh, Pennsylvania. (August 1980, p. 453)

MAY 1981

11-13. THIRTEENTH ACM SYMPOSIUM ON THEORY OF COMPUTING, Milwaukee, Wisconsin. (October 1980, p. 548)

11-15. SECOND AUSTRALASIAN MATHEMATICS CONVENTION, Sydney, Australia. (October 1980, p. 548)

16-23. INTERNATIONAL CONFERENCE ON FUNCTIONAL-DIFFERENTIAL SYSTEMS AND RELATED TOPICS. II, Kozubnik, Poland. (August 1980, p. 453)

21-22. THIRD SYMPOSIUM ON MATHEMATICAL PROGRAMMING WITH DATA PERTURBATIONS, The George Washington University, Washington, D.C.

Sponsors: Institute for Management Science and Engineering; Department of Operations Research,

School of Engineering and Applied Science, The George Washington University.

Purpose: This symposium is designed to bring together practitioners who use mathematical programming optimization models, and who have to deal with questions of sensitivity analysis, with academic and other research workers who are developing tools applicable to these problems.

Call for Papers: Papers are solicited in the following areas: sensitivity and stability analysis results and their applications; solution methods for problems involving implicitly defined problem functions; solution methods for problems involving deterministic or stochastic parameter changes; solution approximation techniques and error analysis. "Clinical" presentations are also solicited that describe problems in sensitivity or stability analysis encountered in applications.

Deadline for Abstracts: March 1, 1981. Abstracts should be good technical summaries, but should avoid the use of mathematical symbols and references, should not exceed 500 words, and should include a title and the name and full mailing address of each author. Abstracts should be sent in triplicate to the address below.

Information: Anthony V. Fiacco, Department of Operations Research, School of Engineering and Applied Science, The George Washington University, Washington, D.C. 20052, (202) 676-7511.

JUNE 1981

1-5. ENERGY SYSTEMS, Salisbury State College, Salisbury, Maryland.

Principal Lecturer: H. T. Odum, University of Florida.

Sponsor: MD-DC-VA Section of the MAA.

Purpose: To make available to teachers in two- and four-year colleges important topics in applicable mathematics.

Information: B. A. Fusaro, Department of Mathematical Sciences, Salisbury State College, Salisbury, Maryland 21801. (301) 546-3261 Ext. 369.

8-10. CONFERENCE ON ANALYSING PROBLEM CLASSES AND PROGRAMMING FOR PARALLEL COMPUTING, Nurnburg, Federal Republic of Germany. (October 1980, p. 548)

8-12. COMBINATORIAL PROBLEM-SOLVING, Salisbury State College, Salisbury, Maryland.

Principal Lecturer: Alan Tucker, SUNY, Stony Brook.

Sponsor: MD-DC-VA Section of the MAA.

Purpose: To make available to teachers in two- and four-year colleges important topics in applicable mathematics.

Information: B. A. Fusaro, Department of Mathematical Sciences, Salisbury State College, Salisbury, Maryland 21801, (301) 546-3261 Ext. 369.

9-July 3. SYMPOSIUM ON CATEGORICAL ALGEBRA AND TOPOLOGY, University of Cape Town, Cape Town, South Africa.

Speakers (tentative): B. Banaschewski, G. C. L. Brummer, P. Cherenack, C. R. A. Gilmour, K. A. Hardie, D. R. A. Harvey, P. J. Hilton, A. V. Jansen, L. D. Nel, S. Salbany, A. P. J. van der Walt, S. J. R. Vorster.

Call for Papers: Contributions to algebra and topology that are category-theoretical in motivation or in method are solicited. The Proceedings will be published as a special issue of Quaestiones Mathematicae. The papers will be refereed individually.

Information: K. A. Hardie, Department of Mathematics, University of Cape Town, Rondebosch 7700, South Africa.

17-19. SECOND INTERNATIONAL CONFERENCE ON THE NUMERICAL ANALYSIS OF SEMICONDUCTOR DEVICES AND INTEGRATED CIRCUITS, Dublin, Ireland. (October 1980, p. 548)

Deadline for Papers: Preliminary versions of papers should be submitted not later than March 20,

1981, and must be accompanied by a separate one-page abstract.

22-27. INTERNATIONAL SYMPOSIUM ON STOCHASTICS AND ANALYSIS, Tübingen, West Germany. (October 1980, p. 548)

22-July 3. WORKSHOP ON FEEDBACK AND SYNTHESIS OF LINEAR AND NONLINEAR SYSTEMS, Center for Interdisciplinary Research, Bielefeld, West Germany; Rome. Program: The first week of the workshop will be on linear systems and held at Bielefeld; the second week will be on nonlinear systems and will be in Rome.

Information: Feedback and Synthesis of Linear and Nonlinear Systems, Zentrum für Interdisziplinäre Forschung, D-48 Bielefeld 1, Wellenberg 1, West Germany.

28-July 5. NINTH INTERNATIONAL CONGRESS ON THE APPLICATION OF MATHEMATICS IN ENGINEERING, Weimar, German Democratic Republic. (August 1980, p. 453)

29-July 10. CURRENT TRENDS IN ALGEBRAIC TOPOLOGY, The University of Western Ontario, London, Ontario, Canada. (August 1980, p. 453)

30-July 2. FOURTH IMACS INTERNATIONAL SYMPOSIUM ON COMPUTER METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS, Lehigh University, Bethlehem, Pennsylvania. (October 1980, p. 548)

JULY 1981

19-25. SUMMER MEETING IN CATEGORY THEORY, Cambridge, England. (October 1980, p. 548)

20-24. EIGHTH BRITISH COMBINATORIAL CONFERENCE, Swansea, South Wales. (October 1980, p. 549)

AUGUST 1981

3-7. INTERNATIONAL SEMINAR ON FUNCTIONAL ANALYSIS, HOLOMORPHY AND APPROXIMATION THEORY, Universidade Federal do Rio de Janeiro, Brazil. (October 1980, p. 549)

5-7. 1981 ACM SYMPOSIUM ON SYMBOLIC AND ALGEBRAIC COMPUTATION, Snowbird, Utah. (October 1980, p. 549)

11-21. SIXTH INTERNATIONAL CONFERENCE ON MATHEMATICAL PHYSICS, Berlin, Federal Republic of Germany. (October 1980, p. 549)

23-28. TENTH CONFERENCE ON STOCHASTIC PROCESSES AND THEIR APPLICATIONS, Montreal, Canada. (October 1980, p. 549)

30-September 6. NINTH INTERNATIONAL CONFERENCE ON NONLINEAR OSCILLATIONS, Kiev, USSR. (August 1980, p. 453)

31-September 5. SIXTH CONGRESS OF THE GROUPEMENT DES MATHÉMATIENS D'EXPRESSION LATINE, Centre Universitaire de Luxembourg, Luxembourg. (October 1980, p. 549)

SEPTEMBER 1981

8-10. INTERNATIONAL SYMPOSIUM ON SEMI-INFINITE PROGRAMMING AND APPLICATIONS, Austin, Texas. (October 1980, p. 549)

21-26. JOURNÉES ARITHMÉTIQUES, Metz, France. (October 1980, p. 549)

AUGUST 1982

11-19. INTERNATIONAL CONGRESS OF MATHEMATICIANS, Warsaw, Poland. (October 1980, p. 549)

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.

Melvin Woodard has been appointed by Presidents Dorothy L. Bernstein and Peter D. Lax to the joint *AMS-MAA Committee on Arrangements for the Pittsburgh Meeting*, August 17-21, 1981. Other members of the committee are Elayne Arrington-Idowu, William A. Beck, Mario Benedicty, Frank T. Birtel (ex officio), Jacob Burbea (chairman), Barbara

T. Faires, James P. Fink, William J. LeVeque (ex officio), Richard A. Moore, Earle F. Myers (publicity director), David P. Roselle (ex officio), and Kathleen Ann Taylor.

Jack K. Hale (1983) has been appointed by President Peter D. Lax to the AMS subcommittee of the joint *AMS-IMS Committee on Translations from Russian and Other Languages*. Continuing members of this subcommittee are Israel Berstein (1983), Ronald G. Douglas, chairman (1982), Eugene B. Dynkin (1981), David G. Ebin (1983), Solomon Feferman (1982), Frederick P. Gardiner (1982), John B. Garnett (1982), Victor Kac (1981), Nicholas D. Kazarinoff (1981), Boris Mityagin (1983), Melvyn Nathanson (1983), and Arthur H. Stone (1982).

Candidates Nominated for 1980 Elections

Following are the candidates in the elections of 1980.

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NOMINATING COMMITTEE FOR 1981

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Meyer Jerison

PROBABILITY THEORY and STATISTICS

New and Backlist Selections

MODERN STATISTICS: METHODS AND APPLICATIONS

edited by *Robert V. Hogg*

This volume contains the lecture notes prepared by the speakers for the AMS Short Course given in San Antonio on January 7-8, 1980.

The choice of topics from a field as large as Statistics is a difficult one. The organizers wanted to avoid any substantial overlap with the short course on statistics held three years earlier in St. Louis; therefore it seemed very natural to begin with one important topic that is sometimes overlooked in an introductory course, particularly one in mathematical statistics. This topic is one through which the general public most often hears about statistics, namely, survey sampling. Wayne Fuller spoke on *Samples and Surveys*, noting the operations necessary in conducting a survey of a human population. In his article, he explains the construction of a probability sample design and the corresponding optimal estimators.

The more general problem of the design and analysis of an experiment was covered by Peter John in his *Analysis of Variance*. These techniques have been extremely important in applications and have also motivated a large amount of statistical research. It is clear that even in an elementary design the experimenter must understand the importance of randomization.

Nonparametric statistical methods have played a major role in modern statistics. Two coordinated talks on that subject were given by Ronald Randles and Thomas Hettmansperger. Randles introduced distribution-free rank tests, such as one by Wilcoxon, and some of their good asymptotic properties. Hettmansperger then explained how these rank tests could be used to obtain point and interval estimates for various parameters, including the regression situation. These resulting *R*-estimates are very robust because they are not highly sensitive to reasonable deviations from the underlying assumptions.

The important topic of regression was continued by considering isotonic regression and time series. F. T. Wright showed how to use the method of maximum likelihood to estimate ordered parameters. Then Douglas Martin considered a time sequence of data. After presenting a collection of interesting examples, he discussed appropriate models and their estimates, including robust ones.

This book provides an introduction to the statistical topics above. A background of good mathematics through advanced calculus with a little statistics is adequate preparation for enjoyment of the contents. The attentive reader will gain a fairly good understanding of the nature of survey sampling, design and analysis of experiments, nonparametric methods, isotonic regression, and time series. *Modern*

Statistics: Methods and Applications is an excellent companion to MAA's *Studies in Statistics* also edited by Professor Hogg.

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SELECTED TABLES IN MATHEMATICAL STATISTICS

THE DISTRIBUTION OF THE SIZE OF THE MAXIMUM CLUSTER OF POINTS ON A LINE

by *Norman D. Neff and Joseph I. Naus*

Researchers in many fields deal with the clustering of events in time and space. The probabilities of large clusters under various models are tools of the natural, physical and social sciences. The present book provides probabilities for the size of the largest cluster of random points on the line. Tables of exact values and functional forms are given. A wide variety of applications is given.

Those who will benefit from this volume are researchers who seek to investigate unusual clustering. These include quality control experts investigating clusters of defectives, communications engineers who design system capacity to accommodate clusters, and experts in epidemiology, traffic control, ecology and many other fields who study the clustering of events in time and space. Just as experts in these and other fields use the binomial, Poisson, negative binomial and other distributions, the present tables are an important addition to statistical, technical and scientific libraries.

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edited by *D. B. Owen and R. E. Odeh* with *J. M. Davenport* as managing editor

The purpose of the series, Selected Tables in Mathematical Statistics, is to provide an outlet for tables of high quality and utility which are too long to be published in a technical journal but too short for separate publication. Each table is carefully checked for accuracy before it is accepted. The series is edited by the Institute of Mathematical Statistics.

This book consists of three parts:

- G. L. Tietjen, D. K. Kahaner and R. J. Beckman, *Variances and covariances of the normal order statistics for sample sizes 2 to 50*
H. A. David, W. J. Kennedy and R. D. Knight, *Means, variances and covariances of the normal order statistics in the presence of an outlier*
G. Randall Murdock and William O. Williford, *Tables for obtaining optimal confidence intervals involving the chi-square distribution*

The background needed for use of these Tables is a basic knowledge of mathematical and applied statistics.

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SELECTED TABLES IN MATHEMATICAL STATISTICS. Volume 4

edited by *D. B. Owen* and *R. E. Odeh* with *J. M. Davenport* as managing editor

In this volume by M. Sobel, V. R. R. Uppuluri, and K. Frankowski, the incomplete Type 1-Dirichlet integral is tabulated in a variety of useful forms. A rather long introductory section gives the essential properties that were used in the calculation and illustrates various ways of using tables. It also gives in Section 2 some mathematical results that are related to problems of interpolation in the table. In general, this Dirichlet integral can be used with most multinomial problems, especially those concerned with the maximum or minimum frequency in a homogeneous multinomial. Combinatorial aspects and relations to Stirling numbers of the second kind are also included; in fact these relations give rise to generalized Stirling numbers ($r > 1$), which are listed in Table E along with the usual Stirling numbers ($r = 1$). Table F gives exact and approximate values of n needed for a multinomial selection problem described in Section 4.1, the calculation of which depended on the Type 1-Dirichlet integral.

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SELECTED TABLES IN MATHEMATICAL STATISTICS. Volume 3

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The following tables are included in this volume:

- Bernard Harris and Andrew P. Soms, *Tables of the two factor and three factor generalized incomplete modified Bessel distributions*
Kimiko O. Bowman and Marvin A. Kastenbaum, *Sample size requirement: Single and double classification experiments.*

J. Keilson and H. F. Ross, *Passage time distributions for Gaussian Markov (Ornstein-Uhlenbeck) statistical processes*

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DECOMPOSITION OF RANDOM VARIABLES AND VECTORS

Ju. V. Linnik and *L. V. Ostrovskii*

The main problem in the theory of decompositions of random variables is the investigation of the possible representations of such a variable in the form of a sum of independent random variables. In this book important results in this theory, and some applications, are presented. Analytic properties of the characteristic functions of random variables and vectors are studied in detail. One chapter is devoted to limit theorems without the condition of asymptotic negligibility. The results and methods of the theory of functions of a complex variable are used.

Material relating to the history of the topics involved and references to the literature are collected in notes at the end of the book.

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- Ju. V. Kozachenko, *Sufficient conditions for the continuity with probability one of sub-Gaussian random processes*
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- B. L. Granovskii, *On the variance of random quadratures of Gaussian type*

These articles were selected by a joint committee of the Institute for Mathematical Statistics and the American Mathematical Society.

Volume 14, Selected Translations in Mathematical Statistics and Probability
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PROBABILITY

edited by *J. L. Doob*

In March 1976, a symposium on probability was held at the University of Illinois at Urbana-Champaign. Following is the list of articles and authors included in these Proceedings.

- R. F. Anderson and Steven Orey, *Small random perturbations of dynamical systems with reflecting boundary.*
- D. L. Burkholder, *Brownian motion and classical analysis.*
- Hans Föllmer, *A Liapunov principle for semimartingales.*
- R. Holley, D. Stroock and D. Williams, *Applications of dual processes to diffusion theory.*
- Jean Jacod, *A general theorem of representation for martingales.*
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- Harry Kesten, *A renewal theorem for random walk in a random environment.*
- Frank B. Knight, *On prediction processes.*
- Oscar E. Lanford III, *A derivation of the Boltzmann equation from classical mechanics.*
- P. Warwick Millar, *Random times and decomposition theorems.*
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- William E. Pruitt and S. James Taylor, *Some sample path properties of the asymmetric Cauchy processes.*
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- John Walsh, *The cofine topology revisited.*
- Shinzo Watanabe, *Poisson point process of Brownian excursions and its applications to diffusion processes.*
- David Williams, *Some Q-matrix problems.*

Volume 31, Proceedings of Symposia in Pure Mathematics
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PROBLEMS IN THE CONSTRUCTIVE TREND IN MATHEMATICS. VI

edited by *V. P. Orevkov* and *N. A. Šanin*

This volume is the sixth collection of papers on constructive mathematics. The collection consists of papers on the theory of complexity of algorithms, constructive mathematical analysis and constructive mathematical logic. The papers were presented at a seminar on constructive mathematics at the Leningrad Branch of the Steklov Mathematical Institute of the Academy of Sciences of the USSR and at a scientific seminar of the Mathematics—Mechanics Faculty of Leningrad University.

The titles of the papers follow:

- N. K. Kosovskii, *Constructive versions of the laws of large numbers*
- V. F. Orevkov, *On the complexity of expansion of algebraic irrationalities in continued fractions*
- A. O. Slisenko, *Recognizing a symmetry predicate by multihead Turing machines with input*
- N. A. Šanin, *On a hierarchy of methods of interpreting propositions in constructive mathematics*

Part V was published as Number 113 of the Steklov book series and Part IV as Number 93 (MR 49 #4761 and MR 41 #1539).

Number 129 (1973), Proceedings of the Steklov Institute
1976, 272 pages (soft cover); List \$55.60
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STOCHASTIC APPROXIMATION AND RECURSIVE ESTIMATION

M. B. Nevel'son and *R. Z. Has'minskiĭ*

This book is devoted to sequential methods of solving a class of problems to which belongs, for ex-

ample, the problem of finding a maximum point of a function if each measured value of this function contains a random error. Some basic procedures of stochastic approximation are investigated from a single point of view, namely the theory of Markov processes and martingales. Examples are considered of applications of the theorems to some problems of estimation theory, educational theory and control theory, and also to some problems of information transmission in the presence of inverse feedback.

Unfortunately, an elementary course of probability theory, as given, say, at technical colleges, is not sufficient for an understanding of this book, since the authors make active use of concepts (such as martingales and Markov processes) based on Kolmogorov's general conception of probability theory as a branch of measure theory. The authors should nevertheless like the book to be accessible to engineers. The first four sections of the book constitute an attempt to resolve this dilemma. They are hardly more than a résumé of some definitions and theorems from Kolmogorov's *Grundbegriffe*, collected for later reference.

Chapters 5 and 6 were written by Nevel'son, Chapters 8–10 by Has'minskii, and the remaining chapters by both authors in collaboration. Each chapter is prefaced by a brief outline of its contents. Most of the references are assembled in the notes following the last chapter.

The book was translated from the Russian by the Israel Program for Scientific Translations; the translation was edited by B. Silver.

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ALMOST SURE INVARIANCE PRINCIPLES FOR PARTIAL SUMS OF WEAKLY DEPENDENT RANDOM VARIABLES

Walter Philipp and William Stout

Let $\{x_n\}$ be a sequence of random variables, centered at expectations with finite $(2 + \delta)$ moments where $\delta > 0$. For $t \geq 0$ let $S_t = S(t) = \sum_{n \leq t} x_n$. Assume that $\lim_{n \rightarrow \infty} n^{-1} ES_n^2 = 1$ (*). The authors establish the following almost sure invariance principle for certain Markov sequences, and for what they call retarded asymptotic martingale difference sequences: Without changing its distribution they re-define the process $\{S(t), t \geq 0\}$ on a new probability space together with standard Brownian motion $\{X(t), t \geq 0\}$ such that $S(t) - X(t) = o(t^{1/2-\lambda})$ a.s., where $\lambda > 0$ only depends on the given sequence $\{x_n\}$. This result implies the usual upper and lower class results for partial sums and for maxima of partial sums, the functional versions of the law of the iterated logarithm for partial sums and for maxima of partial sums, and distribution type invariance principles. They do not make any stationarity assumptions. As a matter of fact they also obtain similar results when (*) is not satisfied.

The following chapters are included: 1. Introduction, 2. Description of the method, 3. Lacunary trigonometric series with unweighted summands, 4. Stationary φ -mixing sequences, 5. Gaussian sequences, 6. Lacunary trigonometric series with weights, 7. Functions of strongly mixing random variables, 8. Nonstationary mixing sequences, 9. A refinement of the Shannon-McMillan-Breiman theorem, 10. Markov sequences, 11. Retarded asymptotic martingale difference sequences, and 12. Continuous parameter stochastic processes.

Two appendixes are also included: 1. The Gal-Koksma strong law of large numbers, and 2. An example.

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edited by G. B. Dantzig and A. F. Veinott, Jr.

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**PROBABILITY AND RELATED TOPICS IN
PHYSICAL SCIENCES**

Mark Kac

This book is an expanded version of twelve lectures delivered at the Seminar in Applied Mathematics held in Boulder, Colorado, in the summer of 1957. It furnishes an introduction to probability theory to a mature audience with little or no prior knowledge of the subject.

The book is divided into four chapters. The first (Nature of Probabilistic Reasoning) serves mainly to illustrate how probabilistic notions are introduced and usefully employed in the treatment of a variety of problems.

The second (Some Tools and Techniques of Probability Theory) is primarily designed to show how a problem is attacked and solved.

The third is Probability in Some Problems of Classical Statistical Mechanics. This chapter is supplemented by two lectures (reproduced by Appendix I) by Professor G. E. Uhlenbeck on the Boltzmann equation.

The fourth chapter is devoted to a novel way of looking at many problems of classical analysis and physics. The fundamental ideas were introduced in the early twenties by N. Wiener and from a different point of view by R. P. Feynman in 1942. A lecture on the Feynman approach to nonrelativistic quantum mechanics by A. R. Hibbs is reproduced in Appendix II.

The final two appendices contain lectures delivered by Professor Balth. van der Pol at the invitation of the program committee.

Volume 1A, Lectures in Applied Mathematics
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UNIVERSITY OF MARYLAND, College Park 20742—Mathematics Department. Anticipate positions at all ranks in mathematics and statistics beginning August, 1981. Outstanding research credentials required. Vita, brief description of current research and three letters of recommendation should be submitted to W. E. Kirwan, Chairman, by January 30, 1981, to guarantee full consideration.

SCUOLA NORMALE SUPERIORE PISA, ITALY

Postdoctoral Position in *Mathematics* is offered for a period of 10 months from 1 October 1981.

Applicants may be of any nationality.

The total salary attached to this position is 8 million Italian lire. Successful candidates may apply for a partial reimbursement of travel expenses. Applications should be sent by January 15, 1981 to

*Director of the Scuola Normale Superiore
Piazza dei Cavalieri, 7
I - 56100 Pisa, Italy*

and should include a curriculum vitae, a detailed programme of study, letters from three referees, and reprints of published papers.

UNIVERSITY OF SOUTH CAROLINA Department of Mathematics and Statistics Columbia, South Carolina 29208

The Department invites applications for several tenure-track positions in **Mathematics and Statistics** beginning Fall, 1981. The Department is committed to continued growth and development in Pure and Applied Mathematics and in its Statistics programs. The Ph.D. degree with a commitment to excellence in teaching and strong potential for research are required. The standard teaching load is two courses per semester.

Applicants should submit a résumé and arrange for four letters of recommendation to be sent to Professor W. T. Trotter, Jr., Chairman, Department of Science and Mathematics, The University of South Carolina is an affirmative action/equal opportunity employer.

TENURE-TRACK POSITIONS

***MATHEMATICS—COMPUTER SCIENCE.** Tenure-track position beginning August 1, 1981. Ph.D. in mathematics with Master's degree in computer science or sufficient experience to teach lower division computer science courses.

***MATHEMATICS.** Tenure-track position beginning August 1, 1981, teaching general undergraduate mathematics courses. Master's degree required, Ph.D. preferred.

Send résumé and names of three references to Dr. Jerry D. Wilson, Chairman, Department of Science and Mathematics, **LANDER COLLEGE**, Greenwood, South Carolina 29646. Lander College, a 4-year state supported institution, is an affirmative action, equal opportunity employer.

The Administrative Committee of the **TECHNICAL UNIVERSITY OF CRETE** is pleased to announce the expected opening of **30 professorial positions** in the areas of Mathematics, Physics, Chemistry, Mechanics, Electrical and Electronic Engineering, Computer Science, Chemical Engineering and Metallurgical Engineering.

These positions will be in the following three departments:

General Engineering
Electrical Engineering
Chemical Engineering

It is expected that the official announcement of the openings specifying the academic areas and procedures for submitting candidacies will be announced by the end of the year and that it will be widely publicised. The establishment of 30 more positions will follow in the near future.

It is also announced that the Technical University of Crete will consist of three Schools each one of which comprises departments as follows.

1. School of Technical Sciences, with departments of
 - (a) Electrical Engineering
 - (b) Mechanical Engineering
 - (c) Chemical Engineering
 - (d) Civil Engineering
 2. School of Applied Sciences, with departments of
 - (a) General Engineering
 - (b) Technical Education
 - (c) Engineering Management
 - (d) Geotechnical and Biological Sciences
 3. School of Architecture and Regional Planning, with departments of
 - (a) City Planning
 - (b) Architecture
 - (c) Regional Planning
 - (d) Arts
-

MATHEMATICS: The **VIRGINIA MILITARY INSTITUTE**, a state supported undergraduate college, anticipates openings at the instructor or the assistant professor level in the Department of Mathematics in August 1981. The applicant should have a strong interest in teaching undergraduates in a military college environment. Send your résumé by February 15, 1981 to Department of Mathematics, The Virginia Military Institute, Lexington, Virginia 24450. AA/EEO.

HALF-TIME VISITING ASSOCIATE PROFESSORSHIPS

The Department of Mathematics at **ITHACA COLLEGE** anticipates that it will have two one-year half-time visiting associate professorships for the academic year 1981-1982. The teaching load will consist of two courses one term and one course the other term. In addition, the successful applicant will be expected to participate actively in departmental activities. Letters of inquiry and letters of reference on teaching and research should be sent by 1 December 1980 to: Recruiting Committee, Department of Mathematics, Ithaca College, Ithaca, New York 14850.

POSITIONS AVAILABLE

COMPUTER SCIENCE & MATHEMATICAL FACULTY POSITIONS SUSQUEHANNA UNIVERSITY

The Department of Mathematical Sciences at Susquehanna University anticipates openings commencing September 1981 in one or more faculty positions teaching undergraduate courses in Computer Science and Mathematics. Doctorate preferred, but others may apply. Academic rank will be Assistant Professor, unless credentials are unusually strong. Salary will be commensurate with qualifications. To apply, a résumé, graduate transcripts, and three letters of reference should be sent to Professor John M. Reade, Chairman, Department of Mathematical Sciences, Susquehanna University, Selinsgrove, PA 17870.

Susquehanna has a new Hewlett-Packard 3000 computer and a strong and growing academic program in computer science with eighty-nine majors in addition to the thirty-two students majoring in mathematics. Ability to contribute to the continued development of a strong computer science major will be an important consideration in these searches.

Susquehanna University is an Equal Employment Opportunity, Affirmative Action, and Title IX institution.

SAMUEL G. ORDWAY CHAIR IN MATHEMATICS UNIVERSITY OF MINNESOTA, MINNEAPOLIS

The School of Mathematics at the University of Minnesota announces an endowed Chair:

SAMUEL G. ORDWAY PROFESSOR OF MATHEMATICS

This position is dedicated to research and graduate education. Nominations and inquiries on behalf of candidates at the highest level of accomplishment and experience in their fields are solicited. The position becomes available on September 16, 1981, but will not be filled until a candidate of suitable distinction is found. Please send letters of nomination and inquiries to:

Professor Willard Miller, Jr., Head
School of Mathematics (127 VH)
206 Church Street S.E.
University of Minnesota
Minneapolis, Minnesota 55455

Consideration of nominations for the position will begin January 12, 1981.

The University of Minnesota is an equal opportunity educator and employer. The University specifically invites and encourages applications from women and minorities.

CHAIRPERSON

DEPARTMENT OF MATHEMATICS AND STATISTICS UNIVERSITY OF SOUTH ALABAMA

Applications are invited for the position of Chairperson of the Department of Mathematics and Statistics. Applicants must be qualified for appointment as Associate Professor or Professor of Mathematics. Starting date for position is September 1, 1981. Qualifications include proven research ability, commitment to quality teaching, and capability to provide dynamic leadership.

The University of South Alabama, located in the greater Mobile area and established in 1963, serves as the only major public institution of higher learning on the upper Gulf Coast. Current enrollment exceeds 7200. The 17 full-time faculty members participate in undergraduate and graduate degree programs in mathematics, as well as in a strong minor program in applied statistics. A wide variety of service courses for other colleges on campus is provided.

Applicants must submit a detailed résumé, three letters of reference, and a letter of interest by December 30, 1980, to Dr. Suzanne McGill, Chairman-Faculty Search Committee, University of South Alabama, Faculty Court South #1, Mobile, Alabama 36688. AA/EOE.

RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY

Department of Mathematics at New Brunswick expects to have the following positions available beginning September 1981:

(1) **VISITING POSITIONS.** Candidates must have Ph.D., proven record of outstanding research accomplishments in pure or applied mathematics, and concern for teaching. These are *terminal* one-year positions.

(2) **HILL ASSISTANT PROFESSORSHIPS.** Candidates must have Ph.D., with outstanding research ability in pure or applied mathematics, and concern for teaching. These are three-year *non-renewable* positions.

(3) **TENURE-TRACK ASSISTANT PROFESSORSHIPS.** Candidates must have Ph.D., show outstanding promise in research and a concern for teaching. Preference will be given to those whose research interests are in some area of **GEOMETRY** or **ANALYSIS** (especially algebraic geometry).

Résumés and letters of recommendation should be sent to: Prof. Daniel Gorenstein, Chmn., Dept. of Math. at New Brunswick, Rutgers University, New Brunswick, New Jersey 08903. **RUTGERS UNIVERSITY IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.**

Research Positions in theoretical and computational fusion physics.

The Magnetofluid Dynamics Division of the **COURANT INSTITUTE OF MATHEMATICAL SCIENCES**, New York University, is seeking candidates for full-time research positions in theoretical and computational fusion physics. The MFD Division has been an active participant in the world fusion program for over twenty years and specializes in those areas of fusion physics which benefit from a sharper mathematical viewpoint. Present research concerns theoretical problems of both mainline and alternate magnetic confinement fusion approaches, and close contact is maintained with national laboratory programs. An on-site mini user service center of the MFE national computer network has been established by DOE. Interaction with the Courant Institute staff engaged in varied research programs provides a stimulating scientific environment. Rank and salary will depend on education and experience.

Send résumé and three letters of recommendation to: Director, Magnetofluid Dynamics Division, New York University, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, NY 10012.

Special year in applied mathematics 1981-1982.

The Department of Mathematics of the **UNIVERSITY OF CONNECTICUT** expects to support several visitors in applied mathematics for either one or both semesters during the 1981-1982 academic year. Numerical analysis is to have a significant representation in this special year. Send curriculum vita and references to Professor John Roulier, Department of Mathematics, University of Connecticut, Storrs, CT 06268. Application deadline is February 1, 1981. The University of Connecticut is an equal opportunity/affirmative action employer.

The Department of Mathematics of the **UNIVERSITY OF CONNECTICUT** anticipates a number of tenure-track openings beginning fall 1981. Applications are invited for:

1. positions at all levels in applied mathematics,
2. an assistant or associate professor level position in any area, with preference given to candidates with research interests compatible with those of the present faculty.

All applicants should hold a Ph.D. in mathematics and have a strong record in research and teaching. Send a curriculum vita and references to: Jeffrey L. Tollefson, Head, Department of Mathematics U-9, The University of Connecticut, Storrs, CT 06268. An equal opportunity/affirmative action employer.

POSITIONS AVAILABLE

APPLIED MATHEMATICIAN

UNIVERSITY OF ALABAMA IN HUNTSVILLE. Tenure-track position beginning September 1, 1981. Rank and salary commensurate with experience and credentials. A Ph.D. degree in mathematics, specialty area(s) in applied mathematics, strong research credentials, and evidence of active interest in quality teaching are required. Industrial and/or mathematical modeling experience preferred. UAH, with over 5,000 students, has advanced degrees in all science, computer science, and engineering disciplines. The University is located in the midst of a large number of research and high-technology companies, thereby providing considerable opportunities for scholarly contract and consulting work. Teaching assignments will be at the undergraduate and graduate levels. Send letter of application, vita, graduate transcripts, and three letters of reference to F. L. Cook, Chairman, Department of Mathematics, The University of Alabama in Huntsville, Huntsville, AL 35899. Screening of applicants will begin February 1, 1981. The University of Alabama in Huntsville is an Equal Opportunity/Affirmative Action Institution.

ASSISTANT PROFESSOR

Applications are invited for an opening at the Assistant Professor level, starting fall semester, 1981. Minimum requirements: Ph.D., evidence of strong research potential and teaching ability, specialty in an area of applied mathematics. U. S. resident status or citizenship.

Vitae and at least three letters of recommendation should be sent to Professor Warren S. Edelstein, Department of Mathematics, ILLINOIS INSTITUTE OF TECHNOLOGY, Chicago, IL 60616.

An Equal Opportunity/Affirmative Action Employer.

MICHIGAN TECHNOLOGICAL UNIVERSITY DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE HOUGHTON, MI 49931

Applications are invited for several positions at all levels. There are limited-term instructorships, for which an M.S. is required, and tenure-track positions, for which a Ph.D. is required. We are looking for people in numerical analysis, statistics, applicable mathematics, computer science, and other areas of mathematics. Candidates for tenure-track positions should show evidence of strong research potential and teaching ability. MTU is located in Michigan's beautiful Upper Peninsula with excellent opportunities for outdoor recreation. Write Dr. William P. Francis, Acting Head. Michigan Technological University is an equal opportunity educational institution/equal opportunity employer.

WESLEYAN UNIVERSITY, Department of Mathematics, Middletown, CT 06457.

Tenure-track assistant professorship in combinatorial or discrete mathematics or in another area of applicable mathematics. Four-year contract beginning academic year 1981-1982; six hours teaching weekly.

This faculty member will complement Wesleyan's growing computer science program; will sometimes teach computer-related courses and introductory programming.

Send vita, three letters of recommendation to: Search Committee, Department of Mathematics.

Wesleyan University is an Equal Opportunity/Affirmative Action Employer.

SEARCH REOPENED

HEAD

Department of Mathematics
Mississippi State University

The Department of Mathematics has 29 full-time faculty members and offers degree programs leading to the B.A., B.S., M.A., and M.S. in mathematics as well as service courses for all university students. **MISSISSIPPI STATE UNIVERSITY** is a comprehensive land grant university offering programs in agriculture and home economics, architecture, arts and sciences, business and industry, education, engineering, forest resources, and veterinary medicine. The Department of Mathematics is one of twenty academic units in the College of Arts and Sciences.

The Head is the chief administrative officer and academic leader of the department and reports to the Dean of the College. The Head is appointed on a 12-months basis but also holds faculty rank and is eligible for tenure on a 9-months' contract. The salary is competitive.

Qualified candidates will have the terminal degree and a demonstrated record of accomplishments in teaching and research which would merit the rank of associate professor or professor. Administrative experience, especially in budget and personnel matters, is highly desirable.

Candidates should send a curriculum vitae and arrange to have three letters of reference submitted on or before February 1, 1981 to:

Paul W. Spikes, Chairman
Mathematics Head Search Committee
Drawer MA
Mississippi State University
Mississippi State, Mississippi 39762

Mississippi State University is an Affirmative Action/Equal Opportunity Employer.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE SOUTHWEST TEXAS STATE UNIVERSITY

Applications invited for positions beginning fall 1981:

Assistant or Associate Professorships in Computer Science, tenure and non-tenure-track. Applicants should have a Ph.D. in Computer Science and demonstrate potential for excellence in teaching graduate and undergraduate courses in Computer Science.

Assistant or Associate Professorships in Mathematics, tenure and non-tenure-track. Applicants should have a Ph.D. in Mathematics (or closely related area) and demonstrate potential for excellence in research and teaching. Preference will be given candidates with research interests in Topology (decomposition space theory, Q-manifolds, knot theory, differential topology, continua theory, or group actions on manifolds), Number Theory (analytic or algebraic), Analysis (integration theory, integral equations, fixed-point theory, fractional analysis, or differential equations), Applied Mathematics (applied statistics, numerical analysis, operations research, fluid dynamics, applied matrix theory, modeling, biomathematics or combinatorics), and Mathematics Education (elementary or secondary).

Instructorships, non-tenure-track. Applicants should have an M.A. or equivalent in Mathematics (or closely related area), demonstrate teaching ability or teaching potential, and be willing to participate in faculty seminars and committee projects.

Salary and rank commensurate with qualifications and experience. Further information concerning specific positions is available from: Dr. John Spellman, Chairman, Department of Mathematics and Computer Science, Southwest Texas State University, San Marcos, Texas 78666. Deadline for receipt of complete applications: February 15, 1981 (late applications will be considered if openings exist). SWTSU is an equal opportunity/affirmative action employer.

POSITIONS AVAILABLE

APPLIED MATHEMATICS SOUTHERN METHODIST UNIVERSITY

The Mathematics Department expects to have several positions available in the fall of 1981. Individuals with proven outstanding research ability or potential and a commitment to quality teaching are invited to apply to join our expanding applied mathematics group. Salary and academic rank are negotiable.

Applicants should send their résumé and the names of three references to G. W. Reddien, Chairman, Department of Mathematics, Southern Methodist University, Dallas, Texas 75275.

An equal opportunity/affirmative action employer.

JOHNS HOPKINS UNIVERSITY, DEPARTMENT OF MATHEMATICAL SCIENCES, BALTIMORE, MD 21218 (301-338-7200)

Tenure-track junior appointment in statistics-probability, starts 1981-1982 academic year. Requires research strength and teaching interests in statistical theory and methodology, or in probability theory and stochastic processes, and promise and demonstration of excellence in research, teaching, innovative application. Applicant should furnish vita and university transcripts with letter describing professional interests and aspirations, and have three letters of recommendation sent to:

Professor Robert J. Serfling
Faculty Search Committee
Mathematical Sciences Department

HEAD, DEPARTMENT OF MATHEMATICAL SCIENCES

The South Dakota School of Mines and Technology invites applications for the position of Head, Department of Mathematical Sciences. The department provides the mathematical training for the engineering and science students of the College and also offers a B.S. degree in mathematics, a B.S. degree in computer science and an M.S. degree in mathematics. The Department is primarily concerned with the teaching of undergraduate courses and lower level graduate courses. In addition, Department members have been consistently active in professional mathematical organizations and in the publication and presentation of papers on a voluntary basis.

Candidates for the position should hold a Ph.D. in mathematics, have interest and experience in undergraduate teaching, have research experience and an interest in stimulating scholarly activities, and have the ability to work with members of engineering and science departments on problems concerning the curriculum and course content. Administrative experience is desirable. Preference may be given to those candidates who have experience in Computer Science.

Salary is competitive for the nine-month position. Starting date is August 1981. Deadline for applications is November 15, 1980.

Persons interested in the above position should send a letter of application, resume and at least three letters of reference to: Dr. Harold Orville, Chairman, Search Committee, Institute of Atmospheric Sciences, South Dakota School of Mines and Technology, Rapid City, South Dakota 57701.

South Dakota School of Mines and Technology is an equal opportunity and affirmative action employer.

Department of Mathematics OREGON STATE UNIVERSITY

Applications invited for one or more tenure-track Assistant Professor positions, available beginning in September 1981 for an applied mathematician. A Ph.D. or the equivalent is required. Duties include research activity, teaching 6 to 8 class hours per week, and assisting in the development and implementation of applied and interdisciplinary programs in mathematics. Salary \$17,000-\$19,000, depending on qualifications. Closing date for applications is January 20, 1981. For further information, write to: Dr. Richard M. Schori, Chairman, Department of Mathematics, Oregon State University, Corvallis, OR 97331.

An Affirmative Action/Equal Opportunity Employer

Applications invited for one or more tenure-track Assistant Professor positions in pure mathematics, available beginning September 1981. Preference will be given, first, to candidates in geometric topology, and second, to candidates in algebraic number theory. A Ph.D. or the equivalent is required. Duties include research activity and teaching 6 to 8 class hours per week. Salary \$17,000-\$19,000, depending on qualifications. The closing date for applications is January 20, 1981. For further information, write to: Dr. Richard M. Schori, Chairman, Department of Mathematics, Oregon State University, Corvallis, OR 97331.

An Affirmative Action/Equal Opportunity Employer

Applications invited for a possible tenure-track Associate Professor position, available beginning in September 1981, for a pure or applied mathematician. A Ph.D. or the equivalent is required. Duties include research activity, teaching 6 to 8 class hours per week, and (for an applied mathematician) assisting in the development and implementation of applied and interdisciplinary programs in mathematics. Closing date for applications is January 20, 1981. For further information, write to: Dr. Richard M. Schori, Chairman, Department of Mathematics, Oregon State University, Corvallis, OR 97331.

An Affirmative Action/Equal Opportunity Employer

APPLIED MATHEMATICS *Department of Mathematics & Statistics* UNIVERSITY OF PITTSBURGH

Applications are invited for three tenure stream faculty positions on the Assistant/Associate Professor level in computational applied mathematics, numerical analysis or applied partial differential equations. A Ph.D. is required, and demonstrated potential in research and interest in teaching are essential.

The Department offers undergraduate/graduate degrees in applied mathematics. Its Institute for Computational Mathematics and Applications fosters research in numerical analysis/applied mathematics and operates a research computer laboratory.

Rank and salary depend on qualifications. Applications will be accepted until positions are filled. Please send vita and supporting material and have at least three letters of reference sent to: Professor Charles Hall, Department of Mathematics & Statistics, 212 MIB, University of Pittsburgh, Pittsburgh, PA 15261.

The University of Pittsburgh is an Equal Opportunity/Affirmative Action Employer.

PERSONALS

MATHEMATICAL TYPING. Professional papers, textbooks. F. Fairbrother, Box 1095, Arroyo Grande, CA 93420.

The **ASSOCIATION FOR PHYSICAL AND SYSTEMS MATHEMATICS** would like to contact people with ideas for innovative proposals which have the potential for developing mathematics outside of its usual channels. We are particularly interested in such ideas from physicists and engineers and from people with some journalism background and some mathematical training who want to develop a project of "mathematical journalism." Write to: R. Hermann, 53 Jordan Rd., Brookline, MA 02146 (617-738-1039).

FOR SALE

J of Algebra, Vol. 1 thru Vol. 32. PAUL WEICHSEL, MATH, U of Ill., Urbana, IL 61801.

Copies of the *Proceedings of the Conference on Semigroups* in honor of A. H. Clifford held at Tulane University September 1, 2, 3, 1978, are available from the Mathematics Research Library, Gibson Hall, Tulane University, New Orleans, LA 70118. There is a charge of \$8 to cover the cost of duplicating and shipping the volume.

CBMS REGIONAL CONFERENCE SERIES IN MATHEMATICS

Supported by the National Science Foundation

AN INTRODUCTION TO THE THEORY OF SPECIAL DIVISORS ON ALGEBRAIC CURVES

by Phillip A. Griffiths

In May, 1979, an NSF Regional Conference was held at the University of Georgia in Athens. The topic of the conference was "Special divisors on algebraic curves," and at that time an informal set of lecture notes with the same title was distributed. About one-half the material in those notes contained an exposition of results from the literature, while the other part gave an account of recent joint work by Enrico Arbarello, Maurizio Cornalba, Joe Harris, and P. A. Griffiths. In writing up this monograph it was decided to restrict to a discussion of the very elementary aspects of the theory and an explanation without complete proofs of a few unpublished results together with some from the recent literature, and then to publish an expanded version of the remaining contents of the Athens notes in a more traditional research format; specifically in *Special divisors on algebraic curves* by the authors listed above (to appear). This monograph, then, gives an exposition of the elementary aspects of the theory of special divisors together with an explanation of some more advanced results that are not too technical. As such, it is intended to be an introduction to recent sources.

As with most subjects, one may approach the theory of special divisors from several points of view.

The one adopted here pertains to Clifford's theorem, and may be informally stated as follows: *The failure of a maximally strong version of Clifford's theorem to hold imposes nontrivial conditions on the moduli of an algebraic curve.*

This monograph contains two sections, respectively studying special divisors using the Riemann-Roch theorem and the Jacobian variety. In the first section the author begins pretty much at ground zero, so that a reader who has only passing familiarity with Riemann surfaces or algebraic curves may be able to follow the discussion. The respective subtopics in this first section are (a) the Riemann-Roch theorem, (b) Clifford's theorem and the μ_0 -mapping, and (c) canonical curves and the Brill-Noether matrix. In the second section he assumes a little more, although again an attempt has been made to explain, if not prove, anything. The respective subtopics are (a) Abel's theorem, (b) the reappearance of the Brill-Noether matrix with applications to the singularities of W_d and the Kleiman-Laksov existence proof, (c) the reappearance of the μ_0 -mapping, and (d) special linear systems in low genus.

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Send for the book(s) above to: AMS, P.O. Box 1571, Annex Station, Providence, RI 02901.

CBMS REGIONAL CONFERENCE SERIES IN MATHEMATICS

(Supported by the National Science Foundation)

SPECIAL FUNCTIONS AND LINEAR REPRESENTATIONS OF LIE GROUPS

by Jean Dieudonné

Contents: Introduction, Representations of $SU(2)$, The general theory of linear representations of compact groups, Lie theory of representations of compact connected Lie groups, Induced representations of compact groups, Spherical functions on

compact groups, Examples—spherical harmonics, The general theory of spherical functions, Fourier and Plancherel transforms, Extension of the Plancherel transform, The subtleties of harmonic analysis, Differential properties of spherical functions on Lie groups, Spherical functions on semisimple Lie groups, More on $SL(2, \mathbb{R})$, Automorphic functions, Groups of isometries and Bessel functions, Other special functions.

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Prepayment is required for all American Mathematical Society publications.

Send for the book(s) above to: AMS, P.O. Box 1571, Annex Station, Providence, RI 02901.

UNIVERSITY OF CALIFORNIA, BERKELEY
Department of Mathematics, Berkeley, CA 94720
A. Weinstein – Vice Chairman for Faculty Appts.

One tenure track faculty position anticipated, pending budgetary approval, effective Fall 1981 at the Asst. Prof. level (or Associate Prof. level with tenure for individuals with exceptional qualifications who currently hold non-tenured positions), in the areas of algebra, analysis, applied math., foundations, or geometry. Applicants should have demonstrated potential in research & teaching. Send by Jan. 15, 1981, curriculum vitae, list of publications, a few selected reprints or preprints, & the names of three referees. The University of California is an *Affirmative Action Employer*.

UNIVERSITY OF CALIFORNIA
BERKELEY
Department of Mathematics
Berkeley, CA 94720

A. Weinstein –
Vice Chairman for Faculty Appts.

Professorship in Mathematics, starting date & salary negotiable, in the areas of algebra, analysis, applied mathematics, foundations, or geometry. Very substantial achievement and capacity to furnish scientific leadership required. Breadth of mathematical interest desired. Send by February 15, 1981, curriculum vitae, list of publications, and names of three referees. The University of California is an *Affirmative Action Employer*.

**CBMS REGIONAL CONFERENCE
SERIES IN MATHEMATICS**
(Supported by The National Science Foundation)

*POLYNOMIAL RINGS
AND AFFINE SPACES*
by Masayoshi Nagata

This volume contains expository lectures from the Conference Board of the Mathematical Sciences Regional Conference held at Northern Illinois University on July 25-29, 1977.

In addition to an Introduction and References, the Table of Contents is:

Elementary properties of polynomial rings
Affine spaces and projective spaces
Ruled surfaces and rational surfaces
Automorphism groups of polynomial rings
Cremona groups
Group actions on affine rings
Complete reducibility of rational representations
Rings of invariants
Some remarks on orbits

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P. O. Box 1571, Annex Station, Providence, RI 02901

THE MATHEMATICS DEPARTMENT
of the
UNIVERSITY OF FLORIDA

announces the opening of a tenure-track assistant professorship beginning August, 1981. Those applying for this position should have demonstrable research potential. The academic year salary for this position will be between \$16,129 and \$18,212.

Applicants should provide a resume, a list of publications, and should arrange for at least three letters of reference to be sent to:

Mark L. Teply
Chairman, Search and Screen Committee
Department of Mathematics
University of Florida
Gainesville, Florida 32611

The application deadline is January 28, 1981. The University of Florida is an *equal opportunity employer*.

**UNIVERSITY OF UTAH
Department of Mathematics**

invites applications for the following positions

1. Three or four 3-year instructorships. Persons of any age receiving Ph.D. degrees in 1980 or 1981 are eligible. Applicants will be selected on the basis of ability and potential in teaching and research. Starting salary will be \$18,000. Duties consist of teaching two courses through the academic year.
2. One visiting position of one year or less. Selection criteria will be teaching ability and potential contribution to our research environment.
3. One or two assistant professorships with particular interest in Probability, Statistical, and Applied Mathematics, but other areas will be considered.

Applications should include curriculum vita, bibliography and references and should be sent by March 1, 1981 to:

**Ms. Sylvia Morris
Committee on Staffing
Department of Mathematics
University of Utah
Salt Lake City, Utah 84112**

The University of Utah is an equal opportunity – affirmative action employer.



Am Seminar für Angewandte Mathematik der Universität Zürich ist eine Professur (Ass. Professur oder Extraordinariat) zu besetzen.

Gedacht ist an einen Vertreter der

Angewandten Statistik oder Biomathematik.

Zu den Aufgaben des Stelleninhabers gehören Kurs-Vorlesungen sowie die Betreuung eines Beratungsdienstes für Biologen. Bevorzugt werden Bewerber, die mit biologischen Fragestellungen vertraut sind.

Bewerbungen sind mit den üblichen Unterlagen bis zum 15. November 1980 zu senden an den Dekan der Philosophischen Fakultät II der Universität Zürich, Rämistr. 71, CH-8006 Zürich.

KUWAIT UNIVERSITY

Applications are invited for posts as professors, associate professors and assistant professors for the academic year commencing September 1, 1981, in *computer science, operations research, statistics and numerical analysis.*

Initial contracts may be entered for a maximum of three years and are renewable upon mutual agreement of both parties. Applicants must have a Ph.D. or equivalent.

Application forms may be obtained from:

**Embassy of the State of Kuwait
Kuwait University Office
4201 Connecticut Avenue N.W., Suite 404
Washington, DC 20008**

Completed applications together with non-returnable copies of academic qualifications and representative publications must be received in this office by December 15, 1980.

Appointments are governed by the following considerations:

1. Rank and salary will be determined according to present academic position, qualifications and years of experience. There is no Kuwaiti income tax deduction.
2. Annual return air tickets to the country of citizenship or permanent residence are provided to spouse and three children not exceeding the age of twenty.
3. Free furnished accommodations with utilities supplied.
4. Education allowance for school-age children.
5. End of service gratuity equal to one month's basic salary for each year spent in the service of the University.

English is the language of instruction in the Department of Mathematics.

**PROCEEDINGS
of the
CONFERENCE ON SEMIGROUPS**

in honor of
A. H. CLIFFORD
Tulane University
September 1–3, 1978

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New Orleans, Louisiana 70118**

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NEW SERIES

The "Annales de la Faculté des Sciences de Toulouse" have published 78 volumes since 1897. Thomas Stieltjes in his short life, was one of the first editors of this journal. The "Annales" were mainly devoted to mathematical research, and published papers by E. Picard, Liapounov, P. Appell, P. Painlevé, E. Borel, D. Hilbert, D. Klein and H. Poincaré. The publication stopped in 1968 and started again in a "new series" in 1979.

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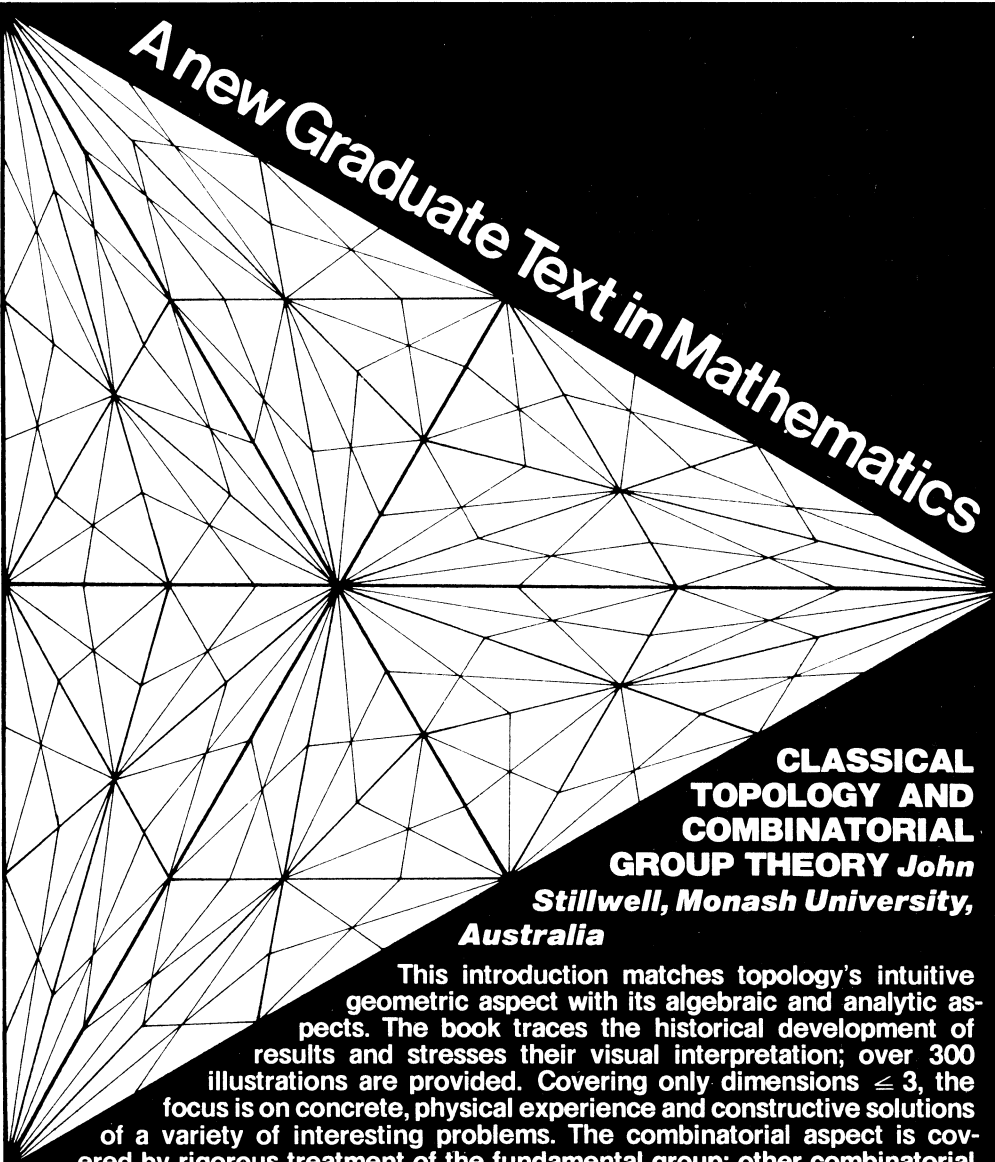
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