NOTICES AMER. MATH. SOC. Volume 28, Number 1 January 1981

Notices
of the American Mathematical Society

January 1981, Issue 207
Volume 28, Number 1, Pages 1–144
Providence, Rhode Island USA
ISSN 0002-9920

CALENDAR OF AMS MEETINGS

THIS CALENDAR lists all meetings which have been approved by the Council prior to the date this issue of the **Notices** was sent to 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
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, 1982	Austin, Texas		
	January 13-17, 1982 (88th Annual Meeting)	Cincinnati, Ohio		
	April 16-17, 1982	Madison, Wisconsin		
	January 5-9, 1983 (89th Annual Meeting)	Denver, Colorado		
	January 9-13, 1985 (91st Annual Meeting)	Anaheim, California		
	January 21-25, 1987 (93rd Annual Meeting)	San Antonio, Texas		

ADDITIONAL DEADLINES	FEBRUARY ISSUE	APRIL ISSUE
Advertising	January 27	March 10
News and Special Meetings	January 12	February 23

OTHER EVENTS SPONSORED BY THE SOCIETY

January 5-6, AMS Short Course. Cryptology in Revolution: Mathematics and Models, San Francisco, California, This issue, p. 3

January 8, AMS-SIAM Symposium on Some Mathematical Questions in Biology, Toronto, Ontario, Canada, This issue, p. 73

June 29-July 11, AMS-SIAM Summer Seminar on Fluid-Dynamical Problems in Astrophysics and Geophysics, This issue, p. 79

July 20-August 7, AMS Summer Institute on Singularities, Humboldt State University, Arcata, California, This issue, p. 79

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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	Expired
Preregistration and Housing	Expired
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, titles, and 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 in gauge field theories*, 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, Institut des Hautes Études Scientifiques, France, *Geometry of limit sets of Kleinian groups*, 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.

The AMS and MAA will cosponsor a talk by the new AMS-MAA-SIAM Congressional Science Fellow, Cheryl G. Tropf, at 3:30 p.m. on Saturday, January 10. In October 1980 Dr. Tropf joined the minority staff of the Subcommittee on Science, Technology,

American Mathematical Society Short Course Series

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

Data encryption: Problems, applications, and controversy. George Davida, Department of Electrical Engineering, University of Wisconsin, Milwaukee, and Department of Information and Computer Sciences, Georgia Institute of Technology.

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?

and Space of the Senate Committee on Commerce, Science, and Transportation.

Special Sessions

In consultation with the Program Committee, seventeen sessions of selected papers are scheduled.

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. The list of speakers is Michael Aschbacher, Andrew Chermak, Walter Feit, Robert H. Gilman, George Glauberman, Daniel Gorenstein, Robert Louis Griess, Jr., Richard N. Lyons, Geoffrey Mason, Gary M. Seitz, Stephen D. Smith, Ronald M. Solomon, B. Stellmacher, and Franz G. Timmesfeld.

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

Homotopy theory, organized by FREDERICK R. COHEN of the University of Kentucky. A list of speakers is Donald W. Anderson, David J. Anick, Michael G. Barratt, Edgar H. Brown, Jr., Michael Ernest Chisholm, Ralph Cohen, Donald M. Davis, Zbigniew Fiedorowicz, John Harper, David Copeland Johnson, Larry A. Lambe, James P. Lin, Charles A. McGibbon, Mark Mahowald, J. Peter May, Haynes R. Miller, Joseph Neisendorfer, Douglas C. Ravenel, Paul S. Selick, Victor P. Snaith, Robert John Wellington, Clarence W. Wilkerson, and E. Bruce Williams.

L_1 and related metric spaces (Friday afternoon), organized by M. DEZA and RONALD L. GRAHAM at Bell Laboratories in Murray Hill, New Jersey. The list of speakers is 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 is William A. Adkins, Carlos Andradas, Gregory W. Brumfiel, Arthur E. Bukowski, Charles N. Delzell, Andreas W. M. Dress, Gustave A. Efroymson, Victor Espino, Robert Gilmer, Danielle Gondard, Melvin Henriksen, John R. Isbell, Jonathan L. Merzel, Joe L. Mott, Jack E. Ohm, Albrecht Pfister, Tomas Recio, Alex Rosenberg, Heinz-Werner Schülting, Niels C. Schwartz, Daniel B. Shapiro, Alberto Tognoli, T. M. Viswanathan, and Roger P. Ware. There will be a problem session at 5:20 p.m. on Wednesday afternoon.

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

Qualitative theory of differential equations, organized by GARRET J. ETGEN of the University of Houston and KURT KREITH of the University of California, Davis. The list of speakers is Calvin D. Ahlbrandt, Shair Ahmad, Walter Allegretto, John V. Baxley, Moses Boudourides, Geoffrey J. Butler, John R. Graef, Philip Hartman, Johnny L. Henderson, Gary D. Jones, Woo Jong Kim, Takasi Kusano, Sung J. Lee, Roger T. Lewis, James H. Lightbourne III, James S. Muldowney, Allan C. Peterson, Binyamin Schwarz, William E. Taylor, Jr., William F. Trench, and Norio Yoshida.

Elliptic systems in the plane, organized by ROBERT P. GILBERT of the University of Delaware. The list of speakers is A. Kadir Aziz, M. S. Baouendi, Freddy Brackx, James L. Buchanan, R. Delanghe, Leon Ehrenpreiss, Paul R. Garabedian, Robert P. Gilbert, Gerard N. Hile, George Chia-Chu Hsiao, Robert A. Hummel, Carlos E. Kenig, David S. Kinderlehrer, Pertti Lounesto, Peter A. McCoy, Murray H. Protter, James M. Sloss, and François Treves.

Geometric structures on manifolds, organized by MORRIS W. HIRSCH of the University of California, Berkeley. The list of speakers is David Fried, William Mark Goldman, Troels Jorgensen, Steven P. Kerckhoff, Shoshichi Kobayashi, Gilbert Levitt, and Phillippe Tondeur.

Mathematical physics, organized by JOEL L. LEBOWITZ of Rutgers University. The list of speakers is Michael Aizenman, Joseph Avron, Jean Bricmont, Russel Caflisch, Mitchell Feigenbaum, Sheldon Goldstein, Charles M. Newman, Barry Simon, Isadore M. Singer, Thomas Spencer, 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. The list of speakers is Steven A. Bleiler, Andrew Casson, William D. Dunbar, Micheal Dyer, H. Clay Fickle, Michael Freedman, David Gabai, Cameron McA. Gordon, Louis H. Kauffman, Robert J. Kramer, Jerome P. Levine, S. J. Lomonaco, Jr., Richard Mandelbaum, William Wyatt Menasco, Robert Meyerhoff, Robert Meyers, Kunio Murasugi, Lee Neuwirth, Steven P. Plotnick, John G. Ratcliffe, Dale Rolfsen, Allan J. Sieradski, Martin Scharlemann, Denis Sjerve, Ronald J. Stern, and James M. Van Buskirk.

Number theory, organized by MELVYN B. NATHANSON and DON REDMOND of Southern Illinois University, Carbondale. The list of speakers is Tom M. Apostol, A. O. L. Atkin, Andrew M. Baily, W. Dale Brownawell, Richard T. Bumby, David V. Chudnovsky, Harvey Cohn, Thomas W. Cusick, Jean-Marie De Koninck, P. D. T. A. Elliott, Paul Erdös, John B. Friedlander, Frank E. Gerth III, Dorian Goldfeld, Larry J. Goldstein, Ronald L. Graham, Stanley J. Gurak, Douglas A. Hensley, Neil B. Hindman, James G. Huard, Daniel J. Madden, Kevin Snow McCurley, Julia Mueller, Melvyn B. Nathanson, Don Redmond, Kenneth H. Rosen, John Sadowsky, Audrey A. Terras, and John W. Van Horne.

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 John Jay College of Criminal Justice. The list of speakers is Paul T. Bateman, George B. Dantzig,

TIMETABLE

All sessions are at the San Francisco Hilton and Tower, unless noted as follows: HI - Holiday Inn Union Square

(Pacific Standard 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 - Outside Continental Parlor 6
	CONTINENTAL PARLOR 6
2:00 p.m. - 4:45 p.m.	Data encryption: Problems, applications and controversy George Davida
TUESDAY, January 6	
	CONTINENTAL PARLOR 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 - Tower Lobby	
4:00 p.m. - 8:00 p.m.	AMS BOOK SALE Tower Lobby	MAA BOOK SALE Tower Lobby
2:00 p.m. - 10:00 p.m.	COUNCIL MEETING Continental Parlors 1 and 2	
WEDNESDAY, January 7	AMS	MAA
8:00 a.m. - 5:00 p.m.	REGISTRATION - Tower Lobby	
8:00 a.m. - 5:00 p.m.	AMS BOOK SALE Tower Lobby	MAA BOOK SALE Tower Lobby
	SPECIAL SESSIONS	
8:00 a.m. - 12:05 p.m.	Number Theory I Continental Parlor 7	
8:00 a.m. - 10:10 a.m.	Operator Algebras and K-theory I Anza Room	
8:00 a.m. - 11:50 a.m.	Ordered Fields and Real Algebraic Geometry I Balboa Room	
8:00 a.m. - 11:50 a.m.	Qualitative Theory of Differential Equations I Continental Parlor 8	
8:00 a.m. - 11:50 a.m.	Topics in Complex Variables I Continental Parlor 3	
	SESSIONS FOR CONTRIBUTED PAPERS	
8:00 a.m. - 10:25 a.m.	General Topology I Dolores Room	
8:00 a.m. - 10:25 a.m.	Global Analysis I Rosewood Suite	
	SPECIAL SESSION	
8:15 a.m. - 10:15 a.m.	Low Dimensional Topology I Cabrillo Room	
	SESSIONS FOR CONTRIBUTED PAPERS	
8:30 a.m. - 11:55 a.m.	Associative Rings Walnut Suite	
8:30 a.m. - 11:40 a.m.	Fourier Analysis Continental Parlor I	

Jean A. Dieudonné, Lars Gårding, Herman Goldstine, 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. SCHOBER at Indiana University. The list of speakers is Albert Baernstein II, James E. Brennan, Carl C. Cowen, Jr., David Drasin, Peter L. Duren, Carl H. FitzGerald, Wolfgang H. Fuchs, Frederick W. Gehring, Walter Hengartner, David Jerison, Peter Jones, William E. Kirwan II, Boris Korenblum, Thomas H. MacGregor, Edgar Reich, 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. The list of speakers is William B. Arveson, Paul F. Baum, Bruce E. Blackadar, Joel Cohen, David Handelman, Wu-Chung Hsiang, Jerry Kaminker, Calvin C. Moore, H. Moscovici, William L. Paschke, Jonathan M. Rosenberg, and Norberto Salinas. There will be a problem session led by Edward George Effros.

Differential geometry and global analysis, organized by ALEXANDER P. STONE of the University of New Mexico. The list of speakers is Stephanie B. Alexander, David E. Blair, Murray R. Cantor, Thomas E. Cecil, Isaac Chavel, Su-shing Chen, B. V. Dekster, Patrick Barry Eberlein, Francis J. Flaherty, Robert B. Gardner, Peter B. Gilkey, Samuel I. Goldberg, Robert D. Gulliver II, Jerry L. Kazdan, Bertram Kostant, Howard A. Osborn, Nirmala Prakash, William Shadwick, Theodore Shifrin, Lesley M. Sibner, Robert J. Sibner, William L. Taber, Jaak Vilms, and Brigitte Wettstein.

Contributed Paper Sessions

There will be sessions for contributed papers Wednesday morning and afternoon, Thursday morning and afternoon, Friday afternoon, and Saturday afternoon. 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 1980s*. This panel discussion has been 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 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.

Panel Discussions

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. Background information appears on page 8.

At 4:30 p.m. on Friday, January 9, there will be a panel discussion on *The joy of TEX*. Members of the panel will be Arnold Pizer, Michael Spivak, Donald E. Knuth, Robert A. Morris, and Richard S. Palais (moderator).

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 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

TIMETABLE

WEDNESDAY, January 7	American Mathematical Society	Mathematical Association of America
	SESSION FOR CONTRIBUTED PAPERS	
8:30 a.m. - 11:55 a.m.	Graph Theory I Teakwood Suite	
	SPECIAL SESSIONS	
9:00 a.m. - 11:50 a.m.	History of Contemporary Mathematics I Imperial Ballroom	
9:00 a.m. - 11:50 a.m.	Mathematical Physics I Continental Parlor 9	
	SESSIONS FOR CONTRIBUTED PAPERS	
9:00 a.m. - 11:55 a.m.	Functional Analysis I Continental Parlor 2	
9:30 a.m. - 11:40 a.m.	Control and Information Theory Cypress Room	
9:30 a.m. - 11:40 a.m.	Lattices and Boolean Algebra Toyon Suite	
10:30 a.m. - 11:30 a.m.	INVITED ADDRESS Geometry of limit sets of Kleinian groups Dennis Sullivan, Continental Ballroom	
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURES Lecture I: Some mathematical problems suggested by questions in physics Mark Kac, Continental Ballroom	
1:00 p.m. - 5:00 p.m.	EXHIBITS - Hilton Plaza	
	SPECIAL SESSIONS	
2:10 p.m. - 5:00 p.m.	History of Contemporary Mathematics II Imperial Ballroom	
2:10 p.m. - 5:50 p.m.	Low Dimensional Topology II Cabrillo Room	
2:10 p.m. - 6:00 p.m.	Mathematical Physics II Continental Parlor 9	
2:10 p.m. - 5:50 p.m.	Number Theory II Continental Parlor 7	
2:10 p.m. - 5:40 p.m.	Operator Algebras and K-theory II Anza Room	
2:10 p.m. - 6:00 p.m.	Ordered Fields and Real Algebraic Geometry II Balboa Room	
2:10 p.m. - 6:00 p.m.	Qualitative Theory of Differential Equations II Continental Parlor 8	
2:10 p.m. - 6:00 p.m.	Topics in Complex Variables II Continental Parlor 3	
2:15 p.m. - 3:15 p.m.	INVITED ADDRESS Stabilization in algebraic K-theory R. Keith Dennis, Continental Ballroom	
	SESSIONS FOR CONTRIBUTED PAPERS	
2:15 p.m. - 5:55 p.m.	Combinatorics I Rosewood Suite	
2:15 p.m. - 5:25 p.m.	Commutative Rings and Algebras Lassen Room	
2:15 p.m. - 5:40 p.m.	Computer Science and Applied Mathematics Shasta Room	
2:15 p.m. - 4:55 p.m.	Differential Geometry I Toyon Suite	
2:15 p.m. - 5:40 p.m.	Functional Analysis II Continental Parlor 2	
2:15 p.m. - 4:40 p.m.	General Systems and Ordered Groups Whitney Room	
2:15 p.m. - 5:55 p.m.	General Topology II Dolores Room	
2:15 p.m. - 5:40 p.m.	Graph Theory II Teakwood Suite	
2:15 p.m. - 5:25 p.m.	Group Theory I Walnut Suite	
2:15 p.m. - 5:25 p.m.	Partial Differential Equations I Cypress Room	
2:15 p.m. - 5:10 p.m.	Real Functions, Measure and Integration Theory Continental Parlor 1	
3:30 p.m. - 4:30 p.m.	INVITED ADDRESS Some geometrical aspects of representations of Lie groups Michele Vergne, Continental Ballroom	

JEWISH AUTHORS IN MAT. SBORNIK

The Council of the American Mathematical Society has been concerned over reports that MAT. SBORNIK discriminates against Jewish authors. At the Annual Meeting of 1981 on January 7, there will be a Panel Discussion of some of the aspects of the problem. This article is intended to give some of the historical background.

At its meeting of 22 August 1979, the Council noted that it had received reports that MAT. SBORNIK discriminates against Jewish authors. The evidence lay primarily in the apparent very sharp decline in the number of articles by Jewish authors which took place beginning about 1975. A tabulation, printed in the Notices (November 1978, page 496), was before the Council. A similar but more detailed and up-to-date tabulation, prepared by a member of the AMS staff, appears below.

In the light of the evidence, the Council deplored the state of affairs and sought clarification. The President wrote a letter of inquiry to Academician A. P. Alexandrov, President of the Academy of Sciences of the USSR, on December 17, 1979. No response was received.

The Council further passed the following resolution:

> "If, before the May [1980] meeting of the AMS Trustees, no satisfactory clarification of the Council's inquiry to the Soviet Academy of Science has been received, the Council recommends that the AMS seek to renegotiate the contract with VAAP for translation of Russian journals for the purpose of dropping the translation of MAT. SBORNIK."

The Council noted specifically that they were establishing no timetable but left the Trustees free to use their judgment as to when to start negotiations. The Trustees, in consultation with the Executive Committee, considered the Council recommendation on 2–3 May 1980 and deferred action with a request that the President write a second letter of inquiry. President Lax did so on June 4, 1980, but no response was received.

At the Business Meeting of August 21, 1980, a procedural resolution was introduced to place on the agenda of the Business Meeting of January 8, 1981, a motion urging the Trustees to proceed forcefully forthwith. The procedural resolution was defeated. At the time of writing of this note, the Budget Committee (the agenda committee of the Trustees) has placed the issue on the agenda of the Trustees meeting of 21–23 November for further consideration.

This situation is complex, for it involves not only the translation of MAT. SBORNIK but also the whole translation program of journals by the American Mathematical Society for the Society and the Institute of Mathematical Statistics. The nature of the contract has been described by the Executive Director as follows. EP

The Society's contract for translating Soviet mathematics

The Soviet Union was not signatory to the International Copyright Convention (ICC) until 1973, and until that time translations were made from Russian to English, or from English to Russian, without permission being requested or fees being paid, on either side. Since that time, the Soviet Union has enjoyed the same protection, and has had the same responsibility to observe copyright rules, as the United States or other adherents to the ICC. Copyright questions in this country are handled by the individual copyright owners (normally the publishers), but in the Soviet Union there is a central agency, with acronym VAAP, which has authority to deal with all international copyright matters. In May 1975 the Society signed a contract with VAAP which authorizes the Society to make cover-to-cover translations of the journals whose AMS titles are

Mathematics of the USSR – Izvestija
Mathematics of the USSR – Sbornik
Proceedings of the Steklov Institute of Mathematics
Theory of Probability and Mathematical Statistics
Transactions of the Moscow Mathematical Society

and to translate the mathematical portions of two other journals which are published by the Society as

Soviet Mathematics – Doklady
Vestnik of the Leningrad University (Mathematics)

The Society pays a royalty to VAAP on sales income from all these journals.

The contract has three provisions that may be especially relevant to the forthcoming discussion:

(a) the agreement is "automatically renewed for a consecutive period of one year each, unless either party shall notify the other party of its desire to cancel or modify this Agreement at least six months before the expiration of the period of its validity or of the current renewed yearly period."

(b) The agreement "terminates automatically if the Society should be declared bankrupt or violate any of the terms of this agreement and not rectify such violation within one month of having received written notice from VAAP to do so."

(c) The Society "guarantees to publish high-quality English translations, with complete adherence to the content of the original, and also to provide high-quality graphic reproduction. The AMS shall not, without express prior consent of VAAP, make any substantial change by way of amendment or abridgement, addition or deletion to or from the original text, omission or change of the name of the author or the title of the work . . .". WJL

Distribution of Authors in MAT. SBORNIK by Year

	At least one Jewish author	Non-Jewish	Doubtful	Foreign Authors	Total
1972	44	59	9	1	113
1973	27	66	11	2	106
1974	29	69	3	0	101
1975	7	83	5	1	96
1976	8	89	4	0	101
1977	4	86	3	0	93
1978	4	88	1	1	94
1979	5	100	0	0	105
1980 (through Oct.)	1	75	1	2	79

STATEMENT BY THE BOARD OF TRUSTEES. On November 22, 1980, The Board of Trustees of the American Mathematical Society adopted the following statement and requested that it be published in the Notices. "The introduction of non-mathematical criteria for judging mathematical papers is abhorrent to the members of the Society. There is very convincing evidence that this has taken place in Sbornik in the form of denying Jews the right to publish. The President of the Society has twice inquired, on this matter, of the Chairman of the Soviet Academy of Sciences, but there has been no response. The Trustees are investigating further actions which they might take to press Sbornik to return to its old standards. These actions include ultimately discontinuing the translation of Sbornik by the Society."

TIMETABLE

WEDNESDAY, January 7	American Mathematical Society	Mathematical Association of America
	SESSION FOR CONTRIBUTED PAPERS	
3:30 p.m. - 5:55 p.m.	Linear Algebra and Matrix Theory Diablo Room	
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 Continental Ballroom	
8:30 p.m. - 9:30 p.m.	JOSIAH WILLARD GIBBS LECTURE The mathematical approach to the sonic barrier Cathleen S. Morawetz, Continental Ballroom	

THURSDAY, January 8	AMS	Other Organizations
8:00 a.m. - 4:00 p.m.	REGISTRATION - Tower Lobby	
8:00 a.m. - 4:00 p.m.	AMS BOOK SALE Tower Lobby	MAA BOOK SALE Tower Lobby
	SPECIAL SESSIONS	
8:00 a.m. - 10:20 a.m.	History of Mathematics I Continental Parlors 1 and 2	
8:00 a.m. - 10:25 a.m.	Low Dimensional Topology III Cabrillo Room	
8:00 a.m. - 10:25 a.m.	Number Theory III Continental Parlor 7	
8:00 a.m. - 10:10 a.m.	Operator Algebras and K-theory III Anza Room	
8:00 a.m. - 10:25 a.m.	Ordered Fields and Real Algebraic Geometry III Balboa Room	
8:00 a.m. - 10:20 a.m.	Qualitative Theory of Differential Equations III Continental Parlor 8	
8:00 a.m. - 10:20 a.m.	Topics in Complex Variables III Continental Parlor 3	
	SESSIONS FOR CONTRIBUTED PAPERS	
8:00 a.m. - 10:25 a.m.	Applied Mathematics I Toyon Suite	
8:00 a.m. - 9:25 a.m.	Associative Algebras Lassen Room	
8:00 a.m. - 10:40 a.m.	Functional Analysis III Teakwood Suite	
8:00 a.m. - 10:40 a.m.	General Topology III Dolores Room	
8:00 a.m. - 10:40 a.m.	Global Analysis II Rosewood Suite	
8:00 a.m. - 10:40 a.m.	Numerical Analysis I Walnut Suite	
8:00 a.m. - 10:10 a.m.	Partial Differential Equations II Cypress Room	
8:00 a.m. - 10:40 a.m.	Set Theory, Logic and Foundations Diablo Room	
9:00 a.m. - 9:30 a.m.	EMPLOYMENT REGISTER ORIENTATION SESSION - Imperial Ballroom	
	SPECIAL SESSION	
9:00 a.m. - 10:30 a.m.	Mathematical Physics III Continental Parlor 9	
9:00 a.m. - 4:00 p.m.		Mathematical Association of America BOARD OF GOVERNORS MEETING California Room
9:00 a.m. - 5:00 p.m.	EXHIBITS - Hilton Plaza	
9:30 a.m. - 10:30 a.m.	INVITED ADDRESS Some problems in the cohomology of algebraic groups James E. Humphreys, Continental Ballroom	
9:30 a.m. - 4:00 p.m.	EMPLOYMENT REGISTER REGISTRATION - Imperial Ballroom	

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

meeting of the MAA will take place at 10:00 a.m. on Sunday, January 11, when the 1981 Chauvenet Prize and the twentieth Award for Distinguished Service to Mathematicians will be presented.

The MAA will sponsor a Minicourse on *Topics in data analysis* on Friday and Saturday, January 9–10. The instructors will be John Kettenring and Paul Tukey of Bell Laboratories. The enrollment for this course is limited, and is open only to participants who have registered for the Joint Mathematics Meetings. The Minicourse registration fee is $15.

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

Minicourse Synopsis. "Real world" data sets cannot always be readily analyzed by the methods of classical statistics. Data analysis can be likened to detective work, hunting for clues to discover buried relationships and structure. Many investigative tools can be applied to data drawn from varied disciplines; some of which are simple enough to be taught to persons without mathematical or statistical expertise. Several such methods will be taught in this minicourse and will be applied (with appropriate computational aid) to "real world" data.

The Association for Symbolic Logic (ASL) will hold its 1981 annual meeting on Friday and Saturday, January 9–10. Invited lectures will be given by Kenneth Kunen, Alain Louveau, Angus McIntyre, Richard Shore, and Hugh Woodin, and there will be several sessions of contributed papers. For a more detailed listing of the activities of ASL, see the Timetable.

The Association for Women in Mathematics (AWM) will sponsor a panel discussion on "AWM at ten: Past, present, and future" at 11:00 a.m. on Friday, January 9. Members of the panel are Lenore Blum, Mary Gray, Alice Schafer, and Michele Vergne. The panel will be immediately followed by the AWM Business Meeting. The second annual AWM Emmy Noether Lecture will be given at 10:00 a.m. on Friday, by Olga Taussky-Todd, who will speak on *The many aspects of Pythagorean triangles.*

The Conference Board of the Mathematical Sciences (CBMS) will sponsor a half-day symposium on *Energy research and the mathematical sciences* at 9:00 a.m. on Friday, January 9. The speakers are Bill Buzbee of the Los Alamos Scientific Laboratory; Wayne Cowell of the Argonne National Laboratory; George Dantzig of Stanford University; and Gail S. Young of Case Western Reserve University. Truman A. Botts of CBMS will give a short introductory talk. The CBMS Council will meet on Saturday, January 10, from 9:00 a.m. to 4:00 p.m.

The Mathematicians Action Group (MAG) panel discussion and Business Meeting previously scheduled for Friday evening have been cancelled.

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 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.

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.

OTHER EVENTS OF INTEREST

Employment Register. The Employment Register provides opportunities for mathematical scientists seeking professional employment to meet employers

TIMETABLE

ASL sessions at Holiday Inn Union Square - HI

THURSDAY, January 8	American Mathematical Society	Other Organizations
10:45 a.m. - 11:45 a.m.	RETIRING PRESIDENTIAL ADDRESS The influence of computing on mathematics Peter D. Lax, Continental Ballroom	
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURES Lecture II: Some mathematical problems suggested by questions in physics Mark Kac, Continental Ballroom	
	SPECIAL SESSIONS	
2:10 p.m. - 3:55 p.m.	Differential Geometry and Global Analysis I Balboa Room	
2:10 p.m. - 3:55 p.m.	Elliptic Systems in the Plane I Continental Parlor 3	
2:10 p.m. - 3:45 p.m.	Graph Theory I Anza Room	
2:10 p.m. - 3:55 p.m.	Homotopy Theory I Dolores Room	
2:10 p.m. - 3:55 p.m.	Number Theory IV Continental Parlor 7	
2:10 p.m. - 3:55 p.m.	Quadratic Form Theory I Continental Parlor 9	
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, Continental Ballroom	
	SESSIONS FOR CONTRIBUTED PAPERS	
2:15 p.m. - 3:55 p.m.	Banach Algebras Toyon Suite	
2:15 p.m. - 3:55 p.m.	Group Theory II Teakwood Suite	
2:15 p.m. - 3:55 p.m.	History and Mathematical Education Continental Parlors 1 and 2	
2:15 p.m. - 3:55 p.m.	Low Dimensional Topology Cabrillo Room	
2:15 p.m. - 3:40 p.m.	Nonassociative Rings and Algebras Rosewood Suite	
2:15 p.m. - 3:55 p.m.	Numerical Analysis II Walnut Suite	
2:15 p.m. - 3:55 p.m.	Several Complex Variables Continental Parlor 8	
2:15 p.m. - 3:25 p.m.	Special Functions Lassen Room	
4:00 p.m. - 5:00 p.m.	PRIZE SESSION Continental Ballroom	
5:00 p.m. - 6:00 p.m.	BUSINESS MEETING Continental Ballroom	
5:30 p.m. - 7:00 p.m.		Association for Symbolic Logic Cocktail Party Cotillion East Reception Area, HI
7:00 p.m. - 9:30 p.m.		MAA - FILM PROGRAM
		Continental Ballroom
7:00 p.m.		Nim and other oriented graph games (Gleason) - A film from the MAA Mathematics Today Film Series
8:07 p.m.		Conics
8:20 p.m.		The Gauss-Bonnet Theorem
8:48 p.m.		Regular homotopies in the plane: Part II
9:11 p.m.		Sampling and estimation, inferential statistics: Part I
	SPECIAL SESSION	
7:30 p.m. - 9:55 p.m.	Low Dimensional Topology IV Continental Parlors 1 and 2	
	SESSION FOR CONTRIBUTED PAPERS	
7:30 p.m. - 9:25 p.m.	Differential Geometry II Continental Parlor 3	

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, the additional fee for participating in the Employment Register is $15 at the meeting.

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.

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.

TIMETABLE

ASL sessions at Holiday Inn Union Square - HI

THURSDAY, January 8	American Mathematical Society	Other Organizations
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 Frank T. Birtel Edward A. Connors John W. Jewett Donald C. Rung (moderator) Srinivasa S. R. Varadhan California Room	

FRIDAY, January 9	AMS	Other Organizations
8:00 a.m. - 4:00 p.m.	REGISTRATION - Tower Lobby	
8:00 a.m. - 4:00 p.m.	AMS BOOK SALE Tower Lobby	MAA BOOK SALE Tower Lobby
9:00 a.m. - 11:50 a.m.		MAA and National Council of Teachers of Mathematics - JOINT SESSIONS
		Continental Ballroom
9:00 a.m.		INVITED ADDRESS The differing ideals of Dedekind and Kronecker Harold M. Edwards
10:00 a.m.		INVITED ADDRESS Agenda for action: Progress and problems Max A. Sobel, President NCTM
11:00 a.m.		INVITED ADDRESS Contact measures in integral geometry William J. Firey
9:00 a.m. - noon		Conference Board of the Mathematical Sciences - SYMPOSIUM on Energy Research and the Mathematical Sciences Truman A. Botts (moderator) Bill Buzbee Wayne Cowell George Dantzig Gail S. Young California Room
9:00 a.m. - 5:00 p.m.	EXHIBITS - Hilton Plaza	
9:20 a.m. - 10:30 a.m.		ASL - CONTRIBUTED PAPER SESSION Cotillion East, HI
9:30 a.m. - 5:30 p.m.	EMPLOYMENT REGISTER INTERVIEWS - Imperial Ballroom	
10:00 a.m. - 11:00 a.m.		Association for Women in Mathematics EMMY NOETHER LECTURE The many aspects of Pythagorean triangles Olga Taussky-Todd Continental Parlors 1 and 2
10:45 a.m. - 11:45 a.m.		ASL - INVITED LECTURE The degrees of unsolvability: Global results Richard A. Shore, Cotillion East, HI
11:00 a.m. - noon		AWM - PANEL DISCUSSION AWM at ten: Past, present and future Lenore Blum Mary Gray Alice Schafer Michele Vergne Cypress Room
noon - 12:30 p.m.		AWM - BUSINESS MEETING Cypress Room
noon - 12:50 p.m.		MAA - INVITED ADDRESS Applications from UMAP Ross L. Finney, Continental Ballroom
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURES Lecture III: Some mathematical problems suggested by questions in physics Mark Kac, Continental Ballroom	

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.

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

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 Friday, January 9 Saturday, January 10	8:00 a.m. – 4:00 p.m.

ASSISTANCE AND INFORMATION DESK

Outside Continental Ballroom, San Francisco Hilton

Sunday, January 11	8:30 a.m. – 12:30 p.m.

AMS SHORT COURSE

Outside Continental Parlor 6, San Francisco Hilton

Monday, January 5	9:00 a.m. – 4:00 p.m.

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.

Assistance, Comments and Complaints. A log for registering participants' comments or complaints about the meeting is kept at the Transparencies section of the registration desk. All participants are encouraged to use this method of helping to improve future meetings. Comments on all phases of the meeting are welcome. If a written reply is desired, participants should furnish their name and address.

Participants with problems of an immediate nature requiring action at the meeting should see the 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

ASL sessions at Holiday Inn Union Square - HI

FRIDAY, January 9	American Mathematical Society	Other Organizations
	SPECIAL SESSIONS	
1:00 p.m. - 4:50 p.m.	Classification of Finite Simple Groups I Continental Parlors 7 and 8	
1:00 p.m. - 5:50 p.m.	Differential Geometry and Global Analysis II Balboa Room	
1:00 p.m. - 5:30 p.m.	Elliptic Systems in the Plane II Continental Parlor 3	
1:00 p.m. - 6:00 p.m.	Geometric Structures Cabrillo Room	
1:00 p.m. - 2:55 p.m.	Graph Theory II Anza Room	
1:00 p.m. - 3:50 p.m.	History of Mathematics II Continental Parlors 1 and 2	
1:00 p.m. - 5:50 p.m.	Homotopy Theory II Dolores Room	
1:00 p.m. - 5:50 p.m.	L_1 and Related Metric Spaces Cypress Room	
1:00 p.m. - 5:20 p.m.	Quadratic Form Theory II Continental Parlor 9	
	SESSIONS FOR CONTRIBUTED PAPERS	
1:00 p.m. - 3:10 p.m.	Approximations and Expansions Diablo Room	
1:00 p.m. - 2:25 p.m.	Combinatorics II Tamalpais Room	
1:00 p.m. - 2:40 p.m.	Complex Analysis I Toyon Suite	
1:00 p.m. - 3:40 p.m.	Field Theory Whitney Room	
1:00 p.m. - 3:10 p.m.	Geometry and Convex Sets Shasta Room	
1:00 p.m. - 3:10 p.m.	Number Theory I Rosewood Suite	
1:00 p.m. - 3:10 p.m.	Operator Theory I Walnut Suite	
1:00 p.m. - 3:10 p.m.	Ordinary and Partial Differential Equations Teakwood Suite	
1:00 p.m. - 2:55 p.m.	Statistics Lassen Room	
2:00 p.m. - 4:00 p.m.		Rocky Mountain Mathematics Consortium BOARD OF DIRECTORS MEETING Embarcadero Room
2:15 p.m. - 3:15 p.m.	INVITED ADDRESS Quaternion functions in gauge field theories Feza Gürsey, Continental Ballroom	
2:15 p.m. - 3:15 p.m.		ASL - INVITED LECTURE Borel sets in products of Polish spaces Alain Louveau, Cotillion East, HI
	SPECIAL SESSION	
3:20 p.m. - 5:15 p.m.	Graph Theory III Anza Room	
3:30 p.m. - 4:30 p.m.	INVITED ADDRESS How do eigenfunctions decay—some recent results Shmuel Agmon, Continental Ballroom	
	SESSIONS FOR CONTRIBUTED PAPERS	
3:30 p.m. - 5:40 p.m.	Algebraic Geometry Shasta Room	
3:30 p.m. - 5:55 p.m.	Applied Mathematics II Walnut Suite	
3:30 p.m. - 5:40 p.m.	Complex Analysis II Toyon Suite	
3:30 p.m. - 4:55 p.m.	Matrix Theory Tamalpais Room	
3:30 p.m. - 5:40 p.m.	Number Theory II Rosewood Suite	
3:30 p.m. - 5:25 p.m.	Probability I Lassen Room	
3:30 p.m. - 5:55 p.m.	Summability and Functional Equations Diablo Room	
3:30 p.m. - 5:05 p.m.		ASL - CONTRIBUTED PAPER SESSIONS Cotillion East and West, HI

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.

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 is 415-441-2004.

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, $115
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

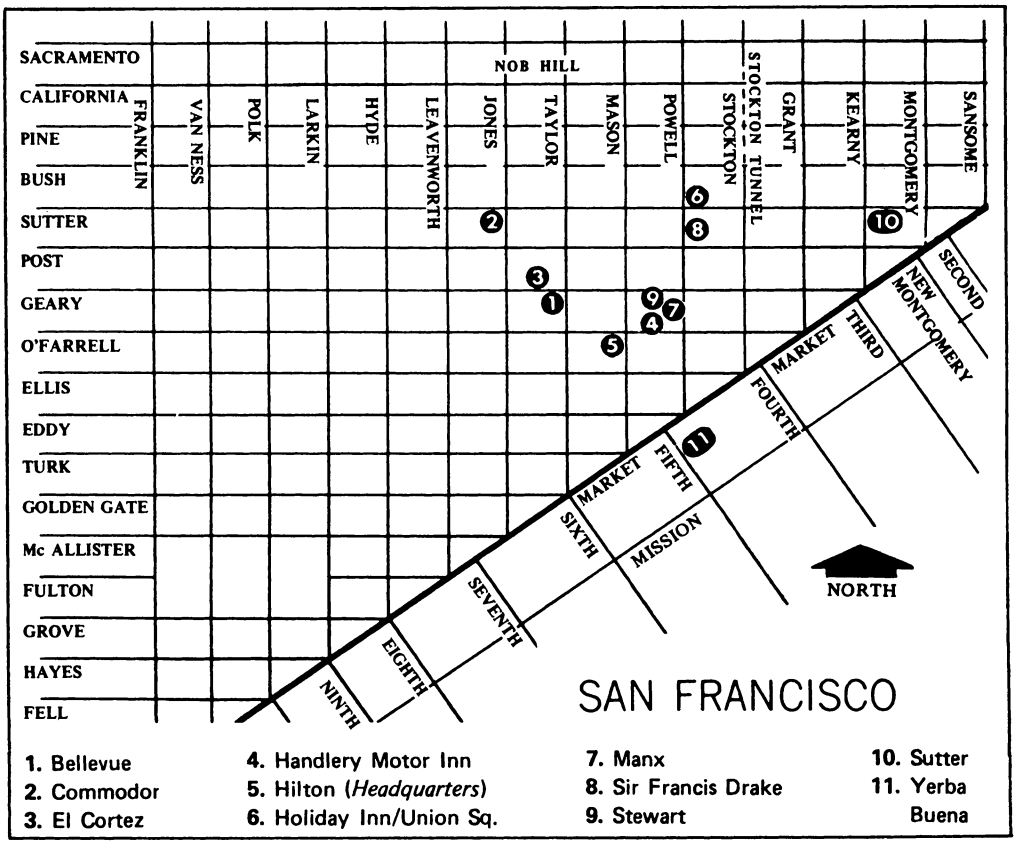
Singles	$49, $69, $79
Doubles	$59, $79, $89
Twins	$59, $79, $89
Triples	$71, $91, $101
Suites	$175 – $215

TIMETABLE

ASL sessions at Holiday Inn Union Square - HI

FRIDAY, January 9	American Mathematical Society	Other Organizations
	SESSION FOR CONTRIBUTED PAPERS	
4:00 p.m. - 5:10 p.m.	Polynomials and Rings Whitney Room	
4:30 p.m. - 5:30 p.m.	PANEL DISCUSSION: Joy of TEX Donald E. Knuth Robert Morris Richard S. Palais (moderator) Arnold Pizer Michael Spivak Continental Ballroom	
	SESSION FOR CONTRIBUTED PAPERS	
4:45 p.m. - 5:55 p.m.	Differential Equations I Teakwood Suite	
5:30 p.m. - 7:00 p.m.		ASL - Cocktail Party Savoy Hall, HI
6:30 p.m. - 9:00 p.m.		MAA - MINICOURSE Topics in data analysis Anza Room
	SESSION FOR CONTRIBUTED PAPERS	
7:30 p.m. - 9:40 p.m.	Algebraic Topology Continental Parlor 7	
8:00 p.m.		ASL - COUNCIL MEETING Salons A, B & C, HI
9:00 p.m. - 12:30 a.m.	COCKTAIL PARTY/DANCE Continental Ballroom	

SATURDAY, January 10	AMS	Other Organizations
8:00 a.m. - 4:00 p.m.	REGISTRATION - Tower Lobby	
8:00 a.m. - 4:00 p.m.	AMS BOOK SALE Tower Lobby	MAA BOOK SALE Tower Lobby
9:00 a.m. - noon	EXHIBITS - Hilton Plaza	
9:00 a.m. - 4:00 p.m.		CBMS - COUNCIL MEETING Embarcadero Room
9:15 a.m. - 10:45 a.m.		MAA and NCTM - JOINT SESSION PANEL DISCUSSION: Gifted students <u>Continental Ballroom</u> Local programs for gifted high school students Jean J. Pedersen (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, California Room	
9:30 a.m. - 5:30 p.m.	EMPLOYMENT REGISTER INTERVIEWS - Imperial Ballroom	
9:35 a.m. - 10:35 a.m.		ASL - INVITED LECTURE Some applications of Radin forcing Hugh Woodin, Cotillion East, HI
10:45 a.m. - 11:45 a.m.		ASL - INVITED LECTURE Profinite model theory Angus McIntyre, Cotillion East, HI
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, Continental Ballroom



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

Sutter Hotel (10)
191 Sutter Street 94104
Telephone: 415-781-3060

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

MISCELLANEOUS INFORMATION

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. An additional list of babysitters will be available at the Local Information section of the registration desk.

Entertainment. If sufficient interest was 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, wool socks, hats, gloves, and/or boots). Also highly recommended is a good supply of seasickness pills, since rough seas may be encountered.

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 $2.50 each, and should be purchased at the Transparencies section of the meetings registration desk before 4:00 p.m. on Friday.

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

Parking. Free indoor parking is provided by the Hilton for guests occupying rooms on the fifth

TIMETABLE

ASL sessions at Holiday Inn Union Square - HI

SATURDAY, January 10	American Mathematical Society	Other Organizations
1:00 p.m. - 2:00 p.m.	COLLOQUIUM LECTURES Lecture IV: Some mathematical problems suggested by questions in physics Mark Kac, Continental Ballroom	
	SPECIAL SESSIONS	
1:00 p.m. - 5:25 p.m.	Classification of Finite Simple Groups II Continental Parlors 7 and 8	
1:00 p.m. - 5:50 p.m.	Differential Geometry and Global Analysis III Balboa Room	
1:00 p.m. - 5:45 p.m.	Elliptic Systems in the Plane III Continental Parlor 3	
1:00 p.m. - 2:50 p.m.	Graph Theory IV Anza Room	
1:00 p.m. - 5:20 p.m.	Homotopy Theory III Dolores Room	
1:00 p.m. - 4:20 p.m.	Quadratic Form Theory III Continental Parlor 9	
	SESSIONS FOR CONTRIBUTED PAPERS	
1:00 p.m. - 2:55 p.m.	Applied Mathematics III Walnut Suite	
1:00 p.m. - 2:40 p.m.	Complex Analysis III Continental Parlor 2	
1:00 p.m. - 2:55 p.m.	Differential Equations II Teakwood Suite	
1:00 p.m. - 3:25 p.m.	Homological Algebra and Category Theory Cabrillo Room	
1:00 p.m. - 2:25 p.m.	Number Theory III Rosewood Suite	
1:00 p.m. - 1:55 p.m.	Operator Theory II Toyon Suite	
1:00 p.m. - 2:55 p.m.	Probability II Continental Parlor 1	
1:00 p.m. - 3:10 p.m.	Topology and Topological Groups Lassen Room	
2:15 p.m. - 3:15 p.m.	INVITED ADDRESS Report on von Neumann algebras Masamichi Takesaki, Continental Ballroom	
2:15 p.m. - 3:15 p.m.		ASL - INVITED LECTURE Spaces satisfying the Baire category theorem Kenneth Kunen, Cotillion East, HI
	SPECIAL SESSION	
3:20 p.m. - 4:55 p.m.	Graph Theory V Anza Room	
3:30 p.m. - 4:30 p.m.	AMS-MAA-SIAM Progress report on the work of a Congressional Fellow Cheryl G. Tropf, Continental Ballroom	
	SESSIONS FOR CONTRIBUTED PAPERS	
3:30 p.m. - 5:10 p.m.	Applied Mathematics IV Walnut Suite	
3:30 p.m. - 4:25 p.m.	Complex Analysis IV Continental Parlor 2	
3:30 p.m. - 5:25 p.m.	Differential Equations III Teakwood Suite	
3:30 p.m. - 5:55 p.m.	Harmonic Analysis Diablo Room	
3:30 p.m. - 5:55 p.m.	Integral Equations and Integral Transforms Rosewood Suite	
3:30 p.m. - 5:40 p.m.	Operator Theory III Toyon Suite	
3:30 p.m. - 5:40 p.m.	Probability III Continental Parlor I	
3:30 p.m. - 5:55 p.m.	Semigroups Lassen Room	
3:30 p.m. - 5:05 p.m.		ASL - CONTRIBUTED PAPER SESSIONS Cotillion East, HI
5:00 p.m.		ASL - COUNCIL MEETING Salons A, B and C, HI

through eleventh floors. Participants not staying in the 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.

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 liklihood 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.

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TIMETABLE

SATURDAY, January 10		Other Organizations
7:00 p.m. - 9:30 p.m.		MAA - MINICOURSE Topics in data analysis Anza Room
7:00 p.m. - 9:30 p.m.		MAA - FILM PROGRAM Continental Ballroom
7:00 p.m.		Space filling curves
7:28 p.m.		Mathematical peep show
7:42 p.m.		Equidecomposable polygons
7:56 p.m.		Group theory - A B.B.C. Broadcast as part of the Open University's Foundation Course in Mathematics
8:24 p.m.		Congruent triangles
8:34 p.m.		Matrices
8:45 p.m.		Geometric introduction to partial derivatives
9:02 p.m.		Isn't that the limit!
9:22 p.m.		Accidental nuclear war
SUNDAY, January 11		**MAA**
8:30 a.m. - 12:30 p.m.	ASSISTANCE AND INFORMATION DESK - Outside Continental Ballroom	
		Continental Ballroom
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
1:30 p.m. - 4:20 p.m.		MAA - SPECIAL SESSION What is computational complexity theory? David Gale (organizer)
1:30 p.m.		Algorithms that toss coins Richard Karp
2:30 p.m.		Complexity, combinatorics, and group theory—A look at graph isomorphism Maria M. Klawe
3:30 p.m.		Complexity theory in number theory Leonard Adleman

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PROGRAM OF THE SESSIONS

The time limit for each contributed paper in the AMS general sessions is ten minutes. In the special sessions the time varies from session to session and within sessions. 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 January 1981 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.

WEDNESDAY, 8:00 A. M.

Special Session on Number Theory. I, Continental Parlor 7

8:00– 8:20 (1) *Results and open problems concerning sums of arithmetical functions.* Dr. JEAN-MARIE DE KONINCK, Université Laval (783-10-28)

8:25– 8:45 (2) *Multiplicative arithmetic functions and Ramanujan's τ-function.* Professor P. D. T. A. ELLIOTT, University of Colorado, Boulder (783-10-19)

8:50– 9:10 (3) *Elliptic curves over a quadratic field.* Professor DORIAN GOLDFELD, Massachusetts Institute of Technology

9:15– 9:35 (4) *The least quadratic non-residue.* LARRY J. GOLDSTEIN, University of Maryland, College Park (783-10-56)

9:40–10:00 (5) *Analysis on positive matrices as it might have occurred to Fourier.* AUDREY A. TERRAS, University of California, San Diego (783-10-16)

10:05–10:25 (6) *Explicit bounds for primes in progressions, with an application.* Preliminary report. KEVIN S. McCURLEY, University of Illinois, Urbana-Champaign (783-10-30)

10:30–10:50 (7) *On the difference between consecutive zeta zeros.* Professor JULIA MUELLER, Fordham University (783-10-18)

10:55–11:15 (8) *Some properties of specially multiplicative functions.* DON REDMOND*, Southern Illinois University, Carbondale, and R. SIVARAMAKRISHNAN, Calicut University, India (783-10-13)

11:20–11:40 (9) *Elementary proof of the transformation formula for Lambert series involving generalized Dedekind sums.* Professor TOM M. APOSTOL, California Institute of Technology (783-10-1)

11:45–12:05 (10) *Sifting short intervals.* Professor JOHN B. FRIEDLANDER, University of Toronto, Scarborough College

WEDNESDAY, 8:00 A. M.

Special Session on Operator Algebras and K-Theory. I, Anza Room

8:00– 8:20 (11) *K_0^* of a C*-algebra.* Preliminary report. Dr. BRUCE BLACKADAR*, University of Nevada, Reno, and Dr. DAVID HANDELMAN, University of Ottawa (783-46-18)

8:30– 8:50 (12) *K-theory for actions of the circle group on C*-algebras.* WILLIAM L. PASCHKE, University of Kansas (783-46-7)

9:00– 9:20 (13) *Reducible topological Markov chains via K_0-theory and Ext.* Preliminary report. Professor DAVID HANDELMAN, University of Ottawa (783-46-12) (Introduced by Wulf Rossmann)

9:30–10:00 (14) *The role of K-theory in non-commutative algebraic topology.* Professor JONATHAN ROSENBERG, University of Pennsylvania, Philadelphia (783-46-6)

WEDNESDAY, 8:00 A. M.

Special Session on Ordered Fields and Real Algebraic Geometry. I, Balboa Room

8:00– 8:20 Introductions

8:20– 8:40 (15) *Signatures of fields and extension theory.* Professor EBERHARD BECKER, Universität Dortmund, Federal Republic of Germany, Dr. JOHN HARMAN, TRW, Los Angeles, and Professor ALEX ROSENBERG*, Cornell University (783-12-11)

8:50– 9:05 (16) *The square class invariant for Pythagorean fields.* Preliminary report. Professor DANIEL B. SHAPIRO*, Ohio State University, Columbus, and Professor T.-Y. LAM, University of California, Berkeley (783-12-4)

9:10– 9:25 (17) *Some properties of the hyperplane sections of a real algebraic surface.* Preliminary report. VICTOR ESPINO, University of New Mexico (783-14-7) (Introduced by Professor Donald W. Dubois)

9:30– 9:45 (18) *A continuous solution to Hilbert's 17th problem.* Professor CHARLES N. DELZELL, Louisiana State University, Baton Rouge (783-12-28)

9:50–10:05 (19) *Extension of an order to a simple transcendental field extension.* Professor ROBERT GILMER, Florida State University (783-12-7)

10:10–10:25 (20) *The Nash ring of a real surface.* Preliminary report. Professor G. A. EFROYMSON, University of New Mexico (783-14-3)

10:30–10:50 (21) *Finitely generated groups of divisibility.* Professor BRUCE GLASTAD, University of Mississippi, and Professor JOE L. MOTT*, Florida State University (783-13-5)

11:00–11:20 (22) *Tamhankar's commuting theorem.* Professor JOHN ISBELL, State University of New York, Buffalo (783-06-1)

11:30–11:50 (23) *On the numbers of archimedean and nonarchimedean orderings of preordered fields.* Preliminary report. Dr. JONATHAN L. MERZEL, Holy Names College (783-12-21)

WEDNESDAY, 8:00 A. M.

Special Session on Qualitative Theory of Differential Equations. I, Continental Parlor 8

8:00– 8:20 (24) *Continuous dependence for two-point boundary value problems.* Professor JOHN V. BAXLEY, Wake Forest University (783-34-14)

8:30– 8:50 (25) *Cosine families and damped nonlinear second order differential equations.* J. H. LIGHTBOURNE III* and S. M. RANKIN III, West Virginia University (783-35-13)

9:00– 9:20 (26) *Oscillation and essential uniqueness in certain linear differential equations.* Professor W. E. TAYLOR, JR., Texas A&M University (783-34-20)

9:30– 9:50 (27) *Oscillatory subspaces of* $y^n + py = 0$. Preliminary report. Professor GARY JONES, Murray State University (783-34-32)

10:00–10:20 (28) *On Sturmian theory for systems.* Preliminary report. Professor SHAIR AHMAD, University of Miami (783-34-34)

10:30–10:50 (29) *Positive solutions of elliptic operators in unbounded domains.* Dr. W. ALLEGRETTO, University of Alberta (783-35-21)

11:00–11:20 (30) *Generalization of Sturm's second comparison theorem.* Professor PHILIP HARTMAN, Naval Postgraduate School (783-34-9)

11:30–11:50 (31) *Characteristic exponents and applications to differential equations.* Professor MOSES A. BOUDOURIDES*, Democritus University of Thrace, Greece, and Professor FRANCESCO S. DE BLASI, Instituto Matematico "U. Dini", Italy (783-34-35)

WEDNESDAY, 8:00 A. M.

Special Session on Topics in Complex Variables. I, Continental Parlor 3

8:00– 8:20 (32) *Level sets of univalent functions on disks.* Dr. WALTER K. HAYMAN, Imperial College, England, and Dr. JANG-MEI G. WU*, University of Illinois, Urbana-Champaign (783-30-10)

8:30– 8:50 (33) *Boundary behavior of the Riemann mapping function of asymptotically conformal curves.* Professor F. D. LESLEY, San Diego State University, and Professor S. E. WARSCHAWSKI*, University of California, San Diego (783-30-22)

9:00– 9:20 (34) *Hardy spaces,* A_∞, *and singular integrals on chord-arc domains.* DAVID S. JERISON*, University of Chicago, and CARLOS E. KENIG, University of Minnesota, Minneapolis (783-30-4)

9:30– 9:50 (35) *On biunivalent functions.* Preliminary report. Professor TED J. SUFFRIDGE, University of Kentucky (783-30-40)

10:00–10:20 (36) *Subordinations and estimates on derivatives of meromorphic, univalent functions.* Preliminary report. Professor P. C. COCHRANE, Bloomsburg State College, and Professor T. H. MAC GREGOR*, State University of New York, Albany (783-30-9)

10:30–10:50 (37) *A continuation method for the solution of extremal problems.* Preliminary report. Professor W. E. KIRWAN*, University of Maryland, College Park, and GLENN SCHOBER, Indiana University, Bloomington (783-30-28)

11:00–11:20 (38) *Arcs omitted by support points of univalent functions.* Professor PETER L. DUREN, University of Michigan, Ann Arbor (783-30-8)

11:30–11:50 (39) *Complex variables and the theory of complexity.* Professor STEVE SMALE, University of California, Berkeley (783-30-2)

WEDNESDAY, 8:00 A. M.

Session on General Topology. I, Dolores Room

8:00– 8:10 (40) *A theorem on the decomposition of an uncountable set into a null set and a set of first category relative to an arbitrary sequence of sets.* Professor C. G. MENDEZ, Metropolitan State College (783-54-1)

8:15– 8:25 (41) *Fuzzy addition in the L-fuzzy real line.* Preliminary report. Professor S. E. RODABAUGH, Youngstown State University (783-54-25)

8:30– 8:40 (42) *Ordered hereditarily p-spaces.* Dr. W. KULPA, Silesian University, Poland, and Dr. D. LUTZER*, Texas Tech University (783-54-6)

8:45– 8:55 (43) *Connected sets that separate no connected set.* Professor BYRON L. McALLISTER, Montana State University (783-54-4)

9:00– 9:10 (44) *Locally connected, rim compact Moore spaces are K-semimetrizable.* Preliminary report. Professor E. E. GRACE, Arizona State University (783-54-40)

9:15– 9:25 (45) *Generalizations of the Baire category theorem.* Preliminary report. M. SOLVEIG ESPELIE, JAMES E. JOSEPH, and MYUNG H. KWACK*, Howard University (783-54-38)

9:30– 9:40 (46) *Transitivity in the spaces with ortho-bases.* Dr. JACOB KOFNER, George Mason University (783-54-27)

9:45– 9:55 (47) *Applications of order-cushioned refinements.* J. C. SMITH, Virginia Polytechnic Institute and State University, Blacksburg (783-54-20)

10:00–10:10 (48) *Pre-images of quasi-compacta.* Preliminary report. Professor JOHN MACK, University of Kentucky, Lexington (783-54-31)

10:15–10:25 (49) *The pseudoweights of a space.* Dr. BRIAN M. SCOTT, Cleveland State University (783-54-18) (Introduced by Thomas W. Hungerford)

WEDNESDAY, 8:00 A. M.

Session on Global Analysis. I, Rosewood Suite

8:00– 8:10 (50) *Realizing subshifts of finite type in fitted diffeomorphisms of surfaces.* Preliminary report. PAUL BLANCHARD, Boston University (783-58-17)

8:15– 8:25 (51) *Fourier integral operators as Fréchet-Lie group.* Preliminary report. Professor TUDOR RATIU, University of Michigan, Ann Arbor, and Dr. RUDOLF SCHMID*, University of California, Berkeley (783-58-20)

8:30– 8:40 (52) *The vertical bracket in the theory of nonlinear infinite-dimensional Hamiltonian systems.* Preliminary report. Professor YVETTE KOSMANN-SCHWARZBACH, Brooklyn College, City University of New York (783-58-8)

8:45– 8:55 (53) *Pseudocomplex geometry and the structure of real transitive Lie algebras.* Professor JACK F. CONN, California Institute of Technology (783-58-3)

9:00– 9:10 (54) *Classification of Kupka-Smale flows on the torus.* CHRIS GARDINER, University of Illinois, Urbana-Champaign (783-58-16)

9:15– 9:25 (55) *The dynamics of Morse-Smale diffeomorphisms on compact surfaces.* Preliminary report. STEVE BATTERSON, Institute for Advanced Study (783-58-18)

9:30– 9:40 (56) *Structurally stable flows in the plane.* Preliminary report. JANINA KOTUS, Warsaw Technical University, Poland, Professor MICHAŁ KRYCH*, University of Warsaw, Poland, and Tufts University, and Professor ZBIGNIEW NITECKI, Tufts University (783-58-5)

9:45– 9:55 (57) *Structure of minimum orbits for periodic points of a map on the real line.* Preliminary report. Professor CHUNG-WU HO, Southern Illinois University, Edwardsville (783-58-14)

10:00–10:10 (58) *Averaging and metrics.* Preliminary report. DAVID HART, University of Florida (783-58-23)

10:15–10:25 (59) *Rotation intervals for a class of endomorphisms of the circle.* Dr. CHRIS R. BERNHARDT, Southern Illinois University, Carbondale (783-58-11) (Introduced by Dr. Martin Dixon)

WEDNESDAY, 8:15 A. M.

Special Session on Low Dimensional Topology. I, Cabrillo Room

8:15– 8:35 (60) *On J. H. C. Whitehead's aspherical question.* Professor MICHEAL N. DYER, University of Oregon (783-57-25)

8:40– 9:00 (61) *Framed links in two-dimensional homotopy theory.* ALLAN J. SIERADSKI, University of Oregon (783-55-35)

9:05– 9:25 (62) *Homotopy equivalences and free modules.* Professor STEVEN PLOTNICK, University of Chicago (783-57-30)

9:30– 9:50 (63) *Hyperbolic models for cohomology and Massey products.* Dr. ROGER FENN, University of Sussex, England, and Dr. DENIS SJERVE*, University of British Columbia (783-55-18) (Introduced by Professor S. J. Lomonaco, Jr.)

9:55–10:15 (64) *On one-relator groups which satisfy Poincaré duality.* Professor JOHN G. RATCLIFFE, University of Wisconsin, Madison (783-20-42)

WEDNESDAY, 8:30 A. M.

Session on Associative Rings, Walnut Suite

8:30– 8:40 (65) *Subidealizer rings and the splitting properties.* Preliminary report. Dr. MARK L. TEPLY, University of Florida (783-16-3)

8:45– 8:55 (66) *Direct sums of d-continuous modules.* Dr. SAAD MOHAMED, Kuwait University, Kuwait, and Dr. BRUNO J. MUELLER*, McMaster University (783-16-1)

9:00– 9:10 (67) *Pseudo-semisimple rings.* Dr. SAAD MOHAMED*, Kuwait University, Kuwait, and Dr. BRUNO J. MUELLER, McMaster University (783-16-2)

9:15– 9:25 (68) *On free quadratic extensions of rings.* Preliminary report. Professor GEORGE SZETO, Bradley University (783-16-17)

9:30– 9:40 (69) *On the density theorem.* Professor BYOUNG SONG CHWE*, and JOSEPH NEGGERS, University of Alabama (783-16-19)

9:45– 9:55 (70) *Commutativity theorems for rings and groups satisfying identities on commutators.* EVAGELOS PSOMOPOULOS and Professor ADIL YAQUB*, University of California, Santa Barbara (783-16-11)

10:00–10:10 (71) *A generalization of a result of Goldman on rings of quotients.* Preliminary report. Professor JITENDRA MANOCHA, Kent State University, Warren (783-16-9)

10:15–10:25 (72) *Central closures of certain Lie rings.* Professor WILLARD E. BAXTER*, University of Delaware, and Professor WALLACE S. MARTINDALE III, University of Massachusetts, Amherst (783-16-5)

10:30–10:40 (73) *The Hilbert Basis Theorem for skew polynomial rings.* Preliminary report. PETER MALCOLMSON* and JAY SHAPIRO, Wayne State University (783-16-12)

10:45–10:55 (74) *Group actions of selfinjective regular rings.* J. M. GOURSAUD, J. OSTERBURG*, J. PASCAUD, and J. VALETTE, University of Cincinnati and University of Poitiers, France (783-16-13)

11:00–11:10 (75) *Krull and global dimensions of Noetherian PI-rings.* Preliminary report. RICHARD RESCO*, University of Southern California, L. W. SMALL, University of California, San Diego, and J. T. STAFFORD, Gonville and Caius College, Cambridge (783-16-18)

11:15–11:25 (76) *Essentially closed classes of rings and upper radicals.* Professor TERRY L. JENKINS*, University of Wyoming, and Professor H. J. LEROUX and Professor G. A. P. HEYMAN, University of the Orange Free State, South Africa (783-16-10) (Introduced by Professor Joseph Martin)

11:30–11:40 (77) *Radicals of strong supplementary semilattice sums of rings.* Dr. ELEANOR G. TURMAN, Bell Laboratories, Holmdel (783-16-15)

11:45–11:55 (78) *Some examples of representable functors from associative k-rings to semigroups.* Dr. ADAM O. HAUSKNECHT, University of Minnesota, Duluth (783-16-16)

WEDNESDAY, 8:30 A. M.

Session on Fourier Analysis, Continental Parlor 1

8:30– 8:40 (79) *The sup norm of a polynomial with perturbed coefficients.* Professor J. S. BYRNES, University of Massachusetts, Boston (783-42-13)

8:45– 8:55 (80) *Spectral properties of orthogonal polynomials on unbounded sets.* Professor T. S. CHIHARA, Purdue University, Calumet (783-42-4)

9:00– 9:10 (81) *A characterization of periodic Beurling distributions by the growth rate of their Fourier coefficients.* Professor M. GARY COLLIER, The Citadel, and Professor JOHN A. KELINGOS*, Vanderbilt University (783-42-1)

9:15– 9:25 (82) *A class of L_1-convergence.* Preliminary report. Professor R. BOJANIC*, Ohio State University, Columbus, and Professor Č. V. STANOJEVIĆ, University of Missouri, Rolla (783-42-5)

9:30– 9:40 (83) *On integrability and L^1 convergence of trigonometric series.* WILLIAM O. BRAY* and Dr. ČASIAV V. STANOJEVIĆ , University of Missouri, Rolla (783-42-2)

9:45– 9:55 (84) *Lipschitz spaces and mixed Lebesgue spaces.* Professor WOLODYMYR R. MADYCH, Iowa State University (783-42-11)

10:00–10:10 (85) *A note on oscillating kernels in two dimensions.* G. SAMPSON, Syracuse University (783-42-6)

10:15–10:25 (86) *Spherical harmonic expansions with limited sampling.* Preliminary report. F. ALBERTO GRÜNBAUM and L. LOUGHI, University of California, Berkeley, and M. PERLSTADT*, Georgia Institute of Technology (783-42-10)

10:30–10:40 (87) *Finite convolution operators in symmetric spaces.* Professor F. ALBERTO GRÜNBAUM, University of California, Berkeley (783-42-8) (Introduced by Professor Jacob Feldman)

10:45–10:55 (88) *The Hardy-Littlewood maximal function on $L(p,q)$ spaces with weights.* HUANN-MING CHUNG, RICHARD A. HUNT, and DOUGLAS S. KURTZ*, Purdue University, West Lafayette (783-42-3)

11:00–11:10 (89) *The Hilbert transform and maximal function for approximately homogeneous curves.* Preliminary report. Professor DAVID A. WEINBERG, Texas Tech University (783-42-9)

11:15–11:25 (90) *Hilbert transform of generalized functions.* Dr. J. M. PANDEY, Carleton University (783-42-12)

11:30–11:40 (91) *H^1 q-martingales.* Dr. J.-A. CHAO*, Clevaland State University, and Dr. SVANTE JANSON, Institut Mittag-Leffler, Sweden (783-42-7)

WEDNESDAY, 8:30 A. M.

Session on Graph Theory. I, Teakwood Suite

8:30– 8:40 (92) *Distances between phylogenetic trees.* Professor TIM MARGUSH, Beloit College (783-05-72)

8:45– 8:55 (93) *Some applications of graph theory to finite groups.* Preliminary report. Professor EDWARD A. BERTRAM, University of Hawaii, Honolulu (783-05-77)

9:00– 9:10 (94) *Some metrics in groups.* Preliminary report. GERARD D. COHEN, Ec. Nat. Sup. Télécom., France (783-05-20) (Introduced by Professor M. Deza)

9:15– 9:25 (95) *Distance-regularity in graphs.* Professor PAUL M. WEICHSEL, University of Illinois, Urbana-Champaign (783-05-19)

9:30– 9:40 (96) *The conjunction of two Cayley diagrams.* KEVIN KEATING, Washington University (783-05-2) (Introduced by Edward Wilson)

9:45– 9:55 (97) *Hamiltonian paths and circuits in Cayley diagrams of abelian groups.* Preliminary report. STEPHEN J. CURRAN, Beloit College (783-05-71) (Introduced by Professor Philip D. Straffin, Jr.)

10:00–10:10 (98) *Hamilton circuits in graphs of group presentations.* Preliminary report. Professor MARK RAMRAS, Northeastern University (783-05-59)

10:15–10:25 (99) *Hamiltonian paths in the groups $[p,q]$.* Preliminary report. DOUGLAS DUNHAM*, University of Minnesota, Duluth, and DAVID WITTE, University of Chicago (783-06-13)

10:30–10:40 (100) *Hamiltonian circuits in cartesian products with a metacyclic factor.* GAIL LETZTER, Harvard University (783-05-30) (Introduced by J. A. Gallian)

10:45–10:55 (101) *Abelian group valued functions on graphs.* Preliminary report. JOHN GIMBEL, Western Michigan University (783-05-43)

11:00–11:10 (102) *Randomly antitraceable digraphs.* JOHN FREDERICK FINK, Western Michigan University (783-05-52)

11:15–11:25 (103) *Line graphs and their chromatic polynomials.* Preliminary report. Professor RUTH A. BARI, George Washington University (783-05-34)

11:30–11:40 (104) *On minimum k-geodetically connected graphs of diameter* 2. Dr. DOUGLAS E. JACKSON*, Eastern New Mexico University, and Dr. ROGER C. ENTRINGER, University of New Mexico (783-05-33)

11:45–11:55 (105) *Spanning subgraphs of k-connected digraphs.* Dr. DANIEL A. MARCUS, California State Polytechnic University (783-05-44)

WEDNESDAY, 9:00 A. M.

Special Session on the History of Contemporary Mathematics. I, Imperial Ballroom

9:00– 9:50 (106) *Analytic number theory in the 20th century.* Professor HUGH L. MONTGOMERY, University of Michigan, Ann Arbor (789-99-4)

10:00–10:50 (107) *The re-emergence of analysis in the sacred garden of algebra.* Professor H. M. STARK, University of California, San Diego (783-12-32)

11:00–11:50 (108) *Applications of real multiplication: a legacy from Zolotarev.* Professor JOHN TODD, California Institute of Technology (783-01-1)

WEDNESDAY, 9:00 A. M.

Special Session on Mathematical Physics. I, Continental Parlor 9

9:00– 9:50 (109) *The laws of nature as seen by a physicist.* Professor LEONARD SUSSKIND, Stanford University

10:00–10:50 (110) *The laws of nature as seen by a mathematician.* Professor ISADORE SINGER, University of California, Berkeley

11:00–11:50 (111) *Phase transitions in statistical mechanics and quantum field theory.* Preliminary report. THOMAS SPENCER, Courant Institute of Mathematical Sciences (783-82-2)

WEDNESDAY, 9:00 A. M.

Session on Functional Analysis. I, Continental Parlor 2

9:00– 9:10 (112) *Fixed and common fixed points in convex metric spaces.* Preliminary report. Dr. S. A. NAIMPALLY and Dr. K. L. SINGH*, Lakehead University (783-46-15)

9:15– 9:25 (113) *Finite dimensional convexity topological spaces.* Professor MERLE GUAY*, University of Maine, Portland, and S. A. NAIMPALLY, Lakehead University (783-46-49)

9:30– 9:40 (114) *Metrizable (LF)-spaces, (db)-spaces, and the separable quotient problem.* Dr. STEPHEN A. SAXON, University of Florida, and Dr. P. P. NARAYANASWAMI*, Memorial University of Newfoundland (783-46-33)

9:45– 9:55 (115) *Metrizable [normable] (LF)-spaces and two classical problems in Fréchet [Banach] spaces.* Preliminary report. Dr. STEPHEN A. SAXON*, University of Florida, and Dr. P. P. NARAYANASWAMI, Memorial University of Newfoundland (783-46-29)

10:00–10:10 (116) *Ultrapowers and preduality in non-archimedean Banach spaces.* Preliminary report. Professor MAHOUD HAIFAWI, Middle East Technical University, Turkey (783-46-1)

10:15–10:25 (117) *Point-wise multipliers.* Dr. ROSHDI KHALIL, University of Kuwait, Kuwait (783-46-13)

10:30–10:40 (118) *A note on the gl constant of* $E \overset{\vee}{\otimes} E$. Professor YEHORAM GORDON, Texas A&M University, College Station (783-46-21)

10:45–10:55 (119) *Weak Radon-Nikodým sets in conjugate Banach spaces.* LAWRENCE H. RIDDLE, University of Illinois, Urbana-Champaign (783-46-9)

11:00–11:10 (120) *A Banach space that is MLUR but not HR.* Dr. MARK A. SMITH, Miami University, Oxford (783-46-34)

11:15–11:25 (121) *Holomorphic mappings of finite rank.* Preliminary report. Professor SOO BONG CHAE, New College, University of South Florida (783-46-42)

11:30–11:40 (122) *On the structure of the solution set of nonlinear operator equations.* Preliminary report. Dr. MARIO MARTELLI, Bryn Mawr College (783-46-31)

11:45–11:55 (123) *Uniqueness of the gradient in a normed linear space.* Preliminary report. Professor IVIE STEIN, JR., University of Toledo (783-46-47)

WEDNESDAY, 9:30 A. M.

Session on Control and Information Theory, Cypress Room

9:30– 9:40 (124) *The set of periodicity of periodic control systems.* Preliminary report. Dr. LYNNELL E. STERN, Simmons College (783-49-3)

9:45– 9:55 (125) *Approximation of control problems.* Preliminary report. Dr. WENDELL H. MILLS* and Dr. GOONG GHEN, Pennsylvania State University, University Park (783-49-2)

10:00–10:10 (126) *Nonlinear control.* Professor L. R. HUNT, NASA Ames Research Center (783-93-1)

10:15–10:25 (127) *A variational problem with operator constraints.* Preliminary report. Professor TORU MARUYAMA, Keio University, Japan (783-49-1)

10:30–10:40 (128) *Approximation of solutions of integro-differential equations with delay differential equations.* Preliminary report. Professor VERNON L. BAKKE, University of Arkansas, Fayetteville (783-49-4) (Introduced by William A. Feldman)

10:45–10:55 (129) *A nearly ill-posed filtering problem.* Professor L. LORNE CAMPBELL, Queen's University (783-94-1)

11:00–11:10 (130) *Spectral optimization algorithms for constant-carrier envelope signaling.* C. R. GIARDINA, The Singer Company, Fairleigh Dickinson University, and Stevens Institute of Technology, and R. Y. PARADISE*, The Singer Company (783-94-4)

11:15–11:25 (131) *Inequivalent irreducible Goppa codes.* ROBERT E. KIBLER, Department of Defense (783-94-2)

11:30–11:40 (132) *Threshold schemes and error correcting codes.* Preliminary report. Dr. JOHN R. BLOOM, Texas A&M University (783-94-3)

WEDNESDAY, 9:30 A. M.

Session on Lattices and Boolean Algebra, Toyon Suite

9:30– 9:40 (133) *Heyting algebras with dual pseudocomplementation.* Dr. H. P. SANKAPPANAVAR, Universidade Federal da Bahia, Brasil (783-06-19)

9:45– 9:55 (134) *On representations of Boolean algebras.* Dr. J. GLENN BROOKSHEAR, Marquette University (783-06-8)

10:00–10:10 (135) *Representation of binary relations by generalized Boolean functions.* Dr. ROBERT A. MELTER*, Southampton College of Long Island University, and Dr. SERGIU RUDEANU, University of Bucharest, Romania (783-06-2)

10:15–10:25 (136) *On the join-irreducibles in the tensor product of finite distributive lattices.* ANDREW M. BELL* and MICHAEL R. BROWN, California State University, Hayward, and GRANT A. FRASER, University of Santa Clara (783-06-18)

10:30–10:40 (137) *Completions of symmetric lattices.* Preliminary report. Professor ERIK SCHREINER, Western Michigan University (783-06-11)

10:45–10:55 (138) *Subalgebra lattices of algebras whose monoid of endomorphisms is singly generated.* Professor N. SAUER and Professor M. G. STONE*, University of Calgary (783-08-3)

11:00–11:10 (139) *A Kaplansky analog of $C(X)$ for geometries.* Professor DON E. EDMONDSON, University of Texas, Austin (783-06-4)

11:15–11:25 (140) *On complete semilattices.* Professor NAOKI KIMURA, University of Arkansas, Fayetteville (783-06-20)

11:30–11:40 (141) *Closures in implicative semilattices.* WILLIAM C. NEMITZ, Southwestern at Memphis (783-06-3)

WEDNESDAY, 10:30 A. M.

Invited Address, Continental Ballroom

(142) *Geometry of limit sets of Kleinian groups.* Professor DENNIS SULLIVAN, Institut des Hautes Études Scientifique, France (783-99-1)

WEDNESDAY, 1:00 P. M.

Colloquium Lectures: Lecture I, Continental Ballroom

(143) *Some mathematical problems suggested by questions in physics.* Professor MARK KAC, Rockefeller University

WEDNESDAY, 2:10 P. M.

Special Session on the History of Contemporary Mathematics. II, Imperial Ballroom

2:10– 3:00 (144) *From Poincaré to the* 1960s. Professor STEVE SMALE, University of California, Berkeley (783-01-03)

3:10– 4:00 (145) *Changing views of geometry.* Professor GARRETT BIRKHOFF, Harvard University (783-01-5)

4:10– 5:00 (146) *How do we assess the significance of mathematical achievements.* Professor FELIX BROWDER, University of Chicago (783-01-2)

WEDNESDAY, 2:10 P. M.

Special Session on Low Dimensional Topology. II, Cabrillo Room

2:10– 2:30 (147) *A presentation for knots.* Preliminary report. Dr. LEE NEUWIRTH, Institute for Defense Analyses (783-57-12)

2:35– 2:55 (148) *A conservative Dehn's Lemma.* MICHAEL H. FREEDMAN, University of California, San Diego (783-57-15)

3:00– 3:20 (149) *Modules of 2-component links.* Preliminary report. Professor JEROME P. LEVINE, Brandeis University (783-55-24)

3:25– 3:45 (150) *The Murasugi sum is a natural geometric operation.* Professor DAVID GABAI, Harvard University (783-57-9)

3:50– 4:10 (151) *Dihedral coverings of knots and homology 3-spheres.* Preliminary report. Professor KUNIO MURASUGI, University of Toronto (783-55-39)

4:15– 4:35 (152) *Knots and universes.* Preliminary report. Professor LOUIS H. KAUFFMAN, University of Illinois, Chicago Circle (783-57-8)

4:40– 5:00 (153) *Incompressible surfaces in the complement of alternating knots and links.* Preliminary report. WILLIAM W. MENASCO, University of California, Berkeley (783-54-8)

5:05– 5:25 (154) *Knots prime on many strings.* Preliminary report. STEVEN A. BLEILER, University of Oregon (783-55-15)

5:30– 5:50 (155) *Positive knot and link representatives.* Professor J. M. VAN BUSKIRK, University of Oregon (783-55-30)

WEDNESDAY, 2:10 P. M.

Special Session on Mathematical Physics. II, Continental Parlor 9

2:10– 2:35 (156) *Stochastic-geometrical aspects of phase transitions.* Dr. MICHAEL AIZENMAN, Princeton University (783-82-3)

2:40– 3:05 (157) *Infinite clusters in percolation models.* Professor CHARLES M. NEWMAN*, University of Arizona, and Professor LARRY S. SCHULMAN, Technion, Israel (783-60-13)

3:10– 3:35 (158) *Perturbation theory around a massless Gaussian lattice field.* Dr. JEAN BRICMONT, Princeton University (783-82-4) (Introduced by Professor Joel L. Lebowitz)

3:40– 4:05 (159) *Mechanical models of Brownian motion.* Professor DETLEF DURR, Ruhr-Universität, Germany, and Professor SHELDON GOLDSTEIN* and Professor JOEL L. LEBOWITZ, Rutgers University, New Brunswick (783-60-4)

4:35– 5:00 (160) *On the Flory exponent.* M. JOHN WESTWATER, University of Washington (783-80-3)

5:05– 5:30 (161) *The fluid dynamic limit of the Boltzmann equation.* Professor RUSSEL E. CAFLISCH, Stanford University (783-35-5)

5:35– 6:00 (162) *The universal metric properties of maps and the onset spectrum of turbulence.* MITCHELL J. FEIGENBAUM, Los Alamos Scientific Laboratory (783-76-5) (Introduced by Professor Joel L. Lebowitz)

WEDNESDAY, 2:10 P. M.

Special Session on Number Theory. II, Continental Parlor 7

2:10– 2:30 (163) *Zero bounds for certain functions.* W. DALE BROWNAWELL, Pennsylvania State University, University Park (783-10-40)

2:35– 2:55 (164) *Diophantine equations of the form* $Ax^4 + By^2 = 4$. Preliminary report. Professor RICHARD T. BUMBY, Rutgers University, New Brunswick (783-10-32)

3:00– 3:20 (165) *Bäcklund transformation and "addition of indices" for special functions with applications.* Professor DAVID V. CHUDNOVSKY, Columbia University (783-10-4)

3:25– 3:45 (166) *Equality theorems for dual two-dimensional diophantine approximation constants.* Professor THOMAS W. CUSICK, State University of New York, Buffalo (783-10-25)

3:50– 4:10 (167) *Old and new problems on the divisors of numbers.* Professor PAUL ERDÖS, Hungarian Academy of Sciences, Hungary (783-10-47)

4:15– 4:35 (168) *On irregularity of distribution.* Preliminary report. FAN R. K. CHUNG and R. L. GRAHAM*, Bell Laboratories, Murray Hill (783-10-55)

4:40– 5:00 (169) *Lattice vertex polytopes with interior lattice points.* Preliminary report. DOUGLAS HENSLEY, Texas A&M University (783-10-41)

5:05– 5:25 (170) *Pairwise sums and sets with positive upper density.* Preliminary report. Professor NEIL HINDMAN, Howard University (783-10-14)

5:30– 5:50 (171) *Applications of probability to additive number theory.* Professor MELVYN B. NATHANSON, Southern Illinois University, Carbondale (783-10-48)

WEDNESDAY, 2:10 P. M.

Special Session on Operator Algebras and K-Theory. II, Anza Room

2:10– 2:50 (172) *The index theorem for foliations.* Professor CALVIN C. MOORE, University of California, Berkeley (783-46-27)

3:00– 3:20 (173) *Elliptic operators on locally homogeneous spaces of finite volume.* Preliminary report. HENRI MOSCOVICI, Ohio State University, Columbus (783-22-3)

3:30– 3:50 (174) *The pseudo-differential operator extension on a manifold.* Professor JEROME KAMINKER, Indiana University-Purdue University, Indianapolis (783-46-26)

4:00– 4:20 (175) *Some remarks on the classification of essentially binormal operators.* Preliminary report. Professor NORBERTO SALINAS, University of Kansas (783-47-1)

4:30– 4:50 (176) *Radial functions on the free group.* Preliminary report. Professor JOEL M. COHEN*, University of Maryland, College Park, and Professor LEO DE MICHELE, Università di Milano, Italy (783-46-25)

5:00– 5:40 (177) *Ext and index theory.* Professor PAUL BAUM*, Brown University, and Professor RONALD G. DOUGLAS, State University of New York, Stony Brook (783-55-6)

WEDNESDAY, 2:10 P. M.

Special Session on Ordered Fields and Real Algebraic Geometry. II, Balboa Room

2:10– 2:25 (178) *Algebraic structure on a family of polyhedra.* A. TOGNOLI, Istituto Matematico, Italy (783-14-16) (Introduced by Professor Donald W. Dubois)

2:30– 2:45 (179) *The maximal part of a real algebraic variety.* Preliminary report. Professor WILLIAM A. ADKINS, Louisiana State University, Baton Rouge (783-14-15) (Introduced by J. William Hoffman)

2:50– 3:05 (180) *Normal decompositions of semialgebraic sets.* Preliminary report. Professor CARLOS ANDRADAS, Universidad Complutense, Spain (783-14-17) (Introduced by Professor Donald W. Dubois)

3:10– 3:30 (181) *Chirotops: higher dimensional analogues of (one dimensional) ordered structures—a new aspect of combinatorial geometry.* Preliminary report. ANDREAS W. M. DRESS, University of Bielefeld, Federal Republic of Germany (783-51-2)

3:40– 3:55 (182) *Derivations of f-rings.* Professor MELVIN HENRIKSEN, Harvey Mudd College (783-06-14)

4:00– 4:15 (183) *Simple transcendental extensions of valued fields.* JACK OHM, Louisiana State University, Baton Rouge (783-12-13)

4:20– 4:35 (184) *Hyperplane sections and order extensions.* Preliminary report. D. W. DUBOIS, University of New Mexico, and T. RECIO*, Universidad de Malaga, Spain (783-14-6)

4:40– 5:10 (185) *The strong topology on real algebraic varieties.* NIELS SCHWARTZ, Mathematisches Institut der Universität München, Federal Republic of Germany (783-14-2)

5:20– 6:00 Problem session

WEDNESDAY, 2:10 P. M.

Special Session on Qualitative Theory of Differential Equations. II, Continental Parlor 8

2:10– 2:30 (186) *Oscillation criteria for Bianchi equations.* Preliminary report. Dr. NORIO YOSHIDA, Iwate University, Japan (783-35-20) (Introduced by Professor Kurt Kreith)

2:40– 3:00 (187) *Boundedness of solutions of higher order ordinary differential equations.* Preliminary report. TAKAŜI KUSANO* and MANABU NAITO, Hiroshima University, Japan (783-34-8)

3:10– 3:30 (188) *Transformations of certain partial differential operators.* Preliminary report. Professor C. D. AHLBRANDT, University of Missouri, Columbia, Professor D. H. HINTON, University of Tennessee, Knoxville, and Professor R. T. LEWIS*, University of Alabama, Birmingham (783-35-19)

3:40– 4:00 (189) *Equivalence of Riccati operators.* Preliminary report. Professor CALVIN D. AHLBRANDT, University of Missouri, Columbia (783-34-11)

4:10– 4:30 (190) *Asymptotic theory of perturbed general disconjugate equations.* Professor WILLIAM F. TRENCH, Drexel University (783-34-18)

4:40– 5:00 (191) *Asymptotic behavior of solutions of generalized Thomas-Fermi equations.* Professor JOHN R. GRAEF* and Professor PAUL W. SPIKES, Mississippi State University, and Professor MYRON K. GRAMMATIKOPOULOS, University of Ioannina, Greece (783-34-24)

5:10– 5:30 (192) *Asymptotic behaviour of linear differential systems.* Professor JAMES S. MULDOWNEY, University of Alberta (783-34-37)

5:40– 6:00 (193) *Comparison theorems for differential equations in abstract spaces.* Professor G. J. BUTLER* and Professor L. H. ERBE, University of Alberta (783-34-31)

WEDNESDAY, 2:10 P. M.

Special Session on Topics in Complex Variables. II, Continental Parlor 3

2:10– 2:30 (194) *On the logarithmic derivative of monotone slit mappings.* Professor ALBERT BAERNSTEIN II, Washington University (783-30-20)

2:40– 3:00 (195) *Univalent functions with large late coefficients.* Preliminary report. Professor CARL H. FITZGERALD, University of California, San Diego (783-30-37)

3:10– 3:30 (196) *Interpolation, continuation, and quadratic inequalities.* Professor WALTER HENGARTNER, Université Laval (783-30-36) (Introduced by Professor Glenn Schober)

3:40–4:00 (197) *Approximation in the mean and harmonic continuation.* JAMES E. BRENNAN, University of Kentucky (783-30-45)

4:10– 4:30 (198) *Inequalities for derivatives at fixed points of an analytic function in the unit disk.* Preliminary report. Professor CARL C. COWEN*, Purdue University, and Professor CHRISTIAN POMMERENKI, Technische Universität Berlin, Federal Republic of Germany (783-30-39)

4:40– 5:00 (199) *Cyclic elements in some spaces of analytic functions.* Professor BORIS KORENBLUM, State University of New York, Albany (783-30-16)

5:00– 5:30 (200) *Cyclic vectors in the Dirichlet space.* Professor LEON BROWN, Wayne State University, and Professor ALLEN SHIELDS*, University of Michigan, Ann Arbor (783-30-47)

5:40– 6:00 (201) *Cauchy transforms of certain subalgebras of $C(T)$.* Preliminary report. Professor DAVID A. STEGENGA, University of Hawaii, Honolulu (783-30-48) (Introduced by Professor Glenn Schober)

WEDNESDAY, 2:15 P. M.

Invited Address, Continental Ballroom

(202) *Stabilization in algebraic K-theory.* Professor R. KEITH DENNIS, Cornell University (783-18-10)

WEDNESDAY, 2:15 P. M.

Session on Combinatorics. I, Rosewood Suite

2:15– 2:25 (203) *Elementary proofs of certain vector partition identities.* Preliminary report. Dr. BRUCE E. SAGAN, University of Michigan, Ann Arbor (783-05-61)

2:30– 2:40 (204) *A new combinatorial proof for Lagrange inversion.* Professor GILBERT LABELLE, Université du Québec, Montréal (783-05-63)

2:45– 2:55 (205) *Stocking theorems for generalized Pascal triangles.* Dr. DONALD R. SNOW, Brigham Young University (783-05-73)

3:00– 3:10 (206) *Counting royal trips.* Preliminary report. Professor ROBERT L. WILSON, JR., Washington and Lee University (783-05-47)

3:15– 3:25 (207) *Paving segments with triominoes.* Preliminary report. AARON MEYEROWITZ, Colorado State University (783-05-66)

3:30– 3:40 (208) *Algorithm for tiling a regular $2n$-gon with $[n/2]$ rhombs and $[((n-1)/2)^2]$ pairs of rhombs.* Professor ALAN H. SCHOEN, Southern Illinois University, Carbondale (783-05-58) (Introduced by Paul Bankston)

3:45– 3:55 (209) *Fibinomial coefficients and triangular categories.* Professor PIERRE LEROUX, Université du Québec, Montréal (783-05-64)

4:00– 4:10 (210) *The r-major index.* Dr. DON RAWLINGS, California Polytechnic State University (783-05-48)

4:15– 4:25 (211) *Some partial results on the circulant Hadamard matrix conjecture.* Preliminary report. Professor JAMES H. McKAY and Professor STUART S.-S. WANG*, Oakland University (783-05-70)

4:30– 4:40 (212) *A class of (0, 1)-matrices covering a given matrix.* Dr. RICHARD ANSTEE, University of Waterloo (783-05-53)

4:45– 4:55 (213) *A global code invariant under the Higman-Sims group.* Dr. ROBERT CALDERBANK*, Bell Laboratories, Murray Hill, and Dr. DAVID WALES, California Institute of Technology (783-05-65)

5:00– 5:10 (214) *Generalized quadrangles and the Higman-Sims technique.* Preliminary report. Dr. J. A. THAS, University of Ghent, Belgium, and Dr. S. E. PAYNE*, Miami University (783-05-1)

5:15– 5:25 (215) *Periods of subsequences of periodic sequences.* Professor G. R. BLAKLEY* and Professor G. B. PURDY, Texas A&M University (783-05-76)

5:30– 5:40 (216) *Aperiodic words on three symbols* III. Professor ROBERT O. SHELTON* and Professor RAJ PAL SONI, University of Tennessee, Knoxville (783-05-46)

5:45– 5:55 (217) *Factorial series and umbral algebras.* JOHN M. FREEMAN, Florida Atlantic University (783-05-75) (Introduced by Frederick Hoffman)

WEDNESDAY, 2:15 P. M.

Session on Commutative Rings and Algebras, Lassen Room

2:15– 2:25 (218) *A class of semi-group rings whose associated graded rings are Cohen-Macaulay.* Preliminary report. Professor SHERWOOD WASHBURN, Seton Hall University (783-13-6)

2:30– 2:40 (219) *On overrings of a domain.* Preliminary report. Professor NICK VAUGHAN, North Texas State University (783-13-12)

2:45– 2:55 (220) *Every finite abelian group is the Brauer group of a ring.* Dr. TIMOTHY FORD, Colorado State University (783-13-1)

3:00– 3:10 (221) *Prime divisors and flat extensions.* RAYMOND C. HEITMANN, University of Texas, Austin (783-13-8)

3:15– 3:25 (222) *Filtrations with finite power type on Noetherian domains.* Preliminary report. Professor WAYNE W. BISHOP*, California State University, Los Angeles, and Professor JOHN W. PETRO, Western Michigan University (783-13-9)

3:30– 3:40 (223) *A note on the power invariant rings.* Preliminary report. Dr. J. H. KIM, East Carolina University (783-13-14)

3:45– 3:55 (224) *Comaximal decompositions and the maximal ideal spectrum.* Professor JOHN W. PETRO, Western Michigan University (783-13-10)

4:00– 4:10 (225) *The Laskerian property in commutative rings.* Professor WILLIAM HEINZER, Purdue University, and Professor DAVID LANTZ*, Colgate University (783-13-3)

4:15– 4:25 (226) *On the invariance of homological properties under algebra retraction.* Professor ALAN B. EVANS, Vassar College (783-13-4)

4:30– 4:40 (227) *Affine surfaces and cancellation of torsion-free modules.* Preliminary report. Professor ROGER WIEGAND, University of Nebraska, Lincoln (783-13-7)

4:45– 4:55 (228) *"Going up" in a graded ring.* Preliminary report. CHARLES C. HANNA, United States Naval Academy (783-13-15)

5:00– 5:10 (229) *The generalized transform and integral closure.* Preliminary report. Professor JON L. JOHNSON, Elmhurst College (783-13-13)

5:15– 5:25 (230) *Algebraic power series on the disc are rational.* Professor DAVID HARBATER, University of Pennsylvania, Philadelphia (783-13-11)

WEDNESDAY, 2:15 P. M.

Session on Computer Science and Applied Mathematics, Shasta Room

2:15– 2:25 (231) *What is an implementation?* Preliminary report. Dr. JIM KEETON-WILLIAMS, The MITRE Corporation, Bedford, Massachusetts (783-68-5)

2:30– 2:40 (232) *Matrix multiplication and twisted polynomial algebras.* Preliminary report. DAVE RIFFELMACHER, Bell Laboratories, Holmdel (783-68-4)

2:45– 2:55 (233) *Analyzing Petri nets using homomorphisms.* Preliminary report. Professor RICHARD JOHNSONBAUGH, Chicago State University (783-68-2) (Introduced by Nancy Johnson)

3:00– 3:10 (234) *Modern computing methods with Roman numerals.* JAMES G. KENNEDY*, Hughes Aircraft Co., Los Angeles, and JANE I. ROBERTSON, Ann Arbor, Michigan (783-68-3) (Introduced by J. G. Wendel)

3:15– 3:25 (235) *Root-finding algorithms in algebraic settings.* Preliminary report. Dr. DON GOELMAN, Villanova University (783-68-7)

3:30– 3:40 (236) *An algorithm for translating formulas in a Morse system.* Dr. ROBERT A. ALPS, The Wyatt Co., Chicago (783-68-8) (Introduced by Professor Robert C. Neveln)

3:45– 3:55 (237) *Morse languages: syntax and inference.* Professor ROBERT C. NEVELN, University of Texas, Austin (783-68-6)

4:00– 4:10 (238) *The encoding of arbitrary surfaces.* Preliminary report. Dr. GERHARD X. RITTER*, University of Florida, and Dr. STEPHANIE M. BOYLES, Bell Laboratories, Holmdel (783-68-1)

4:15– 4:25 (239) *An algorithm for the Rubik cube.* Dr. GLORIA G. GAGOLA, Texas A&M University (783-90-4)

4:30– 4:40 (240) *A problem in geometric optimization.* Preliminary report. Dr. PETER F. ASH, University of Massachusetts, Boston (783-90-3) (Introduced by Geza Schay)

4:45– 4:55 (241) *Subsets of S_n which are single-peaked.* Preliminary report. Dr. CATHERINE M. MURPHY, Purdue University, Calumet (783-90-1)

5:00– 5:10 (242) *Second-order sufficiency conditions for nondifferentiable programming problems.* Professor R. W. CHANEY, Western Washington University (783-90-5)

5:15– 5:25 (243) *Minimal message space dimension and the structure of $C^\infty(R^N, R^M)$.* STEVEN R. WILLIAMS, Northwestern University (783-90-6)

5:30– 5:40 (244) *Minimax inspection policies.* Professor HARVEY DIAMOND, West Virginia University (783-90-7)

WEDNESDAY, 2:15 P. M.

Session on Differential Geometry. I, Toyon Suite

2:15– 2:25 (245) *Curvature and causality in Lorentzian manifolds.* Dr. GREGORY J. GALLOWAY, University of Miami (783-53-10)

2:30– 2:40 (246) *An axiomatic presentation of parallel transport.* Preliminary report. Dr. WALTER A. POOR, Center for Naval Analyses, Alexandria (783-53-3)

2:45– 2:55 (247) *An analogue of the complex tangent bundle for complex-foliated manifolds.* Professor ALICE M. DEAN, Smith College (783-53-14)

3:00– 3:10 (248) *Bundle-like foliations.* Preliminary report. RICHARD H. ESCOBALES, JR., Canisius College (783-53-25)

3:15– 3:25 (249) *Geometry of almost contingent manifolds as applied in general relativity.* K. L. DUGGAL*, University of Windsor, and E. D. MOSKAL, University of Waterloo (783-53-8)

3:30– 3:40 (250) *A class of Einstein metrics with negative curvature.* Preliminary report. Professor EDWARD D. DELOFF, California State College, San Bernardino (783-53-27)

3:45– 3:55 (251) *Equivariant geometry and Kervaire spheres.* Preliminary report. Professor WU-YI HSIANG, University of California, Berkeley, and Professor ALLEN BACK*, Cornell University (783-53-15)

4:00– 4:10 (252) *The determination of the volume of Blaschke manifolds of the homotopy type of complex projective spaces.* C. T. YANG, University of Pennsylvania (783-52-4)

4:15– 4:25 (253) *An inequality between the volume and convexity radius of a Riemannian manifold.* JAMES J. HEBDA, Michigan State University (783-53-20)

4:30– 4:40 (254) *Semisimple subgroups of transitive Riemannian isometry groups.* Dr. CAROLYN S. GORDON, Lehigh University (783-53-28)

4:45– 4:55 (255) *Isometry groups on homogeneous nilmanifolds.* Professor EDWARD N. WILSON, Washington University (783-53-7)

WEDNESDAY, 2:15 P. M.

Session on Functional Analysis. II, Continental Parlor 2

2:15– 2:25 (256) *Precursors of the Hahn-Banach theorem—Another look at the problem of measure.* Professor JOHN J. SACCOMAN, Seton Hall University (783-46-19)

2:30– 2:40 (257) *Spaces of Baire functions and P-spaces.* Professor C. T. TUCKER, University of Houston (783-46-48)

2:45– 2:55 (258) *The measure spectrum of a uniform algebra and subharmonicity.* Professor DONNA KUMAGAI, Pennsylvania State University, Hazleton (783-46-4)

3:00– 3:10 (259) *On the isomorphic classification of spaces of continuous functions defined on intervals of ordinal numbers.* Dr. MARCEL A. LABBÉ, Collège Militaire Royal de Saint-Jean, (783-46-3)

3:15– 3:25 (260) *Sequence spaces and two-norm spaces.* P. K. SUBRAMANIAN, Missouri Southern State College (783-46-43)

3:30– 3:40 (261) *Prediction in Orlicz spaces.* Preliminary report. Dr. RICHARD B. DARST, Colorado State University, and Dr. DAVID A. LEGG and Dr. DOUGLAS W. TOWNSEND*, Indiana University-Purdue University, Fort Wayne (783-46-22)

3:45– 3:55 (262) *Reflexivity through uniform convexity for a class of Orlicz spaces and applications to some variational problems involving nonlinear Hill's equations.* Preliminary report. Professor PIERRE A. VUILLERMOT, Emory University (783-46-14)

4:00– 4:10 (263) *Banach spaces of unbounded linear functionals on l_p spaces.* Preliminary report. RONALD E. RIETZ, Gustavus Adolphus College (783-46-45)

4:15– 4:25 (264) *Isometries and L^p-structure of Bochner L^p-spaces.* Dr. PETER GREIM, Freie Universitaet, West Germany (783-46-5)

4:30– 4:40 (265) *Some Banach spaces on which all biholomorphic automorphisms are linear.* Preliminary report. R. J. FLEMING and J. E. JAMISON*, Memphis State University (783-46-54)

4:45– 4:55 (266) *An extension theorem for disjointly additive functionals on L^p, $0 < p < 1$.* Preliminary report. Professor JUDITH A. PALAGALLO, University of Akron (783-46-30)

5:00– 5:10 (267) *The differentiability with respect to a parameter of the solution of a linear abstract Cauchy problem.* Professor DENNIS W. BREWER, University of Arkansas, Fayetteville (783-46-36)

5:15– 5:25 (268) *On the geometry of the Bergman space over the unit disc.* Professor M. GOLDSTEIN, Arizona State University, and Professor S. SWAMINATHAN*, Dalhousie University (783-46-50)

5:30– 5:40 (269) *A duality result for unique minimality of Fourier projections.* Professor PETER D. MORRIS, Pennsylvania State University, University Park (783-46-20)

WEDNESDAY, 2:15 P. M.

Session on General Systems and Ordered Groups, Whitney Room

2:15– 2:25 (270) *Subsets of the class of sur-real numbers.* Preliminary report. Professor HARRY GONSHOR, Rutgers University, New Brunswick (783-08-1)

2:30– 2:40 (271) *A decomposition theory in double coset and orbit spaces.* Preliminary report. Dr. JAMES W. FERNANDEZ, General Motors Institute (783-08-2)

2:45– 2:55 (272) *Representations of posets and a bilinear form.* S. YUZVINSKY, University of Oregon (783-06-9)

3:00– 3:10 (273) *A characterization of atoms in σ-complete Riesz spaces.* Preliminary report. Dr. JOHN T. ANNULIS, University of Arkansas, Monticello (783-06-17)

3:15– 3:25 (274) *Completions of semigroups with Conrad's order.* Dr. MARLOW ANDERSON, Indiana University-Purdue University, Fort Wayne (783-06-15)

3:30– 3:40 (275) *A representation theorem for distributive l-monoids.* Dr. C. C. EDWARDS* and Dr. MARLOW ANDERSON, Indiana University-Purdue University, Fort Wayne (783-06-16)

3:45– 3:55 (276) *Free products in the class of abelian l-groups.* Professor WAYNE B. POWELL*, Oklahoma State University, Stillwater, and Professor CONSTANTINE TSINAKIS, Vanderbilt University (783-06-6)

4:00– 4:10 (277) *The distributive lattice free product as a sublattice of the abelian l-group free product.* Professor WAYNE B. POWELL, Oklahoma State University, Stillwater, and Professor CONSTANTINE TSINAKIS*, Vanderbilt University (783-06-7)

4:15– 4:25 (278) *Characterizing varieties of lattice-ordered groups.* Preliminary report. Dr. JO E. SMITH, General Motors Institute (783-06-12)

4:30– 4:40 (279) *Quasi-varieties of lattice-ordered groups.* Preliminary report. ASHOK KUMAR, Bowling Green State University (738-06-10)

WEDNESDAY, 2:15 P. M.

Session on General Topology. II, Dolores Room

2:15– 2:25 (280) *A note on transformation groups with an invariant measure.* Preliminary report. Professor JEONG S. YANG, University of South Carolina, Columbia (783-54-29)

2:30– 2:40 (281) *Dynamical systems: countability and stability.* Dr. GARY FAULKNER, Dr. JOHN FRANKE*, and Dr. LUDVIK JANOS, North Carolina State University (783-54-19)

2:45– 2:55 (282) *P-equicontinuity and P-locally weakly almost periodicity in flows.* Dr. SABER ELAYDI, University of Kuwait (783-54-3)

3:00– 3:10 (283) *Periods of periodic points of maps of the circle which have a fixed point.* Dr. LOUIS BLOCK, University of Florida (783-54-7)

3:15– 3:25 (284) *A counterexample to the bounded orbit conjecture.* Dr. STEPHANIE M. BOYLE, Bell Laboratories, Holmdel (783-54-12)

3:30– 3:40 (285) *ϵ-covering dimension.* Professors WILLIAM JULIAN*, RAY MINES, FRED RICHMAN, and ALLAN CALDER, New Mexico State University, Las Cruces (783-54-24)

3:45– 3:55 (286) *The complete tunnel axiom.* Professor PETER J. NYIKOS, University of South Carolina, Columbia (783-54-34)

4:00– 4:10 (287) *Orderable subspaces of Stone-Čech remainders.* Preliminary report. Dr. SCOTT W. WILLIAMS, Institute for Medicine and Mathematics, Athens (783-54-14)

4:15– 4:25 (288) *Topological extensions and subspaces of η_α sets.* PAUL BANKSTON, Southern Illinois University, Carbondale (783-54-5)

4:30– 4:40 (289) *w^* and $w\dagger$.* Preliminary report. Dr. STEVEN GLAZER, Floral Park, New York (783-54-39)

4:45– 4:55 (290) *A note on duality in S and L spaces.* Professor GEORGE M. REED, Ohio University and NSF, Washington, D.C. (783-54-33)

5:00– 5:10 (291) *Topologies generated by a minimal collection of compacta.* Preliminary report. Dr. JOE A. GUTHRIE, University of Texas, El Paso (783-54-26)

5:15– 5:25 (292) *A classical construction of β-like compactifications.* Preliminary report. Dr. MICHAEL J. D'AMBROSA, Seton Hall University (783-54-37)

5:30– 5:40 (293) *Singular remainders.* RICHARD E. CHANDLER and GARY D. FAULKNER*, North Carolina State University (783-54-10)

5:45– 5:55 (294) *New characterizations of $u(i)$ spaces.* Preliminary report. M. SOLVEIG ESPEILIE*, JAMES E. JOSEPH, and MYUNG H. KWACK, Howard University (783-54-35)

WEDNESDAY, 2:15 P. M.

Session on Graph Theory. II, Teakwood Suite

2:15– 2:25 (295) *Restricted vertices of T-graphs.* Dr. FUAD MULLA, University of Kuwait, Kuwait (783-05-31)

2:30– 2:40 (296) *A relationship among triangulated graphs, comparability graphs, proper interval graphs, proper circular-arc graphs, and nested interval graphs.* Preliminary report. DALE J. SKRIEN, Colby College (783-05-36)

2:45– 2:55 (297) *Voltage-graphic matroids.* THOMAS ZASLAVSKY, Ohio State University, Columbus (783-05-62)

3:00– 3:10 (298) *Tough graphs with large cyclability.* Dr. MARC J. LIPMAN, Naval Research Laboratory and Purdue University, Fort Wayne (783-05-29)

3:15– 3:25 (299) *The bandwidth and other invariants of the Möbius ladder.* Professor PHYLLIS ZWEIG CHINN, Humboldt State University (783-05-39)

3:30– 3:40 (300) *On elegant graphs.* Preliminary report. Professor D. FRANK HSU, Fordham University (783-05-69)

3:45– 3:55 (301) *Domination critical graphs.* Preliminary report. Professor DAVID P. SUMNER, University of South Carolina, Columbia (783-05-67)

4:00– 4:10 (302) *Packing trees in complete graphs. III.* Preliminary report. Professor ARTHUR M. HOBBS, Texas A&M University (783-05-68)

4:15– 4:25 (303) *Caps with constant elimination number as strongly regular sets.* Dr. RICHARD A. GAMES* and Professor DIJEN K. RAY-CHAUDHURI, Ohio State University, Columbus (783-05-60)

4:30– 4:40 (304) *Tight subdesigns of symmetric designs and $G_2(d)$ graphs.* Professor A. BAARTMANS and Professor M. S. SHRIKHANDE*, Southern Illinois University, Carbondale (783-05-42)

4:45– 4:55 (305) *Finite discrete linear strings with periodicities.* RONALD B. KIRK and CARL E. LANGENHOP*, Southern Illinois University, Carbondale (783-05-51)

5:00– 5:10 (306) *A lower bound for the order of a graph in terms of the diameter and minimum degree.* Professor DONALD L. GOLDSMITH*, Western Michigan University, Professor BENNET MANVEL, Colorado State University, and Dr. VANCE FABER, Los Alamos Scientific Laboratory (783-05-41)

5:15– 5:25 (307) *On the maximal number of disjoint chains connecting given terminals in a graph.* A. K. KELMANS, Institute of Control Sciences, Moscow, USSR, and M. V. LOMONOSOV*, Institute for Problems of Information Transmission, Moscow, USSR (783-05-49)

5:30– 5:40 (308) *How can a subset of vertices of a graph not lie on a cycle?* A. K. KELMANS*, Institute of Control Sciences, Moscow, USSR, and M. V. LOMONOSOV, Institute for Problems of Information Transmission, Moscow, USSR (783-05-50)

WEDNESDAY, 2:15 P. M.

Session on Group Theory. I, Walnut Suite

2:15– 2:25 (309) *Isomorphic hyperbolic orthogonal groups over arbitrary domains.* Professor JAMES H. FREEMAN, University of Notre Dame (783-20-45)

2:30– 2:40 (310) *Automorphisms and fitting factors of finite groups.* Professor M. R. PETTET, Texas A&M University (783-20-26)

2:45– 2:55 (311) *Normal p-subgroups in the outer automorphism group of a finite p-group.* Dr. DAWN RICKARD SHAPIRO, General Motors Institute (783-20-22)

3:00– 3:10 (312) *On the number of outer automorphisms of an infinite nilpotent p-group. II.* Professor JOSEPH BUCKLEY*, Western Michigan University, and Professor JAMES WIEGOLD, University College, United Kingdom (783-20-5)

3:15– 3:25 (313) *Preradicals in abelian groups.* TEMPLE FAY, ED OXFORD*, and GARY WALLS, University of Southern Mississippi (783-20-4)

3:30– 3:40 (314) *Two generator groups. II.* J. L. BRENNER*, Palo Alto, and JAMES WIEGOLD, University College, United Kingdom (783-20-1)

3:45– 3:55 (315) *A general construction for groups with identical subgroup structures.* Preliminary report. Dr. CHARLES S. HOLMES, Miami University, Oxford (783-20-31)

4:00– 4:10 (316) *Products of fuzzy subgroups.* Professor H. SHERWOOD, University of Central Florida (783-20-41)

4:15– 4:25 (317) *Homomorphisms onto a free group.* Professor JOHN R. STALLINGS, University of California, Berkeley (783-20-28)

4:30– 4:40 (318) *A theorem on basic commutators.* Preliminary report. Professor ANTHONY M. GAGLIONE, United States Naval Academy (783-20-18)

4:45– 4:55 (319) *Solutions of quadratic equations in small-cancellation groups.* Preliminary report. CLAUDE W. ANDERSON III, University of Illinois, Urbana-Champaign (783-20-32)

5:00– 5:10 (320) *Quadratic exponential equations over free groups.* Professor LEO P. COMERFORD, JR.*, University of Wisconsin, Parkside, and Professor CHARLES C. EDMUNDS, Mount Saint Vincent University (783-20-34)

5:15– 5:25 (321) *On verbal embeddings of a free associative ring in a group.* Dr. KENNETH W. WESTON, University of Wisconsin, Parkside (783-20-48)

WEDNESDAY, 2:15 P. M.

Session on Partial Differential Equations. I, Cypress Room

2:15– 2:25 (322) *Liouville theorems for elliptic systems and nonlinear equations of fourth order.* Professor PHILIP W. SCHAEFER*, University of Tennessee, Knoxville, and Professor VINOD B. GOYAL, Kurukshetra University, India (783-35-27)

2:30– 2:40 (323) *The Riemann problem for a class of hyperbolic conservation laws exhibiting a parabolic degeneracy.* Professor BARBARA L. KEYFITZ, Arizona State University, and Professor HERBERT C. KRANZER*, Adelphi University (783-35-15)

2:45– 2:55 (324) *Stability results for solutions of reaction diffusion equations by the method of quasi-solutions.* Dr. A. S. VATSALA, Oklahoma State University (783-35-17)

3:00– 3:10 (325) *Solutions for a flux-dependent diffusion model.* Dr. JONATHAN BELL*, Dr. WILLY BERTIGER, and CHRIS COSNER, Texas A&M University (783-35-18)

3:15– 3:25 (326) *Functionally independent solutions to certain systems of nonlinear first order partial differential equations.* Preliminary report. Professor GREGORY A. FREDRICKS, Texas Tech University (783-35-22)

3:30– 3:40 (327) *On the threshold problem for FitzHugh-Nagumo equations.* Professor C. CORDUNEANU, University of Texas, Arlington (783-35-26)

3:45– 3:55 (328) *Jordan algebras and evolution equations.* P. DEAN GERBER, IBM Thomas J. Watson Research Center (783-35-38)

4:00– 4:10 (329) *The structure at a corner of the eigenfunctions of a clamped plate.* Professor CHARLES V. COFFMAN, Carnegie-Mellon University (783-35-39) (Introduced by Carole L. Grover)

4:15– 4:25 (330) *The elliptic boundary value problem on non-compact domains.* Preliminary report. Dr. ALBERT K. ERKIP, Middle East Technical University, Turkey (783-35-41) (Introduced by Professor Erasan Akyildiz)

4:30– 4:40 (331) *Pointwise a priori bounds for strongly coupled semilinear systems of parabolic partial differential equations.* CHRIS COSNER, Texas A&M University (783-35-23)

4:45– 4:55 (332) *Boundary values of parabolic functions.* Professor H. S. BEAR, University of Hawaii, Honolulu (783-35-9)

5:00– 5:10 (333) *Asymptotic behavior for a delay-diffusion model.* Preliminary report. Dr. DAVID GREEN, JR.*, General Motors Institute, and Dr. HARLAN W. STECH, Virginia Polytechnic Institute and State University (783-35-7)

5:15– 5:25 (334) *Characteristic methods for evolution equations.* Professor MARC BERGER and Professor ALAN SLOAN*, Georgia Institute of Technology (783-35-40)

WEDNESDAY, 2:15 P. M.

Session on Real Functions, Measure and Integration Theory, Continental Parlor 1

2:15– 2:25 (335) *Comparing the Kakutani and Bauer representations.* Preliminary report. Professor DONALD G. HARTIG, California Polytechnic State University (783-28-4) (Introduced by Professor Jack Levine)

2:30– 2:40 (336) *Weakly compact and unconditionally converging operators on continuous function spaces.* Preliminary report. Professor RUSSELL G. BILYEU and Professor PAUL W. LEWIS*, North Texas State University (783-28-5)

2:45– 2:55 (337) *Representation of convex functionals as integrals.* Professor P. C. DELIYANNIS*, Illinois Institute of Technology, and Professor J. C. WENGER, Loop College (783-28-8)

3:00– 3:10 (338) *Geometry and the Pettis integral.* Professor ROBERT F. GEITZ, Oberlin College (783-28-7)

3:15– 3:25 (339) *Continuous homomorphisms of Bernoulli schemes.* A. DEL JUNCO, Ohio State University, M. KEANE, Technische Hogeschool Delft, The Netherlands, B. KITCHENS and B. MARCUS, University of North Carolina, and LAIF SWANSON*, Texas A&M University (783-28-6)

3:30– 3:40 (340) *Finite signed measures on function spaces.* Dr. A. J. VAN HAAGEN, Southern Illinois University, Carbondale (783-28-2)

3:45– 3:55 (341) *A unified treatment of the 'bootstrap' theorems of real analysis.* Professor MORTON L. SLATER*, Texas Christian University, and KENNETH W. EVANS, Elbert, Colorado (783-28-3)

4:00– 4:10 (342) *Invariants groups of finitely additive extensions of Lebesgue measure.* STANLEY WAGON, Smith College (783-28-1)

4:15– 4:25 (343) *Bimeasurable functions.* Preliminary report. DAN MAULDIN, North Texas State University, Denton (783-26-4)

4:30– 4:40 (344) *Baire classes of functions.* Professor PAUL D. HUMKE*, St. Olaf College, and Dr. G. V. COX, TRW Systems (738-26-1)

4:45– 4:55 (345) *Relative goodness of a function and its decreasing rearrangement.* Preliminary report. Professor J. MARSHALL ASH, DePaul University (783-26-2)

5:00– 5:10 (346) *Approximation of functions of several variables.* Preliminary report. Dr. CAREN L. DIEFENDERFER, Hollins College (783-26-3)

WEDNESDAY, 3:30 P. M.

Invited Address, Continental Ballroom

(347) *Some geometrical aspects of representations of Lie groups.* Professor MICHELE VERGNE, Massachusetts Institute of Technology (783-22-8)

WEDNESDAY, 3:30 P. M.

Session on Linear Algebra and Matrix Theory, Diablo Room

3:30– 3:40 (348) *A result about isometries in characteristic two.* Preliminary report. Dr. DAVID R. RICHMAN, University of Illinois, Urbana-Champaign (783-15-16)

3:45– 3:55 (349) *The G-numerical range.* Professor MARVIN MARCUS and MARKUS SANDY*, University of California, Santa Barbara (783-15-4)

4:00– 4:10 (350) *Nonnegative spectraloid matrices.* Preliminary report. Professor EMERIC DEUTSCH, Polytechnic Institute of New York (783-15-13)

4:15– 4:25 (351) *Equivalence classes of certain transformations on vector spaces over a finite field.* Professor JOEL V. BRAWLEY*, Clemson University, and Professor JACK LEVINE, North Carolina State University (783-15-11)

4:30– 4:40 (352) *Matrix equivalence over a finite field,* II. Preliminary report. Professor GARY L. MULLEN, Pennsylvania State University, Sharon (783-15-3)

4:45– 4:55 (353) *The number of elements in submodules of* $(Z_m)^s$. Preliminary report. Dr. JOHN A. HOWELL, Franklin and Marshall College (783-15-9) (Introduced by Dr. A. Feldman)

5:00– 5:10 (354) *Semi-similarity for matrices over a division ring.* Preliminary report. Dr. ROBERT E. HARTWIG*, and Dr. MOHAN S. PUTCHA, North Carolina State University (783-15-10) (Introduced by Professor Jack Levine)

5:15– 5:25 (355) *Some spectral properties of polar decomposition.* Professor BRYAN E. CAIN, Iowa State University (783-15-12)

5:30– 5:40 (356) *Some duality theorems for nonnegative rank factorizations.* Preliminary report. Dr. MELVYN W. JETER* and Dr. W. C. PYE, University of Southern Mississippi (783-15-5)

5:45– 5:55 (357) *A reverse order law for integral generalized inverses of integral matrices.* Preliminary report. Dr. JIMMIE D. GILBERT, Louisiana Tech University (783-15-6)

WEDNESDAY, 8:30 P. M.

Fifty-fourth Josiah Willard Gibbs Lecture, Continental Ballroom

(358) *The mathematical approach to the sonic barrier.* Professor CATHLEEN S. MORAWETZ, Courant Institute of Mathematical Sciences

THURSDAY, 8:00 A. M.

Special Session on History of Mathematics. I, Continental Parlors 1 and 2

8:00– 8:20 (359) *Major figures in the history of the prime number theorem.* PAUL T. BATEMAN, University of Michigan, Ann Arbor (783-01-6)

8:30– 8:50 (360) *Functional analysis in the theory of partial differential equations.* Preliminary report. Professor LARS GÅRDING, University of Lund, Sweden (783-01-12)

9:00– 9:20 (361) *Influences of population biology on the development of some areas of mathematics.* Professor FRANK C. HOPPENSTEADT, University of Utah (783-01-15)

9:30– 9:50 (362) *Origins of turning point theory.* Professor WOLFGANG WASOW, University of Wisconsin, Madison (783-01-13)

10:00–10:20 (363) *Thermodynamics—an example of Unordnung and fruehes Leid.* Professor CLIFFORD A. TRUESDELL, Johns Hopkins University (783-01-11)

THURSDAY, 8:00 A. M.

Special Session on Low Dimensional Topology. III, Cabrillo Room

8:00– 8:20 (364) *Some new surfaces of general type.* Preliminary report. Professor RICHARD MANDELBAUM, University of Rochester (783-57-17)

8:25– 8:45 (365) *The complex of curves on nonorientable surfaces.* MARTIN G. SCHARLEMANN, University of California, Santa Barbara (783-57-7)

8:50– 9:10 (366) *Building contractible 4-manifolds.* Professor RONALD J. STERN, University of Utah (783-57-31)

9:15– 9:35 (367) *The second homotopy group of the complement of 3-manifolds in the 5-sphere.* Preliminary report. Professor S. J. LOMONACO, JR., University of Oregon (783-57-19)

9:40–10:00 (368) *Dehn surgery and satellite knots.* Professor CAMERON McA. GORDON, University of Texas, Austin (783-57-16)

10:05–10:25 (369) *Fibered ribbon knots.* Preliminary report. Professor A. J. CASSON*, Trinity College, Cambridge, England, and Professor CAMERON McA. GORDON, University of Texas, Austin (783-57-27)

THURSDAY, 8:00 A. M.

Special Session on Number Theory. III, Continental Parlor 7

8:00– 8:20 (370) *On the representation theory for full decomposable forms.* Professor STAN GURAK, University of San Diego (783-12-9) (Introduced by Professor Audrey Terras)

8:25– 8:45 (371) *Polynomials and primitive roots in finite fields.* Professor DANIEL J. MADDEN, University of Arizona (783-10-2)

8:50– 9:10 (372) *Asymptotic behavior of number fields with prescribed l-class numbers.* Professor FRANK GERTH III, University of Texas, Austin (783-12-2)

9:15– 9:35 (373) *The existence of a Weber-Hecke ring class field theory.* Professor HARVEY COHN, City University of New York, City College (783-10-5)

9:40–10:00 (374) *Cubic index forms modulo discriminant divisors.* Preliminary report. Professor JAMES G. HUARD, Niagara University (783-12-16)

10:05–10:25 (375) *The computation of pure cubic units.* Preliminary report. Professor A. O. L. ATKIN, University of Illinois, Chicago Circle (783-10-12)

THURSDAY, 8:00 A. M.

Special Session on Operator Algebras and K-Theory. III, Anza Room

8:00– 8:20 (376) *σ-C*-algebras and tangent algebras.* Professor WILLIAM ARVESON, University of California, Berkeley (783-46-55)

8:30– 9:10 (377) *A survey on Novikov conjecture.* Preliminary report. WU-CHUNG HSIANG, Princeton University (783-55-37)

9:20–10:10 (377A) Problem session led by Professor EDWARD GEORGE EFFROS

THURSDAY, 8:00 A. M.

Special Session on Ordered Fields and Real Algebraic Geometry. III, Balboa Room

8:00– 8:10 Introductions

8:10– 8:25 (378) *On quadratic forms and abelian varieties over real function fields.* Preliminary report. Professor A. PFISTER, University of Mainz, Federal Republic of Germany (783-14-1) (Introduced by Professor Donald W. Dubois)

8:30– 8:45 (379) *Real points and real places.* Dr. HEINZ-WERNER SCHUELTING, Universität Dortmund, Federal Republic of Germany (783-12-6)

8:50– 9:05 (380) *Rigid elements in fields and valuation rings.* Professor ROGER WARE, Pennsylvania State University, University Park (783-12-5)

9:10– 9:25 (381) *Ordered fields and valuation theory.* Professor ANTONIO JOSÉ ENGLER and Professor T. M. VISWANATHAN*, Universidade Estadual de Campinas, Brazil (783-12-38)

9:30– 9:45 (382) *A logic method for sums of squares and positive definite functions on real algebraic varieties.* Professor DANIELLE GONDARD, Université de Paris VI, France (783-14-14)

9:50–10:05 (383) *Real places and branches.* ARTHUR BUKOWSKI, University of Alaska, Anchorage (783-12-37) (Introduced by Professor Donald W. Dubois)

10:10–10:25 (384) *Higher-order phenomena in real algebra.* Preliminary report. Professor GREGORY W. BRUMFIEL, Stanford University (783-13-2)

THURSDAY, 8:00 A. M.

Special Session on Qualitative Theory of Differential Equations. III, Continental Parlor 8

8:00– 8:20 (385) *Nonhomogeneous boundary conditions in the space of bounded variations.* Preliminary report. Professor SUNG J. LEE, Pan American University (783-34-3)

8:30– 8:50 (386) *A disfocality function for a nonlinear ordinary differential equation.* Professor ALLAN C. PETERSON, University of Nebraska, Lincoln (783-34-28)

9:00– 9:20 (387) *Uniqueness-existence of solutions of right focal point boundary value problems for ordinary differential equations.* JOHNNY HENDERSON, University of Nebraska, Lincoln (783-34-1)

9:30– 9:50 (388) *Matrix differential systems and matrix Möbius transformations.* BINYAMIN SCHWARZ, Technion-Israel Institute of Technology, Israel (783-34-21)

10:00–10:20 (389) *Properties of disconjugate linear differential operators.* Professor W. J. KIM, State University of New York, Stony Brook (783-34-7)

THURSDAY, 8:00 A. M.

Special Session on Topics in Complex Variables. III, Continental Parlor 3

8:00– 8:20 (390) *L^∞ estimates for the $\bar{\partial}$ problem.* Preliminary report. PETER W. JONES, University of Chicago (783-30-3)

8:30– 8:50 (391) *Quasi-isometries and Lipschitz classes.* Professor F. W. GEHRING, University of Michigan, Ann Arbor (783-30-38)

9:00– 9:20 (392) *Uniqueness of Hahn-Banach extensions from a space of analytic functions.* Professor EDGAR REICH, University of Minnesota, Minneapolis (783-30-13)

9:30– 9:50 (393) *Meromorphic functions and their derivatives.* Preliminary report. DAVID DRASIN, Purdue University (783-30-27)

10:00–10:20 (394) *Approximation of entire functions by rational functions on* $[0,\infty)$. Preliminary report. W. H. J. FUCHS, Cornell University (783-30-26)

THURSDAY, 8:00 A. M.

Session on Applied Mathematics. I, Toyon Suite

8:00– 8:10 (395) *A Hopf bifurcation in the Hodgkin-Huxley equations.* Preliminary report. Dr. JOSEPH M. McDONOUGH, West Virginia University (783-92-5)

8:15– 8:25 (396) *Optimal vaccination strategies for the control of an epidemic.* Professor THOMAS HAIGH, St. John's University, Minnesota (783-92-9)

8:30– 8:40 (397) *The optimal harvesting of populations with continuous age structure.* LEA F. MURPHY, Oregon State University (783-92-4) (Introduced by Morton E. Gurtin)

8:45– 8:55 (398) *Cyclic regulations of population size by genetic feedback—existence of periodic solutions of a mathematical model.* Dr. FERN HUNT, Howard University (783-92-7)

9:00– 9:10 (399) *Dynamic model of population smoking-quitting behavior.* Preliminary report. Professor KUANG-HO CHEN, Stanford University School of Medicine (783-92-1)

9:15– 9:25 (400) *Immigration in the Leslie matrix model.* Dr. KENNETH LANE*, Hamilton College, and Dr. LINDA HILL, Idaho State University (783-92-2)

9:30– 9:40 (401) *Estimation of the dimensionality of the ability space underlying a psychological test.* Preliminary report. Professor MICHAEL LEVINE and Professor WILLIAM STOUT*, University of Illinois, Urbana-Champaign (783-92-6) (Introduced by Professor Carl G. Jockusch, Jr.)

9:45– 9:55 (402) *Consistent statistical estimation of psychological test parameters.* Preliminary report. Professor MICHAEL LEVINE* and Professor WILLIAM STOUT, University of Illinois, Urbana-Champaign (783-92-8) (Introduced by Professor Carl G. Jockusch, Jr.)

10:00–10:10 (403) *Catastrophe theory and the rule of the case.* Professor R. KEOWN, University of Arkansas, Fayetteville (783-92-3)

10:15–10:25 (404) *Continuous social decision procedures.* Professor EDWARD W. PACKEL*, Lake Forest College, and Professor JOHN A. FEREJOHN, California Institute of Technology (783-90-2)

THURSDAY, 8:00 A. M.

Session on Associative Algebras, Lassen Room

8:00– 8:10 (405) *Some applications of a theorem of Joachim Heinze.* Professor V. K. SRINIVASAN, University of Texas, El Paso (783-16-6)

8:15– 8:25 (406) Non-cocommutative divided power sequences. Preliminary report. Professor EARL J. TAFT, Rutgers University, New Brunswick (783-16-4)

8:30– 8:40 (407) *A necessary and sufficient condition for a Lie algebra to be proper.* Professor WALTER J. MICHAELIS, University of Montana (783-16-7)

8:45– 8:55 (408) *Graded Artin algebras.* Professor ROBERT GORDON*, Temple University, and Professor EDWARD L. GREEN, Virginia Polytechnic Institute and State University (783-16-8)

9:00– 9:10 (409) *The Gelfand-Kirillov dimension of the preprojective algebras.* Professor V. J. DLAB*, Carleton University, and C. M. RINGEL, Universität Bielefeld, Federal Republic of Germany (783-16-14)

9:15– 9:25 (410) *Non-singular FPF rings.* Preliminary report. Professor STANLEY S. PAGE, University of British Columbia (783-17-2)

THURSDAY, 8:00 A. M.

Session on Functional Analysis. III, Teakwood Suite

8:00– 8:10 (411) *On the correspondence between Beurling distributions on the line and on the circle.* Professor M. GARY COLLIER*, The Citadel, and Professor JOHN A. KELINGOS, Vanderbilt University (783-46-11)

8:15– 8:25 (412) *Representation of compact and weakly compact operators on the space of Bochner integrable functions.* Professor KEVIN T. ANDREWS, Texas A&M University (783-46-39)

8:30– 8:40 (413) *An application to a product theorem for the Radon-Nikodým property.* Preliminary report. Dr. AGGIE G. HO, Iowa State University (783-46-52)

8:45– 8:55 (414) *Automatic continuity of Banach algebras of lower triangular matrices.* Preliminary report. Dr. JOHN TRIPP, Southeast Missouri State University (783-46-44)

9:00– 9:10 (415) *Continuity of positive functionals on topological *-algebras.* Professor DAVID L. JOHNSON, University of Arkansas, Fayetteville (783-46-28)

9:15– 9:25 (416) *Vector lattice representation theorems.* Dr. HUEYTZEN J. WU, Texas A & I University (783-46-8)

9:30– 9:40 (417) *A convergence structure for lattice-ordered algebras.* Preliminary report. Professor WILLIAM A. FELDMAN, University of Arkansas, Fayetteville (783-46-40)

9:45– 9:55 (418) *On weakly compact operators on Banach lattices.* Professor C. D. ALIPRANTIS* and Professor O. BURKINSHAW, Indiana University-Purdue University, Indianapolis (783-46-24)

10:00–10:10 (419) *Positive compact operators on Banach lattices.* Professor C. D. ALIPRANTIS and Professor O. BURKINSHAW*, Indiana University-Purdue University, Indianapolis (783-46-23)

10:15–10:25 (420) *Uniqueness of representation spaces for Banach lattices.* Preliminary report. Professor JAMES F. PORTER* and Professor WILLIAM A. FELDMAN, University of Arkansas, Fayetteville (783-46-41)

10:30–10:40 (421) *A factorization theorem in Banach lattices and its application to Lorentz spaces.* Dr. SHLOMO REISNER, Texas A&M University (783-46-17)

THURSDAY, 8:00 A. M.

Session on General Topology. III, Dolores Room

8:00– 8:10 (422) *Decompositions of Σ^3 into arcs.* Preliminary report. ARLO W. SCHURLE, University of North Carolina, Charlotte (783-54-32)

8:15– 8:25 (423) *The equivalence of zero span and zero semispan.* JAMES F. DAVIS, California State University, Sacramento (783-54-17)

8:30– 8:40 (424) *Almost continuous images of Peano continua.* Professor KENNETH R. KELLUM, California State University, Sacramento (783-54-22) (Introduced by Professor Charles L. Hagopian)

8:45– 8:55 (425) *Characterizations of arboroids and dendritic spaces.* Dr. T. B. MUENZENBERGER*, Kansas State University, Dr. R. E. SMITHSON, University of Wyoming, and Dr. L. E. WARD, JR., University of Oregon, Eugene (783-54-11)

9:00– 9:10 (426) *Decomposition spaces of solenoid.* Dr. NEELIMA SHRIKHANDE, Southern Illinois University, Carbondale (783-54-13) (Introduced by M. S. Shrikhande)

9:15– 9:25 (427) *An almost continuous retract without the fixed point property.* Preliminary report. Professor B. D. GARRETT, University of Alabama (783-54-16)

9:30– 9:40 (428) *Metrization of spaces of ANR's.* Preliminary report. Professor ZVONKO ČERIN, University of Oklahoma (783-54-41)

9:45– 9:55 (429) *On inverse convergence of sets, inverse limits, and homotopy regularity.* Professor LOUIS F. McAULEY*, State University of New York, Binghamton, and Professor ERIC E. ROBINSON, Ithaca College (783-54-28)

10:00–10:10 (430) *A Vietoris theorem in CG-shape.* Professor THOMAS J. SANDERS, U. S. Naval Academy (783-54-2)

10:15–10:25 (431) *On nonexpansive selfmappings of compact spaces.* LUDVIK JANOS, University of Maryland, College Park (783-54-23)

10:30–10:40 (432) *Closed continuous mappings onto q-spaces.* Preliminary report. Professor H. H. WICKE* and Professor J. M. WORELL, JR., Ohio University, Athens (783-54-36)

THURSDAY, 8:00 A. M.

Session on Global Analysis. II, Rosewood Suite

8:00– 8:10 (433) *On the Morse-Tompkins and Shiffman theory and Plateau's problem.* Professor THEMISTOCLES M. RASSIAS, Mathematics Institute, Bonn, West Germany (783-58-6)

8:15– 8:25 (434) *A solution to a problem of S. M. Ulam and a new characterization of the sphere.* Professor GEORGE M. RASSIAS, University of Bonn, West Germany (783-57-5)

8:30– 8:40 (435) *Codimension one spheres in R^n with double tangent balls.* Professor L. DUANE LOVELAND and Professor DAVID G. WRIGHT*, Utah State University (783-57-29)

8:45– 8:55 (436) *Piecewise linear embeddings of R^∞-manifolds.* Professor RICHARD E. HEISEY, Vanderbilt University (783-57-22)

9:00– 9:10 (437) *Classification of discontinuities.* Dr. MARWAN AWARTANI*, Birzeit University, Israel, and Dr. SAMIR KHABBAZ, Lehigh University (783-55-28) (Introduced by Gilbert Stengle)

9:15– 9:25 (438) *A symplectic fixed point theorem on open manifolds.* Professor MICHAEL COLVIN and Professor KENT MORRISON*, California Polytechnic State University (783-58-4)

9:30– 9:40 (439) *Completely unstable flows on n-manifold.* Preliminary report. SUDHIR K. GOEL, Bowling Green State University (783-58-25)

9:45– 9:55 (440) *On the growth of meromorphic functions over a parabolic manifold.* Dr. CHEN-HAN SUNG, University of Notre Dame (783-58-13)

10:00–10:10 (441) *Rate of approach to minima and sinks.* Dr. HELENA S. WISNIEWSKI, Seton Hall University (783-58-2)

10:15–10:25 (442) *Trivially covered foliations.* Preliminary report. SUE E. GOODMAN, University of North Carolina, Chapel Hill (783-58-19)

10:30–10:40 (443) *Removing isolated fixed points of index zero.* Professor MORTON BROWN, University of Michigan, Ann Arbor (783-57-24)

THURSDAY, 8:00 A. M.

Session on Numerical Analysis. I, Walnut Suite

8:00– 8:10 (444) *The method of lines for elliptic partial differential equations.* Preliminary report. Professor BRUCE H. EDWARDS, University of Florida (783-65-3)

8:15– 8:25 (445) *Computational experience with a single phase Stefan problem.* Dr. NEIL EKLUND*, Centre College, and Dr. ALAN SOLOMON and Dr. D. G. WILSON, Union Carbide Corporation (783-35-25)

8:30– 8:40 (446) *Continuation methods for solving a singular equation with a small parameter.* Professor TAI-CHI LEE, University of North Florida (783-65-7)

8:45– 8:55 (447) *Numerical solution of a beam deflection problem.* GILBERT N. LEWIS, Michigan Technological University (783-65-1)

9:00– 9:10 (448) *An effective test of controllability with applications.* Professor BISWA NATH DATTA, Pennsylvania State University, University Park (783-65-10) (Introduced by Professor A. Wouk)

9:15– 9:25 (449) *Continuous and semicontinuous analogues of iterative methods of Cimmino and Kaczmarz.* Professor M. ZUHAIR NASHED, University of Delaware (783-65-17)

9:30– 9:40 (450) *On convergence of three point monotone difference schemes with irregular spatial differencing.* RICHARD SANDERS, University of California, Los Angeles (783-65-2)

9:45– 9:55 (451) *Optimization of multistep methods.* RICHARD F. HANEY, University of Maine, Orono (783-65-8)

10:00–10:10 (452) *Numerical methods for high resolution in advecting flows.* Dr. CHARLES FENIMORE, National Bureau of Standards (783-65-12)

10:15–10:25 (453) *Dominant integrability of functions of two variables.* Mr. NARAYAN S. MURTHY*, University of Rhode Island, Dr. CHARLES F. OSGOOD, Naval Research Laboratory, and Professor OVED SHISHA, University of Rhode Island (783-65-11)

10:30–10:40 (454) *Parameters for integrating periodic functions of several variables.* SEYMOUR HAVER, National Bureau of Standards (783-65-13)

THURSDAY, 8:00 A. M.

Session on Partial Differential Equations. II, Cypress Room

8:00– 8:10 (455) *Boundary value problem for nonlinear second order stochastic differential equations of Îto-type.* Dr. JAGDISH CHANDRA, U.S. Army Research Office, Durham, and Professor G. S. LADDE*, and Professor V. LAKSHMIKANTHAM, University of Texas, Arlington (783-34-36)

8:15– 8:25 (456) *Monotone schemes for semilinear elliptic systems related to ecology.* Preliminary report. Professor ANTHONY W. LEUNG, University of Cincinnati (783-35-35)

8:30– 8:40 (457) *Regularity and existence to the optimal stopping time problem with controls on the diffusion coefficients.* SUZANNE LENHART, University of Kentucky (783-35-37)

8:45– 8:55 (458) *A hyperbolic problem.* Dr. ABDELOUAHAB EL-KOHEN, University of Wisconsin, Madison (783-35-33)

9:00– 9:10 (459) *Global solution of a Riemann problem for a non-strictly hyperbolic system arising in enhanced oil recovery.* Dr. ELI L. ISAACSON, Rockefeller University (783-35-45)

9:15– 9:25 (460) *On Carleman estimates.* Professor MONTY J. STRAUSS, Texas Tech University (783-35-1)

9:30– 9:40 (461) *Global existence for a class of* 2 X 2 *nonlinear conservation laws with arbitrary Cauchy data.* Preliminary report. J. BLAKE TEMPLE, Rockefeller University (783-35-46)

9:45– 9:55 (462) *On a class of nonlinear singular integro-differential equations.* Professor MARK J. ABLOWITZ, Clarkson College (783-35-24)

10:00–10:10 (463) *Integral inequalities in n independent variables.* Preliminary report. Professor EUTIQUIO C. YOUNG, Florida State University (783-35-3)

THURSDAY, 8:00 A. M.

Session on Set Theory, Logic and Foundations, Diablo Room

8:00– 8:10 (464) *Extension theorems and* $V = L$. Preliminary report. Professor MARGARET M. LASALLE, University of Southwestern Louisiana (783-03-7)

8:15– 8:25 (465) *Expansions of models of* ω*-stable theories.* Preliminary report. STEVEN BUECHLER, University of Maryland, College Park (783-03-5)

8:30– 8:40 (466) *P-genericity for recursively enumerable sets.* Professor MICHAEL A. INGRASSIA, Western Illinois University (783-03-6)

8:45– 8:55 (467) *Recursive function theory in semigroups.* VARDEMAN G. MOORE, Texas Tech University (783-03-8)

9:00– 9:10 (468) *The order indiscernibles of real closed fields.* Preliminary report. DAVID A. ROSENTHAL, University of Wisconsin, Madison (783-03-1)

9:15– 9:25 (469) *The reduction property usually fails for invariant sets.* Preliminary report. PETER NASH, University of California, Berkeley (783-03-4)

9:30– 9:40 (470) *A generalization of the determinateness property of games.* Preliminary report. Dr. BARRY BURD, Drew University (783-03-3) (Introduced by Professor Edward Chillak)

9:45– 9:55 (471) *Consequences of an infinite exponent partition relation.* Preliminary report. RONALD J. WATRO, State University of New York, Buffalo (783-04-2)

10:00–10:10 (472) *On a generalization of hugeness.* Professor JULIUS BARBANEL, Union College, Schenectady (783-04-4)

10:15–10:25 (473) *A characterization of 2-square ultrafilters.* Preliminary report. Professor NED I. ROSEN, Union College, Schenectady (783-04-3)

10:30–10:40 (474) *A set that meets each line in the plane exactly twice.* Dr. RUSSELL A. SMUCKER, Kalamazoo College (783-04-1)

THURSDAY, 9:00 A. M.

Special Session on Mathematical Physics. III, Continental Parlor 9

9:00– 9:50 (475) *Singular spectrum of Schrödinger operators.* BARRY SIMON, Princeton University and California Institute of Technology (783-81-1)

10:00–10:30 (476) *Perturbation theory in large orders for the Zeeman Hamiltonian.* Professor JOSEPH AVRON, California Institute of Technology and Princeton University (783-99-2)

THURSDAY, 9:30 A. M.

Invited Address, Continental Ballroom

(477) *Some problems in the cohomology of algebraic groups.* Professor JAMES E. HUMPHREYS, University of Massachusetts, Amherst (783-20-21)

THURSDAY, 10:45 A. M.

Retiring Presidential Address, Continental Ballroom

(478) *The influence of computing on mathematics.* Professor PETER D. LAX, Courant Institute of Mathematical Sciences

THURSDAY, 1:00 P. M.

Colloquium Lectures: Lecture II, Continental Ballroom

(479) *Some mathematical problems suggested by questions in physics.* Professor MARK KAC, Rockefeller University

THURSDAY, 2:10 P. M.

Special Session on Differential Geometry and Global Analysis. I, Balboa Room

2:10– 2:30 (480) *The eta invariant for a class of elliptic boundary value problems.* PETER B. GILKEY*, University of Southern California, and LAWRENCE SMITH, Courant Institute of Mathematical Sciences (783-58-12)

2:35– 2:55 (481) *Web geometry and partial differential equations.* Preliminary report. Professor ROBERT B. GARDNER, University of North Carolina, Chapel Hill (783-58-15)

3:05– 3:25 (482) *Some regularity theorems in Riemannian geometry.* DENNIS M. DETURCK, Courant Institute of Mathematical Sciences, and JERRY L. KAZDAN*, University of Pennsylvania (783-53-33)

3:35– 3:55 (483) *Noether's theorem and completely integrable partial differential equations.* Dr. WILLIAM F. SHADWICK, University of North Carolina, Chapel Hill (783-58-7)

THURSDAY, 2:10 P. M.

Special Session on Elliptic Systems in the Plane. I, Continental Parlor 3

2:10– 2:40 (484) *Analytic hypoellipticity of first order systems and extendability of CR functions.* Preliminary report. Professor M. S. BAOUENDI*, Purdue University, and Professor F. TREVES, Rutgers University, New Brunswick (783-35-43)

2:50– 3:20 (485) *On vector fields in the plane that annihilate only the constant functions.* FRANÇOIS TREVES, Rutgers University, New Brunswick (783-35-8)

3:25– 3:55 (486) *Complex characteristics and Fourier transform.* LEON EHRENPREISS, Yeshiva University

THURSDAY, 2:10 P. M.

Special Session on Graph Theory. I, Anza Room

2:10– 2:25 (487) *Graph coloring algorithms.* Preliminary report. Professor BENNET MANVEL, Colorado State University (783-05-25)

2:30– 2:45 (488) *Connected graphs with complementary edge-orbits.* ELLEN GETHNER and Professor JOAN P. HUTCHINSON*, Smith College (783-05-12)

2:50– 3:05 (489) *Powers and centers of chordal graphs.* Dr. RENU LASKAR*, Clemson University, and Dr. D. R. SHIER, National Bureau of Standards (783-05-14)

3:10– 3:25 (490) *Homogeneously n-traceable graphs.* Preliminary report. Dr. CURTISS E. WALL*, Old Dominion University, and Dr. GARY CHARTRAND and Dr. LINDA LESNIAK-FOSTER, Western Michigan University (783-05-4)

3:30– 3:45 (491) *The traceability of a graph.* Dr. GARY CHARTRAND and Dr. LINDA LESNIAK-FOSTER*, Western Michigan University, Dr. JOHN K. COOPER, Eastern Michigan University, and Dr. CURTISS E. WALL, Old Dominion University (783-05-8)

THURSDAY, 2:10 P. M.

Special Session on Homotopy Theory. I, Dolores Room

2:10– 2:30 (492) *The extension and classification of multiplicative structures.* Preliminary report. Dr. C. A. McGIBBON, Indiana University, Bloomington (783-55-17)

2:35– 2:55 (493) *Exponents of Postnikov systems.* CHARLES McGIBBON, Indiana University, Bloomington, and JOSEPH NEISENDORFER*, Institute for Advanced Study (783-55-1)

3:05– 3:25 (494) *The Hurewicz homomorphism and finite H-spaces.* MICHAEL E. CHISHOLM, University of Washington (783-55-12)

3:35– 3:55 (495) *Two torsion in the cohomology of finite H-spaces.* Professor JAMES P. LIN, University of California, San Diego (783-55-19)

THURSDAY, 2:10 P. M.

Special Session on Number Theory. IV, Continental Parlor 7

2:10– 2:30 (496) *On the central limit theorem for theta series.* Professor W. B. JURKAT, Syracuse University, and Professor JOHN VAN HORNE*, State University of New York, Binghamton (783-10-9)

2:35– 2:55 (497) *A p-adic Dedekind sum.* Preliminary report. Professor KENNETH H. ROSEN* and Professor WILLIAM M. SNYDER, University of Maine, Orono (783-10-51)

3:05– 3:25 (498) *On octic fields of exponent* 2. Preliminary report. Professor ANDREW M. BAILY, Michigan State University (783-12-12)

3:35– 3:55 (499) *An upper bound in asymptotic diophantine approximations with reduced fractions.* Preliminary report. Dr. JOHN SADOWSKY, Hadron Incorporated, McLean, Virginia (783-10-6)

THURSDAY, 2:10 P. M.

Special Session on Quadratic Form Theory. I, Continental Parlor 9

2:10– 2:30 (500) *On the classification of integral quadratic forms.* Preliminary report. Professor J. S. HSIA, Ohio State University, Columbus (783-10-15)

2:35– 2:55 (501) *Exceptional integers of a genus of ternary quadratic forms.* Professor ANDREW G. EARNEST, University of Southern California (783-10-17)

3:05– 3:25 (502) *A conjecture concerning finitely generated Witt rings.* Professor MURRAY MARSHALL, University of Saskatchewan (783-12-3)

3:35– 3:55 (503) *Quotient quaternionic mappings.* Preliminary report. Professor JOSEPH L. YUCAS, Southern Illinois University, Carbondale (783-10-7)

THURSDAY, 2:15 P. M.

Invited Address, Continental Ballroom

(504) *An explicit solution of classical and quantum field theory models and parallel arithmetical problems. A unified approach.* Professor GREGORY V. CHUDNOVSKY, Columbia University (783-10-57)

THURSDAY, 2:15 P. M.

Session on Banach Algebras, Toyon Suite

2:15– 2:25 (505) *A Stone-Weierstrass theorem for double centralizer algebras.* Professor ROBERT A. FONTENOT, Whitman College (783-46-32)

2:30– 2:40 (506) *The geometric structure of generalized state spaces.* Professor R. R. SMITH* and Professor J. D. WARD, Texas A&M University (783-46-53)

2:45– 2:55 (507) *On tracial linear maps of C*-algebras.* Professor SZE-KAI TSUI, Oakland University (783-46-46)

3:00– 3:10 (508) *Transformation group C*-algebras with continuous trace.* DANA P. WILLIAMS, Texas A&M University (783-46-16)

3:15– 3:25 (509) *On the irreducibility of an induced representation.* II. Professor JOHN C. QUIGG, Villanova University (783-46-35)

3:30– 3:40 (510) *An F. and M. Riesz theorem for W*-dynamical systems.* Dr. JON KRAUS, State University of New York, Buffalo (783-46-38)

3:45– 3:55 (511) *Asymptotic commutants and zeros of von Neumann algebras.* SZE-KAI TSUI and STEVE WRIGHT*, Oakland University (783-46-37)

THURSDAY, 2:15 P. M.

Session on Group Theory. II, Teakwood Suite

2:15– 2:25 (512) *Projective class group of the symmetric group.* Preliminary report. Dr. ANDREW MATCHETT, Texas A&M University (783-20-14)

2:30– 2:40 (513) *Formation theory in groups with min-p for all primes p.* Dr. MARTYN R. DIXON, Southern Illinois University (783-20-9)

2:45– 2:55 (514) *Irreducible subgroups of unitary and orthogonal groups generated by long root groups.* Dr. AGNES ANDREASSIAN, Central College (783-20-23)

3:00– 3:10 (515) *On the Lie algebra of a finite group of Lie type.* MASAHARU KANEDA* and Professor GARY M. SEITZ, University of Oregon (783-20-33)

3:15– 3:25 (516) *Irreducible representations of finite groups of Lie type through block theory and special conjugacy classes.* RICHARD A. BOYCE, Ohio State University, Columbus (783-20-39)

3:30– 3:40 (517) *Rational representations and permutation representations of Q-groups.* Preliminary report. Professor DENNIS KLETZING, Stetson University (783-20-8)

3:45– 3:55 (518) *Real characters, double covers, and the multiplier.* II. Preliminary report. Dr. STEPHEN M. GAGOLA, JR., and Dr. SIDNEY C. GARRISON*, Texas A&M University (783-20-29)

THURSDAY, 2:15 P. M.

Session on History and Mathematical Education, Continental Parlors 1 and 2

2:15– 2:25 (519) *Seeking help in mathematics: is it a sex-related trait?* Preliminary report. JULIA PHOEBE KENNEDY, Georgia State University (783-98-4)

2:30– 2:40 (520) *Mathematics in the humanities.* Professor JAMES R.C. LEITZEL, Ohio State University, Columbus (783-98-1)

2:45– 2:55 (521) *Staying alive—some ideas on faculty development.* Preliminary report. Dr. RON BARNES, University of Houston, Downtown College (783-98-3) (Introduced by Dr. Robert Stafford)

3:00– 3:10 (522) *A program to encourage creativity in mathematics.* PAUL FJELSTAD, Paracollege of St. Olaf College (783-98-2) (Introduced by Professor J. Arthur Seebach, Jr.)

3:15– 3:25 (523) *Albertus Magnus and mathematics.* Professor ANTHONY LO BELLO, Allegheny College (783-01-8)

3:30– 3:40 (524) *Some historical observations on the Rayleigh-Ritz method.* Preliminary report. FRANK WILLIAMSON, JR., Ramapo College (783-01-4)

3:45– 3:55 (525) *The concept of point and its effect on the foundations of mathematics.* Dr. ALVIN C. SUGAR, Los Angeles, California (783-03-2)

THURSDAY, 2:15 P. M.

Session on Low Dimensional Topology, Cabrillo Room

2:15– 2:25 (526) *The topological structure of 3-pseudomanifolds.* Professor AMOS ALTSHULER*, Temple University, and Professor ULRICH BREHM, Albert-Ludwigs-Universität, West Germany (783-57-14)

2:30– 2:40 (527) *The relationship between the Heegaard genus and the Morse characteristic of a 3-manifold.* Professor JOHN D. BLANTON, St. John Fisher College (783-57-21)

2:45– 2:55 (528) *Homeomorphisms of non-irreducible 3-manifolds.* Preliminary report. JOHN KALLIONGIS, University of Connecticut, Storrs (783-57-26)

3:00– 3:10 (529) *Boundary-fixed homeomorphisms of compact 2-manifolds.* Preliminary report. Professor DAVID J. SPROWS, Villanova University (783-57-23)

3:15– 3:25 (530) *Cyclic branched coverings of CP^2.* Professor ANATOLY LIBGOBER, University of Illinois, Chicago Circle (783-57-18)

3:30– 3:40 (531) *One-relator knots are prime.* Dr. FREDERICK NORWOOD, Institute for Advanced Study (783-57-6)

3:45– 3:55 (532) *Doubled branched covers of pretzel knots.* Preliminary report. Professor RICHARD E. BEDIENT, Hamilton College (783-57-13)

THURSDAY, 2:15 P. M.

Session on Nonassociative Rings and Algebras, Rosewood Suite

2:15– 2:25 (533) *Distributive property of quasi-domains.* Preliminary report. Dr. HALA O. PFLUGFELDER, Temple University (783-17-3)

2:30– 2:40 (534) *A generalization of the 2nd Whitehead lemma.* Preliminary report. SCOTT M. FARRAND, University of California, San Diego (783-17-7)

2:45– 2:55 (535) *Radicals and homotopes of Jordan algebras.* Professor LESLIE HOGBEN, Iowa State University (783-17-1)

3:00– 3:10 (536) *Ideal theory of loop algebras.* Professor JAMES F. HURLEY*, University of Connecticut, Storrs, and JUN MORITA, Tsukuba University, Japan (783-17-5)

3:15– 3:25 (537) *Cohomology of restricted Lie algebras.* Preliminary report. JOYCE O'HALLORAN, University of Notre Dame (783-17-4)

3:30– 3:40 (538) *Constant term identities for finite and affine root systems.* Preliminary report. WALTER G. MORRIS, University of Wisconsin, Madison (783-17-6)

THURSDAY, 2:15 P. M.

Session on Numerical Analysis. II, Walnut Suite

2:15– 2:25 (539) *A numerical method for a class of weakly singular integral equations of the second kind.* Preliminary report. Professor L. J. LARDY, Syracuse University (783-65-6)

2:30– 2:40 (540) *Multiple solutions and bifurcations of finite difference approximations to some model fluid dynamics problems.* Dr. A. B. STEPHENS* and Dr. G. R. SHUBIN, Naval Surface Weapons Center (783-65-14)

2:45– 2:55 (541) *The numerical approximation of functions with a finite number of poles.* Preliminary report. Professor THOMAS E. PRICE, JR., University of Akron (783-65-9)

3:00– 3:10 (542) *Approximation with exponential sums and splines.* Dr. LUDWIG J. CROMME, University of California, Berkeley (783-65-5) (Introduced by Professor Steve Smale)

3:15– 3:25 (543) *Tchebycheff approximation of continuous functions on conic sections by harmonic polynomials.* Dr. WILLIAM D. SHOAFF, Murray State University (783-65-4)

3:30– 3:40 (544) *A numerical algorithm for solving Fredholm integral equations with displacement kernels.* Professor R. C. ALLEN*, University of New Mexico, and Dr. G. P. BOICOURT, Los Alamos Scientific Laboratory (783-65-15) (Introduced by W. T. Kyner)

3:45– 3:55 (545) *Parameter curve fitting to points and tangents.* Preliminary report. DAVID FERGUSON* and JAMES PHILLIPS, Boeing Computer Services (783-65-16)

THURSDAY, 2:15 P. M.

Session on Several Complex Variables, Continental Parlor 8

2:15– 2:25 (546) *On a distortion problem for starlike functions.* Professor ALBERT SCHILD, Temple University (783-30-34)

2:30– 2:40 (547) *Families of analytic discs with boundaries on a non-generic CR manifold.* Professor GERALDINE A. TAIANI, Pace University (783-32-8)

2:45– 2:55 (548) *Zeros of functions of finite order on the ball.* Professor WILLIAM F. MOSS and Professor NICHOLAS J. WEYLAND*, Georgia Institute of Technology (783-32-6)

3:00– 3:10 (549) *Holomorphic functions in tubes which have distributional boundary values and which are H^p functions.* Preliminary report. Professor RICHARD D. CARMICHAEL and Professor STEPHEN P. RICHTERS*, Wake Forest University (783-32-5)

3:15– 3:25 (550) *On the rate of growth of the means of holomorphic and pluriharmonic functions on the ball.* Preliminary report. Dr. MANFRED STOLL, University of South Carolina, Columbia (783-32-7)

3:30– 3:40 (551) *Fatou's theorem and its converse for positive pluriharmonic functions.* Preliminary report. WADE RAMEY* and DAVID ULLRICH, University of Wisconsin, Madison (783-32-3)

3:45– 3:55 (552) *Fatou's theorem and its converse for positive pluriharmonic functions.* II. WADE RAMEY and DAVID ULLRICH*, University of Wisconsin, Madison (783-32-10)

THURSDAY, 2:15 P. M.

Session on Special Functions, Lassen Room

2:15– 2:25 (553) *Applications of the expansion theorem in the umbral calculus.* Preliminary report. Professor PAUL N. DE LAND, California State University, Fullerton (783-33-3)

2:30– 2:40 (554) *Leibniz' rule in the umbral calculus.* Preliminary report. Professor HARRIS S. SHULTZ, California State University, Fullerton (783-33-4)

2:45– 2:55 (555) *Monotonicity properties of the zeros of Bessel functions.* ROGER C. McCANN, Mississippi State University (783-33-1)

3:00– 3:10 (556) *Series of Szegö polynomials as hyperfunctions.* Dr. AHMED I. ZAYED, California Polytechnic State University (783-33-5)

3:15– 3:25 (557) *Nonnegativity of the coefficients in the linearization of the product of continuous q-Jacobi polynomials.* Professor GEORGE GASPER, Northwestern University (783-33-2)

THURSDAY, 4:00 P. M.

1981 Oswald Veblen Prize in Geometry, Continental Ballroom

THURSDAY, 5:00 P. M.

Business Meeting, Continental Ballroom

THURSDAY, 7:30 P. M.

Special Session on Low Dimensional Topology. IV, Continental Parlors 1 and 2

7:30– 7:50 (558) *Homology cobordisms, link concordances, and hyperbolic 3-manifolds.* Professor ROBERT MYERS, Oklahoma State University, Stillwater (783-57-3)

7:55– 8:15 (559) *Standard spines of the cube are 1-collapsible.* Professor DALE ROLFSEN*, University of British Columbia, and Professor DAVID GILLMAN, University of California, Los Angeles (783-57-10) (Introduced by Professor S. J. Lomonaco)

8:20– 8:40 (560) *Singular sets of 3-orbifolds with underlying space S^3.* Preliminary report. WILLIAM D. DUNBAR, University of Colorado, Boulder (783-51-3)

8:45– 9:05 (561) *Solid tubes around short geodesics in hyperbolic 3-manifolds.* Preliminary report. ROBERT MEYERHOFF, University of Colorado, Boulder (783-51-4)

9:10– 9:30 (562) *Some Brieskorn homology 3-spheres which bound contractible manifolds.* Preliminary report. CLAY FICKLE, University of California, Santa Barbara (783-57-28)

9:35– 9:55 (563) *Dehn twists and handlebodies of genus two.* ROBERT KRAMER, Louisiana State University, Baton Rouge (783-57-2)

THURSDAY, 7:30 P. M.

Session on Differential Geometry. II, Continental Parlor 3

7:30– 7:40 (564) *The multidimensional four-web generated by four hypersurfaces of a projective space.* Professor VLADISLAV V. GOLDBERG, Lehigh University (783-53-1)

7:45– 7:55 (565) *Local analytic isometric deformations.* HOWARD JACOBOWITZ, Rutgers University, Camden (783-53-19)

8:00– 8:10 (566) *Null sectional curvature and Robertson-Walker spaces.* Preliminary report. Professor STEVEN G. HARRIS, Brown University (783-53-23)

8:15– 8:25 (567) *On the sectional curvature of holomorphic curvature operators.* Preliminary report. Professor IGNACIO GUERRERO, University of Georgia, and Professor STANLEY M. ZOLTEK*, George Mason University (783-53-9)

8:30– 8:40 (568) *A Gauss-Bonnet theorem for a smooth complex of dimension two.* Preliminary report. Professor GERALD R. CHACHERE, Howard University (783-53-29)

8:45– 8:55 (569) *Stability of minimal submanifolds in symmetric spaces.* Preliminary report. Professor BANG-YEN CHEN, Michigan State University, FRED LEUNG, University of Notre Dame, and Professor TADASHI NAGANO*, University of Notre Dame (783-53-22)

9:00– 9:10 (570) *An average process in the calculus of variations.* Professor S. WALTER WEI, University of Hawaii, Honolulu (783-53-26)

9:15– 9:25 (571) *The geometry of rolling curves.* Dr. LEE WHITT* and Dr. JOHN BLOOM, Texas A&M University (783-53-17)

FRIDAY, 1:00 P. M.

Colloquium Lectures: Lecture III, Continental Ballroom

(572) *Some mathematical problems suggested by questions in physics.* Professor MARK KAC, Rockefeller University

FRIDAY, 1:00 P. M.

Special Session on the Classification of Finite Simple Groups. I, Continental Parlors 7 and 8

1:00– 1:25 (573) *Standard form problems for finite groups.* Professor MICHAEL ASCHBACHER, California Institute of Technology (783-20-11)

1:30– 1:55 (574) *Finite simple groups with exceptional standard subgroups.* Professor RONALD SOLOMON, Ohio State University, Columbus (783-20-6)

2:00– 2:50 (575) *The classification of small simple groups of characteristic 2-type.* Professor GEOFFREY MASON, University of California, Santa Cruz (783-20-7) (Introduced by Professor Michael Aschbacher)

3:00– 3:25 (576) *The embedding of 2-locals in finite groups of characteristic two type.* Professor M. ASCHBACHER, California Institute of Technology, and Professor D. GORENSTEIN and Professor R. LYONS*, Rutgers University, New Brunswick (783-20-43)

3:30– 3:55 (577) *They came from the* 196883*rd dimension—the friendly giant and his happy family of sporadic groups.* ROBERT L. GRIESS, JR., University of Michigan, Ann Arbor (783-20-40)

4:00– 4:50 (578) *Finite groups with standard components of Lie type over fields of characteristic two.* Professor ROBERT H. GILMAN*, Stevens Institute of Technology, and Professor ROBERT L. GRIESS, JR., University of Michigan, Ann Arbor (783-20-44)

FRIDAY, 1:00 P. M.

Special Session on Differential Geometry and Global Analysis. II, Balboa Room

1:00– 1:20 (579) *Spectra of manifolds with small handles.* Professor ISAAC CHAVEL*, City College of the City University of New York, and Professor EDGAR A. FELDMAN, Graduate Center of the City University of New York (783-58-26)

1:30– 1:50 (580) *The isoperimetric inequality in maximal surfaces.* FRANCIS J. FLAHERTY, Oregon State University (783-53-24)

2:00– 2:20 (581) *The unoriented Hopf ring and the signature ring.* Professor HOWARD OSBORN, University of Illinois, Urbana-Champaign (783-57-1)

2:30– 2:50 (582) *Toward embedded surfaces of constant mean curvature.* Professor ROBERT GULLIVER, University of Minnesota and Stanford University (783-53-31)

3:00– 3:20 (583) *On conformal images of flat submanifolds.* Professor DAVID E. BLAIR, Michigan State University (783-53-6)

3:30– 3:50 (584) *Brownian motion, negative curvature, and harmonic mappings of bounded dilatation.* Preliminary report. Professor SAMUEL I. GOLDBERG, University of Illinois, Urbana-Champaign (783-58-9)

4:00– 4:20 (585) *Rigidity of lattices of nonpositive curvature.* PATRICK EBERLEIN, University of North Carolina, Chapel Hill (783-53-13)

4:30– 4:50 (586) *On the decomposition of curvature operators.* Preliminary report. Professor JAAK VILMS, Colorado State University (783-53-18)

5:00– 5:20 (587) *Locally convex immersions of manifolds-with-boundary.* Preliminary report. Professor S. ALEXANDER, University of Illinois, Urbana-Champaign (783-53-32)

5:30– 5:50 (588) *Projectively equivalent metrics subject to constraints.* Professor WILLIAM L. TABER, University of Guam, Guam (783-53-35)

FRIDAY, 1:00 P. M.

Special Session on Elliptic Systems in the Plane. II, Continental Parlor 3

1:00– 1:30 (589) *Remarks about Signorini's problem in elasticity.* Professor DAVID KINDERLEHRER, University of Minnesota, Minneapolis (783-35-30)

1:40– 2:10 (590) *Gradient bounds for elliptic systems.* Professor MURRAY H. PROTTER, University of California, Berkeley (783-35-10)

2:20– 2:50 (591) *Generalized Beltrami systems.* Professor GERALD N. HILE, University of Hawaii, Manoa (783-35-6)

3:00– 3:30 (592) *Boundary values on the sphere of null solutions of a generalized Cauchy-Riemann equation.* Preliminary report. Professor R. DELANGHE* and Dr. F. SOMMEN, State University of Ghent, Belgium (783-46-51) (Introduced by Professor Robert P. Gilbert)

3:40– 4:10 (593) *Clifford analysis: Newtonian potentials for a special elliptic system in space.* Preliminary report. Dr. FREDDY F. BRACKX* and WILLY PINCKET, State University of Ghent, Belgium (783-30-46)

4:20– 4:50 (594) *Boundary value problems for generalized hyperanalytic functions.* Professor ROBERT P. GILBERT, University of Delaware (783-35-44)

5:00– 5:30 (595) *Nonlinear boundary value problems for a semilinear elliptic system in the plane.* Professor HEINRICH BEGEHR, Freie Universität, Berlin, Federal Republic of Germany, and Professor GEORGE C. HSIAO*, University of Delaware (783-35-28)

FRIDAY, 1:00 P. M.

Special Session on Geometric Structures on Manifolds, Cabrillo Room

1:00– 1:30 (596) *Polynomials on affine manifolds.* DAVID FRIED, University of California, Santa Cruz (783-53-16) (Introduced by Professor Morris W. Hirsch)

1:45– 2:15 (597) *Three-dimensional affine crystallographic groups.* Preliminary report. Dr. DAVID FRIED, University of California, Santa Cruz, and Dr. WILLIAM M. GOLDMAN*, University of Colorado, Boulder (783-53-5)

2:30– 3:00 (598) *Holomorphic geometric structures.* Professor SHOSHICHI KOBAYASHI, University of California, Berkeley (783-32-1)

3:15– 3:45 (599) *Deformations of hyperbolic surfaces.* Preliminary report. Dr. STEVEN P. KERCKHOFF, University of California, Berkeley (783-53-30)

4:00– 4:30 (600) *Hyperbolic manifolds.* TROELS JORGENSEN, University of Minnesota and Columbia University (783-30-6) (Introduced by Professor Morris W. Hirsch)

4:45– 5:15 (601) *Foliations and laminations on surfaces.* Preliminary report. Dr. GILBERT LEVITT, Université de Paris VII, France, and University of California, Berkeley (783-57-20) (Introduced by Professor Morris W. Hirsch)

5:30– 6:00 (602) *Harmonic foliations.* FRANZ W. KAMBER and PHILIPPE TONDEUR*, University of Illinois, Urbana-Champaign (783-58-10)

FRIDAY, 1:00 P. M.

Special Session on Graph Theory. II, Anza Room

1:00– 1:15 (603) *Fundamental and uniform mission networks.* Preliminary report. Professor L. LESNIAK-FOSTER, Western Michigan University, and Professor R. D. RINGEISEN*, Clemson University (783-05-11)

1:20– 1:35 (604) *Threshold distance random graphs.* Dr. PAUL C. KAINEN, Bell Laboratories, Holmdel (783-05-13)

1:40– 1:55 (605) *A new method of proving theorems on chromatic index.* Preliminary report. A. EHRENFEUCHT, University of Colorado, Boulder, V. FABER*, Los Alamos Scientific Laboratory, and H. KIERSTEAD, University of South Carolina, Columbia (783-05-37)

2:00– 2:15 (606) *The Ramsey book.* Professor C. C. ROUSSEAU, Memphis State University (783-05-5)

2:20– 2:35 (607) *On the Ramsey numbers* $R(3,8)$ *and* $R(3,9)$. Preliminary report. Professor CHARLES M. GRINSTEAD*, Virginia Polytechnic Institute and State University, and SAM ROBERTS, Dartmouth College (783-05-9)

2:40– 2:55 (608) *Multicolor Ramsey numbers involving graphs with long suspended paths.* Dr. STEFAN A. BURR, City College, City University of New York (783-05-74)

FRIDAY, 1:00 P. M.

Special Session on History of Mathematics. II, Continental Parlors 1 and 2

1:00– 1:20 (609) *Sturm, Liouville, and Picone's theorem.* Preliminary report. Dr. KURT KREITH, University of California, Davis (783-01-16)

1:30– 1:50 (610) *Stochastic theory of epidemics: continuing efforts to achieve realism.* JERZY NEYMAN, University of California, Berkeley (783-01-10)

2:00– 2:20 (611) *Ex ungue leonem.* HERMAN H. GOLDSTINE, IBM Research Center, Yorktown Heights, and Institute for Advanced Study (783-01-9)

2:30– 2:50 (612) *The wide world of pure mathematics that goes by other names.* Professor GEORGE B. DANTZIG, Stanford University (783-01-14)

3:00– 3:20 (613) *How probability theory looked to some of us in the middle* 30s. MARK KAC, Rockefeller University (783-01-7)

3:30– 3:50 (614) *The history of formal groups* (1950–1980). JEAN A. DIEUDONNÉ, Nice, France

FRIDAY, 1:00 P. M.

Special Session on Homotopy Theory. II, Dolores Room

1:00– 1:20 (615) *A counterexample to a conjecture of Serre.* Preliminary report. Dr. DAVID J. ANICK, University of California, Berkeley (783-55-11)

1:30– 1:50 (616) *The cohomology algebras of some well-known Hopf algebras.* Preliminary report. Professor CLARENCE WILKERSON*, Wayne State University, and Professor HAYNES MILLER, University of Washington (783-55-26)

2:00– 2:20 (617) *A generalized algebraic Kahn-Priddy theorem.* Professor HAYNES MILLER, University of Washington (783-55-21)

2:30– 2:50 (618) *Kuzual type resolutions for calculating Ext groups.* Professor MARK MAHOWALD, Northwestern University (783-55-3)

3:00– 3:20 (619) *Looping Adams resolutions.* Preliminary report. Professor JOHN R. HARPER, University of Rochester (783-55-22) (Introduced by Professor Frederick R. Cohen)

3:30– 3:50 (620) *Equivariant cohomology theory.* Professor J. P. MAY, University of Chicago (783-55-23)

4:00– 4:20 (621) *Homotopy limits and Kan extensions.* Dr. DON ANDERSON, University of California, San Diego (783-55-29)

4:30– 4:50 (622) *The Segal conjecture for cyclic groups.* Professor DOUGLAS C. RAVENEL, University of Washington (783-55-14)

5:00– 5:20 (623) *On the Segal conjecture for* $Z_2 \times Z_2$. Preliminary report. Professor DONALD M. DAVIS, Lehigh University (783-55-32)

5:30– 5:50 (624) *The Brown-Peterson homology of* $BZ/p \times \cdots \times BZ/p$. Preliminary report. Professor DAVID COPELAND JOHNSON*, University of Kentucky, and Professor W. STEPHEN WILSON, Johns Hopkins University (783-55-16)

FRIDAY, 1:00 P. M.

Special Session on L_1 and Related Metric Spaces, Cypress Room

1:00– 1:20 (625) *Geodesics and hypermetrics.* Preliminary report. Professor RALPH ALEXANDER, University of Illinois, Urbana-Champaign (783-52-6)

1:30– 1:50 (626) *Strength of the hypermetric inequalities: two examples.* Dr. PATRICE ASSOUAD, Université de Paris Sud, France (783-52-7)

2:00– 2:20 (627) *Hypermetric spaces and the Hamming cone.* Professor DAVID AVIS, McGill University (783-52-2)

2:30– 2:50 (628) *McKay's observation, Delsarte's theory on association schemes, and a duality theorem for the character table of a finite group.* Preliminary report. Professor EIICHI BANNAI, Ohio State University, Columbus (783-05-57)

3:00– 3:20 (629) *Metrics on permutations: A survey of applications in statistics.* Professor PERSI DIACONIS, Stanford University (783-62-1)

3:30– 3:50 (630) *Betweenness in graphs.* Dr. EDWARD HOWORKA, University of Virginia (783-06-5)

4:00– 4:20 (631) *Structural rigidity—a combinatorial metric problem.* Dr. IVO G. ROSENBERG, Université de Montreal (783-05-21)

4:30– 4:50 (632) *Tchebychev type inequalities for* L_1 *prediction.* W. C. THOMPSON, Bell Laboratories, Murray Hill (783-60-5)

5:00– 5:20 (633) *On the notion of distance and relative complexity in certain formal systems.* Professor STANISLAW M. ULAM, Los Alamos Scientific Laboratory, New Mexico, and University of Florida (783-05-78)

5:30– 5:50 (634) *Imbedding in L_1 and the quadrilateral property.* Dr. H. S. WITSENHAUSEN, Bell Laboratories, Murray Hill (783-46-2)

FRIDAY, 1:00 P. M.

Special Session on Quadratic Form Theory. II, Continental Parlor 9

1:00– 1:20 (635) *Generalized Hilbert fields.* Preliminary report. Professor KAZIMIERZ SZYMICZEK, Southern Illinois University, Carbondale, and Silesian University, Poland (783-10-8)

1:30– 1:50 (636) *Real closures of fields at orderings of higher level.* Preliminary report. RON BROWN, University of Hawaii, Honolulu (783-12-27)

2:00– 2:20 (637) *Representations of binary quadratic forms by positive definite quaternary quadratic forms.* Preliminary report. Professor PAUL PONOMAREV, Ohio State University, Columbus (783-10-33)

2:30– 2:50 (638) *Theta series, modular forms, and the basis problem.* Preliminary report. Professor ARNOLD PIZER*, University of Rochester, H. HIJIKATA, Kyoto University, Japan, and T. SHEMANSKE, Temple University (783-10-23)

3:00– 3:20 (639) *Pfister forms and function fields.* Professor ROBERT W. FITZGERALD, Dartmouth College (783-12-8)

3:30– 3:50 (640) *Graded Witt rings and Galois cohomology.* Preliminary report. BILL JACOB, University of California, Los Angeles (783-12-14)

4:00– 4:20 (641) *Orthogonal groups–homomorphisms and geometry.* Professor D. G. JAMES, Pennsylvania State University, University Park (783-20-2)

4:30– 4:50 (642) *Transversals for inner product spaces over rings with many units.* Professor BERNARD R. McDONALD, University of Oklahoma, Norman (783-15-17)

5:00– 5:20 (643) *Saturated sets for Witt rings of higher level.* JERROLD KLEINSTEIN, State University of New York, Stony Brook (783-99-3)

FRIDAY, 1:00 P. M.

Session on Approximations and Expansions, Diablo Room

1:00– 1:10 (644) *Bounds on the aliasing error in cardinal series expansions.* C. R. GIARDINA, The Singer Company, Fairleigh Dickinson University, and Stevens Institute of Technology (783-41-3)

1:15– 1:25 (645) *Estimating functions by partial sums of their Fourier series.* Professor DANIEL WATERMAN, Syracuse University (783-41-6)

1:30– 1:40 (646) *Interpolation by generalized polynomials.* Professor YEN TZU FU, Indiana State University (783-41-1)

1:45– 1:55 (647) *Scattering theory and matrix orthogonal polynomials on the real line.* Preliminary report. Dr. JEFFREY S. GERONIMO, Georgia Institute of Technology (783-39-4)

2:00– 2:10 (648) *Finite systems of orthogonal polynomials.* Professor NORMAN EGGERT and Professor JOHN LUND*, Montana State University (783-41-2)

2:15– 2:25 (649) *Minimizing a functional associated with interpolation.* NICHOLAS PASSELL, New College (783-41-7)

2:30– 2:40 (650) *A dual basis for L-splines and applications.* Dr. LARRY L. SCHUMAKER, Texas A&M University (783-41-4) (Introduced by Professor H. Elton Lacey)

2:45– 2:55 (651) *Continuity properties of spline functions.* Dr. BORIS SHEKHTMAN, University of Wisconsin, Madison (783-41-8)

3:00– 3:10 (652) *Characterization of an element of best simultaneous approximation.* Preliminary report. Professor ROBERT W. OWENS, Lewis and Clark College (783-41-5)

FRIDAY, 1:00 P. M.

Session on Combinatorics. II, Tamalpais Room

1:00– 1:10 (653) *Enumeration of generalized Latin rectangles.* Preliminary report. JAMES NECHVATAL, University of Cincinnati (783-05-54)

1:15– 1:25 (654) *Self dual harmonic models for the creation of additive and subtractive color patterns.* E. P. MILES, JR., Florida State University (783-05-32)

1:30– 1:40 (655) *Continuous colorings and duality.* Preliminary report. Dr. STEVE FISK, Bowdoin College (783-05-18)

1:45– 1:55 (656) *Routing past unions of disjoint linear barriers.* Preliminary report. Professor ORIN CHEIN* and Professor LEON STEINBERG, Temple University (783-05-40)

2:00– 2:10 (657) *Randomly 3-axial graphs.* Dr. SABRA S. ANDERSON, University of Minnesota, Duluth, and Dr. YOUSEF ALAVI*, Dr. GARY CHARTRAND, and Dr. S. F. KAPOOR, Western Michigan University (783-05-55)

2:15– 2:25 (658) *Randomly k-axial graphs.* Dr. DAVID BURNS, Ferris State College, and Dr. GARY CHARTRAND*, Dr. S. F. KAPOOR, and FARROKH SABA, Western Michigan University (783-05-56)

FRIDAY, 1:00 P. M.

Session on Complex Analysis. I, Toyon Suite

1:00– 1:10 (659) *Local turning and Nevanlinna defect.* Preliminary report. Professor J. R. QUINE, Florida State University (783-30-44)

1:15– 1:25 (660) *Detection of singular points.* V. G. COWLING, State University of New York, Albany, and J. P. KING*, Lehigh University (783-30-29)

1:30– 1:40 (661) *A generalization of a theorem of Levin and Ostrovskii.* LI-CHIEN SHEN, University of Wisconsin, Madison (783-30-32)

1:45– 1:55 (662) *Zeros of sections of the Taylor expansions of entire functions.* Professor ALBERT EDREI, Syracuse University (783-30-12)

2:00– 2:10 (663) *The reciprocal of an entire function of infinite order and the distribution of the zeros of its second derivative.* Dr. JOHN ROSSI, University of Hawaii, Honolulu (783-30-1)

2:15– 2:25 (664) *Necessary conditions for universal interpolation in* $\tilde{\mathcal{E}}'$. Dr. W. A. SQUIRES, California Institute of Technology (783-30-5)

2:30– 2:40 (665) *Generalizations of p-valent functions via the Hadamard product.* Preliminary report. ANIL SONI, Bowling Green State University (783-30-25)

FRIDAY, 1:00 P. M.

Session on Field Theory, Whitney Room

1:00– 1:10 (666) *On the lattice of algebraically closed subfields of an algebraically closed field of characteristic* 0. III. Preliminary report. Dr. JOHN W. ROSENTHAL, Ithaca College (783-12-22)

1:15– 1:25 (667) *Arithmetic in elliptic function fields.* BOB ALAN WAKE, University of Wisconsin, Milwaukee (783-12-25)

1:30– 1:40 (668) *Elliptic units in global function fields.* Preliminary report. Professor DAVID R. HAYES, University of Massachusetts, Amherst (783-12-34)

1:45– 1:55 (669) *Nonclassical complex numbers.* I: *four different square roots.* DANIEL K.C. CHEN, Normal Institute of Shanghai, People's Republic of China (783-12-29)

2:00– 2:10 (670) *Infinite sums of Fibonacci numbers and binomial coefficients.* Preliminary report. Dr. CONSTANTINE K. KLIORYS, Pennsylvania State University, Sharon (783-12-10)

2:15– 2:25 (671) *The automorphism group of certain Hopf maps.* Preliminary report. Professor JOANN S. TURISCO, United States Naval Academy (783-12-36)

2:30– 2:40 (672) *Diagonalization up to Witt.* MAX WARSHAUER, Southwest Texas State University (783-12-35)

2:45– 2:55 (673) *Isomorphism of modules under ground ring extension.* Dr. ROBERT GURALNICK, University of Southern California, Los Angeles (783-12-23) (Introduced by Professor A. G. Earnest)

3:00– 3:10 (674) *Class group computations for imaginary quadratic fields.* Dr. JAMES SOLDERITSCH, Villanova University (783-12-26)

3:15– 3:25 (675) *Fundamental systems of units of certain fields of degree* 4 *and of degree* 8 *over Q.* CLAUDE LEVESQUE, Université Laval (783-12-19)

3:30– 3:40 (676) *A Goldbach conjecture for polynomials over finite fields.* GOVE EFFINGER, University of Massachusetts, Amherst (783-12-17)

FRIDAY, 1:00 P. M.

Session on Geometry and Convex Sets. Shasta Room

1:00– 1:10 (677) *Neighborly families of 2^d d-simplices in E^d.* Professor JOSEPH ZAKS, Texas A&M University (783-52-3) (Introduced by Y. Gordon)

1:15– 1:25 (678) *The mean value of the area of polygons circumscribed about a convex body.* Professor J. R. SANGWINE-YAGER, Saint Mary's College of California (783-52-1)

1:30– 1:40 (679) *Probability and Radon's theorem.* Professor JOHN R. REAY, Western Washington University (783-52-5) (Introduced by Professor Robert Kauffman)

1:45– 1:55 (680) *Flag-transitive projective planes of non-fourth-power order.* Professor JOHN B. FINK, Kalamazoo College (783-51-6) (Introduced by J. E. McLaughlin)

2:00– 2:10 (681) *Distance in finite geometries.* I (*Translation planes*). ANTHONY B. EVANS, Washington State University (783-51-7) (Introduced by Professor M. J. Kallaher)

2:15– 2:25 (682) *Finite simplicial hyperbolic spaces.* Professor ROBERT J. BUMCROT* and Professor WILLIAM F. ORR, Hofstra University (783-51-8)

2:30– 2:40 (683) *Quadratic forms on polygons.* Preliminary report. Dr. J. C. FISHER and Dr. J. SHILLETO*, University of Regina (783-51-9)

2:45– 2:55 (684) *Paper-folding.* GEORGE E. MARTIN, State University of New York, Albany (783-51-5)

3:00– 3:10 (685) *A ruled Moebius surface self intersects in a straight line.* JOSEPH F. MacDONNELL, Fairfield University (783-51-1)

FRIDAY, 1:00 P. M.

Session on Number Theory. I, Rosewood Suite

1:00– 1:10 (686) *Zeta matrices of elliptic curves via lifted p-adic homology with compact supports.* Preliminary report. GORO C. KATO, East Carolina University (783-10-27)

1:15– 1:25 (687) *Cuspidal newforms and character twists.* Dr. THOMAS R. SHEMANSKE, Temple University, (783-10-10)

1:30– 1:40 (688) *On the rationality of a certain generating function.* Professor DIANE MEUSER, Boston University (783-10-37)

1:45– 1:55 (689) *How often does the number of divisors of n divide n?* Preliminary report. CLAUDIA A. SPIRO, University of Illinois, Urbana-Champaign (783-10-45)

2:00– 2:10 (690) *Generalizations of Bohr's equivalence theorem on Dirichlet series.* Preliminary report. Dr. FRANK R. WADLEIGH, University of California, San Diego (783-10-42)

2:15– 2:25 (691) *Linearly recurring solution sequences for equations over finite fields.* Preliminary report. Professor KENNETH W. SPACKMAN, University of Kentucky (783-10-44)

2:30– 2:40 (692) *The distribution of relatively r-prime integers in residue classes.* Preliminary report. Professor J. E. NYMANN, University of Texas, El Paso (783-10-31)

2:45– 2:55 (693) *Identities for sums of Dedekind type.* Professor TOM M. APOSTOL and THIENNU H. VU*, California Institute of Technology (783-10-26)

3:00– 3:10 (694) *On Diophantine equations of the form* $1 + 2^a = p^b q^c + 2^d p^e q^f$. Professor LEO J. ALEX*, State University of New York, Oneonta, and Professor LORRAINE L. FOSTER, California State University, Northridge (783-10-39)

FRIDAY, 1:00 P. M.

Session on Operator Theory. I, Walnut Suite

1:00– 1:10 (695) *Toeplitz matrices with banded inverses.* Preliminary report. Dr. WAYNE W. BARRETT, Texas A&M University (783-47-9)

1:15– 1:25 (696) *Determinants of Wiener-Hopf operators.* Preliminary report. Professor ESTELLE L. BASOR, California Polytechnic State University (783-47-6)

1:30– 1:40 (697) *Multiparametered nonhomogeneous nonlinear equations.* Dr. KATHERINE A. YERION, Gonzaga University (783-47-19)

1:45– 1:55 (698) *Perturbation theory for selfadjoint operators in spaces with indefinite inner product.* BRANKO NAJMAN, University of Zagreb, Yugoslavia, and University of California, Berkeley (783-47-13) (Introduced by Professor Tosio Kato)

2:00– 2:15 (699) *A convergent variational method of eigenvalue approximation.* Professor W. M. GREENLEE, University of Arizona (783-47-5)

2:15– 2:25 (700) *Stability of singular spectrum of multiplication operators under smooth perturbations.* Professor LOREN D. PITT, University of Virginia (783-47-10)

2:30– 2:40 (701) *Dissipative operators and series inequalities.* Professor HERBERT A. GINDLER*, San Diego State University, and Professor JEROME A. GOLDSTEIN, Tulane University (783-47-11) (Introduced by Professor Richard L. Van de Wetering)

2:45– 2:55 (702) *Reduction theorems for a class of semilinear equations with resonance.* Professor PETER W. BATES, Texas A&M University (783-47-12)

3:00– 3:10 (703) *On compactness of integral operators.* Dr. ANTON R. SCHEP, California Institute of Technology (783-47-8)

FRIDAY, 1:00 P. M.

Session on Ordinary and Partial Differential Equations. Teakwood Suite

1:00– 1:10 (704) *Singular perturbations for a semi-linear hyperbolic equation.* Professor GEORGE C. HSIAO and Professor RICHARD J. WEINACHT*, University of Delaware (783-35-32)

1:15– 1:25 (705) *Bifurcation at multiple eigenvalues for symmetric Dirichlet problems.* Preliminary report. Dr. ANDRE L. VANDERBAUWHEDE, Rijksuniversiteit Gent, Belgium (783-35-4)

1:30– 1:40 (706) *Formation of singularities for a damped conservation law.* Preliminary report. Professor R. MALEK-MADANI* and Professor JOHN A. NOHEL, University of Wisconsin, Madison (783-35-34)

1:45– 1:55 (707) *Why solution space is only a vector space but not an algebra.* Professor L. O. CHUNG* and Professor J. LUH, North Carolina State University, Raleigh (783-35-31)

2:00– 2:10 (708) *Existence of limit cycles in certain systems of differential equations with discontinuous terms.* Preliminary report. Dr. R. K. MILLER*, Iowa State University, and Dr. S. J. SKAR, Oklahoma State University (783-34-30)

2:15– 2:25 (709) *Diffusion and convection in a family of tubes.* Professor J. B. GARNER*, Louisiana Tech University, and Professor R. B. KELLOGG, University of Maryland, College Park (783-34-15)

2:30– 2:40 (710) *Topological versus differentiable hyperbolicity.* Preliminary report. Dr. RUSSELL B. WALKER, University of Missouri, Columbia (783-34-29)

2:45– 2:55 (711) *Recurrent and Poisson stable flows.* Professor RONALD A. KNIGHT, Northeast Missouri State University (783-34-12)

3:00– 3:10 (712) *Generalized Hopf bifurcation in R^n and asymptotic stability.* Dr. S. R. BERNFELD*, University of Texas, Arlington, Dr. P. NEGRINI, University of Camerino, Italy, and Dr. L. SALVADORI, University of Trento, Italy (783-34-6)

FRIDAY, 1:00 P. M.

Session on Statistics. Lassen Room

1:00– 1:10 (713) *Testing hypotheses for effects on survival by the analysis of a matched retrospective design.* BERNARD HARRIS*, University of Wisconsin, Madison and ANASTASIOS A. TSIATIS, St. Jude Children's Research Hospital, Memphis (783-62-7)

1:15– 1:25 (714) *Alternative quantile estimation.* Dr. W. D. KAIGH, University of Texas, El Paso (783-62-5) (Introduced by Professor James E. Nymann)

1:30– 1:40 (715) *Empirical Bayesian estimators for the Makeham-Gompertz failure model.* Dr. ALEX S. PAPADOPOULOS*, University of North Carolina, Charlotte, and Dr. CRIS P. TSOKOS, University of South Florida (783-62-8)

1:45– 1:55 (716) *Balanced Latin squares.* Professor GREGORY CAMPBELL, Purdue University, and Professor SUSAN C. GELLER*, Radcliffe College/Harvard University (783-62-3)

2:00– 2:10 (717) *Main effect plus one plans for 2^m factorial designs.* Dr. B. C. GUPTA, Instituto de Mathematica – UFRJ, Brazil (783-62-10) (Introduced by Dr. G. P. Menzala)

2:15– 2:25 (718) *Sample size tables for simple random sampling.* Preliminary report. Dr. HOWARD B. STAUFFER, British Columbia Ministry of Forests (783-62-2)

2:30– 2:40 (719) *On probability proportional to size sampling designs.* Preliminary report. BING-YING L. LIN, University of Illinois, Chicago Circle (783-62-9)

2:45– 2:55 (720) *The Gauss-Markov theorem for nonlinear models.* Preliminary report. THOMAS LOUTON, Memphis State University (783-62-4)

FRIDAY, 2:15 P. M.

Invited Address. Continental Ballroom

(721) *Quaternion functions in gauge field theories.* Professor FEZA GÜRSEY, Yale University (738-58-21)

FRIDAY, 3:20 P. M.

Special Session on Graph Theory. III, Anza Room

3:20– 3:35 (722) *Degree sets of k-trees.* Dr. R. A. DUKE*, Georgia Institute of Technology, and Dr. P. M. WINKLER, Emory University (783-05-22)

3:40– 3:55 (723) *Longest cycles in r-regular r-connected graphs.* Dr. BRAD JACKSON, University of California, Santa Cruz, and Dr. T. D. PARSONS*, Pennsylvania State University, University Park (783-05-15)

4:00– 4:15 (724) *Algebraic, topological and combinatorial aspects of Steiner quasigroups.* Preliminary report. A. K. DEWDNEY, University of Western Ontario (783-05-3)

4:20– 4:35 (725) *On finding maximum independent set in a graph.* Preliminary report. Professor VIERA KRNANOVA PROULX, Northeastern University (783-05-27)

4:40– 4:55 (726) *Permutation-partition pairs. II: Bounds on the genus of the amalgamation of graphs.* Preliminary report. Dr. SAUL STAHL, University of Kansas (783-05-7)

5:00– 5:15 (727) *Are odd graphs spectrally unique?* Preliminary report. Professor ALLEN J. SCHWENK, United States Naval Academy (783-05-28)

FRIDAY, 3:30 P. M.

Invited Address. Continental Ballroom

(728) *How do eigenfunctions decay—some recent results.* Professor SHMUEL AGMON, Hebrew University, Israel, and University of Virginia (783-35-14)

FRIDAY, 3:30 P. M.

Session on Algebraic Geometry. Shasta Room

3:30– 3:40 (729) *Higher K-theory of Dedekind rings.* Professor CLAYTON C. SHERMAN, Texas Tech University (783-18-5)

3:45– 3:55 (730) *Graded cohomology of algebraic submersions.* Professor BILL WATSON, St. John's University (783-14-5)

4:00– 4:10 (731) *Topological equivalence of singularities in unimodal families.* Preliminary report. Dr. DONAL B. O'SHEA, Mount Holyoke College (783-14-10)

4:15– 4:25 (732) *Singular points and Weierstrass points of algebraic curves.* Preliminary report. BEN THOMAS, Lewis and Clark College (783-14-11)

4:30– 4:40 (733) *Classical and supersingular Enriques surfaces in characteristic two are unirational.* Dr. PIOTR BLASS, University of Pennsylvania, Philadelphia (783-14-13)

4:45– 4:55 (734) *A Mordell-Weil group of rank 8, and a subgroup of finite index.* Preliminary report. Professor CHARLES F. SCHWARTZ, Rider College (783-14-8)

5:00– 5:10 (735) *Complete linear systems cut out by hypersurfaces on projections of d-uple embeddings.* Preliminary report. CATHERINE MEADOWS, University of Illinois, Urbana-Champaign (783-14-9)

5:15– 5:25 (736) *The monoid of effective divisor classes on certain algebraic varieties.* Professor JEFFREY A. ROSOFF, Illinois State University (783-14-4)

5:30– 5:40 (737) *Triangles and multiple points.* Preliminary report. Professor ROBERT SPEISER*, Illinois State University, and JOEL ROBERTS, University of Minnesota, Minneapolis (783-14-12)

FRIDAY, 3:30 P. M.

Session on Applied Mathematics. II, Walnut Suite

3:30– 3:40 (738) *The solution of certain heat transfer problems by means of bilinear mappings.* Professor JOAN R. HUNDHAUSEN* and Professor ROBERT A. WALSH, Colorado School of Mines (783-80-2)

3:45– 3:55 (739) *Applications of temperature profiles generated by a source term in motion; The nonlinear heat equation.* Preliminary report. Dr. BRUCE FRIEDMAN*, Annapolis Laboratory, and Professor PETER A. McCOY, U. S. Naval Academy (783-80-1)

4:00– 4:10 (740) *Particle concentrations in the Tonks gas.* Preliminary report. Dr. ED WAYMIRE*, University of Arizona, and Dr. V. K. GUPTA, University of Mississippi (783-82-1)

4:15– 4:25 (741) *Time evolution of nonequilibrium states in statistical mechanics.* Preliminary report. Dr. A. HURD, University of Victoria (783-82-5)

4:30– 4:40 (742) *Two-dimensional Ising correlations: convergence of the scaling limit.* JOHN PALMER* and C. TRACY, Dartmouth College (783-82-6)

4:45– 4:55 (743) *On the spacetime associated with the special theory of relativity (STR).* Dr. BERNARD MARCUS, San Diego State University (783-83-1)

5:00– 5:10 (744) *Mathematical properties of the Schrödinger operator.* Final report. Dr. DAVID K. COHOON, School of Aerospace Medicine (783-81-7)

5:15– 5:25 (745) *Quantum-mechanical scattering theory for oscillatory potentials.* Dr. BRIAN BOURGEOIS, Texas A&M University (783-81-3)

5:30– 5:40 (746) *A fifty year old problem in mathematical physics.* TEPPER L. GILL, Howard University (783-81-4)

5:45– 5:55 (747) *Multiplicities of quantized von Neumann algebras.* Professor MARK A. KON, Boston University (783-81-6)

FRIDAY, 3:30 P. M.

Session on Complex Analysis. II, Toyon Suite

3:30– 3:40 (748) *On a problem of Doob about the fine topology and normal functions.* Professor J. S. HWANG, Institute of Mathematics, Academia Sinica, Taiwan (783-31-1) (Author introduced by W. Seidel)

3:45– 3:55 (749) *On the quotient of an analytic function and its partial sums.* HERB SILVERMAN, College of Charleston (783-30-14)

4:00– 4:10 (750) *The Denjoy conjecture for harmonic functions.* Professor KARL F. BARTH*, Syracuse University, and Professor DAVID A. BRANNAN, The Open University, Milton Keynes, England (783-30-19)

4:15– 4:25 (751) *A problem of F. John for non-univalent functions.* Preliminary report. Professor ROGER BARNARD and Professor KENT PEARCE*, Texas Tech University (783-30-43)

4:30– 4:40 (752) *Covering results for univalent functions.* Professor DAVID A. BRANNAN, The Open University, Milton Keynes, England (783-30-35)

4:45– 4:55 (753) *Invariant operators and univalent functions.* REUVEN HARMELIN, University of Maryland, College Park (783-30-31) (Introduced by Professor Uri Srebro)

5:00– 5:10 (754) *Distortion theorems for univalent functions and the Denjoy conjecture.* Preliminary report. URI SREBRO*, University of Maryland, College Park, and Technion, Israel, and DOV AHARONOV, Technion, Israel (783-30-18)

5:15– 5:25 (755) *Class preserving integrals of certain univalent functions.* Professor SHYAM K. BAJPAI, Indiana-Purdue University, Fort Wayne (783-30-15)

5:30– 5:40 (756) *The second coefficient of a function with all derivatives univalent.* Professor A. SATHAYE and S. M. SHAH*, University of Kentucky, and Professor S. Y. TRIMBLE, University of Missouri, Rolla (783-30-21)

FRIDAY, 3:30 P. M.

Session on Matrix Theory. Tamalpais Room

3:30– 3:40 (757) *Inverse elementary divisor problem for doubly stochastic matrices.* Professor HENRYK MINC, University of California, Santa Barbara (783-15-1)

3:45– 3:55 (758) *Monotonicity conjecture on permanents of doubly stochastic matrices.* Dr. KO-WEI LIH, Institute of Mathematics, Academia Sinica, Taiwan, and Professor EDWARD T. H. WANG*, Wilfrid Laurier University (783-15-2)

4:00– 4:10 (759) *Inequalities for generalized matrix functions.* Professor RUSSELL MERRIS, California State University, Hayward (783-15-8)

4:15– 4:25 (760) *On the uniqueness of generalized matrix functions.* Dr. LEROY B. BEASLEY*, Caldwell, Idaho, and Professor LARRY J. CUMMINGS, University of Waterloo (783-15-7)

4:30– 4:40 (761) *Weak generalized inverses of matrices $A(s, z)$ over $R[s, z]$.* Preliminary report. Dr. JOHN JONES, JR., Air Force Institute of Technology, Wright-Patterson AFB (783-15-14)

4:45– 4:55 (762) *Products of EP matrices.* III. Professor IRVING KATZ, George Washington University (783-15-15)

FRIDAY, 3:30 P. M.

Session on Number Theory. II, Rosewood Suite

3:30– 3:40 (763) *A number-theoretic formula generated by crossed diffraction gratings.* KEITH M. KENDING, Cleveland State University (783-10-36) (Introduced by Professor Shih-Hung Chang)

3:45– 3:55 (764) *A note on sum-distinct sets and a problem of Erdös.* Preliminary report. Dr. ARTHUR L. RUBIN, Jet Propulsion Laboratory, Pasadena (783-10-50)

4:00– 4:10 (765) *Classes of extensions of an old factorial quotient result.* RODNEY T. HANSEN*, Montana State University, and ROY W. RYDEN, Humboldt State University (783-10-49)

4:15– 4:25 (766) *Iterating the Carmichael function.* I. BOROSH* and D. HENSLEY, Texas A&M University (783-10-53)

4:30– 4:40 (767) *On the proximity of powers of two integers.* Professor LYNN E. GARNER, Brigham Young University (783-10-22)

4:45– 4:55 (768) *Pascal's triangle modulo P.* CALVIN T. LONG, Washington State University (783-10-20)

5:00– 5:10 (769) *On consecutive triples of quadratic residues.* Preliminary report. Professor MONTIE G. MONZINGO, Southern Methodist University (783-10-29)

5:15– 5:25 (770) *Cycles of differences of integers.* Professor ANNE LUDINGTON FURNO, Hamilton College (783-10-21)

5:30– 5:40 (771) *Fraction sequences with a consecutive mediant property.* Preliminary report. Dr. VENCIL SKARDA, Brigham Young University (783-10-35)

FRIDAY, 3:30 P. M.

Session on Probability. I, Lassen Room

3:30– 3:40 (772) *Solving random linear Volterra integral equations using the method of moments.* Professor MELVIN D. LAX, California State University, Long Beach (783-60-11)

3:45– 3:55 (773) *A spectral analysis for solutions of stochastic differential equations.* Preliminary report. DEBORAH F. ALLINGER, Indiana University, Bloomington (783-60-15)

4:00– 4:10 (774) *Algebraic approximations of the coefficient in the t-distribution.* Professor L. R. BRAGG, and Professor JERROLD W. GROSSMAN*, Oakland University (783-60-2)

4:15– 4:25 (775) *Stable laws of index 2^{-n}.* Professor S. S. MITRA, Pennsylvania State University, DuBois Campus (783-60-1) (Introduced by Professor Moses Glasner)

4:30– 4:40 (776) *An almost sure invariance principle for random variables in the domain of attraction of a stable law.* Preliminary report. EVAN D. FISHER, University of Illinois, Urbana-Champaign (783-60-21)

4:45– 4:55 (777) *Decoupling inequalities for stationary Gaussian processes.* Professor ABEL KLEIN and Dr. DAVID S. SHUCKER*, University of California, Irvine, and Professor LAWRENCE J. LANDAU, University of London, England (783-60-28)

5:00– 5:10 (778) *Inadequacy of stationary plans for finitely-controlled gambling problems.* Professor VICTOR C. PESTIEN, University of Miami (783-60-27)

5:15– 5:25 (779) *The number of increasing subsequences of the random permutation.* Preliminary report. Dr. V. LIFSCHITZ, University of Texas, El Paso, and Dr. B. PITTEL*, Ohio State University, Columbus (783-60-6) (Introduced by Professor Louis Sucheston)

FRIDAY, 3:30 P. M.

Session on Summability and Functional Equations. Diablo Room

3:30– 3:40 (780) *An equation which links associative functions.* Professor M. J. FRANK, Illinois Institute of Technology (783-39-3)

3:45– 3:55 (781) *On some functional equations from additive and nonadditive measures, II.* PL. KANNAPPAN, University of Waterloo (783-39-2)

4:00– 4:10 (782) *Functional equations of supply and demand,* JIM CASE, American Petroleum Institute, Washington, D.C. (783-39-1)

4:15– 4:25 (783) *Inclusion theorems for the absolute summability of divergent integrals.* Dr. HARVEY DIAMOND, West Virginia University, and Dr. LOUISE RAPHAEL*, Clark College, Atlanta (783-40-1)

4:30– 4:40 (784) *A Tauberian theorem for absolute summability.* Professor DAVID F. DAWSON, North Texas State University (783-40-2)

4:45– 4:55 (785) *Absolute Riesz summability of Fourier series.* CHARLES S. REES* and G. D. DIXIT, University of New Orleans (783-40-6)

5:00– 5:10 (786) *On products of summability methods.* Dr. JAMES DeFRANZA, Youngstown State University (783-40-4)

5:15– 5:25 (787) *Summability of alterations based on stretchings of sequences.* Dr. THOMAS A. KEAGY, University of Texas, Tyler (783-40-3)

5:30– 5:40 (788) *Abel transformations into* l^1. Professor J. A. FRIDY, Kent State University (783-40-5)

5:45– 5:55 (789) *The non-existence of convergence preserving functions.* Dr. JOHN KENNISON, Clark University, and Dr. GERALD WILDENBERG*, University of Hartford (783-40-7)

FRIDAY, 4:00 P. M.

Session on Polynomials and Rings. Whitney Room

4:00– 4:10 (790) *Imaginary quadratic extensions where a given prime has order* 3. PHIL HANLON, California Institute of Technology (783-12-33)

4:15– 4:25 (791) *Prime ideals in difference rings.* Professor RONALD P. INFANTE, Seton Hall University (783-12-15)

4:30– 4:40 (792) *Polynomials representing units over the ring of real algebraic integers.* Preliminary report. Professor DENNIS R. ESTES* and Professor ROBERT M. GURALNICK, University of Southern California (783-12-31) (Introduced by Professor A. G. Earnest)

4:45– 4:55 (793) *A combinatorial theory for sums of squares of polynomials.* Professor M. D. CHOI, University of Toronto, Professor T. Y. LAM, University of California, Berkeley, and Professor B. REZNICK*, University of Illinois, Urbana-Champaign (783-12-30)

5:00– 5:10 (794) *Linear polynomials belonging to numerical exponents.* Preliminary report. Professor J. T. B. BEARD, JR.*, Tennessee Technological University, Professor R. M. McCONNEL, University of Tennessee, Knoxville, and K. I. WEST, Dallas, Texas (783-12-24)

FRIDAY, 4:45 P. M.

Session on Differential Equations. I, Teakwood Suite

4:45– 4:55 (795) *Nonlinear problems by linear methods.* Preliminary report. Professor JOHN GREGORY* and CHARLES GIBSON, Southern Illinois University, Carbondale (783-34-33) (Introduced by Professor Ronald B. Kirk)

5:00– 5:10 (796) *A note on the initial value problem* $dx/dt = f(t, x)$, $x(t_0) = x_0$, *with f continuous.* Preliminary report. MICHAEL BALLOTTI, Tulane University (783-34-42)

5:15– 5:25 (797) *On a problem of existence and uniqueness in the large.* Dr. V. SREE HARI RAO, University of Alberta (783-34-41)

5:30– 5:40 (798) *Existence of infinitely many solutions for a class of superlinear problems.* Professor ALFONSO B. CASTRO, C. I. E. A. del I. P. N., Mexico (783-34-2)

5:45– 5:55 (799) *The method of upper and lower solutions for differential equations in a Banach space.* Preliminary report. Professor V. LAKSHMIKANTHAM, University of Texas, Arlington, and S. LEELA*, State University of New York, Geneseo (783-34-27)

FRIDAY, 7:30 P. M.

Session on Algebraic Topology. Continental Parlor 7

7:30– 7:40 (800) *On the genus of generalized flag manifolds.* Professor HENRY H. GLOVER*, Ohio State University, Columbus, and Professor GUIDO MISLIN, Eidgenössische Technische Hochschule Zürich, Switzerland (783-55-27)

7:45– 7:55 (801) *Splitting the tangent bundles of projective spaces.* HENRY H. GLOVER and WILLIAM D. HOMER*, Ohio State University, Columbus, and ROBERT STONG, University of Virginia (783-55-34)

8:00– 8:10 (802) *Wu-like classes for periodic maps.* Preliminary report. Professor T. Y. LIN, University of South Carolina, Aiken (783-55-36)

8:15– 8:25 (803) *On mapping tori and projective bundle constructions in PL cobordism.* Professor BENJAMIN M. MANN*, Bowdoin College, and Professor EDWARD Y. MILLER, Polytechnic Institute of New York (783-55-9)

8:30– 8:40 (804) *A formula for deviation from commutativity: the transfer and Steenrod squares.* Professor RICHARD P. KUBELKA, University of Oklahoma (783-55-33)

8:45– 8:55 (805) *Incompressibility of maps and the homotopy invariance of Čech cohomology.* Dr. ALLAN G. R. CALDER, Birkbeck College, England, and New Mexico State University, and Dr. FRANK WILLIAMS*, New Mexico State University (783-55-20)

9:00– 9:10 (806) *Remarks on equivariant stable homotopy category.* Preliminary report. ROBERT PIACENZA, University of Alaska, Fairbanks (783-55-13)

9:15– 9:25 (807) *Fibre preserving free involutions.* Preliminary report. JAN JAWOROWSKI, Indiana University, Bloomington (783-55-38)

9:30– 9:40 (808) *Some homotopy groups of algebraic groups.* Preliminary report. J. F. JARDINE, University of British Columbia (783-55-7)

SATURDAY, 1:00 P. M.

Colloquium Lectures: Lecture IV, Continental Ballroom

(809) *Some mathematical problems suggested by questions in physics.* Professor MARK KAC, Rockefeller University

SATURDAY, 1:00 P. M.

Special Session on the Classification of Finite Simple Groups. II, Continental Parlors 7 and 8

1:00– 1:50 (810) *On graphs with edge-transitive automorphism groups.* B. STELLMACHER, Universität Bielefeld, Federal Republic of Germany (783-20-16) (Introduced by Professor Michael Aschbacher)

2:00– 2:25 (811) *Results on triangular amalgams.* Preliminary report. ANDREW CHERMAK, University of Minnesota, Minneapolis (783-20-27) (Introduced by Professor David Goldschmidt)

2:30– 2:55 (812) *Revision of local analysis in the odd order paper.* Dr. GEORGE GLAUBERMAN, University of Chicago (783-20-25)

3:00– 3:25 (813) Title to be announced. WALTER FEIT, Yale University

3:30– 3:55 (814) *Standard form revisited.* Preliminary report. Professor DANIEL GORENSTEIN* and Professor RICHARD LYONS, Rutgers University, New Brunswick (783-20-38)

4:00– 4:25 (815) *The root subgroups for maximal tori in finite groups of Lie type.* Professor GARY M. SEITZ, University of Oregon (783-20-24)

4:30– 4:55 (816) *2-local geometries and GF(2)-representations.* Professor STEPHEN D. SMITH, University of Illinois, Chicago Circle (783-20-3)

5:00– 5:25 (817) *Generalization of TI-subgroups.* Preliminary report. Professor FRANZ G. TIMMESFELD, Justus-Liebig-Universität Giessen, Federal Republic of Germany (783-20-17) (Introduced by Professor Michael Aschbacher)

SATURDAY, 1:00 P. M.

Special Session on Differential Geometry and Global Analysis. III, Balboa Room

1:00– 1:20 (818) *On removable singularities of Yang-Mills fields.* Preliminary report. Professor L. M. SIBNER, Polytechnic Institute of New York (783-35-11)

1:30– 1:50 (819) *A sub-elliptic estimate for a class of invariantly defined elliptic systems.* Professor L. M. SIBNER, Polytechnic Institute of New York, and Professor ROBERT J. SIBNER*, Brooklyn College, City University of New York (783-58-22)

2:00– 2:20 (820) *Geometric quantization and character theory.* Professor BERTRAM KOSTANT, Massachusetts Institute of Technology (783-58-24)

2:30– 2:50 (821) *Global behavior of curves in a space of positive curvature.* Professor BORIS V. DEKSTER, University of Notre Dame (783-53-12)

3:00– 3:20 (822) *Elliptic operators and decomposition of tensor fields.* Professor MURRAY CANTOR, University of Texas, Austin (783-58-1)

3:30– 3:50 (823) *Focal sets and real hypersurfaces in complex projective space.* Professor THOMAS E. CECIL*, College of the Holy Cross, and Professor PATRICK J. RYAN, Indiana University, South Bend (783-53-4)

4:00– 4:20 (824) *Topological entropy and convergence of zeta function.* Preliminary report. Dr. SU-SHING CHEN, University of Florida (783-53-11)

4:30– 4:50 (825) *Integro-geometric invariants associated to subvarieties and foliations of complex spaces.* Dr. THEODORE SHIFRIN, Massachusetts Institute of Technology (783-53-2)

5:00– 5:20 (826) *On the development of curves.* Dr. BRIGITTE WETTSTEIN, University of California, Berkeley (783-53-21)

5:30– 5:50 (827) *On fundamental solution of generalized heat equation.* NIRMALA PRAKASH, Ohio State University, Columbus (783-53-34)

SATURDAY, 1:00 P. M.

Special Session on Elliptic Systems in the Plane. III, Continental Parlor 3

1:00– 1:30 (828) *Generalized Cauchy-Riemann equations of two complex variables.* Preliminary report. Dr. JAMES L. BUCHANAN, United States Naval Academy (783-32-9)

1:35– 2:05 (829) *Formulation of well posed problems in transonic flow.* PAUL R. GARABEDIAN, New York University (783-35-42)

2:10– 2:40 (830) *A system of elliptic variational inequalities.* JAMES M. SLOSS, University of California, Santa Barbara (783-35-2)

2:45– 3:15 (831) *Nonlocal boundary conditions and the finite element method for scattering problems.* Professor A. K. AZIZ*, University of Maryland, Baltimore County, and Professor R. B. KELLOGG, University of Maryland, College Park (783-35-36)

3:30– 4:00 (832) *Boundary value problems of the first kind for an elliptic equation on select plane domains.* Preliminary report. Professor PETER A. McCOY, United States Naval Academy (783-35-16)

4:04– 4:35 (833) *The Neumann problem on Lipschitz domains.* Preliminary report. DAVID S. JERISON, University of Chicago, and CARLOS E. KENIG*, University of Minnesota, Minneapolis (783-35-29)

4:40– 5:10 (834) *On a variational inequality for the hodograph method.* ROBERT A. HUMMEL, Courant Institute of Mathematical Sciences (783-35-47)

5:15– 5:45 (835) *Spinor valued regular functions in hypercomplex analysis.* PERTTI LOUNESTO, Helsinki University of Technology, Finland

SATURDAY, 1:00 P. M.

Special Session on Graph Theory. IV, Anza Room

1:00– 1:15 (836) *On distance in graphs.* Preliminary report. Dr. ZEVI MILLER, Miami University, Oxford (783-05-35)

1:20– 1:35 (837) *Uniquely colorable graphs.* Professor HUDSON V. KRONK, State University of New York, Binghamton (783-05-26)

1:40– 1:55 (838) *The recursive chromatic number of an interval graph.* Dr. HENRY A. KIERSTEAD and Dr. WILLIAM T. TROTTER, JR.*, University of South Carolina, Columbia (783-05-17)

2:00– 2:15 (839) *The graph-theoretical approach to network reliability.* F. T. BOESCH and C. L. SUFFEL*, Stevens Institute of Technology (783-05-38)

2:20– 2:50 (840) *Infinite planar graphs.* Professor BRANKO GRÜNBAUM*, University of Washington, and Professor G. C. SHEPHARD, University of East Anglia, England (783-05-45)

SATURDAY, 1:00 P. M.

Special Session on Homotopy Theory. III, Dolores Room

1:00– 1:20 (841) *Surgery on closed manifolds.* Professor LAURENCE TAYLOR and Professor BRUCE WILLIAMS*, University of Notre Dame (783-57-11)

1:30– 1:50 (842) *Configuration spaces and* BO/I_n. Professor E. H. BROWN, JR.*, Brandeis University, and Professor F. P. PETERSON, Massachusetts Institute of Technology (783-55-10)

2:00– 2:20 (843) *The Kervaire invariant of immersions.* Preliminary report. RALPH L. COHEN, Stanford University (783-55-8)

2:30– 2:50 (844) $\Pi^S_*(BO)$ *and the Arf invariant of framed manifolds.* Preliminary report. VICTOR SNAITH*, University of Western Ontario, and JØRGEN TORNEHAVE, Aarhus Universitet, Denmark (783-55-5)

3:00– 3:20 (845) *Applications of algebra to some problems in topology.* Professor M. G. BARRATT, Northwestern University (783-55-41)

3:30– 3:50 (846) *Cohomology of nilmanifolds and torsion free, nilpotent groups.* Professor L. A. LAMBE*, Michigan State University, and Professor S. B. PRIDDY, Northwestern University (783-55-4)

4:00– 4:20 (847) *Uniqueness of iterated delooping machines.* Professor ZBIGNIEW FIEDOROWICZ, University of Michigan, Ann Arbor (783-55-40) (Introduced by Professor Frederick R. Cohen)

4:30– 4:50 (848) *Self-maps of the Dyer-Lashof algebra.* Preliminary report. PAUL SELICK, University of Western Ontario (783-55-25)

5:00– 5:20 (849) *An Adams spectral sequence for semi-stable homotopy groups.* Dr. ROBERT J. WELLINGTON, University of Washington (783-55-31)

SATURDAY, 1:00 P. M.

Special Session on Quadratic Form Theory. III, Continental Parlor 9

1:00– 1:20 (850) *The square class invariant.* Preliminary report. Professor CRAIG CORDES, Louisiana State University, Baton Rouge (783-10-11)

1:30– 1:50 (851) *Witt rings and orderings of skew fields.* Professor THOMAS C. CRAVEN, University of Hawaii, Honolulu (783-12-20)

2:00– 2:20 (852) *Composition of binary quadratic forms via* 2×2 *matrices.* Professor OLGA TAUSSKY-TODD, California Institute of Technology (783-12-1)

2:30– 2:50 (853) *On certain numerical invariants of mappings over finite fields.* Professor TAKASHI ONO, Johns Hopkins University (783-10-3)

3:00– 3:20 (854) *Common value properties of quadratic forms.* Preliminary report. Dr. DAVID B. LEEP, University of Chicago (783-12-18)

3:30– 3:50 (855) *Witt rings and Brauer groups under multiquadratic extensions.* Professor ADRIAN R. WADSWORTH, University of California, San Diego (783-10-54)

4:00– 4:20 (856) *Category equivalences and isomorphisms of classical groups.* Professor ALEXANDER J. HAHN, University of Notre Dame (783-20-20)

SATURDAY, 1:00 P. M.

Session on Applied Mathematics. III, Walnut Suite

1:00– 1:10 (857) *Operator theory on the WKB method and Bremmer series.* DAVID N. DUDLEY*, and Dr. ALAN P. WANG, Arizona State University (783-81-5)

1:15– 1:25 (858) *Hyperbolic-elliptic motion and generalized eccentric axes in the three body problem.* Preliminary report. Dr. NEAL D. HULKOWER, Jet Propulsion Laboratory (783-70-1)

1:30– 1:40 (859) *Some new families of periodic solutions of Hill's problem and of the restricted problem.* Professor LAWRANCE M. PERKO, Northern Arizona University (783-70-2) (Introduced by Professor R. D. Meyer)

1:45– 1:55 (860) *Influence of the thickness in fluid-structure coupling problems.* Dr. AYNUR ÜNAL, Stanford University (783-73-4)

2:00– 2:10 (861) *Stability of periodically supported imperfect shells.* Dr. DEBORAH FRANK LOCKHART, Michigan Technological University (783-73-1)

2:15– 2:25 (862) *The buckling of a thin triangular beam.* Preliminary report. Dr. ERNESTO BUZANO*, Arizona State University, Professor GIUSEPPE GEYMONAT, Politecnico di Torino, Italy, and Professor TIM POSTON, Universität Stuttgart, West Germany (783-73-5)

2:30– 2:40 (863) *Energy release rate calculations for an interface mode* III *crack based on a conservation integral.* Dr. A. NACHMAN* and Dr. J. TWEED, Old Dominion University, and Dr. J. WALTON, Texas A&M University (783-73-3)

2:45– 2:55 (864) *Secondary states of vibrating plates.* B. J. MATKOWSKY, Northwestern University, L. J. PUTNICK*, Siena College, and E. L. REISS, Northwestern University (783-73-2)

SATURDAY, 1:00 P. M.

Session on Complex Analysis. III, Continental Parlor 2

1:00– 1:10 (865) *Some analogies from classical analysis and heat conduction for wave propagation.* EDWARD G. DUNNE*, Harvard University, and Dr. DALE H. MUGLER, University of Santa Clara (783-30-30)

1:15– 1:25 (866) *Zeros of successive iterates of multiplier-sequence operators.* Preliminary report. Dr. CARL PRATHER* and Dr. JOHN SHAW, Virginia Polytechnic Institute and State University (783-30-33)

1:30– 1:40 (867) *A volume-area inequality.* Dr. RUTH MINIOWITZ, University of Kentucky (783-30-17)

1:45– 1:55 (868) *Some problems on $L^2(w)$ and outer functions connected with stochastic processes.* Professor PETER BLOOMFIELD and Professor NICHOLAS P. JEWELL*, Princeton University (783-30-11)

2:00– 2:10 (869) *What physicists can tell us about the type problem.* Preliminary report. PETER GRANT DOYLE, Dartmouth College (783-30-41)

2:15– 2:25 (870) *Criteria for algebraic dependence of meromorphic mappings into algebraic varieties.* S. J. DROUILHET, Yankton College (783-30-42)

2:30– 2:40 (871) *An algebra with zero divisors and a generalization of the complex calculus.* Preliminary report. EDWARD A. BELBRUNO, Boston University (783-30-23)

SATURDAY, 1:00 P. M.

Session on Differential Equations. II, Teakwood Suite

1:00– 1:10 (872) *Integrable-square solutions of a singular ordinary differential equation.* Professor RICHARD C. GILBERT, California State University, Fullerton (783-34-44)

1:15– 1:25 (873) *Central connection for irregular points of modulation.* R. E. MEYER*, University of Wisconsin, Madison, and J. F. PAINTER, Lawrence Livermore Laboratory (783-34-5) (Intorduced by M. Crandall)

1:30– 1:40 (874) *Stability and asymptotic equivalence of perturbations of nonlinear systems of differential equations.* Preliminary report. Professor MICHAEL LORD, Univerity of Texas, Arlington (783-34-40)

1:45– 1:55 (875) *Forced periodic solutions in the plane.* Professor CLIFTON A. LANDO, University of Alaska, Fairbanks (783-34-10)

2:00– 2:10 (876) *Asymptotic behavior of solutions of a certain third order differential equation in the vicinity of an irregular singular point.* T. K. PUTTASWAMY, Ball State University (783-34-23)

2:15– 2:25 (877) *Asymptotic behavior of oscillatory solutions of a differential equation with deviating arguments.* Professor BHAGAT SINGH*, University of Wisconsin, Manitowoc, and Professor TAKASI KUSANO, Hiroshima University, Japan (783-34-16)

2:30– 2:40 (878) *Boundary value problems of singularly perturbed systems.* Preliminary report. RICHARD C. SMOCK, University of Arizona, Tucson (783-34-43)

2:45–2:55 (879) *Differential systems and multipoint boundary value problems.* Professor PAUL W. ELOE*, University of Dayton, and Professor LOUIS J. GRIMM, University of Missouri, Rolla (783-34-4)

SATURDAY, 1:00 P. M.

Session on Homological Algebra and Category Theory. Cabrillo Room

1:00– 1:10 (880) *Group cohomology and equivariant Moore spaces.* JUSTIN R. SMITH, University of Hawaii, Manoa (783-55-2)

1:15– 1:25 (881) *A (category) theoretic model for semantics of functional programming languages.* Professor DANA MAY LATCH, North Carolina State University (783-18-6)

1:30– 1:40 (882) *Hochschild dimension of a monoid.* Preliminary report. Professor CHARLES CHING-AN CHENG, Oakland University (783-18-9)

1:45– 1:55 (883) *Rigidity in closed categories and generalized "Sup-Inf" theorems.* Professor KIMMO ROSENTHAL, Union College, Schenectady (783-18-1)

2:00– 2:10 (884) *Functors with lifting properties in (E, M)-categories.* Dr. JEAN MARIE McDILL, California Polytechnic State University (783-18-2)

2:15– 2:25 (885) *Extensions of categories.* Preliminary report. Professor WILLIAM NICO, Tulane University (783-18-11)

2:30– 2:40 (886) *2-hieratic adjunctions.* I. Professor JOHN MacDONALD, University of British Columbia (783-18-7)

2:45– 2:55 (887) *2-hieratic adjunctions.* II. Dr. ARTHUR STONE, Roseville, California (783-18-8)

3:00– 3:10 (888) *Universal examples for group cohomology.* Preliminary report. Professor BRUCE P. CONRAD, Temple University (783-18-3)

3:15– 3:25 (889) *Simulation of category actions on structured sets.* Professor CHARLES WELLS, Case Western Reserve University (783-18-4)

SATURDAY, 1:00 P. M.

Session on Number Theory. III, Rosewood Suite

1:00– 1:10 (890) *Conjugacy classes in* $SL(2, O/p^n)$. Dr. JOSEPH B. DENNIN, JR., Fairfield University (783-10-46)

1:15– 1:25 (891) *Common forms in gcd algorithm synthesis.* Preliminary report. Professor ARNOLD D. FELDMAN, Franklin and Marshall College (783-10-38)

1:30– 1:40 (892) *A computer study of Waring's problem.* Preliminary report. Dr. JOHN T. BURNS, University of Colorado, Colorado Springs, and Dr. WILLIAM D. SERBYN*, College of St. Thomas (783-10-43)

1:45– 1:55 (893) *A canonical form for planar Farey sets.* Professor NORMAN RICHERT, Loyola Marymount University (783-10-52)

2:00– 2:10 (894) *Rational products of sines of rational angles.* Preliminary report. GERALD MYERSON, State University of New York, Buffalo (783-10-34)

2:15– 2:25 (895) *Formulas for constructing amicable pairs.* Preliminary report. Dr. HILTON CHEN* and DALE WOODS, Northeast Missouri State University (783-10-24)

SATURDAY, 1:00 P. M.

Session on Operator Theory. II, Toyon Suite

1:00– 1:10 (896) C_0*-semigroups in a locally convex space.* YOUNG HAN CHOE, University of Illinois, Chicago Circle (783-47-16)

1:15– 1:25 (897) *Norm ideals and generalized derivations.* Professor RICHARD I. LOEBL, Wayne State University (783-47-4)

1:30– 1:40 (898) *Some remarks on set-valued mappings.* Professor D. J. DOWNING*, Oakland University, and Professor W. O. RAY, University of Oklahoma (783-47-18)

1:45– 1:55 (899) *On the fixed point theory for local k-pseudo-contractions.* Dr. CLAUDIO MORALES, Pan American University (783-47-3)

SATURDAY, 1:00 P. M.

Session on Probability. II, Continental Parlor 1

1:00– 1:10 (900) *Generalized normal distributions.* Preliminary report. Professor ROBERT M. TARDIFF, Franklin and Marshall College (783-60-7)

1:15– 1:25 (901) *Continuity in probabilistic semimetric spaces.* Professor H. SHERWOOD and Professor M. D. TAYLOR*, University of Central Florida (783-60-24)

1:30– 1:40 (902) *Circulation of recurrent Markov chain.* Professor MINPING QIAN*, Washington University and Peking University, China, and Professor QIAN MIN, Peking University, China (783-60-14) (Introduced by Professor Martin L. Silverstein)

1:45– 1:55 (903) *Operator self-similar processes.* Professor J. DAVID MASON*, University of Utah, and Professor W. N. HUDSON, University of Arizona (783-60-25) (Introduced by Howard G. Tucker)

2:00– 2:10 (904) *Potential theory for random evolution processes.* Preliminary report. Dr. KYLE SIEGRIST, University of Alabama, Huntsville (783-60-20)

2:15– 2:25 (905) *Tempered processes and a Riesz decomposition for some martingales in the limit.* LOUIS H. BLAKE, College of Staten Island, City University of New York (783-60-9)

2:30– 2:40 (906) *Intrinsic integral representations of superharmonic measures.* Preliminary report. Professor CHARLES D. LAHR and DANIEL C. SLOUGHTER*, Dartmouth College (783-60-23)

2:45– 2:55 (907) *Pointwise translation of the Radon transform with applications to operator-normed limit theorems.* MARJORIE G. HAHN*, Tufts University, PETER HAHN, Harvard Medical School, and MICHAEL J. KLASS, University of California, Berkeley (783-60-17)

SATURDAY, 1:00 P. M.

Session on Topology and Topological Groups. Lassen Room

1:00– 1:10 (908) *Continuity in quotients of semigroups.* BERNARD L. MADISON, University of Arkansas, Fayetteville (783-20-36)

1:15– 1:25 (909) *Almost-periodic functions, compactifications, and faces of finite-dimensional cones.* Professor MICHAEL FRIEDBERG, University of Houston, Houston (783-22-1)

1:30– 1:40 (910) *Semigroups with commuting threads.* Professor E. E. DEVUN and Professor GEORGE GRAHAM*, Wichita State University (783-22-4)

1:45– 1:55 (911) *Pseudocompact topological group topologies.* Professor W. W. COMFORT*, Wesleyan University, and T. SOUNDARARAJAN, Madurai Kamaraj University, India (783-22-5)

2:00– 2:10 (912) *Free groups, free products, and 0-dimensionality.* Preliminary report. Professor TEMPLE H. FAY, University of Southern Mississippi, Professor M. RAJAGOPALAN, University of Iowa, and Dr. BARBARA V. SMITH-THOMAS*, Georgia Institute of Technology (783-22-6)

2:15– 2:25 (913) *Uniform free topological groups and Samuel compactifications.* Professor ERIC C. NUMMELA, New England College (783-22-2)

2:30– 2:40 (914) *Self-maps of convergence spaces.* II. Preliminary report. Professor C. V. RIECKE, Cameron University (783-54-15)

2:45– 2:55 (915) *Dense sublattices of the lattice of upper semicontinuous functions.* Professor GERALD A. BEER, California State University, Los Angeles (783-54-30)

3:00– 3:10 (916) *Some function space topologies.* Preliminary report. Professor P. LAMBRINOS, Virginia Polytechnic Institute and State University (783-54-21)

SATURDAY, 2:15 P. M.

Invited Address. Continental Ballroom

(917) *Report on von Neumann algebras.* Professor MASAMICHI TAKESAKI, University of California, Los Angeles (783-46-10)

SATURDAY, 3:20 P. M.

Special Session on Graph Theory. V, Anza Room

3:20– 3:35 (918) *A nonfactorial algorithm for the graph isomorphism problem.* Preliminary report. Dr. MARK K. GOLDBERG, University of Waterloo (783-05-23) (Introduced by Professor Gary Chartrand)

3:40– 3:55 (919) *Colorful proofs of generating function identities.* Preliminary report. JANET SIMPSON BEISSINGER* and HERBERT S. WILF, University of Pennsylvania (783-05-24)

4:00– 4:15 (920) *On hamiltonian circuits in cartesian products of Cayley diagrams.* DAVID WITTE, University of Chicago, GAIL LETZTER, Harvard University, and Professor JOSEPH A. GALLIAN*, University of Minnesota, Duluth (783-05-16)

4:20– 4:35 (921) *Finite groups acting on surfaces and the genus of a group.* Professor THOMAS W. TUCKER, Colgate University (783-05-10)

4:40– 4:55 (922) *Validity up to complementation in graph theory.* Dr. TERRY A. McKEE, Wright State University, Dayton (783-05-6)

SATURDAY, 3:30 P. M.

Session on Applied Mathematics. IV, Walnut Suite

3:30– 3:40 (923) *Mixed flow in a cascade.* Professor K. K. PURI, University of Maine, Orono (783-76-8) (Introduced by Dr. Pushpa Gupta)

3:45– 3:55 (924) *Properties of similarity porous media systems.* Professor R. M. ANDERSON*, Professor W. T. FORD, Professor A. G. RUTTAN, and Professor M. J. STRAUSS, Texas Tech University (783-76-6)

4:00– 4:10 (925) *Relation between temporal and spatial stability in three-dimensional flow over a rotating disk.* Dr. K. VAJRAVELU* and Dr. L. DEBNATH, East Carolina University, and Dr. ALI H. NAYFEH, Virginia Polytechnic Institute and State University (783-76-3)

4:15– 4:25 (926) *The intrinsic geometrical and physical properties of plane steady gas flow.* Dr. GUENTER M. SCHINDLER, Rockwell International, Canoga Park, California (783-76-2)

4:30– 4:40 (927) *Traveling wave solutions of a model system for flame propagation.* Preliminary report. Professor SHAO-SHIUNG LIN, University of Wisconsin, Madison (783-76-9)

4:45– 4:55 (928) *A theory of nonlinear wave loading on offshore structures.* Dr. LOKENATH DEBNATH*, University of Oxford, England, and Dr. MATIUR RAHMAN, Technical University of Nova Scotia (783-76-1)

5:00– 5:10 (929) *Large-time behavior for the Navier-Stokes equations with a free surface.* Preliminary report. Dr. J. THOMAS BEALE, Tulane University (783-76-7)

SATURDAY, 3:30 P. M.

Session on Complex Analysis. IV, Continental Parlor 2

3:30– 3:40 (930) *Weakly holomorphic vector fields and tangent cones.* Dr. RICHARD DRAPER* and Dr. KLAUS FISCHER, George Mason University (783-32-12)

3:45– 3:55 (931) *Spectra of holomorphic function algebras.* Dr. WILLIAM D. EMERSON, Texas Tech University (783-32-4)

4:00– 4:10 (932) *Proper holomorphic maps from the disc to* $\mathbf{C}^2$. RALPH HOWARD, California Institute of Technology (783-32-11)

4:15– 4:25 (933) *The Monge-Ampère operator on bounded plurisubharmonic functions.* Preliminary report. Professor ERIC BEDFORD, Institute for Advanced Study, and Professor B. A. TAYLOR*, University of Michigan, Ann Arbor (783-32-2)

SATURDAY, 3:30 P. M.

Session on Differential Equations. III, Teakwood Suite

3:30– 3:40 (934) *Convergence of an iterative method for nonlinear ordinary differential equations arising in plasma physics.* C. D. LUNING, Sam Houston State University, and W. L. PERRY*, Texas A&M University (783-34-26)

3:45– 3:55 (935) *Random vibrations of rotating beams with tip mass: the method of integral equations.* Professor HYUN JOON AHN, Indiana State University (783-34-22)

4:00–4:10 (936) *Existence of solutions of a nonlinear abstract functional differential equation.* ATHANASSIOS G. KARTSATOS and MARY E. PARROTT*, University of South Florida (783-34-25)

4:15– 4:25 (937) *A note on boundary differential operators and associated neutral functional differential equations.* Dr. J. A. BURNS*, Dr. T. L. HERDMAN, and Dr. H. STECH, Virginia Polytechnic Institute and State University (783-34-39)

4:30– 4:40 (938) *A mixed, neutral, functional differential equation.* Preliminary report. Professor R. D. DRIVER, University of Rhode Island, Kingston (783-34-38)

4:45– 4:55 (939) *Distributional and analytic solutions of functional differential equations (FDE).* Preliminary report. Professor JOSEPH WIENER, Pan American University (783-34-19)

5:00–5:10 (940) *Commutative linear differential equations.* Professor DAHLARD L. LUKES, University of Virginia (783-34-13)

5:15– 5:25 (941) *Hopf bifurcation in the non-standard case.* Preliminary report. Professor QIAN MIN, Peking, China, and Northwestern University (783-34-17) (Introduced by Professor Avner Friedman)

SATURDAY, 3:30 P. M.

Session on Harmonic Analysis. Diablo Room

3:30– 3:40 (942) *Representation rings of semi-simple Lie algebras.* Professor R. V. MOODY, University of Saskatchewan (783-22-7)

3:45– 3:55 (943) *Non-cuspidal discrete series representations of* $Sp(n, k)$. Dr. ROBERT A. GUSTAFSON, Texas A&M University (783-22-9)

4:00– 4:10 (944) *The Littlewood conjecture for* $SU(2)$. Preliminary report. Dr. JOHN F. PRICE, University of New South Wales, Australia (783-43-8)

4:15– 4:25 (945) *Strictly cyclic vectors for representations of locally compact groups.* Preliminary report. Professor ROBERT A. BEKES, Colorado College (783-43-5) (Introduced by Professor David W. Roeder)

4:30– 4:40 (946) *Spectral synthesis on motion groups.* Preliminary report. DAVID E. GURARIE, University of California, Irvine (783-43-9)

4:45– 4:55 (947) *Uniqueness of invariant means for measure-preserving transformations.* Professor JOSEPH ROSENBLATT, Ohio State University, Columbus (783-43-1)

5:00– 5:10 (948) *Topological invariant means on VN(G).* Professor CHING CHOU, University of New York, Buffalo (783-43-3)

5:15– 5:25 (949) *Invariant means and analytic actions,* II. Preliminary report. Professor THEODORE MITCHELL, Temple University (783-43-7)

5:30– 5:40 (950) *Amenability induced by amenable homomorphic images.* Professor H. D. JUNGHENN, George Washington University (783-43-4)

5:45– 5:55 (951) *On the Kolmogorov-Tamarkin and M. Riesz compactness criteria.* Preliminary report. Professor NICOLAE DINCULEANU, University of Florida (783-43-6) (Introduced by Professor James Keesling)

SATURDAY, 3:30 P. M.

Session on Integral Equations and Integral Transforms. Rosewood Suite

3:30– 3:40 (952) *On evaluation of a number theoretic function via Laplace transform.* Preliminary report. Professor S. VERMA, University of Nevada (783-44-2) (Introduced by Professor L. J. Simonoff)

3:45– 3:55 (953) *Smoothness of a function from its Radon transform.* Preliminary report. Dr. JAMES V. PETERS, C. W. Post Center of Long Island University (783-44-3)

4:00– 4:10 (954) *Null spaces for the classical and spherical Radon transforms.* Dr. ERIC TODD QUINTO, Tufts University (783-44-1)

4:15– 4:25 (955) *A code for solving certain Volterra equations by conversion.* JOHN M. BOWNDS, University of Arizona (783-45-7)

4:30– 4:40 (956) *On minimal and maximal solutions of nonlinear Volterra integral equations.* Preliminary report. Professor B. G. PACHPATTE, University of Texas, Arlington (783-45-6) (Introduced by Professor V. Lakshmikantham)

4:45– 4:55 (957) *Existence theorems for an integral equation of the Chandrasekhar H-equation with perturbation.* Dr. BARUCH CAHLON*, Oakland University, and Dr. MICHAEL ESKIN, Ben-Gurion University, Israel (783-45-3) (Introduced by Stuart S.-S. Wang)

5:00– 5:10 (958) *Notes on the Feynman integral,* III: *The Schroedinger equation.* Preliminary report. Professor GERALD JOHNSON and Professor DAVID SKOUG*, University of Nebraska, Lincoln (783-45-2)

5:15– 5:25 (959) *The Tjon-Wu equation in Banach space settings.* Dr. M. F. BARNSLEY, Dr. J. V. HEROD, Dr. V. V. JORY, Dr. G. B. PASSTY*, Georgia Institute of Technology (783-45-4)

5:30– 5:40 (960) *Positive nonlinear integral equations with reciprocals of the solution in the integrand.* Dr. TERRY J. WALTERS* and Dr. G. EDGAR PARKER, Pan American University (783-45-1)

5:45– 5:55 (961) *Extension of some existence theorems in the theory of nonlinear integral equations.* Preliminary report. CHAMPAK D. PANCHAL, University of North Florida (783-45-5)

SATURDAY, 3:30 P. M.

Session on Operator Theory. III, Toyon Suite

3:30– 3:40 (962) *The Frank-Wolfe algorithm for approximating the minimum norm solution of a linear operator equation.* Preliminary report. ELAINE M. HUBBARD, Kennesaw College (783-47-15)

3:45– 3:55 (963) *Commutators of compact operators.* Preliminary report. GARY WEISS, University of Cincinnati (783-47-20)

4:00– 4:10 (964) *Spectral inclusion for doubly commuting subnormal n-tuples.* Dr. RAUL E. CURTO, University of Kansas (783-47-7)

4:15– 4:25 (965) *C_p-minimal positive approximants.* Dr. DONALD D. ROGERS* and Dr. JOSEPH D. WARD, Texas A&M University (783-47-21)

4:30– 4:40 (966) *On approximation by unitary operators.* JOSÉ BARRÍA* and RAMON BUZUAL, IVIC, Venezuela (783-47-2)

4:45– 4:55 (967) *Banach space operators and orthogonal bases.* Preliminary report. Dr. JAMES E. ROBINSON, LeMoyne-Owen College (783-47-14) (Introduced by Dr. Richard Fleming)

5:00– 5:10 (968) *Reflexive lattices.* FRANK GILFEATHER* and DAVID R. LARSON, University of Nebraska, Lincoln (783-47-23)

5:15– 5:25 (969) *Recent results in nest algebras.* Preliminary report. Professor DAVID R. LARSON, University of Nebraska, Lincoln (783-47-22)

5:30– 5:40 (970) *Compact operators on Banach algebras.* Professor HERBERT KAMOWITZ, University of Massachusetts, Boston (783-47-17)

SATURDAY, 3:30 P. M.

Session on Probability. III, Continental Parlor 1

3:30– 3:40 (971) *Toward a universal law of the iterated logarithm,* Part III: *The infinite mean case.* MICHAEL J. KLASS, University of California, Berkeley (783-60-29)

3:45– 3:55 (972) *A law of the iterated logarithm for local time.* Dr. CARL E. MUELLER, University of Illinois, Urbana-Champaign (783-60-19)

4:00– 4:10 (973) *Brownian motion with partial information.* TERRY R. McCONNELL, University of Illinois, Urbana-Champaign (783-60-22)

4:15– 4:25 (974) *An infinite dimensional generalization of the Cameron-Martin-Girsanov theorem.* DENIS R. BELL, University of Southern Illinois, Carbondale (783-60-12) (Introduced by Martyn Dixon)

4:30– 4:40 (975) *On the remainder in the central limit theorem for dependent random variables.* Dr. CARLA C. NEADERHOUSER, Texas A&M University (783-60-18)

4:45– 4:55 (976) *Conditional generalizations of strong laws.* Preliminary report. Professor T. P. HILL, Georgia Institute of Technology (783-60-8)

5:00– 5:10 (977) *Some first-crossing time inequalities.* Preliminary report. Professor GRANT A. RITTER, University of Florida (783-60-26)

5:15– 5:25 (978) *Additive comparisons of stop rule and supremum expectations of uniformly bounded independent random variables.* Professor T. P. HILL and Professor ROBERT P. KERTZ*, Georgia Institute of Technology (783-60-16)

5:30– 5:40 (979) *Sample functions of centered random fields with independent increments.* Preliminary report. Professor DITLEV MONRAD, University of Illinois, Urbana-Champaign (783-60-3)

SATURDAY, 3:30 P. M.

Session on Semigroups. Lassen Room

3:30– 3:40 (980) *Maximal inverse subsemigroups of continuous functions.* Preliminary report. Professor BRIDGET B. BAIRD, University of Florida (783-20-35)

3:45– 3:55 (981) *θ-classes in L-unipotent semigroups.* Professor DON LaTORRE, Clemson University (783-20-30)

4:00– 4:10 (982) *Some aspects of Green's relations on periodic semigroups.* Professor DONALD W. MILLER, University of Nebraska, Lincoln (783-20-37)

4:15– 4:25 (983) *Describing uniform bands in terms of uniform semilattices.* Professor JANET E. MILLS, James Madison University (783-20-10)

4:30– 4:40 (984) *Group homomorphisms of Baer-Levy semigroups.* Preliminary report. Professor BORIS M. SCHEIN, University of Arkansas, Fayetteville (783-20-46)

4:45– 4:55 (985) *An absolutely flat inverse semigroup which is not a semilattice of groups.* SYDNEY BULMAN-FLEMING* and KENNETH McDOWELL, Wilfrid Laurier University (783-20-15)

5:00– 5:10 (986) *Absolute affine purity in semigroups.* KENNETH McDOWELL* and SYDNEY BULMAN-FLEMING, Wilfrid Laurier University (783-20-12)

5:15– 5:25 (987) *Orthomodular geometries and their coordinatizing semigroups.* Preliminary report. Professor KAREN E. ZAK, United States Naval Academy (783-20-47)

5:30– 5:40 (988) *Torsion theories.* II. Professor JOHN K. LUEDEMAN, Clemson University (783-20-19)

5:45– 5:55 (989) *Connected algebraic monoids.* Professor MOHAN S. PUTCHA, North Carolina State University (783-20-13)

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APPROXIMATION BY POLYNOMIALS WITH INTEGRAL COEFFICIENTS

Le Baron O. Ferguson

Results in the approximation of functions by polynomials with coefficients which are integers have been appearing since that of Pál in 1914. The body of results has grown to an extent which seems to justify the present book. The intention here is to make these results as accessible as possible.

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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

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

Second 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 are as follows:

DANIEL M. BURNS, JR., University of Michigan, 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, *Elementary methods in pure number theory.*

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 one-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, the names of the organizers, and partial lists of the speakers are as follows:

Analytic number theory, KRISHNASWAMI ALLADI, University of Michigan, Ann Arbor. The tentative list of speakers includes Krishnaswami Alladi, R. Balasubramanian, Bruce C. Berndt, J. Brian Conrey, P.D.T.A. Elliott, Patrick X. Gallagher, Sidney W. Graham, Grigori Kolarnick, Hugh L. Montgomery, Patrick Morton, Melvyn B. Nathanson, Andrew M. Odlyzko, Carl Pomerance, Donald B. Redmond, Ernst G. Straus, Jan W. M. Turk, Jeffrey D. Vaaler, and C. Viola.

Algebraic topology, WILLIAM G. DWYER, University of Notre Dame. The tentative list of speakers includes Francis X. Connolly, Eric M. Friedlander, and John Harper.

Harmonic analysis on semi-simple Lie groups, PAUL J. SALLY, JR., University of Chicago. The tentative list of speakers includes James Arthur, Thomas Enright, C. David Keys, Ronald L. Lipsman, and Gopal Prasad.

Several complex variables, WILHELM F. STOLL, University of Notre Dame. The tentative list of speakers includes Aldo Biancofiore, Pit-Man Wong, and Stephen S. T. Yau.

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.

Registration

The registration desk will be located on the ground floor of the Center for Continuing Education, and will be open from 8:00 a.m. to 4:00 p.m. on Friday and from 8:00 a.m. to 3:00 p.m. on Saturday. It is anticipated that the registration fees will be $10 for members, $15 for nonmembers, and $5 for students and unemployed mathematicians.

Accommodations

A block of rooms has been reserved at the Morris Inn, which is located across the street from the Center for Continuing Education. The room rates are $30 for a single and $36 for a double, plus a 9% tax. To make reservations write Ms. Sherri Tubinis, Reservation Manager, Morris Inn, Notre Dame Avenue, Notre Dame, Indiana 46556, or call her at (219)283-6406.

Food Service

Food service is available in the main dining room of the Morris Inn from 7:00 a.m. to 10:30 a.m., from 11:30 a.m. to 2:00 p.m., and from 5:30 p.m. to 8:30 p.m. Cafeteria service (open to the general public) is available from 7:20 a.m. to 7:00 p.m. in the South Dining Hall, which is a five minute walk to the west from the Morris Inn. In both cases slightly different hours prevail on Sunday.

Entertainment

Plans are under way for a no-host party with a cash bar on Friday evening in the basement of the Center for Continuing Education.

Parking

Visitor parking is available for a modest fee in the lot behind the Center for Continuing Education. Those staying at the Morris Inn are entitled to park in the parking lot adjacent to the Morris Inn.

Travel and Local Information

Notre Dame is located on the northern outskirts of South Bend, Indiana. The Chicago South Shore and South Bend Railroad provides frequent direct service between South Bend and the Randolph Street Station in downtown Chicago. In addition, AMTRAK'S Lake Shore Ltd., which operates daily between Grand Central Terminal in New York City and Union Station in Chicago, provides direct train service between South Bend and such cities as Toledo, Cleveland, Buffalo, Rochester, Syracuse, and Albany. South Bend uses the St. Joseph County Airport and is served by North Central, United, and Sky Stream Air Lines. Those coming by automobile should leave the Indiana Toll Road at Exit 8, drive South on U.S. 31 to Angela Drive, drive east on Angela Drive to Notre Dame Avenue, and finally go north on Notre Dame Avenue to the university campus. The Center for Continuing Education is on the east side of Notre Dame Avenue, while the Morris Inn is on the left.

Ann Arbor, Michigan

Paul T. Bateman
Associate Secretary

Reno, April 23-25, 1981, University of Nevada

First Announcement of the 785th Meeting

The seven hundred eighty-fifth meeting of the American Mathematical Society will be held at the University of Nevada, Reno, Nevada, on Thursday through Saturday, April 23-25, 1981. The main part of the meeting will be on Friday and Saturday, but some of the special sessions may begin on Thursday. The meeting will be held in conjunction with a meeting of the Northern California section of the Society for Industrial and Applied Mathematics (SIAM).

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Far Western Sectional Meetings, there will be two invited one-hour addresses. One of these will be given by ROBERT E. GREENE of the University of California, Los Angeles; the title of his lecture is *Geometric properties of strongly pseudo-convex domains*. The other invited address will be given by CALVIN H. WILCOX of the University of Utah, who will speak on *The method of asymptotic wave functions in scattering theory.*

Special Sessions

There will also be four special sessions of selected papers as follows:

C-algebras*, organized by BRUCE E. BLACKADAR of the University of Nevada, Reno.

Automatic theorem proving, organized by WOODROW W. BLEDSOE of the University of Texas, Austin.

Random permutations, organized by GERALD W. KIMBLE of the University of Nevada, Reno.

Stochastic processes, organized by ALAN CARY KRINIK of the University of Nevada, Reno.

Papers presented at these special sessions are generally by invitation of the organizers. However, anyone contributing an abstract for the meeting who feels that his or her paper would be appropriate for one of the special sessions should indicate this clearly on the abstract and submit it by February 10, 1981, two weeks before the deadline for contributed papers.

Contributed Papers

There will be sessions for contributed ten-minute papers on Friday and Saturday. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in departments of mathematics. They should be sent to the American Mathematical Society, P. O. Box 6248, Providence, RI 02940, so as to arrive prior to the deadline of February 24, 1981. Late papers will be accepted for presentation at the meeting, but will not appear in the printed program.

Information on travel and accommodations will appear in the February issue of the **Notices**.

Vancouver, British Columbia

Kenneth A. Ross
Associate Secretary

Invited Speakers at AMS Meetings

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

Notre Dame, Indiana, March 1981

Daniel M. Burns, Jr.
Harold G. Diamond
Philip C. Kutzko
Robert J. Zimmer

Reno, Nevada, April 1981

Robert E. Greene
Calvin H. Wilcox

Pittsburgh, Pennsylvania, May 1981

Jack K. Hale
Idun Reiten
Frank Warner

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.

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

April 1981 Meeting at Reno, Nevada

Deadline: February 10, 1981

Bruce E. Blackadar
C-algebras*
Woodrow W. Bledsoe
Automatic theorem proving
Gerald W. Kimble
Random permutations
Alan Cary Krinik
Stochastic processes

May 1981 Meeting at Pittsburgh, Pennsylvania

Deadline: February 9, 1981

Ching Chou
Abstract harmonic analysis
Barbara Faires and **Robert Huff**
Vector measures
George Fix
Numerical solutions of partial differential equations
W. Fleissner
Set-theoretic topology
Jack K. Hale
Dynamic bifurcation
V. Komkov
Problems in elastic vibrations, stability and related topics
Idun Reiten
Representations of algebras

June 1981 Meeting at Portland, Oregon

Deadline: April 6, 1981

Roy Ryden
Number theory

Revised Procedures Effective February 1981

Special sessions at Annual and Summer meetings are held under the general supervision of the Program Committee. They are administered by the Associate Secretary in charge of the meeting with staff assistance from the Society office in Providence.

Some special sessions arise from an invitation to a proposed organizer issued through the Associate Secretary. Others are spontaneously proposed by interested organizers or participants. Such proposals are welcome. They may be submitted to the Associate Secretary, to the Chairman of the Program Committee, or to the Secretary, who is a member of the Program Committee. Beginning with the Summer Meeting of 1981, the number of special sessions at a Summer or Annual Meeting is limited to twelve. Proposals, invited or offered, which are received at least eight months prior to the meeting are screened for suitability of the topic and of the proposed list of speakers and for possible overlap or conflict with other proposals. If necessary, the numerical limitation is enforced. Later proposals, within the numerical limit, are accepted if convenience allows.

Special sessions are effective at regional meetings and can usually be accommodated. They are arranged by the Associate Secretary under the supervision of the Committee to invite Hour Speakers for the region. The limitation on the number of sessions depends on the space and time available.

No person is entitled to present more than one paper in the special sessions at any one meeting.

The Associate Secretary who will be in charge of the AMS program at the Summer Meeting in Pittsburgh, August 1981, is Frank T. Birtel. The programs of regional meetings are arranged by the Associate Secretary of the region in question: Far Western Region (Pacific and Mountain), Kenneth A. Ross; Western Region (Midwest), Paul T. Bateman; Northeastern Region, Raymond G. Ayoub; Southeastern Region, Frank T. Birtel.

Pittsburgh, May 15-16, 1981, Duquesne University

First Announcement of the 786th Meeting

The seven hundred eighty-sixth meeting of the American Mathematical Society will take place at Duquesne University in Pittsburgh, Pennsylvania on May 15-16, 1981. This will be a joint meeting with the Allegheny Mountain Section of the Mathematical Association of America.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Eastern Sectional Meetings, there will be three invited one-hour addresses. The speakers will be JACK K. HALE of Brown University; IDUN REITEN, University of Trondheim, currently at Brandeis University; and FRANK WARNER, University of Pennsylvania.

Special Sessions

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

Abstract harmonic analysis, CHING CHOU, University of Buffalo.

Vector measures, BARBARA FAIRES, Westminster College, and ROBERT HUFF, Pennsylvania State University, University Park.

Numerical solutions of partial differential equations, GEORGE FIX, Carnegie-Mellon University.

Set-theoretic topology, W. FLEISSNER, University of Pittsburgh.

Dynamic bifurcation, JACK K. HALE, Brown University.

Problems in elastic vibrations, stability and related topics, V. KOMKOV, West Virginia University.

Representations of algebras, IDUN REITEN, University of Trondheim and Brandeis University.

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 February 9, 1981, three weeks before the deadline for contributed papers.

Contributed Papers

There will also be sessions for contributed ten-minute papers. 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 March 2, 1981.

Details on transportation and accommodations will appear in a later issue of the **Notices**.

University Park, Pennsylvania

Raymond G. Ayoub
Associate Secretary

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.

1981 SUMMER RESEARCH INSTITUTE

Singularities

Humboldt State University, Arcata, California, July 20—August 7, 1981

The twenty-ninth Summer Research Institute sponsored by the American Mathematical Society will be devoted to singularities, and will take place at Humboldt State University in Arcata, California, from July 20 to August 7. The Organizing Committee includes Professors Philip Church, Alan Durfee, Martin Golubitsky, Peter Orlik (chairman), Lê Dũng Tráng, and Philip Wagreich.

The main objective of the institute will be to review the results obtained in the past decade in the newly emerging field of singularities. The area is fertile to a great extent because it employs a wide variety of techniques from differential topology, algebraic geometry, pure algebra, and algebraic topology. It is the hope of the organizers that this institute will serve as a vehicle to bring experts in all these fields together and provide stimulus for new progress in the field.

Housing accommodations will be provided on the campus for those attending the institute, and daily meals will be served in a nearby dining hall. The room and board rate will amount to approximately $22 per person for each day of attendance at the institute. In the early spring a brochure will be available containing information about the scientific program, firm room and board rates, residence and dining hall facilities, local information, and a reservation form for accommodations in the residence halls. Each participant will pay a social fee to cover the cost of refreshments served at breaks, and for social events. Additional information will be included in the February issue of the **Notices**.

Funds for participant support will again be limited, and it is hoped that a number of participants who wish to attend will obtain their own support. Those interested in taking part in the institute and/or being considered for financial assistance should send their requests to the Chairman of the Organizing Committee, c/o Meeting Arrangements Department, American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940, prior to April 15, 1981. The Committee will then consider such requests, and applicants will be notified shortly thereafter.

QUERIES

Edited by Hans Samelson

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

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

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

QUERIES

230. **Lilia Del Castillo** (Department of Mathematics, Universidad Autónoma Metropolitana Iztapalapa, Apartado 55-534 México, 13 D. F.). In 1968 Mal'cev wrote an article in which he generalised the concept of groups products by defining varieties products of universal algebra. In lattices, products have been defined in general. I would appreciate late references to and ideas about the development in the research around this theme.

231. **Alan Evans** (Department of Mathematics, Vassar College, Poughkeepsie, NY 12601). As is well known, in a commutative ring with identity, Zorn's Lemma implies that every ideal is contained in a maximal ideal. Somewhere in the literature I remember having seen a converse, approximately. Where?

232. **Albert A. Mullin** (506 Seaborn Drive, Huntsville, AL 35806). The arithmetical function $f(\cdot) = \varphi(\cdot)\sigma(\cdot)$ (where $\varphi(\cdot)$ is Euler's totient and $\sigma(\cdot)$ is the sum-of-divisors function) is known to be useful in a characterization of two primes that differ by various fixed integers m. Thus, e. g., n is a product of twin primes iff $\varphi(n)\sigma(n) = (n-3)(n+1)$. I would appreciate information concerning the following two conjectures. (C1) For each integer $k \geqslant 1$, there exists an integer n such that $f(n) = f(n+1) = \cdots = f(n+k)$; e. g., $k = 1$, $n = 5$ and $k = 2$, $n = 55$. (C2) $f(89)$ and $f(90)$ are the only two consecutive terms in the sequence $f(\cdot)$ which are orders of nonabelian finite simple groups.

233. **John Synowiec** (Department of Mathematics, Indiana University Northwest, 3400 Broadway, Gary, IN 46408). Does anyone know where one can find a copy of a set of mimeographed lecture notes by José Sebastião e Silva, University of Maryland, 1964, *Theory of distributions*?

RESPONSES

The replies below have been received to queries published recently in the **Notices**. The editor would like to thank all who reply.

201. **(vol. 26, p. 376, October 1979, Nicholas Tzanakis).** Is there an elementary geometric proof of the fact that a line meets a conic section in at most two points? Strictly speaking one should start from an axiom system. One elementary proof goes as follows: Let a conic section be defined as the section of a circular cone by a plane that does not contain the vertex and hence contains no generator. If a line cut a conic section in three points, it could not be a generator. The plane containing the line and the vertex must then intersect the base circle of the cone in three points which lie on a line. For a circle the question is really elementary. (Contributed by A. A. Blank).

222. **(vol. 27, p. 442, August 1980, C. C. White).** Does each component of the group G of invertible elements in $C(X)$ for a compact Hausdorff abelian group X with a totally ordered dual, contain a character on X? Answer: Yes, each component of G contains exactly one character on X. This is a corollary from a theorem of E. R. van Kampen, J. London Math. Soc. 12 (1) (1937), 3–6, which says: If X is a connected compact group, then for every $f \in C(X)$ with $f(x) \neq 0$ there exist exactly one character χ on X and $\varphi \in C(X)$, such that $f = \chi \exp \varphi$. (Contributed by T. V. Tonev).

PROBLEM LISTS

RIGIDITY OF FRAMEWORKS AND SURFACES

The following is a list of conjectures from the special session on the rigidity of frameworks and surfaces at the AMS meeting in Washington, DC, October 20–21, 1979. In the interest of making the following conjectures and questions understandable to the greatest number of people possible, we give some quick definitions of the terms used. See Gluck [6], Asimow and Roth [1], or Connelly [3] for more information.

Let G be a finite abstract graph. A *representation* of G, or a *framework*, is an assignment of a p_i in $\mathbf{R}^n$ for the ith vertex of G, $i = 1, \ldots, v$, where G has v vertices. We write $p = (p_1, \ldots, p_v)$ in $\mathbf{R}^{nv}$, and $G(p)$ as the realization of G. Each edge of G, also called a *member*, is designated as either a *rod*, *cable*, or *strut*. A *flex* of $G(p)$ is a continuous path $p(t)$ in $\mathbf{R}^{nv}$, $p(0) = p$, $0 \leqslant t \leqslant 1$, such that rods have a fixed length, cables do not increase in length, and struts do not decrease in length. Members are allowed to intersect each other at any time. If $p(t)$ is the restriction of a rigid motion of $\mathbf{R}^n$ for all $0 \leqslant t \leqslant 1$, then we say the flex

is *trivial.* If $G(p)$ has only trivial flexes we say $G(p)$ is *rigid.* An *infinitesimal flex* of $G(p)$ is a vector p' in $\mathbf{R}^{nv}$ such that

$$(p_i - p_j) \cdot (p_i' - p_j') \begin{cases} = 0 & \text{if } \{i, j\} \text{ is a rod,} \\ \leqslant 0 & \text{if } \{i, j\} \text{ is a cable,} \\ \geqslant 0 & \text{if } \{i, j\} \text{ is a strut.} \end{cases}$$

If p' is the derivative at $t = 0$ of a trivial flex we say p' is *trivial.* If $G(p)$ has only trivial infinitesimal flexes we say $G(p)$ is *infinitesimally rigid.* It is well known, see Gluck [6], Asimow and Roth [1], or Connelly [3], that if $G(p)$ is infinitesimally rigid, it is rigid. A *stress* for $G(p)$ is an assignment of scalars $\omega_{ij} = \omega_{ji}$ for each member $\{i, j\}$, such that for all i, $\Sigma_j \omega_{ij}(p_i - p_j) = 0$, where the sum is taken over all vertices j adjacent to i. $\omega = (\ldots, \omega_{ij}, \ldots)$ denotes this stress. ω is a proper stress if $\omega_{ij} \geqslant 0$ when $\{i, j\}$ is a cable, and $\omega_{ij} \leqslant 0$ when $\{i, j\}$ is a strut (no condition for rods). This is different from Roth and Whiteley [9].

Conjecture 1 (B. Roth). Let $G(p)$ be a framework in $\mathbf{R}^2$, where the vertices form a convex polygon, with rods as the edges and cables on the interior. If $G(p)$ is rigid in $\mathbf{R}^2$, then $G(p)$ is infinitesimally rigid in $\mathbf{R}^2$. See Roth and Whiteley [9] for more details.

We say a rigid framework $G(p)$ is minimal if the deletion of any member causes $G(p)$ not to be rigid. Let G^* denote the graph obtained from G by calling cables struts, calling struts cables; that is, by interchanging the struts and cables of G.

Conjecture 2 (W. Whiteley). If $G(p)$ in $\mathbf{R}^n$ is rigid, minimal, but not infinitesimally rigid, and has a proper stress nonzero on all cables and struts, then $G^*(p)$ is not rigid.

Conjecture 3 (W. Whiteley). The projection into the plane of a convex polyhedral surfaces, such that the boundary consists of the vertices and edges of a single face, is rigid in the plane when constructed with struts on the boundary and cables through the interior.

A *natural corner* or *edge* of a convex polyhedron is the zero or one dimensional (respectively) intersection of a support plane with the convex polyhedron.

Conjecture 4 (B. Grünbaum, W. Whiteley). If all the faces of a convex polyhedron are replaced by plane rigid frameworks, with the natural corners as the only vertices, then the new framework is rigid in 3-space. (It is also unknown even if vertices are allowed on the natural edges of the polyhedron.)

See Connelly [3] or Roth and Whiteley [9] for relevent information.

The following two conjectures are inspired from R. Buckminster Fuller's tensegrities [5]. Recall that a graph G is 3-*connected* if it takes the removal of 3 or more vertices to disconnect the remaining vertices.

Conjecture 5 (W. Whiteley). Let $G(p)$ be a framework in 3-space, where all the vertices are on the boundary of a convex polyhedron P. All the members of $G(p)$ that are in the boundary of P are cables. All the members that are in the interior of P are struts. Suppose also there is a proper stress on $G(p)$. Suppose the subgraph of G, determined by the cables of $G(p)$ with a nonzero stress, is 3-connected. Then $G(p)$ is rigid.

See Connelly [4] for some special cases and related results.

Conjecture 6 (W. Whiteley). Let $G(p)$ be a framework in 3-space where all the vertices but one are the natural corners of a convex polyhedron P, and the extra vertex is in the interior of P. The natural edges of P determine the cables, and the extra vertex is joined to all the others by struts. Then $G(p)$ is rigid in 3-space.

In the following conjecture a graph G, with all rods, is said to be generically rigid, if there is an open set U in $\mathbf{R}^{nv}$ such that for all p in U, $G(p)$ is (infinitesimally) rigid. See Gluck [6] or Asimow and Roth [1] for more details.

The following was claimed by Henneberg in [8], but the proof is inadequate.

Conjecture 7 (Henneberg). Suppose a rod graph G is generically rigid in 3-space with two rods $\{a, b\}$, $\{c, d\}$, a, b, c, d distinct. Construct a new graph H obtained by deleting these two rods and inserting a new 5 valent vertix 0 and the rods $\{0, a\}$, $\{0, b\}$, $\{0, c\}$, $\{0, d\}$, $\{0, e\}$, where e is any vertex in G distinct from a, b, c, d. Then H is generically rigid.

Question 8 (Connelly). If a framework $G(p)$ is flexible (not rigid), does there exist a flex $p(t)$ such that $p'(0)$ (the first derivative at $t = 0$) is a nontrivial infinitesimal flex?

Suppose G is a rod framework isomorphic to a triangulation of an orientable two dimensional surface. Then for any realization $G(p)$ in $\mathbf{R}^3$ it is possible to define a number $V(p)$, which generalizes the notion of the volume enclosed by the embedded surface. See Connelly [2].

Conjecture 9. Let $p(t)$ be any flex of $G(p)$, $p(0) = p$, $0 \leqslant t \leqslant 1$. Then $V(p(t))$ is constant.

REFERENCES

1. L. Asimow and B. Roth, *The rigidity of graphs,* Trans. Amer. Math. Soc. **245** (1978), 279–289.

2. R. Connelly, *The rigidity of polyhedral surfaces,* Math. Mag., **52** (5) (1979), 275–283.

3. R. Connelly, *The rigidity of certain cabled frameworks and the second order rigidity of arbitrarily triangulated convex surfaces*, Advances in Math. (to appear).

4. ———, *Rigidity and energy*, preprint, Cornell University.

5. R. Buckminster Fuller, *Synergetics, Synergetics* 2, Macmillan, New York, 1975, 1979.

6. H. Gluck, *Almost all simply connected closed surfaces are rigid*, Geometric Topology, Lecture Notes in Math., Vol. 438, Springer-Verlag, Berlin, 1975, pp. 225–239.

7. B. Grünbaum and G. C. Shephard, *Lectures on lost mathematics*, mimeographed notes, University of Washington, Seattle.

8. L. E. Henneberg, *Die Graphische Statik der Starren Systeme*, Leipzig, 1911 (Bibliotheca Mathematica Teubneriana, No. 38). Johnson Reprint 665–669.

9. B. Roth and W. Whiteley, *Tensegrity frameworks*, Trans. Amer. Math. Soc. (to appear).

CODING

The following is a list of problems presented at the special session on coding held during the AMS meeting in Ann Arbor, Michigan, August 19–22, 1980.

(A) (Robert Calderbank and Jacobus van Lint)

(1) If F is a subset of $GF(q^2)$ of size q satisfying (a) $0, 1 \in F$ and (b) $x, y \in F$ implies $x - y$ is a square, is it true that F must be the subfield of size q. The proposers know this is true for q a prime so the question is for q a prime power.

(B) (H. F. Mattson, Jr.)

(2) Prove that the covering radii of the Reed-Muller codes and the extended BCH codes are even.

(3) Prove that the covering radius of the first order Reed-Muller code of $(2^m, 1 + m, 2^{m-1})$ is $2^{m-1} - 2^{(m-1)/2}$ for m odd.

(4) Improve Delsarte's upper bound on the covering radius.

(5) Does the t-error-correcting BCH code of length $2^m - 1$ have covering radius $2t - 1$ for large m? If not, why not?

(C) (Vera Pless)

(6) If an extremal doubly-even (72, 36, 16) code exists, can its group have order divisible by 17, 11, 7, 5 or 3?

(D) (H. N. Ward)

(7) Find bounds on dimensions of linear codes whose weights are divisible by a power of the field characteristic. Are there interesting extremal such codes? Can one use glueing methods?

(8) Study analogues of the extended quadratic residue codes obtained by using a monomial representation of a group (so that the group acts on the code and there are global codes).

(9) There are several information-set problems for quadratic residue codes, for example, whether the orbits of elements of order $(q + 1)/2$ can be used. See also the problems suggested in Ward's Quadratic Residue Code paper for shortened codes.

ORTHOGONAL POLYNOMIALS AND OTHER EXTREMAL POLYNOMIALS

The following questions were prepared for an open problem hour for the special session on orthogonal polynomials and other extremal polynomials at the AMS meeting in Ann Arbor, Michigan, August 19–22, 1980.

1. (J. L. Ullman) Let K be a compact subset of $I = [-1, 1]$ that has positive (logarithmic) capacity, $C(K)$, and has irregular points. Is it true that for every $\epsilon > 0$ there is a compact subset of K, say K_ϵ, without irregular points, such that $C(K_\epsilon) > C(K) - \epsilon$. When K is a compact subset of I with no irregular points, or has irregular points and satisifes this condition, we call K inner regular.

2. (J. L. Ullman) Let α be a finite Borel measure defined on I, let $\{p_n(x, d\alpha)\}$ be the associated monic orthogonal polynomials, and let $N_n^2(d\alpha) = \int p_n^2(x, d\alpha)\, d\alpha$. If $K = \operatorname{supp}(d\alpha)$, $C(K) > 0$ and K is inner regular, then there exists a positive Borel measurable function f, integrable α, such that $N_n^{1/n}(f d\alpha)$ tends to $C(K)$. Can this be shown to be true when K is not regular, and is not obviously inner regular, without settling the question raised in Problem 1?

3. (J. L. Ullman, in memory of G. Freud) Let $d\alpha_m = \exp(-|x|^m)dx$, $m > 0$, $x \in R = (-\infty, \infty)$. Let $X_{m,n}$ be the largest root of $p_n(x, d\alpha_m)$. Does $n^{-1/m} X_{m,n}$ have a finite, positive limit as $n \to \infty$? This is true for $m = 2$ from Hermite polynomial theory, conjectured for positive m by G. Freud (*On the coefficients in the recursion formulae of orthogonal polynomials*, Proc. Royal Irish Academy, Vol. 76, A, 1, (1976), 1–6), and proved there for $m = 4, 6$. In Proc. Conf. Approximation Theory held in Austin, Texas, January 1980 (W. Cheney, ed.) (to appear), in an article *On orthogonal polynomials associated with the infinite interval* by J. L. Ullman, it is shown what the distribution of all the zeros will be for any m for which conjecture holds, thus renewing interest in Freud's conjecture.

4. (George Gasper) The polynomials

$$p_n(z) = {}_2\phi_1\left(q^{-n}, aq^{n-1}; q, qz/x\right), \qquad 0 < |a|, |b|, |c|, |q|, |a/b| < 1,$$

which have been considered by M. E. H. Ismail, satisfy the orthogonality relation

$$\int_{|z|=1} p_n(z) p_m(z) w(z) \frac{dz}{z} \begin{cases} = 0 & n \neq m, \\ \neq 0 & n = m, \end{cases}$$

with $w(z) = {}_2\phi_1(a, b; q, c/z)$. (The weight is not

unique.) What other basic hypergeometric functions satisfy an orthogonality relation of this form for some complex weight?

5. (George Gasper) If $p_n(z)$ are polynomials of precise degree $n = 0, 1, 2, \ldots$, which are orthogonal on the unit circle with respect to a complex measure λ in the sense that

$$\int_{|z|=1} p_n(z)p_m(z)\,d\lambda(z) \begin{cases} = 0 & n \neq m, \\ \neq 0 & n = m, \end{cases}$$

then there are constants A_n, B_n, C_n such that

$$zp_n(z) = A_n p_{n+1}(z) + B_n p_n(z) + C_n p_{n-1}(z), \quad A_n C_n \neq 0,$$

holds for $n = 1, 2, \ldots$. Find additional conditions on A_n, B_n, C_n so that a converse holds.

6. (George Gasper) Find a q-analog of the first Heisenberg group H_1 for which the spherical harmonics are, for certain values of α and β, linear combinations of multiples of the functions

$$C_n^{(\alpha,\beta)}(e^{i\theta}; q) = \sum_{k=0}^{n} \frac{(\alpha; 2)_{n-k}(\beta; q)_k}{(q; q)_{n-k}(q; q)_k} e^{i(2k-n)\theta},$$

where $(a; q)_n = (1 - a)(1 - aq) \cdots (1 - aq^{n-1})$, $(a; q)_0 = 1$. See P. C. Greiner, *Spherical harmonics on the Heisenberg group* (to appear); R. Askey and M. E. H. Ismail, *A generalization of ultraspherical polynomials*, to appear in a memorial volume for P. Turan; and G. Gasper, *Orthogonality of certain functions with respect to complex valued weights*, Canad. J. Math. (to appear).

LETTERS TO THE EDITOR

Textbooks

I once asked (**Notices**, February 1980, p. 181) whether anyone knew of any second edition of an elementary textbook that was smaller, cheaper, or better than the first. Several persons have written (e.g. **Notices**, August 1980, p. 444) with examples of **better**, precisely the one property of the list that admits no objective measurement. All my correspondents seem to agree that **smaller** and **cheaper** are never the case with second editions.

I have known several authors of elementary texts. They are invariably plagued by their publishers to produce a second edition—when the first one had promising sales—whether they, the authors, wanted to or not. Third and later editions, too, until sales petered out.

The reason for this is plain enough: the evasion of the market for used books. This is not an evil of capitalism as such, for it could never succeed in a real market where customers seek to minimize their expenses. We professors prescribe books as physicians prescribe treatments; in both cases the price is generally paid by neither the prescriber nor the consumer, but rather by some helpless third party, the students' parents or the invalids' Blue Cross or Medicaid sponsor. Those of us in a position to reduce costs have no incentive to do so, and indeed we are often so indifferent that we don't know what that cost is!

If there were a way for us to share in the savings that can result from a rational use of books, many of us would probably be using early editions of Sherwood & Taylor's *Calculus*, dog-eared and many times re-sold. As it is, the latest edition of some behemoth slips into our college bookstores without our caring, while ten thousand excellent volumes across the country turn valueless overnight, as if (like the Wonderful One-Hoss Shay) suddenly collapsed into so many heaps of dust.

Ralph A. Raimi
University of Rochester

Readers who wish to respond to letters published in this issue are urged to do so prior to March 16, 1981. Responses received by that date may be edited to reduce repetition and will be considered for publication in the June 1981 issue. A second round of rejoinders to these responses will then be scheduled for possible publication in the October 1981 issue.

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.

1980 WOLF PRIZE

The Wolf Foundation of Herzlia Bet, Israel, announced the award of its 1980 prizes in September. The mathematics prize was shared by Henri Cartan and Andrei N. Kolmogorov. Prizes were also awarded in Agriculture, Chemistry, Physics, and Medicine. Each prize is awarded annually and has a value of $100,000. The 1979 prize in mathematics was shared by Jean Leray and André Weil, and the 1978 prize (the first awarded) was shared by I. M. Gel'fand and Carl L Siegel.

The text of the announcement of the 1980 mathematics awards is as follows:

"The Prize Committee unanimously decided to select as co-recipients of the Wolf Prize for mathematics for 1980: Professor (Emeritus) Henri Cartan, Université de Paris, France, and Professor Andrei N. Kolmogorov, Moscow State University, USSR. Both mathematicians are noteworthy for their breadth of interests and for the depth of the results they have obtained in the various fields of mathematics in which they have been active. Their interests were complementary and, taken together, span almost the whole range of mathematics.

"HENRI CARTAN (born in 1904 in France): For pioneering work in algebraic topology, complex variables, homological algebra and inspired leadership of a generation of mathematicians.

"Henri Cartan began his career in several complex variables when, along with Oka and Thullen, he laid the foundation for the general theory, culminating in the characterization of domains of holomorphy.

"During the post-war period for about 15 years, Cartan was the leader of the famous Seminaire Cartan which attracted mathematicians from all over the world. In this seminar he also turned to algebraic topology and soon made the seminar the center of new developments in this field. The new methods which were introduced by him and by others, formed the basis of an entirely new branch of mathematics, homological algebra, which has grown beyond all expectation. In addition to the above, Cartan has contributed to various theories such as potential theory and harmonic analysis. He was one of the founding fathers of the Bourbaki Circle of French Mathematicians, who have definitely stamped the image of the present science of Mathematics.

"ANDREI N. KOLMOGOROV (born in 1903 in USSR): For deep and original discoveries in Fourier analysis, probability theory, ergodic theory and dynamical systems.

"The work of Andrei N. Kolmogorov is characterized above all by great power. One of his first achievements was to give an example of an L^1 function whose Fourier Series diverges everywhere. In addition, the Kolmogorov-Seliverstov theorem remained for many years the deepest result on convergence of Fourier Series for L^2 functions. However, it was his work in probability theory which truly earned his reputation. In 1933 he wrote a fundamental book on the foundations of probability theory which for the first time put probability theory on a completely secure footing, comparable to the rest of mathematics. He later introduced the critical concept of *entropy*, which enabled one to solve the famous isomorphism problem for Bernoulli shifts, and essentially revived the entire field of ergodic theory.

"His interests include logic, approximation theory, and the theory of real variables, as well as many other subjects. His influence on students has also been very extensive."

BEIJING SYMPOSIUM

From August 18 to September 22, 1980 a delegation sponsored by the Committee on Scholarly Communication with the People's Republic of China took part in an International Symposium on Partial Differential Equations and Differential Geometry held in Beijing under the auspices of the Chinese Academy of Sciences, Beijing University, and Fudan University. The American Delegation consisted of Shiing-shen Chern, Chairman, the University of California, Berkeley; Peter Lax, Vice Chairman, Director of the Courant Institute of New York University; E. Bombieri and Shing-tung Yau of the Institute for Advanced Study, Princeton; Raoul Bott of Harvard University; Felix Browder of the University of Chicago; S. Y. Cheng of the University of California, Los Angeles; Joseph Kohn of Princeton University; Louis Nirenberg of the Courant Institute; Murray Protter, Isadore Singer, and Hung-hsi Wu of the University of California, Berkeley. The leader of the Chinese organizing committee was Professor Wu Wenjun, Deputy Director of the Institute of Mathematics of the Chinese Academy of Sciences. Participants from other countries included M. Atiyah of Oxford, M. Berger of Paris, L. Garding of Lund, S. T. Hildebrandt of Bonn, and T. Ochiai of Tokyo.

The Symposium was divided into two segments, the first running from August 18 to September 2 and the second from September 2 to September 22, with approximately half the American Delegation attending each segment. Each American invitee presented six hours of reports matched by a similar number from the Chinese participants. A final volume of reports presented at the Symposium will be published either in the U. S. or in China.

THEOPHIL HENRY HILDEBRANDT

T. H. Hildebrandt died October 9, 1980 at the age of 92. He was a member of the Society for 67 years, and served as its President in 1945 and 1946. He joined the department of mathematics of the University of Michigan in 1914, and served as its

chairman from 1934 until his retirement as professor emeritus in 1957. He was a member of the Executive Committee of the AMS Council in 1949, he was a member of the Society's Board of Trustees from 1947 to 1952, and he served on dozens of AMS committees over a period of nearly thirty years. He also served as vice president of the Mathematical Association of America, in 1935, and received the Association's Chauvenet Prize in 1929. The University of Michigan established the T. H. Hildebrandt Research Instructorships in his honor.

STATEMENT OF POLICY RELATED TO NSF FUNDING OF CRYPTOLOGIC RESEARCH

The following is a statement of policy by Dr. Donald N. Langenberg, Acting Director of NSF, related to funding of cryptologic research.

"In view of the extensive recent discussion of the respective roles of the National Science Foundation (NSF) and the National Security Agency (NSA) in support of cryptologic research, I believe it may be useful to restate the Foundation's established policy in this area.

"The essential points of our policy with respect to cryptologic research are these:

"1. Since mid-1977 we have routinely referred proposals with relevance to cryptology to NSA for review. We will continue to do this. The practice serves to keep NSA informed of NSF's activities in this area, and gives NSA an opportunity to make technical comments on proposals which can be useful in making funding decisions. It is not a "clearance" process; whatever comments NSA may make are advisory.

"2. NSF has long had a policy of encouraging other agencies to support basic research in areas relevant to their missions. We have specifically encouraged the National Security Agency to establish an unclassified basic research program, and stand ready to assist that agency in this effort. We believe it is fundamentally healthy to have alternative sources of support in important areas of science, and anticipate no difficulties in maintaining close coordination between NSF and NSA.

"3. In cases in which alternative sources of support are available, we routinely encourage principal investigators to apply to such sources as well as to NSF. However, if an investigator prefers to apply only to NSF, we will consider the proposal in the usual manner, without prejudice, and reach a decision on funding using our usual criteria and peer review process.

"4. NSF does not expect that the results of the basic research which it supports will be classified, except in very rare instances. NSF does not currently have classification authority, but it has responsibility, under routine executive orders issued by both the current and previous administrations, to refer any information which it believes might require classification to the agency with appropriate subject matter interest and original classification authority. For cryptologic research, that agency is NSA. The important point here is that it makes no essential difference, in terms of the likelihood of classification, whether research is supported by NSF or NSA. This policy is of long standing, and applies to all areas of research.

"5. NSF has long-established reporting requirements which allow it to meet its responsibility for prudent use of public funds. These might not be adequate in all cases where research might have special relevance to national security, and in such cases we may consider special reporting requirements. We have not done this in the past, and we may not have to do it in the future. If we did have to establish such reporting requirements, however, we would regard this not as a change in policy but simply as a change in administrative procedure necessary to apply a long-standing policy to a changed situation.

"In summary, the Foundation will continue to support cryptologic research, will continue to coordinate such research with NSA, and will continue to encourage NSA to develop its own basic research support program. The results of such research have not been classified in the past, and we don't expect them to be in the future, but we will ensure that our reporting requirements are adequate to allow us to meet our responsibilities with respect to possible classification. Most importantly, the Foundation has a basic policy of supporting the best research it can find in all areas of science and engineering, with the fewest possible restrictions on investigators."

November 6, 1980
—NSF Release

NIGERIAN MATHEMATICAL SOCIETY

A new mathematical society—the Nigerian Mathematical Society—was inaugurated in Nigeria in February 1980. The aim of the Society is the promotion of mathematical research through (i) holding of conferences, symposia, workshops, etc., (ii) publishing a journal of high quality, (iii) awarding prizes for outstanding mathematical work especially to young mathematicians, and (iv) cooperating with other bodies with similar aims.

The following officers were elected: A. Olubummọ, President; E. N. Chukwu, Vice-President; O. Akinyẹle, Secretary; I. B. Mohammed, Treasurer; and H. O. Tejumola, Editor-in-Chief.

N.R.C. TO ADMINISTER POSTDOCTORAL FELLOWSHIPS FOR MINORITIES

The National Research Council plans to award approximately 35 to 40 Postdoctoral Fellowships for Minorities in a program designed to provide opportunities for continued education and experience in research to American Indians and Alaskan Natives (Eskimo or Aleut), Black Americans, Mexican Americans/Chicanos, and Puerto Ricans. Fellowship recipients will be selected from among scientists, engineers, and scholars in the humanities who show greatest promise of future achievement in academic

research and scholarship in higher education.

In this national competition sponsored by the Ford Foundation, with additional support from the National Endowment for the Humanities, citizens of the United States who are members of one of the designated minority groups, who are engaged in college or university teaching, and who hold doctoral degrees may apply for a fellowship award of one year's duration.

Awards will be made in the areas of behavioral and social sciences, humanities, EMP fields (engineering sciences, mathematics, physical sciences), life sciences, and for interdisciplinary programs of study. Awards will not be made in professions such as medicine, law, or social work, or in such areas as educational administration, curriculum supervision, or personnel and guidance. Tenure of fellowship provides postdoctoral research experience at an appropriate nonprofit institution of the Fellow's choice, such as a research university, government laboratory, national laboratory, privately-sponsored nonprofit institute, or a center for advanced study.

The deadline date for the submission of applications is February 2, 1981. Further information and application materials may be obtained from the Fellowship Office, National Research Council, 2101 Constitution Avenue, Washington, DC 20418.

AAAS ESTABLISHES AWARD FOR SCIENTIFIC FREEDOM AND RESPONSIBILITY

The American Association for the Advancement of Science (AAAS) has established a new award for Scientific Freedom and Responsibility, William D. Carey, AAAS executive officer, announced recently. The award, which will be presented for the first time at the 1982 AAAS Annual Meeting in Washington, DC, will consist of a plaque and a cash prize of $1,000. The award was established by action of the AAAS Board of Directors in June 1980.

Under the criteria approved by the AAAS Board, the purpose of the award is to honor scientists and engineers whose actions, often at significant personal cost, have outstandingly exemplified principles of scientific freedom and responsibility. The new prize will recognize scientists and engineers who have:

acted to protect the public's health, safety, or welfare; or

focused public attention on important potential impacts of science and technology on society by their responsible participation in public policy debates; or

established important new precedents in carrying out the social responsibilities or in defending the professional freedoms of scientists and engineers.

As noted by John T. Edsall, professor emeritus of Harvard University and chairman of the AAAS Committee on Scientific Freedom and Responsibility, which proposed the award: "Those scientists and engineers who act on behalf of scientific freedom and responsibility under difficult circumstances are performing services of exceptional value to society. Often such actions also involve high risks to the career of the individual who undertakes them, and require courage beyond the usual call of duty. All of us on the Committee believe that the exceptional people who have performed such services should receive some appropriate recognition. This is in part to honor them, but it also is to spread, among the scientific public and the public in general, awareness of the importance of maintaining scientific freedom and responsibility."

Members of the AAAS or its affiliated professional societies are invited to nominate candidates for the award by providing the following information: the name and address of their nominee; a brief statement (about 100 words) describing the action(s) of their nominee which they believe merits recognition; general background information about their candidate (no longer than three pages); and names and addresses of one or two other persons (one of whom must be a scientist) who support the nomination. Nominations will be reviewed by the Scientific Freedom and Responsibility Award Committee, who may recommend a nominee or nominees to the Chairman of the AAAS Board for final approval.

Nominations should be sent to: Scientific Freedom and Responsibility Award, American Association for the Advancement of Science, 1515 Massachusetts Avenue, N.W., Washington, DC 20005. Deadline for receipt of nominations is 30 June 1981.

Three professional societies affiliated with the American Association for the Advancement of Science also sponsor awards for scientists or engineers in their profession who have taken extraordinary actions in the public interest. These are the Institute of Electrical and Electronics Engineers, the American Physical Society, and the American Psychological Association.

—AAAS News Release

DISTINGUISHED LECTURE SERIES IN APPLIED MATHEMATICS FOR 1980-1981

The Chicago Area Applied Mathematics Consortium has announced its 1980-1981 Distinguished Lecture Series in Applied Mathematics. The lectures for this academic year will be given by T. B. Benjamin, H. B. Keller and D. W. Moore. The Consortium is jointly sponsored by the Department of Engineering Sciences and Applied Mathematics of Northwestern University, The Departments of Mathematics of the University of Chicago, the University of Illinois at Chicago Circle and Illinois Institute of Technology, and The Applied Mathematics Division of Argonne National Laboratory. More detailed information may be obtained from Bernard J. Matkowsky at Northwestern University, Evanston, Illinois 60201.

STATISTICS AND PROBABILITY PROGRAM AT BOWLING GREEN STATE UNIVERSITY

The Department of Mathematics and Statistics offers B.S., M.A., and Ph.D. programs in statistics and mathematics, as well as a joint M.S. degree in applied statistics. A "dual master's degree" is also

available, for those who want to earn two master's degrees simultaneously. Teaching assistantships and fellowships are available for graduate work. For more information, contact Professor Arjun K. Gupta, Graduate Advisor, Department of Mathematics and Statistics, Bowling Green State University, Bowling Green, Ohio 43403.

DUAL DEGREE PROGRAM AT UNIVERSITY OF OKLAHOMA

The University of Oklahoma has established a Master of Business Administration-M.S. in Mathematics dual degree program. Graduates receive both degrees, but up to nine credit hours of course work in each degree program can count toward the other. The program is designed to meet the increasing need for managers and executives with a sophisticated knowledge of modern and classical mathematics.

For more information, write to the Department of Mathematics, University of Oklahoma, 601 Elm Avenue, Norman, OK 73019.

VISITING MATHEMATICIANS AVAILABLE FOR LECTURES

The Visiting Fulbright Professors and Scholars-in-Residence Program of the Council for International Exchange of Scholars (CIES) was established to enable U.S. colleges and universities to invite scholars from abroad to participate in their academic programs. Requests for 1981-1982 Fulbright scholars from abroad are being accepted by the CIES, Eleven Dupont Circle, Washington, D.C. 20036 (202-833-4979).

Among the visiting Fulbright scholars from abroad each year, there are many who welcome opportunities to participate in programs and meet colleagues on campuses other than those where they are officially located. Each year the CIES prepares a Directory of these scholars who may be invited directly to participate in professional conferences or to give occasional lectures or seminars as their programs permit it. The following Fulbright scholars are listed in the 1980-1981 edition of the Directory in the fields of mathematics, computer science and statistics: Moses Boudourides, Bruce M. Brown, Giuseppe Conte, Robert M. Damerell, Robert B. Davies, Yuri Ershov, Constant J. Goutziers, Raimo P. Hamalainen, Daniel A. Jonah, Ulrich Koschorke, Renee Lecomte, Andrew G. Molland, Branko Najman, Baburao G. Pachpatte, Anna Maria Perdon Conte, Gopal Prasad, Rita Procesi Ciampi, Herve Raynaud, David E. Rees, Seppo U. Rickman, Ronald Rousseau, Bruno Simeone, Sri R. Sinha, Tuppal Soundararajan, Alastair Spence, Johannes W. Turk, and Jacek Zieba.

Information on these scientists' home country, place and length of academic visit, and field of special interest may be found in the lists of Visiting Mathematicians in the August and October 1980 issues of the **Notices**, and on page 97 of this issue.

NSF MATHEMATICAL SCIENCES SECTION

The structure of the Mathematical Sciences Section, Division of Mathematical and Computer Sciences, from September 1980 to September 1981 is:

Mathematical Sciences Section
William G. Rosen — Section Head
Algebra and Number Theory Program
Judith S. Sunley — Program Director
Alvin I. Thaler — Program Director
Applied Mathematics Program
James M. Greenberg — Program Director
Classical Analysis Program
John V. Ryff — Program Director
Modern Analysis Program
Neal J. Rothman — Program Director
Special Projects Program
Alvin I. Thaler — Program Director
Statistics and Probability Program
David S. Moore — Program Director
Topology, Geometry and Foundations Program
Ralph M. Krause — Program Director

The mailing address is Mathematical Sciences Section, National Science Foundation, Washington, DC 20550.

The telephone number for all program directors is 202-357-9764; Dr. Rosen's telephone number is 202-357-7341.

POSITIONS OPEN AT NSF

The Division of Mathematical and Computer Sciences of the NSF has positions for program directors in the Mathematical Sciences Section which periodically become available. These positions are one- or two-year rotational positions. They are made possible by the NSF's policy of assigning Intergovernmental Personnel Act (IGPA) personnel to programs for one to two years. Once the assignment is terminated, that individual returns to his or her respective institution. Salaries are negotiable. Applicants should have a Ph.D. or equivalent experience and training in an appropriate field, plus six years of successful scientific research experience. A broad general knowledge of the field and some administrative experience are also required.

Applicants interested in applying for one of these positions should submit a resume to the National Science Foundation, Personnel Administration Branch, Room 212, 1800 G Street, N.W., Washington, DC 20550; Attn: Mr. E. Paul Broglio (202-357-7841). NSF is an Equal Opportunity Employer.

NSF PROGRAM ANNOUNCEMENT

The new announcement, *Research in Information Science*, defines the program's goal: to increase understanding of the properties and structures of information and information transfer, and to contribute to the store of scientific and technical knowledge which can be applied to the design of information systems. Copies of this announcement, NSF 79-68, may be requested from the Forms and Publications Unit, National Science Foundation, 1800 G Street, N.W., Washington, DC 20550.

AMS Research Fellowship

At its meeting in November the AMS Board of Trustees set the 1981 stipend for AMS Research Fellowships at $18,500, plus an expense allowance of $1,000. The application deadline for 1981 awards is December 31, 1980. For more information see page 635 of the November 1980 **Notices**.

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.

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)

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)

January 1, 1981-October 10, 1981. MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH (Weekly Conferences listed below), Federal Republic of Germany.

Information: Martin Barner, Institute Director, Albertstrasse 24, 78 Freiburg i. Br., Federal Republic of Germany.

January

1-3. Arbeitstagung Salzmann,
Chairman: H. Salzmann.

4-10. Mathematische Theorien der Fluide,
Chairmen: W. Burger, I. Muller.

11-17. Modelltheorie (Mengentheoretische Topologie),
Chairmen: M. M. Richter, E.-J. Thiele.

11-17. Abelsche Gruppen,
Chairman: R. Gobel.

18-24. Numerische Methoden der Approximationstheorie,
Chairmen: L. Collatz, G. Meinardus, H. Werner.

25-31. Mathematische Optimierung,
Chairmen: H. Konig, B. Korte, K. Ritter.

February

1-7. Effiziente Algorithmen,
Chairmen: K. Mehlhorn, H. Walter.

8-14. Medizinische Statistik,
Chairmen: J. Berger, E. Walter.

15-21. Funktionentheorie,
Chairmen: Ch. Pommerenke, K. Strebel, H. Wittich.

22-28. Partielle Differentialgleichungen,
Chairmen: G. Hellwig, J. Weidmann.

March

1-7. Topologische Methoden in der Nichtlinearen Funktionalanalysis, der Nichtlinearen Analysis und der Numerischen Mathematik,
Chairmen: J. Mawhin, H. O. Peitgen.

8-14. Mathematische Stochastik,
Chairman: H. G. Kellerer.

15-21. Stochastische Analysis,
Chairmen: K. Krickeberg, J. Jacod.

22-28. Gewöhnliche Differentialgleichungen,
Chairmen: H. W. Knobloch, R. Reissig.

29-April 4. Diophantische Approximationen,
Chairman: Th. Schneider.

April

5-11. Mathematische Logik,
Chairmen: W. Felscher, E. Specker.

12-18. Arbeitsgemeinschaft Geyer-Harder,
Chairman: N. N.

26-May 2. Allgemeine Ungleichungen,
Chairmen: J. Aczel, E. F. Beckenbach, W. Walter.

May

3-9. Gruppentheorie,
Chairmen: W. Gaschütz, K. W. Gruenberg.

10-16. Kommutative Algebra und Algebraische Geometrie,
Chairmen: H. J. Nastold, E. Kunz, L. Szpiro.

17-23. Quadratische Formen,
Chairmen: M. Knebusch, A. Pfister, W. Scharlau.

24-30. Lokale Algebra und Lokale Analytische Geometrie,
Chairmen: R. Berger, J. Lipman, G. Scheja.

June

7-13. Differentialgeometrie im Grossen,
Chairmen: S. S. Chern, W. Klingenberg.

14-20. Darstellungstheorie endlich-dimensionaler Algebren,
Chairmen: G. Michler, C. M. Ringel.

21-27. Masstheorie,
Chairman: D. Kölzow.

28-July 4. Wahrscheinlichkeitsmasse auf Gruppen,
Chairmen: H. Heyer, L. Schmetterer.

28-July 4. Numerische Verfahren zum Lösen von steifen Anfangswertproblemen,
Chairman: R. Jeltsch.

July

5-11. Nichtstandard-Analysis und Anwendungen,
Chairmen: D. Laugwitz, W. A. J. Luxemburg.

12-18. Diskrete Geometrie,
Chairman: L. Fejes Tóth.

19-25. Endliche Gruppen und Permutationsgruppen,
Chairmen: Ch. Hering, B. Huppert.

26-August 1. Harmonische Analyse und Darstellungstheorie topologischer Gruppen,
Chairmen: R. Howe, D. Poguntke.

August

2-8. Banach-Räume,
Chairmen: B. Fuchssteiner, I. Lindenstrauss.

9-15. Algebraische Zahlentheorie,
Chairmen: H. Hasse, P. Roquette.

30-September 5. Komplexe Analysis (Spezialtagung),
Chairmen: H. Grauert, R. Remmert, K. Stein.

September

6-12. Topologie,
Chairmen: T. tom Dieck, K. Lamotke, C. B. Thomas.

13-19. Topologie (Spezialtagung),
Chairman: N. N.

October

4-10. Numerische Integration,
Chairman: G. Hämmerlin.

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. (November 1980, p. 639)

4-5. INFORMAL CONFERENCE ON GROUPS, RINGS AND RELATED TOPICS, University of California, Santa Barbara.
Information: Algebra Committee, Department of Mathematics, University of California, Santa Barbara, California 93106.

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. (November 1980, p. 639)

10-11. DIFFERENTIAL EQUATIONS AND APPLICATIONS TO ECOLOGY EPIDEMICS AND POPULATION PROBLEMS, Harvey Mudd College, Claremont, California. (November 1980, p. 639)

12-16. NSF REGIONAL CONFERENCE ON GLOBAL TOPOLOGICAL METHODS IN APPLIED MATHEMATICS, Pomona College, Claremont, California. (November 1980, p. 640)

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)

25-27. INTERNATIONAL SYMPOSIUM ON DYNAMICAL SYSTEMS, University of Florida, Gainesville, Florida.
Program: The central theme of the Symposium shall be the way in which dynamical systems permeate current research on ordinary and functional differential equations, partial differential equations, stability theory, control theory and optimal control. Attention will be paid to applications in economics, biomathematics, wave theory, vibrations and plasma theory. The program will center about invited lectures related to the above theme and addressed to an exposition of recent advances, present status and future prospects for research and applications.
Speakers: Speakers who have accepted invitations to date include: S. Ahmad, H. Brezis, R. Dandl, D. Greenspan, H. Hale, P. Hess, E. Infante, R. Kalman, R. Kannan, K. Kirchgassner, A. Lazer, R. Nussbaum, D. Sather, D. Sattinger, R. Schowalter, I. Stakgold, S. Ulam, H. Weinberger.
Information: T. C. Bowman, Department of Mathematics, University of Florida, Gainesville, Florida 32611.

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. (October 1980, p. 547)

2-6. NONLINEAR PROBLEMS: PRESENT AND FUTURE, Center for Nonlinear Studies, Los Alamos Scientific Laboratory, University of California. (November 1980, p. 640)

5-7. CHICO CONFERENCE ON CONTINUA THEORY, California State University, Chico, California.
Program: Edward Grace (Arizona State) has accepted an invitation to give the principal lectures. There will be half-hour sessions for contributed papers.
Information: Eldon Vought, Department of Mathematics, California State University, Chico, California 95929.

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 University of the Negev, Israel. (October 1980, p. 547)

18-20. FOURTEENTH ANNUAL SIMULATION SYMPOSIUM, Tampa, Florida. (August 1980, p. 453)

23-27. SIAM SPECIAL CONFERENCE ON DEEP GROUND EXPLORATION, Alexandria, Virginia.
Sponsor: National Science Foundation.
Information: Hugh B. Hair, Society for Industrial and Applied Mathematics, 117 South 17th Street, Philadelphia, Pennsylvania 19103.

25-27. CONFERENCE ON INFORMATION SCIENCES AND SYSTEMS, Baltimore, Maryland. (November 1980, p. 640)

26-28. INTERNATIONAL CONFERENCE ON SPECTRAL THEORY OF DIFFERENTIAL OPERATORS, University of Alabama in Birmingham, Birmingham, Alabama. (October 1980, p. 547)

APRIL 1981

2-3. MINICONFERENCE ON PROBABILITY AND STATISTICAL DISTRIBUTION, Idaho State University, Pocatello, Idaho.
Information: Lyle Cook, Department of Mathematics, Idaho State University, Pocatello, Idaho 83209.

2-4. ANNUAL LECTURE SERIES IN MATHEMATICS: JORDAN STRUCTURE THEORY, University of Arkansas, Fayetteville, Arkansas.

Program: Nathan Jacobson (Yale University) will present a sequence of five lectures. In addition, there will be sessions for contributed papers; abstracts should be received by February 15, 1981.
Support: Support for some participant expenses will be available.
Information: Bernard L. Madison, Department of Mathematics, SE 301, University of Arkansas, Fayetteville, Arkansas 72701.

7-11. FINITE GEOMETRIES, Pullman, Washington.
Sponsor: Washington State University.
Program: Approximately twenty invited forty-minute talks will be given by experts in finite geometries and their applications to other mathematical areas. Invited speakers include A. Barlotti, P. Cameron, D. A. Foulser, C. Hering, D. G. Hymans, D. R. Hughes, W. M. Kantor, H. Lüneburg, E. Shult.
Contributed Papers: Contributed papers are invited as there will be sessions for presentations of such papers.
Information: M. J. Kallaher or C. T. Long, Department of Pure and Applied Mathematics, Washington State University, Pullman, Washington 99164.

8-10. ENVIRONMETRICS '81, Alexandria, Virginia.
Sponsors: Environmental Protection Agency; Society for Industrial and Applied Mathematics, SIAM Institute for Mathematics and Society.
Information: Hugh B. Hair, Society for Industrial and Applied Mathematics, 117 South 17th Street, Philadelphia, Pennsylvania 19103.

8-10. 2e CONFÉRENCE INTERNATIONALE SUR LES SYSTÈMES INFORMATIQUES RÉPARTIS, Paris, France. (August 1980, p. 453)

10-11. SIXTH ANNUAL CONFERENCE ON UNDERGRADUATE MATHEMATICS, Hendrix College, Conway, Arkansas.
Sponsor: Journal of Undergraduate Mathematics.
Support: Partial support is received from the Exxon Educational Foundation.
Program: The meeting will include presentations of papers written by students during their undergraduate careers, as well as invited talks. Papers must be submitted before February 15, 1981.
Invited Speakers: R. H. Bing (University of Texas), Paul R. Halmos (Indiana University), Burton W. Jones (University of Colorado), M. Z. Nashed (University of Delaware), John W. Neuberger (North Texas State University).
Information: J. R. Boyd, Department of Mathematics, Guilford College, Greensboro, North Carolina, 27410 or Robert C. Eslinger, Department of Mathematics, Hendrix College, Conway, Arkansas, 72032.

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. (November 1980, p. 640)

JUNE 1981

1-5. ENERGY SYSTEMS, Salisbury State College, Salisbury, Maryland. (November 1980, p. 641)

2-5. CONFERENCE IN ALGEBRA (IN HONOR OF NATHAN JACOBSON), New Haven, Connecticut.
Program: Eight to twelve fifty-minute lectures and fifteen to thirty shorter talks in ring theory, Galois theory and generalizations, non-associative algebras and other topics in algebra. All talks by invitation.
Invited Speakers: Speakers will include: M. Artin, G. M. Bergman, P. M. Cohn, E. Formanek, I. N. Herstein, G. P. Hochschild, I. Kaplansky, S. MacLane, W. S. Martindale, K. McCrimmon, D. Zelinsky.
Information: George B. Seligman, Department of Mathematics, Box 2155, Yale Station, New Haven, Connecticut 06520.

8-10. CONFERENCE ON ANALYSING PROBLEM CLASSES AND PROGRAMMING FOR PARALLEL COMPUTING, Nürnburg, Federal Republic of Germany. (October 1980, p. 548)

8-12. COMBINATORIAL PROBLEM-SOLVING, Salisbury State College, Salisbury, Maryland. (November 1980, p. 641)

9-July 3. SYMPOSIUM ON CATEGORICAL ALGEBRA AND TOPOLOGY, University of Cape Town, Cape Town, South Africa. (November 1980, p. 641)

17-19. SECOND INTERNATIONAL CONFERENCE ON THE NUMERICAL ANALYSIS OF SEMICONDUCTOR DEVICES AND INTEGRATED CIRCUITS, Dublin, Ireland. (October 1980, p. 548; November 1980, p. 641)

18-26. SYMPOSIUM ON FREE BOUNDARY PROBLEMS: THEORY AND APPLICATIONS, Montecatini, Italy.
Purpose: The Symposium is intended to stimulate the discussion between pure and applied mathematicians in the various fields in which free boundary problems arise.
Information: To apply for an invitation, send a curriculum vitae and several recent publications to A. Fasano or M. Primicerio, Istituto Matematico, viale Morgagni 67/A, 50134 Firenze, Italy.

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. (November 1980, p. 641)

28-July 5. NINTH INTERNATIONAL CONGRESS ON THE APPLICATION OF MATHEMATICS IN ENGINEERING, Weimar, German Democratic Republic. (August 1980, p. 453)

28-July 18. RMMC 1981 SUMMER SEMINAR ON SINGULARITY THEORY, DYNAMICAL SYSTEMS, AND THEIR APPLICATIONS, Fort Lewis College, Durango, Colorado.
Sponsor: Rocky Mountain Mathematics Consortium.
Program: This course on singularity theory, dynamical systems, and their applications is intended for advanced level graduate students and interested faculty. It will consist of two lecture series: one by M. Golubitsky (Arizona State University) titled "A Singularity Theory Approach to Steady State Bifurcation Theory", in which he will explain how the theorems of singularity theory can be adapted to local bifurcation theory and then used to study selected classical problems in applied mathematics as well as to study certain degenerate forms of Hopf bifurcation; the other by P. Holmes (Cornell University) titled

"Dynamical Systems, Bifurcations of Vector Fields and Nonlinear Mechanics" in which he will discuss recent developments in the qualitative theory of dynamical systems, drawing primarily on examples of ordinary differential equations occuring in mechanics, including nonlinear oscillators, dynamic buckling and aero-elastic flutter and magnetoelastic interactions. He will show how such examples have stimulated developments in the 'abstract' theory and how the latter has very recently been brought to bear on other problems in solid and fluid mechanics.
Information: T. L. Sherman, Executive Director, Rocky Mountain Mathematics Consortium, Department of Mathematics, Tempe, Arizona 85281.

29-July 10. CURRENT TRENDS IN ALGEBRAIC TOPOLOGY, The University of Western Ontario, London, Ontario, Canada. (August 1980, p. 453)

29-July 24. RESEARCH WORKSHOP ON BANACH SPACES, University of Iowa, Iowa City, Iowa.
Program: Professor J. Lindenstrauss of Hebrew University will be in residence for at least the first two weeks of the workshop. Other anticipated participants include R. C. James, W. B. Johnson and H. B. Rosenthal.
Information: Bor-Luh Lin, Department of Mathematics, University of Iowa, Iowa City, Iowa 52242.

30-July 2. FOURTH IMACS INTERNATIONAL SYMPOSIUM ON COMPUTER METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS, Lehigh University, Bethlehem, Pennsylvania. (October 1980, p. 548)

30-July 2. FOURTH TOPOLOGY SYMPOSIUM, Edinburgh, Scotland.
Organizers: J. F. Adams, I. M. James, E. G. Rees.
Support: London Mathematical Society, Pergamon Press, The Royal Society.
Program: There will be ten to twelve one-hour lectures on various aspects of topology, especially algebraic topology. Invited speakers include T. tom Dieck, E. Dror, W. Dwyer, C. McA. Gordon, R. Lashof, J. P. May and R. J. Milgram.
Information: E. G. Rees, Department of Mathematics, James Clerk Maxwell Building, King's Buildings, Mayfield Road, Edinburgh EH9 3JZ, Scotland.

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)

24-28. FIFTH SYMPOSIUM ON GENERAL TOPOLOGY AND ITS RELATIONS TO MODERN ANALYSIS AND ALGEBRA, Prague, Czechoslovakia.
Information: Josef Novák, Chairman, Organizing Committee, Matematický ústav ČSAV, Žitná 25, 115 67 Praha 1, Czechoslovakia.

24-28. THIRD INTERNATIONAL CONFERENCE ON FUNDAMENTALS OF COMPUTATION THEORY, Szeged, Hungary.
Program: Symposia topics include: algebraic and constructive theory of machines, computations and languages; abstract algebras, combinatorics and logic in computation theory; computability, decidability and arithmetic complexity.
Deadline for Papers: Five copies of a draft should be submitted by January 10, 1980. Deadline for final text is May 10, 1981.
Information: F. Gecseg or L. Lovasz, Bólyai Institute, University of Szeged, H-6720 Szeged, Hungary.

30-September 6. NINTH INTERNATIONAL CONFERENCE ON NONLINEAR OSCILLATIONS, Kiev, USSR. (August 1980, p. 453)

31-September 5. SIXTH CONGRESS OF THE GROUPEMENT DES MATHÉMATICIENS 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)

13-20. INTERNATIONAL CONFERENCE ON COMPLEX ANALYSIS AND APPLICATIONS, Varna-Golden Sands, Bulgaria.
Sponsors: Bulgarian Academy of Sciences, Sofia University "Kl. Ohridski" and the Union of Bulgarian Mathematicians.
Program: There will be 45-minute invited lectures and 20-minute communications, specialized seminars, problem sessions, poster sessions, etc., devoted to present day problems of complex analysis in a broad sense and its applications as well. Deadline for registration is January 15, 1981.
Information: Conference on Complex Analysis and Applications, Institute of Mathematics, Bulgarian Academy of Sciences, 1090 Sofia, P.O. Box 373, Bulgaria.

21-26. JOURNÉES ARITHMÉTIQUES, Metz, France. (October 1980, p. 549)

30-October 2. FOURTH AACHEN SYMPOSIUM: THEORY AND APPLICATIONS OF SIGNAL PROCESSING, Aachen, West Germany.
Topics: Signal theory and algorithms, in particular discrete signal theory, sampling and quantisation, signal and source models, algorithms for filtering, estimations, etc.; source coding, in particular picture coding; and systems and systems development, including signal processors, programming tools, testing and reliability problems in software and hardware.
Program: The purpose of this interdisciplinary symposium is to bring together engineers, computer scientists, physicists and mathematicians interested in communication engineering, source coding and control theory. There will be sessions for twenty-minute contributed papers in German or English, as well as about four invited survey papers covering a broad spectrum in the respective topics. The symposium is to be held in the form of a workshop. For this reason especially papers on current research activities are encouraged.
Call for Papers: One-page abstracts should be submitted by 21 April, 1981 to H. D. Lüke at the address below.
Information and Organization: H. D. Lüke, Institut für Nachrichtentechnik, Melatener Strasse 23, D-5100 Aachen, West Germany; P. L. Butzer, Lehrstuhl A für Mathematik; H. Meyr, Lehrstuhl für Elektrische Regelungstechnik; H. J. Tafel, Institut für Nachrichtengeräte und Datenverarbeitung, all of the Aachen University of Technology.

AUGUST 1982

11-19. INTERNATIONAL CONGRESS OF MATHEMATICIANS, Warsaw, Poland. (October 1980, p. 549)

NEW AMS PUBLICATIONS

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The two books below are the first books in the new AMS soft-cover series, Contemporary Mathematics. Books in this series are published in the shortest possible time after the manuscript has been accepted and camera copy has been prepared. The cost will be kept low so that copies can be afforded by individuals.

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MARKOV RANDOM FIELDS AND THEIR APPLICATIONS

by *Ross Kinderman* and *J. Laurie Snell*

This book presents an introduction to Markov random fields and the related topic of infinite interacting particle systems. The principal concepts and theorems of the subject are illustrated in terms of models currently being studied. The Ising model is used to motivate the concept of a random field. The concept of a phase transition is discussed in terms of the breakdown of basic probability theorems such as the law of large numbers and the central limit theorem.

Infinite interacting particle systems are illustrated in terms of examples and as the dynamic Ising model, voter models, contact processes and the stepping stone model for genetic drift.

The relation of the study of these models to the problem of cell growth is brought out. Computer graphics are used whenever possible to illustrate the dynamics of these models.

The study of Markov random fields has brought exciting new problems to probability theory which are being developed in parallel with basic investigation in other disciplines, most notably physics. The mathematical and physical literature is often quite technical. This book aims at a more gentle introduction to these new areas of research.

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PROCEEDINGS OF THE CONFERENCE ON INTEGRATION, TOPOLOGY, AND GEOMETRY IN LINEAR SPACES

edited by *William H. Graves*

This book contains survey articles contributed by speakers at a conference held at the University of North Carolina in Chapel Hill in the spring of 1979 and organized around contributions of the late B. J. Pettis to the development of measure and integration in linear spaces and the role of general linear spaces in measure-theoretic considerations. Topics covered include strict topologies in topological measure theory (by H. Collins), the Dunford-Pettis property (by J. Diestel), the Radon-Nikodym property (by R. Huff), the Orlicz-Pettis phenomenon (by N. Kalton), applications of measure and integration in linear spaces (by I. Kluvanek), and the role of the Pettis measurability theory (by J. J. Uhl, Jr.). In addition to these survey articles which impart both a historical and a state-of-the art flavor, the book contains several research articles devoted to topics as diverse as spectral theory (by N. Dunford) and weak and strong compactness in spaces of Pettis integrable functions (by J. Brooks and N. Dinculeanu).

The book gives an overview of the current state of affairs in the study of measure and integration in linear spaces and applications thereof. Those who will enjoy these papers are workers in functional analysis with an interest in measure and integration in linear spaces, especially the many delighted readers of Diestel and Uhl's *Vector Measures* (Amer. Math. Soc. Mathematical Surveys, Volume 15).

Volume 2, x + 269 pages (soft cover)
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LECTURES ON MATHEMATICS IN THE LIFE SCIENCES
(ISSN 0075-8523)

SOME MATHEMATICAL QUESTIONS IN BIOLOGY
edited by *George F. Oster*

Foreword by the Editor

This volume contains lectures from the 14th Symposium on Some Mathematical Questions in Biology, held in San Francisco, California on January 7, 1980, in conjunction with the annual meeting of the American Association for the Advancement of Science. The Symposium was cosponsored by the American Mathematical Society and by the Society for Industrial and Applied Mathematics under the auspices of Section A, Mathematics, of the AAAS.

The papers fall into 3 general categories: (i) population dynamics, (May and Brillinger, et al.), (ii) development and pattern formation (Keller and Oster, et al.), (iii) physiological design (McCracken and McMahon).

Robert May [*Mathematical models in whaling and fishing management*] has presented an excellent example of how theory can provide important insights into practical problems. By examining the science of fisheries management in the light of current ecological theory—no small portion of which he has himself developed—he highlights some pernicious assumptions that currently pervade policymaking in this industry, and indicates the direction future applied research should pursue in order to preserve the productivity of the ocean's biological resources.

One of the most important data sets for understanding the dynamics of a population is its age structure and birth and death rates. Classical life-table analysis is largely restricted to populations whose age structure is nearly stationary (or varying in a simple fashion), and whose vital rates are a function of age only. Furthermore, in order to make inferences even under these restrictive conditions, it has been necessary to estimate ages of individuals sampled from the population. By employing modern techniques from the theory of time series analysis David Brillinger and his coauthors [John Guckenheimer, Peter Guttorp and George Oster, *Empirical modelling of population time series data: The case of age density dependent vital rates*] have developed a method for estimating density dependent vital rates and age distributions for a population with arbitrary dynamics. Furthermore, only aggregate measurements of total rates need be measured.

Physiological systems can be studied as problems in design. The papers by McCracken [*Applications of mathematics to problems concerning the performance of heart valves*] and McMahon [*Scaling physiological time*] adopt such a viewpoint. Marjorie McCracken has examined the operation of heart valves. The opening and closing of these valves depends on the fluid velocity field of the blood flowing through the heart. In principle, the classical equations of fluid mechanics are an accurate model of the process. However, a quantitative understanding of how such valves work depends on actually being able to solve the Navier-Stokes equations for the motion of the fluid boundaries; this can be an incredibly difficult task. Professor McCracken has devised a numerical method whereby one can actually solve the equations and obtain a graphical presentation of the flow field.

Since the last century numerous biologists have compiled large numbers of empirical correlations between an animal's size and other physiological variables as diverse as heart rate and bone diameters. Thomas McMahon has taken a fresh look at this body of data and succeeded in constructing a simple and elegant model which unifies an enormous and diverse set of observations.

Rather than taking the design of a system as given, one can ask the question: How did it get that way? George Oster, Garry Odell and Pere Alberch [*Mechanics, morphogenesis and evolution*] have examined the problem of pattern formation in embryogenesis from an engineering viewpoint. They have constructed a mechanical model for epithelial morphogenesis which unifies a number of disparate phenomena. They also illustrate that much can be learned about the evolution of forms by taking a developmental perspective.

Joseph Keller [*Tendril shape and lichen growth*] has analyzed several phenomena in plant morphogenesis. Using the tools of continuum mechanics [one can] derive the rate of lichen growth and the shape of vine tendrils.

All of the papers presented herein are excellent examples of the modeler's art: to reduce a complex phenomena to a set of equations which retain the essential features and which enhance understanding.

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MEMOIRS OF THE AMERICAN MATHEMATICAL SOCIETY
(ISSN 0065-9266)

THE GEOMETRY OF THE GENERALIZED GAUSS MAP
by *David A. Hoffman* and *Robert Osserman*

Abstract: This paper is devoted primarily to the study of properties of the Grassmannian of oriented 2-planes in $\mathbf{R}^n$ and to applications of these properties to understanding minimal surfaces in $\mathbf{R}^n$ via the generalized Gauss map. The extrinsic geometry of the Grassmannian, when considered as a submanifold of C^{n-2}, is investigated, with special emphasis on the

nature of the intersection of the Grassmannian with linear subspaces of CP^{n-1}. These results are the basis for a discussion of minimal surfaces that are degenerate in various ways; understanding the different types of degeneracy and their interrelations is a critical step toward obtaining a clear picture of the basic geometric properties of minimal surfaces in R^n. In addition, a general representation theorem for minimal surfaces in R^n is established, generalizing the ones due to Weierstrass and Enneper for minimal surfaces in R^3. The paper also contains some new results about the total curvature of complete minimal surfaces and about minimal surfaces whose Gaussian image has constant curvature.

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ACTIONS OF FINITE GROUPS ON THE HYPERFINITE TYPE II_1 FACTOR

by *Vaughn F. R. Jones*

Abstract: The author gives a complete classification up to conjugacy of the actions of a finite group G on the hyperfinite II_1 factor R in terms of three invariants: a normal subgroup N of G; an element of the relative cohomology group $H^2(G/N, G, \mathbf{R}/\mathbf{Z})$ and an element of the quotient of a finite dimensional simplex by a simplicial action of $H^1(N, \mathbf{R}/\mathbf{Z})^G$ coming from permutations of the vertices. All values of the invariants are realized by actions of G on R.

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A. E. Tumanov and G. M. Henkin, *Interpolation submanifolds of pseudoconvex manifolds*

S. V. Hruščev, *Singularities of linear operators in spaces of analytic functions*

V. M. Faĭvyševskiĭ, *Structure of ideals in some Banach algebras satisfying a generalized Ditkin condition*

B. S. Pavlov, *Dilation theory and spectral analysis of nonselfadjoint differential operators*

M. A. Pekker, *Resonances in the scattering of acoustic waves by a spherical inhomogeneity of the density*

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V. P. Gluško and O. M. Smeljanskiĭ, *Coercive solvability of a boundary value problem for a complete degenerate second order differential equation in Hilbert space*

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There are three sections in the CML: an alphabetical listing of all individual members of the AMS, MAA and/or SIAM, a geographical listing of these members, and a geographical listing of academic and institutional members of the three organizations.

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Visiting Mathematicians — *Supplementary List*

The following lists of visiting mathematicians include both foreign mathematicians coming to the United States and Canada, and Americans going abroad. The original lists appeared on pages 458-462 of the August 1980 Notices; supplementary lists appeared on pages 550-554 of the October 1980 issue.

Mathematicians Visiting Abroad

Name and Home Country	Host Institution	Field of Special Interest	Period of Visit
Comer, Stephen D. (U.S.A.)	Oxford University, England	Algebra; Logic	8/80 - 8/81
Muldoon, M. E. (Canada)	University of Dundee, Scotland	Special Functions	7/80 - 6/81
Rieffel, Marc (U.S.A.)	University of Leeds, England	Functional Analysis	9/80 - 6/81
Zalcman, L. (U.S.A.)	Bar-Ilan University, Israel	Complex Variables	8/80 - 5/81

Visiting Foreign Mathematicians

Abi-Khuzam, Faruk F. (Lebanon)	Syracuse University	Theory of Entire and Meromorphic Functions	9/80 - 5/81
Berthelot, Pierre (France)	University of California, Berkeley	Algebraic Geometry	4/81 - 6/81
Cohn, Harry (Australia)	University of California, San Diego	Probability Theory	4/81 - 7/81
Damerell, Robert M. (England)	Ohio State University	Algebraic Combinatorics	1/80 - 8/81
Dicks, Warren J. (England)	Syracuse University	Free Rings	9/80 - 5/81
Hamalainen, Raimo P. (Finland)	University of California, Berkeley	Optimal Control Theory; Decision Making	
Kantorovitz, Shmuel (Israel)	Temple University	Spectral Theory	9/80 - 7/81
Kaup, Wilhelm (Federal Republic of Germany)	University of California, Berkeley	Algebra, Functional Analysis	9/80 - 12/80
Krych, Michal (Poland)	Tufts University	Dynamical Systems Theory	9/80 - 5/81
Maćkowiak, T. (Poland)	University of Saskatchewan	Topology	9/80 - 9/81
Mantel, Francis (Israel)	Rensselaer Polytechnic Institute	Numerical Quadrature	9/80 - 5/81
Molland, Andrew G. (United Kingdom)	Institute for Advanced Study	History of Mathematics	9/80 - 6/81
Moscovici, Henri (Romania)	University of California, Berkeley	Harmonic Analysis	4/81 - 6/81
Nait-Abdallah, Areski (Algeria)	Tulane University	Logic and Computer Science	8/80 - 6/81
Najman, Branko (Yugoslavia)	University of California, Berkeley	Klein-Gordon Equation	9/80 - 3/81
Nevanlinna, Olavi (Finland)	IBM Research Center		9/80 - 7/81
Pachpatte, Baburao G. (India)	University of Texas, Arlington	Differential and Integral Equations	9/80 - 6/81
Pommerenke, Christian (Federal Republic of Germany)	University of California, San Diego	Complex Analysis	3/81 - 8/81
Procesi Ciampi, Rita (Italy)	University of California, Berkeley	Linear Algebra; Invariant Theory	8/79 - 8/81
Qian, Min-ping (China)	University of California, Berkeley	Probability Theory	1/81 - 6/81
Rees, David E. (Australia)	National Center Atmospheric Research, High Altitude Observatory, Boulder	Solar Research; Coronal Dynamics	11/80 - 3/81
Renault, Jean (France)	Tulane University	Functional Analysis, C* Algebras, Mathematical Physics	8/80 - 6/81
Rousseau, Ronald (Belgium)	University of California, Berkeley	Induced Group Representations	2/81 - 8/81
Saad, Youcef (Algeria)	University of California, Berkeley	Numerical Analysis	1/81 - 3/81
Sealey, Howard C. J. (England)	Tulane University	Differential Geometry and Analysis	8/80 - 6/81
Spence, Alastair (United Kingdom)	California Institute of Technology; Stanford University	Numerical Analysis	1/81 - 4/81 5/81 - 8/81
Voiculescu, Dan (Romania)	University of California, Berkeley	Operator Algebras	4/81 - 6/81
Wu, Wen-Tsun (China)	University of California, Berkeley	Differential Geometry	1/81 - 3/81
Zieba, Jacek (Poland)	University of California, Berkeley	Differential Geometry	9/80 - 6/81

Personal Items

Fredric D. Ancel of University of University of Texas at Austin has accepted a position at the University of Oklahoma.

E. Robert Anderson of West Virginia Wesleyan College has been appointed to an assistant professorship at Indiana University, South Bend.

Peter G. Anderson of Seton Hall University has accepted a position at Rochester Institute of Technology.

Kevin Andrews of Catholic University has been appointed to an assistant professorship at Texas A&M University.

George D. Byrne of the University of Pittsburgh has been appointed as senior staff mathematician in the computer technology and services division of Exxon Research and Engineering Company, Linden, New Jersey.

Ronald M. Dotzel of University of Texas at Austin has accepted a position with the University of Missouri, St. Louis.

Alan B. Evans of Michigan State University has been appointed assistant professor at Vassar College.

M. L. Gardner has been appointed assistant professor at Worcester Polytechnic Institute.

Cameron M. Gordon who spent spring semester at Cambridge University has returned to University of Texas at Austin.

Ian Graham of the University of Toronto is on sabbatical at the University of California, Berkeley, for 1980-1981.

H. Peter Gumm of the Technische Hochschule Darmstadt has been appointed to a visiting assistant professorship at the University of Hawaii.

Jean-Pierre Kahane of the University of Paris-Sud (Orsay) has been awarded the Grand Prix of the French Academy of Sciences for his achievements in mathematics research.

Manfred Kochen of University of Michigan has been appointed to a visiting professorship at Rockefeller University.

H. Elton Lacey of University of Texas at Austin has accepted the chairmanship at Texas A&M University.

George Lorentz became Emeritus Professor at the University of Texas at Austin.

Ray Mines of New Mexico State University has been appointed to a visiting associate professorship at the University of Hawaii.

Dale W. Myers of the University of Hawaii will be on leave for the academic year 1980-1981 at the University of Illinois at Chicago Circle.

Eric Reissner of University of California, San Diego, has been admitted to the International Academy of Astronautics.

John F. Rossi has been appointed to a visiting assistant professorship at the University of Hawaii.

Ruth Silverman of Southern Connecticut State College has been appointed visiting fellow in the department of computer science at Yale University.

Bhagat Singh of University of Wisconsin, Madison, has been appointed to a professorship and chairmanship at that university.

Donald Z. Spicer of Vassar College has been appointed associate dean of the college.

S. Walter Wei of the University of California, San Diego, has been appointed to an assistant professorship at the University of Hawaii.

Joel L. Weiner is on leave during the fall semester. He will spend his leave in Europe and at the University of California, Los Angeles.

Daniel P. Weisser has been appointed to a visiting assistant professorship at the University of Hawaii.

PROMOTIONS

To Professor. University of Tennessee: **David E. Dobbs.**

To Associate Professor. Central Missouri State University: **Larry A. Cammack**; New England College: **Edward T. Ordman**; Texas A&M University: **Joe Ward, George Purdy**; University of Hawaii: **Leslie C. Wilson**; University of Texas at Austin: **Frank Gerth, Bruce Palka, Charles Radin, Michael Starbird.**

Deaths

Dr. **Georg Aumann** of Munich, Germany, died on August 4, 1980 at the age of 73. He was a member of the Society for 19 years.

Reinhold Baer of Zurich, Switzerland, died on October 22, 1979 at the age of 77. He was a member of the Society for 43 years.

Ilse Karger Brauer died on July 4, 1980 at the age of 79. She was a member of the Society for 20 years.

T. H. Hildebrandt died on October 9, 1980 at the age of 92. He was a member of the Society for 67 years. (See p. 84.)

Professor **Yoshie Katsurada** of Hokkaido University died on May 10, 1980 at the age of 68. He was a member of the Society for 20 years.

Nariaki Kose of the University of California, Berkeley, died on July 11, 1980 at the age of 27. He was a member of the Society for 1 year. (See page 636 of the November 1980 **Notices.**)

J. S. **Mac Nerney** of the University of Houston died on June 2, 1979 at the age of 56. He was a member of the Society for 31 years.

Dr. **Gerson B. Robison** of New Paltz, New York, died on May 23, 1979 at the age of 70. He was a member of the Society for 28 years.

Jürgen Schmidt of the University of Houston died on October 14, 1980 at the age of 62. He was a member of the Society for 12 years.

Professor **Robert E. Weber** of the Pennsylvania State University died on March 12, 1980 at the age of 35. He was a member of the Society for 10 years.

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.

Hugh Montgomery (1981) has been appointed Chairman of the *Nominating Committee of 1981* by President-Elect Andrew M. Gleason. Other continuing members of the committee are Martin D. Davis (1981), Jane Cronin Scanlon (1981), and Karen Uhlenbeck (1981).

Enrico Bombieri (1983) and Ronald L. Graham (1983) have been appointed by President Peter D. Lax to the *Program Committee for National Meetings*. Continuing members of the committee are Hugh L. Montgomery, chairman (1981), George D. Mostow (1981), Everett Pitcher (ex officio), J. H. Sampson (1982), and Barry Simon (1982).

Hans Schneider (1983) has been reappointed, and Barnet M. Weinstock (1983) has been appointed by President Peter D. Lax to the *Committee on Employment and Educational Policy*. Continuing members of the committee are Lida K. Barrett, chairman (1982), Donald C. Rung (1981), Robert J. Thompson (1982), and William P. Ziemer (1981).

Morton L. Curtis (1982) and Murray Gerstenhaber (1982) have been reappointed by President Peter D. Lax to the *Committee on Legal Aid*. The other members of the committee are Steve Armentrout (1981), and Todd Dupont (1981). Professor Curtis will continue as chairman of this committee.

Scott Williams (1983) has been appointed by President Peter D. Lax to the *Committee on Opportunities in Mathematics for Disadvantaged Groups*. James A. Donaldson (1983) has been reappointed and will continue to serve as chairman; other continuing members of the committee are Manuel Berriozabal (1982), Gloria F. Gilmer (1982), Richard K. Lashoff (1981), and Choy-Tak Taam (1981).

Alan C. Newell (1983) and George C. Papanicolaou (1983) have been appointed by Presidents Peter D. Lax and Richard C. DiPrima to the joint *AMS-SIAM Committee on Applied Mathematics*. Continuing members of the committee are Roger Brockett (1981), John Dennis (1982), Norman Lebovitz (1982), and Sanjoy K. Mitter (1981). Professor Newell will serve as chairman.

Reports of Meetings

THE SUMMER MEETING IN ANN ARBOR

The 84th summer meeting of the American Mathematical Society was held at the University of Michigan, Ann Arbor, Michigan, from Tuesday to Friday, August 19-22, 1980. The meeting was held in conjunction with the 60th summer meeting of the Mathematical Association of America, the 1980 annual meeting of the Institute of Mathematical Statistics, and the 1980 annual meeting of Pi Mu Epsilon. There were 1,334 registrants, including 873 members of the Society.

Colloquium Lectures. JULIA B. ROBINSON of the University of California, Berkeley, gave a series of four Colloquium Lectures on the topic "Between logic and arithmetic." The topics of the four lectures were: *Fifty years after Gödel's discoveries*; *Diophantine equations*; *Definability in fields*; and *Nonstandard models of arithmetic*. The presiding officers at the four lectures were Peter D. Lax, Mary Ellen Rudin, Angus J. MacIntyre, and Roger C. Lyndon.

Prize Session. Two 1980 Norbert Wiener Prizes in Applied Mathematics and three 1980 LeRoy P. Steele prizes were announced at a session held on Thursday, August 21.

The Norbert Wiener Prizes are awarded jointly by the American Mathematical Society and the Society for Industrial and Applied Mathematics. The 1980 recipients were Tosio Kato of the University of California, Berkeley, and Gerald B. Whitham of the California Institute of Technology.

LeRoy P. Steele Prizes are awarded by the American Mathematical Society. The mathematicians selected for the 1980 Steele awards are André Weil of the Institute for Advanced Study, Harold M. Edwards of the Courant Institute of Mathematical Sciences of New York University, and Gerhard P. Hochschild of the University of California, Berkeley.

Further details about the above prizes may be found on pp. 528-533 of the October 1980 issue of the **Notices**.

Invited Addresses. By invitation of the Program Committee there were the following eight invited one-hour addresses.

DAN BURGHELEA, Ohio State University, *Whitehead torsion old and new and its relationship with the geometric topology*; CIPRIAN FOIAS, Indiana University, *The norm preserving lifting of intertwining of vectors and its applications*; HOWARD GARLAND, Yale University, *The arithmetic theory of loop groups*; HEINI HALBERSTAM, University of Illinois at Urbana-Champaign, *Sieves and combinatorial inequalities: From Eratosthenes to Chen*; ROBERT P. KAUFMAN, University of Illinois at Urbana-Champaign, *Differential equations in the com-*

plex domain; JACK C. KIEFER, University of California, Berkeley, *Optimum combinatorial designs*; MICHAEL E. O'NAN, Rutgers University, *A survey of sporadic simple groups*; JACOBUS H. VAN LINT, Eindhoven Institute of Technology, *Good codes*.

The presiding officers at these eight hour addresses were Kyung W. Kwun, Lee A. Rubel, George Daniel Mostow, Hugh L. Montgomery, Kenneth A. Ross, Ernst G. Straus, Robert L. Griess, Jr., and Andrew M. Gleason.

Special Sessions. By invitation of the same committee there were thirteen special sessions of selected twenty-minute papers.

Analytic number theory, organized by BRUCE C. BERNDT of the University of Illinois at Urbana-Champaign. The speakers were Krishnaswami Alladi, George E. Andrews, Bruce C. Berndt, David M. Bressoud, Harvey Cohn, J. Brian Conrey, Harold G. Diamond, Ronald J. Evans, Sidney W. Graham, James L. Hafner, Richard H. Hudson, Kevin W. J. Kadell, Marvin I. Knopp, Grigori Kolesnik, Jeffrey C. Lagarias, Gerald Myerson, L. Alayne Parson, Donald B. Redmond, Kenneth Rogers, Edith T. Stevenson, and Jeffrey D. Vaaler.

Topos theory, organized by ANDREAS R. BLASS of the University of Michigan, Ann Arbor. The speakers were Jonathan M. Beck, Peter T. Johnstone, Joachim Lambek, F. William Lawvere, L. Gaunce Lewis, Jr. and Philip S. Mulry.

Recent trends in nonlinear analysis, organized by LAMBERTO CESARI of the University of Michigan, Ann Arbor. The speakers were Melvyn S. Berger, Lamberto Cesari, Robert M. Goor, Rangachary Kannan, V. Lakshmikantham, Alan C. Lazer, Johannes C.C. Nitsche, W. V. Petryshyn, Simeon Reich, Erich H. Rothe, Jane Cronin Scanlon, Edward Silverman, and Calogero Vinti.

Stochastic analysis, organized by PAO-LIU CHOW of Wayne State University. The speakers were Alain Bensoussan, Albert T. Bharucha-Reid, Donald A. Dawson, Wendell H. Fleming, M. P. Heble, Hui-Hsiung Kuo, Thomas G. Kurtz, George C. Papanicolaou, Mark A. Pinsky, Daniel W. Stroock, and Michael Williams.

Mathematical methods in wave propagation, organized by DAVID L. COLTON of the University of Delaware. The speakers were Clifford O. Bloom, David K. Cohoon, Jeffery M. Cooper, Ronald J. DiPerna, Albert E. Heins, Irvin W. Kay, Andreas Kirsch, Peter D. Lax, Walter Littman, Richard C. MacCamy, Robert F. Millar, Cathleen S. Morawetz, Alexander G. Ramm, Jeffrey B. Rauch, Victor Twersky, and Vaughan H. Weston.

Models of arithmetic, organized by MARTIN D. DAVIS of the Courant Institute of Mathematical Sciences, New York University. The speakers were Andreas R. Blass, Julia F. Knight, Angus J. MacIntyre, George H. Mills, Jan Mycielski, Mark E. Nadel, James H. Schmerl, Craig A. Smoryński, and Lou van den Dries.

Codes, groups, and designs, organized by VERA S. PLESS of the University of Illinois at Chicago Circle. The speakers were Edward F. Assmus, Jr., Eiichi Bannai, Elwyn R. Berlekamp, Kenneth P. Bogart, Robert Calderbank, Paul Camion, John H. Conway, Donald Y. Goldberg, W. Cary Huffman, Noboru Ito, Judith Q. Longyear, F. Jessie Mac Williams, H. F. Mattson, Jr., Andrew M. Odlyzko, Vera S. Pless, Chester J. Salwach, Neil J. A. Sloane, Jacobus H. Van Lint, and Harold N. Ward.

Extremal problems in combinatorial geometry, organized by GEORGE B. PURDY of Texas A&M University. The speakers were Fan R. K. Chung, Joel C. Gibbons, Murray S. Klamkin, William O. J. Moser, George B. Purdy, Charles Radin, Kenneth B. Stolarsky, Ernst G. Strauss, and John E. Wetzel.

Univalent functions: Recent developments, organized by MAXWELL O. READE of the University of Michigan, Ann Arbor. The speakers were Hassoon S. Al-Amiri, Roger W. Barnard, Paul J. Eenigenburg, David J. Hallenbeck, James A. Hummel, Frank R. Keogh, William E. Kirwan, Ronald J. Leach, Thomas H. MacGregor, Edward P. Merkes, Sanford S. Miller, Kent Pearce, John A. Pfaltzgraff, John R. Quine, Jr., Malcolm S. Robertson, Glenn E. Schober, Herbert Silverman, and Evelyn Marie Silvia.

Mathematical symbolic manipulation on the computer, organized by B. DAVID SAUNDERS of Rensselaer Polytechnic Institute. The speakers were Gregory Butler, Bruce W. Char, George E. Collins, James Davenport, David J. Ford, Jerald J. Kovacic, Eugene M. Luks, John McKay, Robert A. Morris, Maxwell A. Rosenlicht, Michael F. Singer, Hale F. Trotter, David Y. Y. Yun, and Hans J. Zassenhaus.

Applications of mathematics to anthropology and sociology, organized by STEPHEN B. SEIDMAN of George Mason University. The speakers were John P. Boyd, Charles H. Goldberg, Penelope J. Greene, Frank Harary, Cornelis Hoede, Jack E. Hunter, Alden S. Klovdahl, Dwight W. Read, Robert G. Reynolds, Stephen B. Seidman, and Stanley S. Wasserman.

Hardy spaces and harmonic analysis, organized by ALBERTO TORCHINSKY of Indiana University. The speakers were Earl R. Berkson, Donald L. Burkholder, Eugene B. Fabes, David S. Jerison, Carlos E. Kenig, John N. McDonald, Kent G. Merryfield, Umberto Neri, Richard H. Rochberg, Donald E. Sarason, Eric T. Sawyer, David A. Stegenga, Carl Sundberg, Stephen Wainger, Guido L. Weiss, and R. L. Wheeden.

Orthogonal polynomials and other extremal polynomials, organized by JOSEPH L. ULLMAN of the University of Michigan, Ann Arbor. The speakers were Richard A. Askey, James Ward Brown, Charles K. Chui, George Gasper, Jr., Jeffrey S. Geronimo, Mourad E. H. Ismail, Lee Lorch, Francisco Marcellán, Attila Máté, H. N. Mhaskar, Daniel S. Moak, Paul G. Nevai, Mizanur Rahman, Joseph L. Ullman, and R. A. Zalik.

Contributed Papers. There were fifteen sessions of contributed ten-minute papers, for which Morton Brown, Jeffery M. Cooper, Ronald J. Evans, Frank Harary, Albert E. Heins, Peter G. Hinman, Craig I. Huneke, Richard I. Loebe, Daniel H. Luecking, Daniel H. Moran, Jeffrey B. Rauch, Kenneth A. Ross,

Chung-Tuo Shih, B. A. Taylor, and Harold N. Ward served as presiding officers. Of the 87 contributed papers listed in the program of the meeting, 13 were withdrawn; one late paper was added to the program, so that 75 ten-minute papers were actually presented.

Ann Arbor, Michigan

Paul T. Bateman
Associate Secretary

Council and Business Meetings

The reports of the Council and Business Meetings held during the Summer Meeting at Ann Arbor were given on page 557 of the October 1980 issue of the **Notices**. It should have been noted that the reports were submitted to the membership by Everett Pitcher, Secretary of the Society.

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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.

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.

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

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. The University of South Carolina is an affirmative action/equal opportunity 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.

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

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.

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 1981-82. 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 1981-82 academic year. Numerical Analysis is to have a significant representation in this special year. Send curriculum vitae 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.

ABOVE APPLICANTS should hold a Ph.D. in mathematics and have a strong record in research and teaching.

(3) An Assistant Professor level position at the Stamford Regional Campus in Stamford, Connecticut. The requirements for this position include a Ph.D. in mathematics, demonstrated excellence as a teacher and continuing research interest.

Send a curriculum vitae and references to:

Jeffrey L. Tollefson, Head, Department of Mathematics U-9
The University of Connecticut, Storrs, CT 06268

The UNIVERSITY OF CONNECTICUT is an equal opportunity/affirmative action employer.

CHAIRMAN, Department of Mathematical Sciences

The **UNIVERSITY OF NORTH CAROLINA** at Wilmington invites applications for the position of Chairman of the Department of Mathematical Sciences. The department offers undergraduate degrees in pure and applied mathematics and in computer science, and courses in statistics. Candidates must hold an earned doctorate in one of these areas; have professional experience in more than one of these areas; have a record of teaching excellence and scholarship to qualify for the rank of Associate Professor. Administrative experience desirable. Applications received by February 15, 1981, are guaranteed consideration. Submit application, résume, transcripts, and at least three letters of reference to Dr. Barbara Greim, Search Committee, Department of Mathematical Sciences, UNCW, Wilmington, NC 28406.
UNCW is an affirmative action/equal opportunity employer.

POSITIONS AVAILABLE

Department of Mathematics and Computer Science
SOUTHWEST TEXAS STATE UNIVERSITY

Applications are 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, functional 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 Spellmann, 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.

STATE UNIVERSITY OF NEW YORK AT BINGHAMTON

expects to have senior and tenure-track-junior positions open in Fall 1981. Applications are invited from candidates having excellent research records. For senior applicants, experience in the supervision of doctoral students is desirable. Of special interest to us are: statisticians, numerical analysts, senior computer scientists, and excellent researchers in other areas of pure and applied mathematics. Send vita and letters of recommendation to:

Shelemyahu Zacks, Chairman
Department of Mathematical Sciences
State University of New York at Binghamton
Binghamton, NY 13901

An Equal Opportunity/Affirmative Action Employer

REED COLLEGE

The Department of Mathematics at Reed College has an opening for one year (with a possibility of at most one additional year) to teach undergraduate mathematics, starting late August 1981. About 11 class hours per week. Doctorate desirable. Salary approximately $17,000, plus fringe benefits. This is a non-tenure-track position replacing faculty on leave. Reed College is an equal opportunity employer. Closing date for applications is February 15, 1981. Applications should be addressed to:

H. E. Chrestenson, Chairman
Department of Mathematics
Reed College
Portland, Oregon 97202

The Department of Mathematical Sciences of **WEST CHESTER STATE COLLEGE**, West Chester, Pennsylvania, invites applications for an expected tenure-track position for fall 1981 as assistant professor of mathematics. Pure mathematics background with an interest in computer science and/or statistics desirable. Candidates must have a Ph.D., serious research interests, and experience in and a dedication to teaching. Will teach a wide variety of courses in pure and applied mathematics, mostly at the undergraduate level. Candidates must apply by letter before February 1, 1981, and supply a full dossier of credentials, including three letters of recommendation. Apply to Professor Frank Milliman, West Chester State College, West Chester, Pennsylvania 19380. Salary depends upon qualifications; excellent retirement system, paid Blue Cross/Blue Shield, eye and dental care, social security, life insurance, sabbaticals and summer school likely. West Chester State is an Equal Opportunity/Affirmative Action Employer.

Assistant or associate professor of computer science beginning fall 1981. Salary scale rated "one" by AAUP among II-A institutions. Ph.D. or Ph.D. candidate in computer science or applied science with business or industrial experience is desirable. May teach in new M.S. program as well as established and rapidly growing B.S. program. Excellent retirement system, Blue Cross/Blue Shield, Major Medical, group life, dental, optical, family tuition waiver, sabbaticals, professional development fund, computer terminal in office, class monitors for on-line demonstrations. Send a full dossier of credentials including three letters of recommendation to Professor James Fabrey, Chairperson, Search Committee, **WEST CHESTER STATE COLLEGE**, West Chester, Pennsylvania 19380 (near Philadelphia). Phone 215-436-3423. Closing date February 1, 1981.

Assistant Professor of Mathematics: Tenure-track. Fall, 1981. Ph.D. in mathematics with an active research program. Graduate training in geometry sufficient to teach advanced undergraduate geometry courses is required. Applicants should also have broad undergraduate teaching interests. Continued research activity is necessary for tenure. The normal teaching load is 9 hours per semester. Send vita, copy of graduate transcripts, and names of three references to:

Search Committee
Department of Mathematics
UNIVERSITY OF LOUISVILLE
Louisville, KY 40292

by February 16, 1981.

An Equal Opportunity/Affirmative Action Employer.

COMPUTER SCIENCE, UNIV. OF NORTH CAROLINA at Greensboro. Asst. Professor, Mathematics Dept., Aug. 81. Teaching computer science, research, providing leadership in the computer science program. Ph.D. in computer science or mathematics, extensive background in computer science. Evidence of research potential. Facilities: two IBM 370/165, Amdahl, DEC VAX 11/780. Computer applications experience. Salary competitive. Coursework offered in computer science through graduate level. Resume and three letters of recommendation: Search Committee, Mathematics Department, UNC-G, Greensboro, NC 27412. Affirmative action/equal opportunity employer.

GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia 30332

The School of Mathematics expects to have available some visiting and tenure track positions beginning in the fall quarter of 1981. Excellent accomplishment or potential in research is required. Applications should be made to the Director, School of Mathematics, Georgia Institute of Technology, Atlanta, Georgia 30332. Georgia Tech is an Equal Opportunity Employer/with an Affirmative Action Program.

POSITIONS AVAILABLE

INSTRUCTOR OF MATHEMATICS

Mathematics Department has openings for three full-time positions for fall 1981 requiring master's in mathematics and master's in mathematics education, with teaching experience in developmental/remedial mathematics preferably at the community college level, or master's in mathematics and a doctorate in mathematics education with teaching experience in developmental/remedial mathematics preferably at the community college level. Résumé, transcripts, and relevant material must be received by March 1, 1981. Send to W. A. Clee, Head, Department of Mathematics, **COMMUNITY COLLEGE OF PHILADELPHIA**, 34 South Eleventh Street, Philadelphia, PA 19107. An Affirmative Action/Equal Opportunity Employer.

The Department of Mathematics and Statistics at **CASE WESTERN RESERVE UNIVERSITY** has places for four assistant professors of mathematics and two of statistics, as part of an expansion and strengthening of the department. All positions are tenure-track. Postdoctoral experience desirable but not essential; high research aptitude essential. One position for numerical analysis; other mathematics positions open. Statisticians preferably in such fields as exploratory data analysis, non-parametric statistics, robust statistics. Résumés and recommendations to Gail S. Young, Chairman, Case Western Reserve University, Cleveland, Ohio 44106.

UNIVERSITY OF CALIFORNIA, RIVERSIDE

Faculty Position in Computer Science

Applications are invited for a permanent position in Computer Science beginning with the 1981–1982 academic year. Applicants must have a Ph.D. in Computer Science and a commitment to teaching and research. Candidates from all areas of specialization in Computer Science will be considered.

Rank and salary are open; candidates for senior rank must have leadership ability and a proven research record.

The Computer Science program at Riverside is housed in the well-established Department of Mathematics, which offers bachelor's, master's, and doctoral degrees. Approximately sixty undergraduates are enrolled in the B.S. program in Computer Science. An M.S. program in Computer Science is pending.

To apply, send résumé with names of three references to:

Professor Albert R. Stralka, Chairman
Department of Mathematics
University of California
Riverside, CA 92521

The University of California is an Equal Opportunity/Affirmative Action Employer.

APPLIED MATHEMATICS
SOUTHERN METHODIST UNIVERSITY

The Department of Mathematics has several positions available in the fall of 1981 for applied mathematicians. 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.

Candidates for a senior position should be able to provide leadership and have a broad general knowledge of applied mathematics and applications.

Salary and academic rank are negotiable. Applicants should send a résumé and the names of three references to G. W. Reddien, Chairman, Department of Mathematics, Southern Methodist University, Dallas, TX 75275, or call 214-692-2506.

An Equal Opportunity/Affirmative Action Employer.

Professor of Mathematics

The Department of Mathematics at **BOSTON UNIVERSITY** seeks a senior scholar to join its group in dynamical systems and applied analysis. Current research interests within this group of ten faculty include dynamical systems, celestial mechanics, mathematical physics, mathematical biology, differential equations, optimal control, singular perturbation theory and aerodynamics. The successful candidate will have a distinguished record in scholarship in one or more of these areas and strong abilities in teaching and program development.

Salary will reflect the individual's qualifications and the University's commitment to developing excellence in this research area.

Nominations and applications including a vitae and the names of three references, to Dennis Berkey, Chairman, Department of Mathematics, Boston University, Boston, MA 02215. First closing January 15, 1981.

Boston University is an Equal Opportunity/Affirmative Action Employer.

Assistant Professor of Mathematics

The Department of Mathematics at **BOSTON UNIVERSITY** anticipates one or more Assistant Professorships in Mathematics to become available for 1981–1982. Teaching load is 6 hours per week. A completed Ph.D., strong potential in research and a commitment to effective teaching are required. Field unrestricted within pure and applied mathematics. Vita and three letters of reference to Dennis Berkey, Chairman, Department of Mathematics, Boston University, Boston, MA 02215.

Boston University is an Equal Opportunity/Affirmative Action Employer.

UNIVERSITY OF VICTORIA
MATHEMATICS

The Department of Mathematics invites applications for a regular faculty position at the Assistant or Associate Professor level to begin July 1, 1981. Applicants should have a Ph.D. in Mathematics, and a strong commitment both to research and to undergraduate teaching. Priority will be given to candidates with an established record of scholarly achievement and a demonstrated ability to interact with other mathematicians. The Department has a preference for individuals with research and teaching interests in one or more of the following areas: functional analysis, modern algebra, and discrete mathematics. Applicants should send a curriculum vitae and the names of three references to Dr. R. R. Davidson, Chairman, Department of Mathematics, University of Victoria, Victoria, British Columbia, Canada V8W 2Y2. The closing date for applications is January 31, 1981.

POSITIONS AT LOUISIANA STATE UNIVERSITY

We anticipate five or more tenure-track openings, at competitive salaries, for Assistant, Associate, and/or full Professors. Starting dates: Jan. 81, Aug. 81, Jan. 82, Aug. 82. Competitive research qualifications and good teaching are essential. Preferred fields: graph theory and combinatorics, probability, mathematical statistics, partial differential equations, numerical analysis. We will consider strong applicants in all fields. We may begin making offers at an early date. We may use some of the positions for visiting or term appointments. To apply, send a résumé and ask at least three persons to send letters of evaluation to: O. Carruth McGehee, Chairman, Department of Mathematics, Louisiana State University, Baton Rouge, Louisiana 70803.

LSU IS AN EQUAL OPPORTUNITY UNIVERSITY

POSITIONS AVAILABLE

Applications are invited for a tenure-track position as Assistant Professor of Mathematics in ALGEBRA at Southern Illinois University, Carbondale, starting August 16, 1981. *Qualifications for the Position*: A Ph.D. is required; candidates must have demonstrated evidence of excellence in research and potential for such in an area of algebra; a broad background and interest in several areas of algebra is desired; evidence of teaching excellence is preferred. Closing date: February 1, 1981, or until position is filled. Applications plus three letters of recommendation should be sent to Algebra Position, c/o Alphonse Baartmans, Chairman, Department of Mathematics, **SOUTHERN ILLINOIS UNIVERSITY**, Carbondale, IL 62901. SIU-C is an Equal Opportunity/Affirmative Action Employer.

Applications are invited for a tenure-track position as Assistant Professor of Mathematics in ANALYSIS at Southern Illinois University, Carbondale, starting August 16, 1981. *Qualifications for the Position*: A Ph.D. is required; any area of analysis will be considered. Candidates must have demonstrated evidence of excellence in research and potential for such in an area of analysis; a broad background and interest in several areas of analysis is desired; evidence of teaching excellence is preferred. Closing date: February 1, 1981, or until position is filled. Applications plus three letters of recommendation should be sent to Analysis Position, c/o Alphonse Baartmans, Chairman, Department of Mathematics, **SOUTHERN ILLINOIS UNIVERSITY**, Carbondale, IL 62901. SIU-C is an Equal Opportunity/Affirmative Action Employer.

Applications are invited from qualified candidates for a tenure-track position as Assistant Professor in NUMERICAL ANALYSIS or COMBINATORIAL ANALYSIS at Southern Illinois University at Carbondale, starting August 16, 1981. *Qualifications for the Position*: A Ph.D. is required. Candidates must have demonstrated evidence of excellence in research and potential for such in numerical analysis or combinatorial analysis. Evidence of teaching excellence is preferred. The salary will be competitive. Closing date: February 1, 1981, or until the position is filled. Applications and inquiries should be directed to Numerical Analysis/Combinatorial Analysis Position, c/o Alphonse Baartmans, Chairman, Department of Mathematics, **SOUTHERN ILLINOIS UNIVERSITY**, Carbondale, IL 62901. SIU-C is an Equal Opportunity/Affirmative Action Employer.

Applications are invited for a tenure-track position at the Assistant Professor level in the Department of Mathematics at Southern Illinois University at Carbondale, starting August 16, 1981. A Ph.D. in mathematics required. AREA OPEN. Preference will be given to candidates with background and experience in Computer Science. However, all qualified candidates will be considered. Candidates must have demonstrated evidence of excellence in research and potential for such in an area of mathematics. Evidence of teaching excellence is preferred. Closing date: February 1, 1981, or until position is filled. Application plus three letters of recommendation should be sent to Continuing Position, c/o Alphonse Baartmans, Chairman, Department of Mathematics, **SOUTHERN ILLINOIS UNIVERSITY**, Carbondale, IL 62901. SIU-C is an Equal Opportunity/Affirmative Action Employer.

DARTMOUTH COLLEGE, Asst. Professor, Algebra. Tenure track position. The qualifications include demonstrated research ability in core algebra (including algebraic number theory and algebraic geometry) and strong interest in undergrad teaching. Ph.D. required. Write to Prof. Donald L. Kreider, Chairman, Dept. of Mathematics, Dartmouth College, Bradley Hall, Hanover, NH 03755 (Attn: Recruiting). Applications should be received by February 1, 1981. EO/AA.

UNIVERSITY OF WISCONSIN-Madison, DEPARTMENT OF MATHEMATICS, 213 VAN VLECK HALL, MADISON, WI 53706.

Mathematics Department solicits applications from persons of established excellence in mathematical logic for a possible tenured position commencing in the Fall of 1981. Applications should be sent no later than January 15, 1981, to Professor Fred Brauer, Chairman, Department of Mathematics, 213 Van Vleck Hall, University of Wisconsin, Madison, Wisconsin 53706. The University of Wisconsin is an Equal Opportunity Employer.

UNIVERSITY OF WISCONSIN-Madison, DEPARTMENT OF MATHEMATICS, 213 VAN VLECK HALL, MADISON, WI 53706.

Van Vleck Assistant Professorships in Mathematics. We invite applications from outstanding mathematicians of any age who are recent recipients of a doctorate—people who will interact well with members of our department, who care about teaching, and who can contribute to our research and instructional programs. Teaching load is 2 courses per semester. High probability of additional income through research or teaching during summers between consecutive years of appointment. Salary dependent on experience—at least $18,000 per academic year. Two or three-year term positions. Write Professor Fred Brauer, Department of Mathematics, 213 Van Vleck Hall, University of Wisconsin-Madison, Wisconsin 53706. The University of Wisconsin is an Equal Opportunity Employer.

UNIVERSITY OF WISCONSIN-Madison, DEPARTMENT OF MATHEMATICS, 213 VAN VLECK HALL, MADISON, WI 53706.

Mathematics Department solicits applications from persons of established excellence, with particular emphasis on mathematical logic and applied mathematics, for possible tenure-track assistant professorships commencing in the Fall of 1981. Applications should be sent no later than January 15, 1981, to Professor Fred Brauer, Chairman, Department of Mathematics,213 Van Vleck Hall, University of Wisconsin-Madison, Wisconsin 53706. The University of Wisconsin is an Equal Opportunity Employer.

COLLEGE OF CHARLESTON, Department of Mathematics CHARLESTON, SC 29401

ASSISTANT/ASSOCIATE PROFESSORS. Four tenure-track positions, available 8-24-81. Teaching in expanding undergrad. programs in applied and pure math. and c. sc. (up to 12 hrs./wk.). Requirements: Ph.D. in math., strong commitment to undergrad. instruction and serious interest in continuing research. Teaching experience is desirable. Preference to those with broad training in pure & applied math. One position reserved for an applied mathematician. Minority and female applicants are encouraged to apply. Min. 9 month salary $18,500.

POSSIBLE VISITING POSITION. Rank: Open. One year appointment, available 8-24-81. Requirements: M.S. in mathematics. A Ph.D. and teaching experience are desirable. All candidates should send three letters of recommendation and resume to W. Hugh Haynsworth, Dept. Chairperson. AA/EOE.

DARTMOUTH COLLEGE, Computer Science, Asst. Professor. Initial 3-year appointment. Possibility of reappointment and eventual tenure. Qualifications include demonstrated research in computer science and ability and interest in teaching undergrad courses in computer science and mathematics. Ph.D. required. Write to Prof. Donald L. Kreider, Chairman, Dept. of Mathematics, Dartmouth College, Bradley Hall, Hanover, NH 03755 (Attn: Recruiting). EO/AA.

POSITIONS AVAILABLE

YOUNGSTOWN STATE UNIVERSITY, Mathematical and Computer Sciences, Youngstown, OH 44555. Regular faculty position for Ph.D. or near Ph.D. in mathematics or related field starting September 1981. Entry level. Responsibilities may include teaching mathematics and/or computer science, research, committees, advising. The department of 26 members offers the bachelor's degree, mathematics and computer science, and master's in mathematics. Send application with complete vita, transcripts, and at least three letters of recommendation to Dean R. Brown, Chairman, by January 16, 1981. Youngstown State University is an affirmative action/equal opportunity employer.

DEPARTMENT OF MATHEMATICAL SCIENCES
Assistant Professor

Applications are invited for a tenure-track position at the level of Assistant Professor in the Department of Mathematical Sciences starting August, 1981. Candidates should possess the Ph.D. degree in Mathematics. Preferred field is Harmonic Analysis. Qualified candidates in other fields will be considered. Duties include teaching at the undergraduate and beginning graduate level, research and service. Applicants should send vitae and three letters of reference to Samuel S. Shapiro, Chairman, Department of Mathematical Sciences, **FLORIDA INTERNATIONAL UNIVERSITY**, Miami, FL 33199. FIU is an Affirmative Action/Equal Opportunity Employer.

ALBION COLLEGE

The Mathematics Department anticipates a new tenure-track position in computer science starting in mid-August, 1981. Rank and salary depend on qualifications. Ph.D. preferred with a firm background in mathematics. Responsibilities include three courses per semester, direction of student research as appropriate, student advising after the first year and normal departmental and collegiate activities. Resources include a strong student body, a Burroughs B6803 with batch and timesharing facilities and a variety of microcomputers. Direct inquiries to John A. Wenzel, Albion College, Albion, Michigan 49224. Closing date: January 15, 1981. Equal Opportunity Employer.

Mathematics. Assistant/Associate Professor. Salary – negotiable. Teach courses in mathematics at the graduate and undergraduate levels each semester. Participate in departmental research effort in areas of expertise. Assist graduate students with dissertation work where applicable. Ph.D. in mathematics from a recognized institution. Record of research in mathematics. Research interests should relate to those present in the department. Reply by February 1, 1981, to Jeffrey L. Tollefson, at U-9, **UNIVERSITY OF CONNECTICUT**, Storrs, Connecticut 06268.

Equal Opportunity Employer.

Department of Mathematical Sciences, **MONTANA STATE UNIVERSITY** has openings for tenure-track faculty starting no later than September 1, 1981 in an expanding program. Junior and senior rank appointments available for statisticians and for specialists in any area of applicable mathematical analysis. Duties include research, teaching and consulting. Ph.D. required. The potential exists for joint appointments to other departments. Applications for visiting and sabbatical positions are also invited. Send resume to: Dr. K. J. Tiahrt, Head, Department of Mathematical Sciences, Montana State University, Bozeman, MT 59717. An Affirmative Action/Equal Opportunity Employer.

MATHEMATICS DEPARTMENT, GEORGIA SOUTHERN COLLEGE, STATESBORO, GEORGIA 30460. One or possibly two tenure-track position(s) starting September, 1981. Salary and rank are dependent upon experience and qualifications. Ph.D. in mathematics with competency to teach statistical methods and procedural computer languages is required. Detailed résumé, three letters of recommendation and other supportive information should be sent by February 15, 1981 to: Dr. Charles L. Christmas, Department of Mathematics and Computer Science, GEORGIA SOUTHERN COLLEGE, Statesboro, Georgia 30460. Georgia Southern is an EO/AA 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.

Journal Aer Sci 1/56–12/59; Notices, Bul, Proc AMS 1/57–8/78; Math of Comp 1/62–4/64. Free to colleges–U pay post. Meisel, 69 Jayson Ave., Great Neck, NY 11021.

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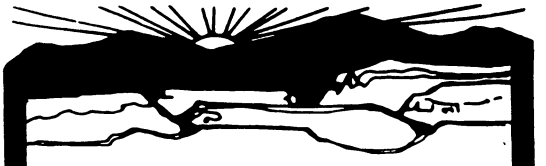

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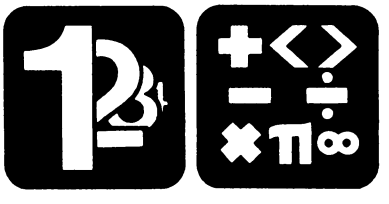

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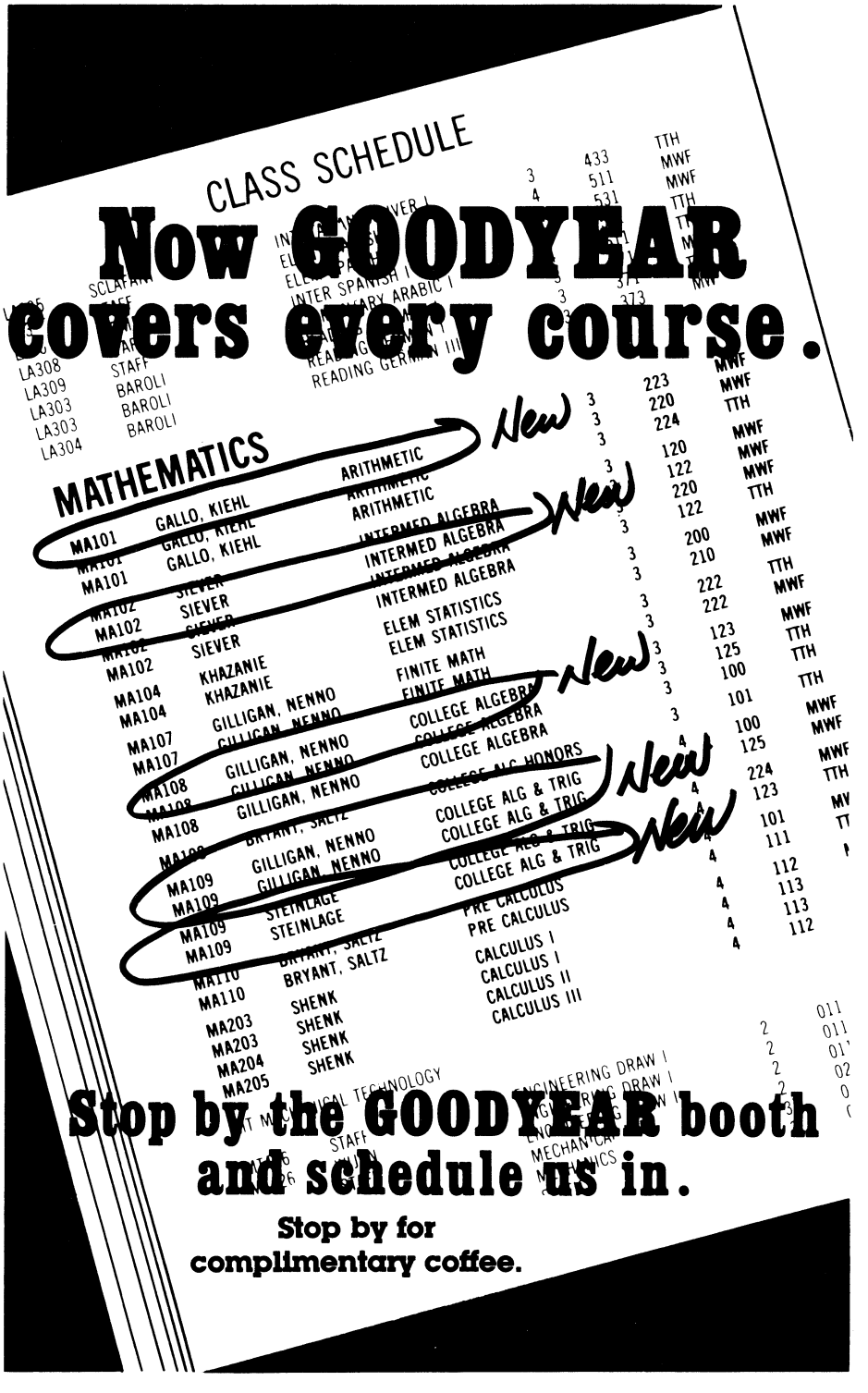
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These lectures comprise an introduction to an important part of the algebraic theory of quadratic forms over fields, a topic which has only partially been treated in existing textbooks. In the first part, Pfister forms are characterized by their multiplicative properties (Pfister's original theory). The generic splitting theory of quadratic forms is then outlined and the central role of Pfister forms in this theory is elucidated. Applications are given to the theory of levels of fields and the theory of Witt rings. This short volume is suitable as a text on quadratic forms. The precise presentation makes this volume especially attractive for students interested in obtaining a basic understanding of this particular theory.

DMV Seminar 2

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Klas Diederich
Ingo Lieb

Neue Ergebnisse und Methoden

1980. ca. 150 pages.
$14.50
ISBN 3-7643-1207-6

Information:
This book is based on a seminar given by the authors during the DMV Annual Meeting in 1979. It is a survey of recent results in the geometric theory of pseudoconvexity, the $\bar{\partial}$-Neumann problem, and regularity theorems for biholomorphic mappings between pseudoconvex domains. The goal of the authors is to introduce the reader who is well-grounded in function theory of several complex variables to the study of original papers in this area. Another goal is to make clear the connections between individual results. The book is also of interest to mathematicians working in areas related to complex analysis, offering them a comprehensive overview of new developments in the area of pseudoconvexity.

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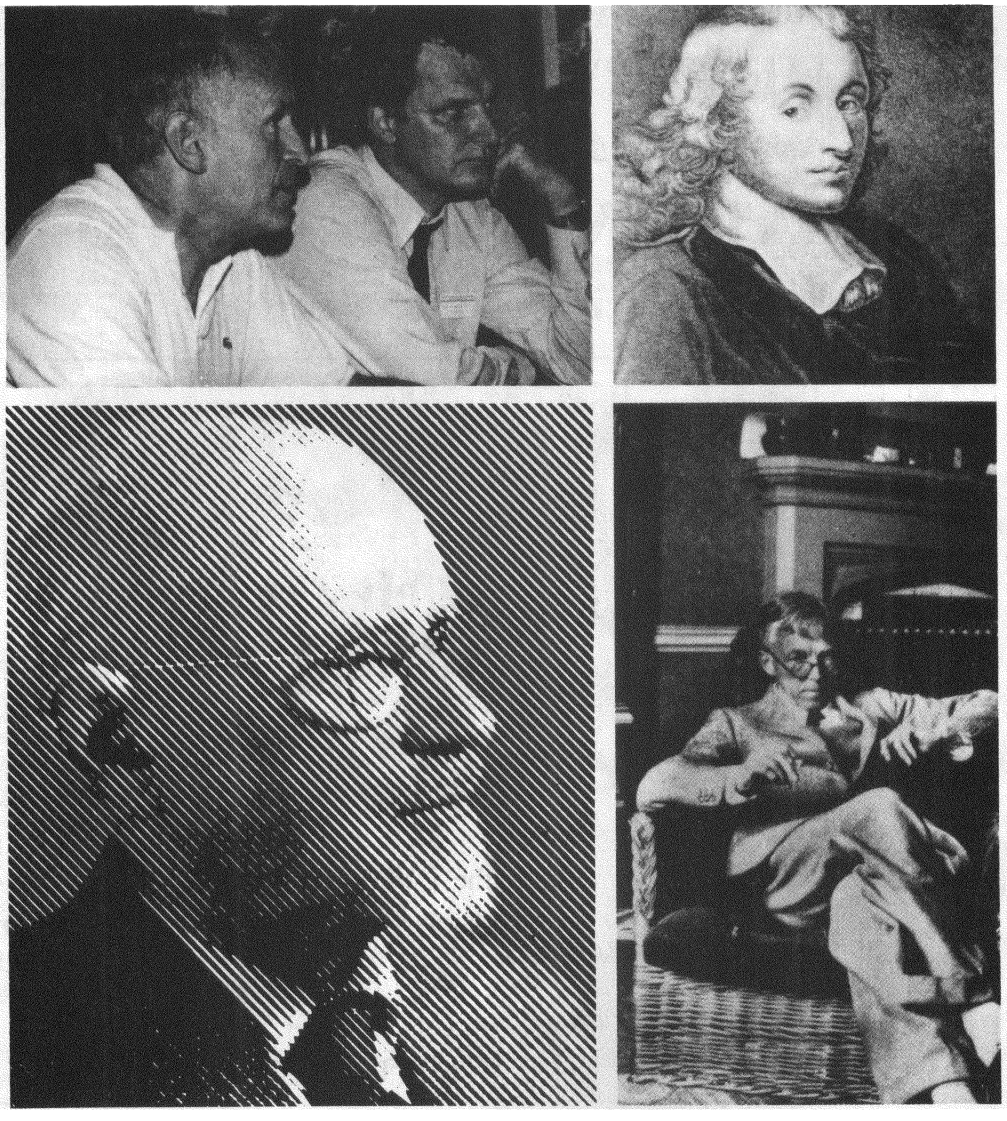

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Philip Davis, Reuben Hersh

January 1981
560 pages
ISBN 3-7643-3018-X
$24.00, hardcover

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Notices of the AMS (ISSN 0002-9920)
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