# Conferences

The pattern of meetings supported by the Society changed with time. Initially the only meetings were the Annual and Summer Meetings and the regional meetings, all of general mathematical scope and with programs of invited addresses and contributed papers. Meetings on specialized topics were not part of the plan though invited lectures clustered in a field were from time to time part of the general programs. Beginning with the Symposia in Applied Mathematics just after WWII, this state of affairs changed. There were introduced the Summer Institutes in pure mathematics, the Summer Seminars in applied mathematics, the Symposia on Mathematical Questions in Biology, and the Summer Research Conferences. Each was accompanied with appropriate opportunities for publication.

## Symposia in Applied Mathematics

When World War II became imminent, the Society supported interest in applied mathematics through a Committee on Preparing Addresses in Applied Mathematics consisting of Richard Courant, chairman, R. M. Foster, and Harold Hotelling. The committee helped prepare three symposia in applied mathematics in 1941. One was a half day symposium in New York on 21 February 1941, which consisted of an address by J. J. Stoker on Mathematical Problems Connected with the Bending and Buckling of Elastic Plates and another by W. A. Shewhart on Mathematical Statistics in Mass Production. The second was a half day in Washington on 3 May 1941 devoted to a Symposium on the Rayleigh-Ritz Method and Its Applications with lectures by a mathematician, an engineer, and a physicist, namely Richard Courant, J. P. Den Hartog, and H. M. James. The third was a half day on 30 December 1941 with a lecture by L. V. Bewley, an electrical engineer, on The Mathematical Theory of Traveling Waves and one by I. S. Sokolnikoff on Some New Methods of Solution of Two-dimensional Problems in Elasticity. The committee recommended a more permanent program than these ad hoc arrangements.

The interest of many mathematicians in applied mathematics and in the applications of mathematics was stimulated by the work in such fields, into which they were thrust in World War II. The time was ripe for consideration of the role of the Society when the war was over.

A Special Committee on Applied Mathematics, with J. L. Synge as chairman, and Ruel V. Churchill, Richard Courant, Griffith Conrad Evans, W. T. Martin, John von Neumann, and J. W. Tukey as members, made several recommendations to the Council of 26 and 27 December 1946. These were adopted by the Council and included the following:

> That a Committee on Applied mathematics be appointed to organize programs in applied mathematics and to make recommendations to the Council in all matters pertaining to the interests of applied mathematics.
>
> That the Society establish an annual symposium on applied mathematics, the Committee on the Role of the Society in Mathematical Publication being requested to study the possibility of the publication of the proceedings of the symposium in book form.

The Committee on Applied Mathematics was duly appointed by President Hille and consisted of J. L. Synge, chairman, Richard Courant, G. C. Evans, John von Neumann, William Prager, and Warren Weaver.

It should be noted that at this time there was considerable debate over the possibility of establishing a division of applied mathematics within the Society. The Special Committee on Applied Mathematics was initially opposed to the idea in the Fall of 1946. In fact von Neumann alone voted for the idea at first but changed his vote. However an informal poll of a number of interested mathematicians showed substantial support as well as opposition, so the committee debated the matter. In a report dated 6 March 1947, the committee did take the position that no separate division should be established at that time but that the issue should be further considered. It is not clear that it was in fact considered.

In August 1947, the first of a continuing series of Symposia in Applied Mathematics was held. These were an almost annual event. The pattern from the beginning consisted of invited lectures and contributed papers on a designated topic. The first three were in the Summer but the standard time changed to the Spring with the seventh in 1955. They were thenceforth usually held contiguous to or overlapping a regional meeting, almost invariably in the East.

Beginning with the symposium of 1967, the Committee on Applied Mathematics became a joint committee with the Society for Industrial and Applied Mathematics. The last of the jointly sponsored symposia in 1983 no longer

suited the needs or the task of SIAM, which withdrew sponsorship of the symposia though not from other work of the selection committee.

The first symposium, on Nonlinear Problems in Mechanics of Continua, was cosponsored by the American Institute of Physics, the American Society of Mechanical Engineers, and the Institute of Aeronautical Sciences. Such multiple sponsorship continued only through the third symposium though there was frequently a second sponsor.

Financial support for these conferences came from many government agencies including the Office of Naval Research, the Army Research Office (Durham), the Air Force Office of Scientific Research, or occasionally the Institute for Defense Analyses (Princeton).

The roles of the committees associated with these symposia have varied and the records that cover the roles are scanty. The pattern that ultimately evolved was that proposals were solicited from individuals or groups for a topic together with a possible organizing committee and speakers. The Committee on Applied Mathematics selected one of these proposals and authorized an organizing committee to produce a firm list of invited speakers. Personnel in the Providence office incorporated the material supplied by the organizing committee into a grant proposal to obtain funds to pay travel costs of speakers and perhaps of some participants, together with incidental costs. In earlier days there were manuscript fees as well. The plan to publish proceedings was part of the grant proposal.

In practice it was sometimes necessary for the Committee on Applied Mathematics to develop a topic and importune an organizing committee to take it over. Sometimes a member of the Committee on Applied Mathematics turned up as chairman of the organizing committee and editor. The personnel of some early committees suggests that they functioned as local arrangements committees rather than or as well as committees on invitations.

There was a separate Editorial Committee on Applied Mathematics Proceedings for a time but later the editor of a particular set of proceedings was designated by the Committee on Applied Mathematics. The matters concerning the reprinting of earlier volumes of proceedings devolved on the Committee on Applied Mathematics.

Proceedings of the first two symposia were published by the Society. Volumes 3 through 8 were published by the McGraw Hill Book Company in an arrangement whereby the Society retained the title but received no royalty. Then in 1957 the Society undertook publication itself. The Society purchased the remaining copies of volumes 3 through 8 and now lists them with the later volumes in the series *Proceedings of Symposia in Applied Mathematics* (PSAM, sometimes familiarly known as "PSALMS"). When SIAM became a cosponsor, this use of PSAM ended though other material appeared

subsequently in the series. The jointly sponsored symposia appeared in a new series AMS-SIAM Proceedings.

Here is a list of the symposia in applied mathematics from the first phase:

Nonlinear Problems in Mechanics of Continua
Brown University, 2–4 August 1947
The program had already been planned by Brown University and was approved. There was no organizing committee.
Editor: E. Reissner
Publication: PSAM vol. 1.

Electromagnetic Theory
Massachusetts Institute of Technology, 29–31 July 1948
Committee on Program and Arrangements: W. T. Martin, chairman, T. R. Hollcroft, J. A. Stratton, J. L. Synge
Editor: A. H. Taub
Publication: PSAM vol. 2.

Elasticity
University of Michigan, 14–16 June 1949
Committee on Program and Arrangements: W. Bartky, R. V. Churchill, E. L. Ericksen, G. E. Hay, D. L. Holl, J. W. T. Youngs
Editor: R. V. Churchill
Publication: PSAM vol. 3.

Fluid Dynamics
University of Maryland, 22–23 June 1951
Arrangements Committee: M. H. Martin, chairman
Editor: M. H. Martin
Publication: PSAM vol. 4.

Wave Motion and Vibration Theory
Carnegie Institute of Technology, 16–17 June 1952
Arrangements Committee: A. E. Heins, chairman
Editor, A. E. Heins
Publication: PSAM vol. 5.

Numerical Analysis
Santa Monica City College, 26–28 August 1953
Arrangements Committee: D. H. Lehmer, chairman, H. F. Bohnenblust, John Hamilton Curtiss, J. W. Green, G. Pólya, John Todd
Editor: John Hamilton Curtiss
Publication: PSAM vol. 6.

Mathematical Probability and its Applications
Polytechnic Institute of Brooklyn, 14–15 April 1955

Organizing Committee: H. W. Bode, chairman, R. Courant, D. H. Lehmer, T. Y. Thomas
Editor: L. A. Mac Coll
Published under title *Applied Probability*: PSAM vol. 7.

Calculus of Variations and its Applications
University of Chicago, 12–13 April 1956
Organizing Committee: William Prager, chairman, L. M. Graves, Norman Levinson, Marston Morse, J. J. Stoker
Editor: L. M. Graves
Publication: PSAM vol. 8.

Orbit Theory
New York University, 4–5 April 1957
Organizing Committee: J. B. Rosser, chairman, G. Birkhoff, W. J. Eckert, Philip Hartman, P. Herget, H. E. Newell
Editors: G. Birkhoff, and R. E. Langer
Publication: PSAM vol. 9.

Combinatorial Designs and Analysis
Columbia University, 24–26 April 1958
Organizing Committee: Marshall Hall, Jr., chairman, R. Bellman, G. E. Kimball, S. A. Schelkunoff, C. B. Tompkins
Editors: R. Bellman and Marshall Hall, Jr.
Published under title *Combinatorial Analysis*: PSAM vol. 10.

Nuclear Reactor Theory
New York, 23–24 April 1959
Organizing Committee: Ernest P. Wigner, chairman, G. Birkhoff, H. L. Garabedian, S. M. Ulam, J. E. Wilkins
Editors: G. Birkhoff and Ernest P. Wigner
Publication: PSAM vol. 11.

Structure of Language and Its Mathematical Aspects
New York, 14–15 April 1960
Organizing Committee: R. Jakobson, chairman, E. S. Klima, Secretary
Editor: R. Jakobson
Publication PSAM vol. 12.

Hydrodynamic Instability and Related Problems
New York, 14–15 April 1960
Organizing Committee: Garrett Birkhoff, chairman, R. Bellman, E. Hopf, C. C. Lin, B. MacMillan
Editors: R. Bellman, G. Birkhoff, and C. C. Lin
Published under title *Hydrodynamic Instability*: PSAM vol. 13.

Mathematical Problems in the Biological Sciences

Mathematical Problems in the Biological Sciences
New York, 5–7 April 1961
Organizing Committee: S. M. Ulam, chairman, Richard E. Bellman, Anthony Bartholomay, J. Jacquez, T. Puck, C. E. Shannon
Editor: R. Bellman.
Publication: PSAM vol. 14.

Experimental Arithmetic
Chicago, 12–14 April 1962
Organizing Committee: N. C. Metropolis, chairman, Marshall Hall, Jr., P. Henrici, M. Kac, R. D. Richtmyer, A. H. Taub

Interactions between Mathematics Research and High Speed Computing
Atlantic City, 16–17 April 1962
Organizing Committee: J. Todd, chairman, G. E. Forsythe, P. D. Lax, D. H. Lehmer, H. H. Goldstine, C. B. Tompkins, D. M. Young
The preceding two symposia were published jointly under the title *Experimental Arithmetic, High Speed Computing, and Mathematics*: PSAM vol.15.
Editors: N. C. Metropolis, A. H. Taub, J. Todd, and C. B. Tompkins

Stochastic Processes in Mathematical Physics and Engineering
New York, 30 April–2 May 1963
Organizing Committee: R. Bellman, A. T. Bharucha-Reid, M. Kac, J. M. Richardson, Joseph B. Keller, L. Zadeh, D. Slepian
Editor: R. Bellman
Publication: PSAM vol. 16.

Applications of Nonlinear Partial Differential Equations in Mathematical Physics
New York, 21–23 April 1964
Organizing Committee: R. Finn, chairman, C. B. Morrey, W. Noll, J. B. Serrin, A. H. Taub
Editor: R. Finn
Publication: PSAM vol. 17.

Magneto-fluid and Plasma Dynamics
New York, 13–15 April 1965
Organizing Committee: H. Grad, chairman, A. Lenard, M. N. Rosenbluth, William R. Sears, H. Weitzner
Editor: H. Grad
Publication: PSAM vol. 18.

Mathematics Aspects of Computer Science
New York, 5–7 April 1966
Organizing Committee: J. T. Schwartz, chairman, M. Davis,

H. H. Goldstine, D. H. Lehmer, J. Todd, Herbert S. Wilf, C. C. Elgot, S. Gorn, H. Huskey, A. G. Oettinger
Editor: J. T. Schwartz
Publication: PSAM vol. 19.

The following constituted the second phase jointly with SIAM:

Transport Theory
New York, 5–7 April 1967
Organizing Committee: G. Birkhoff, chairman, R. E. Bellman, H. Grad, M. Krook, J. E. Moyal, T. W. Mullikin
Editors: I. K. Abu-Shumays, R. E. Bellman, G. Birkhoff
Publication: SIAM-AMS Proc. vol. 1.

Numerical Solution of Field Problems in Continuum Physics
Durham, NC, 5–6 April 1968
Organizing Committee: G. Birkhoff, chairman, Jim Douglas, Jr., R. S. Varga, Calvin Wilcox, Signey Fernbach
Liaison Representatives: Francis G. Dressel, A. S. Galbraith, Gene B. Parrish
Editors: G. Birkhoff, R. S. Varga
Publication: SIAM-AMS Proc. vol. 2.

Mathematical Aspects of Electrical Network Theory, 2–3 April 1969
Organizing Committee: Herbert S. Wilf, chairman, W. A. Blackwell, Frank Branin, Robert Brayton, Frank Harary
Editors: F. Harary, H. S. Wilf
Published as *Mathematical Aspects of Network Analysis*: SIAM-AMS Proc. vol. 3.

Computers in Algebra and Number Theory, New York, 25–26 March 1970
Organizing Committee: Garrett Birkhoff, chairman, Charles C. Sims, D. G. Higman
Editors: G. Birkhoff, M. Hall, Jr.
Publication: SIAM-AMS Proc. vol. 4.

Mathematical Aspects of Statistical Mechanics, New York, 7–8 April 1971
Organizing Committee: Mark Kac, O. E. Lansford III, James C. T. Pool, chairman, Robert T. Powers, Seymour Sherman
Editor: J. C. T. Pool
Publication: SIAM-AMS Proc. vol. 5.

Stochastic Differential Equations, New York, 29–30 March 1972
Organizing Committee: Joseph B. Keller and Henry P. McKean, cochairmen
Editors: J. B. Keller, H. P. McKean
Publication: SIAM-AMS Proc. vol. 6.

Complexity of Real Computational Processes, New York, 18–19 April 1973
Organizing Committee: Richard M. Karp, chairman, Stephen Cook, John Hopcroft, Shmuel Winograd
Editor: R. M. Karp
Published as Complexity of Computation
Publication: SIAM-AMS Proc. vol. 7.

Mathematical Aspects of Chemical and Biochemical Problems and Quantum Chemistry, New York, 10–11 April 1974
Organizing Committee: Donald S. Cohen, chairman, Hirsh G. Cohen, Julian D. Cole, George R. Bavalas, Aron Kupperman
Editor: D. S. Cohen
Publication: SIAM-AMS Proc. vol. 8.

Nonlinear Programming
New York, 23–24 March 1975
Organizing Committee: Richard W. Cottle, chairman, Carleton E. Lemke, Stephen M. Robinson, J. Ben Rosen
Editor: R. W. Cottle
Publication: SIAM-AMS Proc. vol. 9.

Asymptotic Methods and Singular Perturbations
New York, 11–12 April 1976
Organizing Committee: Robert E. O'Malley, Jr., chairman, Donald S. Cohen, Joseph B. Keller, M. D. Van Dyke
Editor: R. E. O'Malley, Jr.
Publication: SIAM-AMS Proc. vol. 10.

Computational Fluid Dynamics
New York, 16–17 April 1977
Organizing Committee: Alexandre Chorin, Herbert B. Keller, chairman, Peter D. Lax, R. W. MacCormick
Editor: Herbert B. Keller
Publication: SIAM-AMS Proc. vol. 11.

Mathematical Problems in Fracture Mechanics
New York, 28–29 March 1978
Organizing Committee: Keiti Aki, Robert Burridge, chairman, James K. Knowles, James R. Rice
Editor: Robert Burridge
Published as *Fracture Mechanics*
Publication: SIAM-AMS Proc. vol. 12.

Mathematical Psychology and Psychophysiology
Philadelphia, 15–16 April 1980
Organizing Committee: W. K. Estes, Stephen Grossberg, chairman,

R. Duncan Luce, M. Frank Norman, H. Simon, George Sperling
Editor: Stephen Grossberg
Publication: SIAM-AMS Proc. vol. 13.

Inverse Problems
New York, 12–13 April 1983
Organizing Committee: Robert Burridge, Joseph B. Keller, Robert B. Marr, David W. McLaughlin, chairman, C. Ray Smith
Editor: D. W. McLaughlin
Publication: SIAM-AMS Proc. vol. 14.

## Summer Institutes

An ad hoc Committee on a Summer Mathematics Institute, consisting of A. A. Albert, Chairman, S. Eilenberg, S. Mac Lane, D. C. Spencer, and O. Zariski, presented a report that the Council approved on 11 August 1952. The committee noted the profound influence of the Institute for Advanced Study but the defect that it did not allow for the gathering together of a group of mathematicians all interested in a single subject. The committee proposed "that a Summer Institute without a building or permanent staff be organized to provide such gatherings of mathematicians active in a particular subject." Support by the National Science Foundation was proposed as well.

A standing Committee on Summer Institutes was then appointed, consisting of A. A. Albert, chairman, and S. Bochner for three years, H. P. Robertson and H. Whitney for two years, and N. Jacobson and O. Zariski for one year. The committee immediately established the first institute for the Summer of 1953.

Several principles were established in the first institute. The subject matter was limited. There was a number (here four) of invited series of lectures by participants. The formal program ran to only about ten hours per week. Younger workers were welcome.

The budget of the first institute was $21,500, of which $20,000 came from the National Science Foundation and the remainder from the Society. There were twenty mathematicians present by invitation. The institute was open to all interested parties and nine others attended.

Almost immediately the Committee on Summer Institutes recommended that the institute be shortened to four weeks and that there be two topics, handled as two separate institutes simultaneously in the same location. The Council declined initially on both recommendations. At the fourth institute in 1956 it became clear that six weeks was indeed too long, as the program and the attendance became thin after four weeks. Thereafter, institutes were shortened to four weeks and then three.

Questions arose of the orientation of summer institutes and of who should be invited or admitted. The error in policy on admission and invitation had apparently been that the policy was at the same time too restrictive, in that the institutes were not properly publicized, and too lax, in that some people with the wrong expectations attended. The Council of 25 January 1961 made the following policy statement. "Summer Institutes should be research conferences, not primarily instructional in nature. But researchers at all levels of development should be admitted."

The growth and popularity of the institutes is exemplified in the twenty-second in 1974, where there were two hundred and seventy mathematicians in attendance, including eighty-four from foreign countries. The program there consisted of ten series of lectures and fifteen seminars. The budgeted cost of the institute was $68,188, of which $62,131 was covered by a grant from the National Science Foundation while the remaining $6,057 was not recovered.

Because of the fact that the aim was research, the institutes themselves sometimes did not produce a published scientific record. Papers that grew out of work at the institutes were of course published in diverse locations. Lecture notes were prepared as a rule but by intent did not constitute publication. The Trustees of 29 November 1961 lodged the authority to produce and distribute them with the executive director with this instruction. "Complete distribution of Lecture Notes is to be made to all participants attending the institute or seminar, but beyond this only to individuals working in the particular field covered." However later Summer Institutes have yielded volumes in the series *Proceedings of Symposia in Pure Mathematics* (PSPUM, sometimes pronounced "PROVERBS" because it followed PSAM).

The committee in charge of an institute has been variously called an organizing committee and an invitations committee. It encompassed both kinds of duties and editorial duties as well. Members of the committee were usually among the principal speakers. Almost from the beginning each institute has had staff support from the Providence office consisting of a full-time employee doing preliminary work in the Providence office and work on site throughout the institute. The Providence office provided other support as did persons employed on the spot.

Here is a list of the Summer Institutes:

Lie Algebras and Lie Groups
Colby College, 20 June–31 July, 1953
Invitations committee: Nathan Jacobson, chairman, C. C. Chevalley, A. M. Gleason
Publication: *Memoirs*, No. 14, consisting of five papers from the institute.

Several Complex Variables
University of Colorado, 21 June–31 July 1954
Invitations Committee: S. Bochner, chairman, D. C. Spencer, alternate chairman, L. Bers, N. Hawley, O. Zariski
Editorial committee: S. S. Chern, W. T. Martin, Oscar Zariski
Publication: *Bulletin* of The American Mathematical Society 62 (1956), 79–141.

Set Theoretic Topology
University of Wisconsin, 24 July–20 August 1955 [several versions of dates are in the files]
Organizing committee: R H Bing, E. G. Begle, L. W. Cohen, G. T. Whyburn, R. L. Wilder

Differential Geometry in the Large
University of Washington, 18 June–27 July 1956
Organizing committee: C. B. Allendoerfer, chairman, H. Busemann, S. S. Chern, J. J. Stoker. (Sumner B. Myers had been named chairman but his unfortunate early death occurred in October 1955.)

Mathematical Logic
Cornell University, July 1957
Organizing Committee: P. R. Halmos, S. C. Kleene, W. V. Quine, J. B. Rosser, chairman, A. Tarski
Publication: *Summaries of Talks Presented at the Summer Institute for Symbolic Logic*, published by the Institute for Defense Analyses.

Surface Area and Related Topics
Bowdoin College, 16 June–11 July, 1958
Organizing committee: T. Rado, chairman, L. C. Young, Lamberto Cesari, H. Federer, J. W. T. Youngs.

Number Theory
University of Colorado, 21 June–18 July 1959
Organizing Committee: Burton W. Jones, chairman, P. T. Bateman, A. Brauer, D. H. Lehmer, Ivan Niven, A. L. Whiteman.

Group Theory
California Institute of Technology, 1–28 August 1960
Organizing Committee: R. Brauer, R. H. Bruck, H. S. MacDonald Coxeter, R. P. Dilworth, M. Hall, Jr., chairman, H. J. Ryser
Editor: M. Hall, Jr.
Publication: PSPUM vol. 6. titled 1960 *Institute on Finite Groups.*

Applications of Linear Operator Theory
Stanford University: 1–26 August 1961
Organizing Committee: P. D. Lax, chairman, H. Helson, R. S. Phillips.

Relativity and Differential Geometry
University of California, Santa Barbara, 18 June–13 July 1962
Organizing Committee: A. H. Taub, chairman, Warren Ambrose, S. S. Chern, C. W. Misner

Differential and Algebraic Topology
University of Washington, 15 July–17 August 1963
Organizing Committee: N. Steenrod, chairman R. Bott, E. Dyer, J. Milnor.

Algebraic Geometry
Woods Hole, 6–31 July 1964
Organizing Committee: O. Zariski, chairman, W. L. Chow, M. Rosenlicht, D. C. Spencer, J. Tate.

Algebraic Groups and Discontinuous Subgroups
University of Colorado, 5 July–6 August 1965
Organizing Committee: A. Borel, co-chairman, G. D. Mostow, co-chairman, A. Selberg, T. Tamagawa
Editors: A. Borel and G. D. Mostow
Publication: PSPUM vol. 9.

Entire Functions and Related Parts of Analysis
University of California, San Diego, 27 June–22 July 1966
Organizing Committee: J. Korevaar, acting chairman, A. Beurling, R. Boas, chairman, Leon Ehrenpreis, W. Fuchs, L. Rubel.
Editors: S. S. Chern, Leon Ehrenpreis, J. Korevaar, W. H. J. Fuchs, and L. A. Rubel
Publication: PSPUM vol. 11.

Axiomatic Set Theory
University of California, Los Angeles, 10 July–5 August 1967
Organizing Committee: A. Robinson, chairman, P. Cohen, D. S. Scott
Editors: D. S. Scott and Thomas J. Jech
Publication: PSPUM vol. 13.

Global Analysis
University of California, Berkeley, 1–26 July 1968
Organizing Committee: S. S. Chern, cochairman, S. Smale, cochairman, F. Browder, L. Hörmander, I. Singer
Editors: S. S. Chern and S. Smale
Publication: PSPUM vol. 14–16.

Number Theory
SUNY at Stony Brook, 7 July–1 August 1969
Organizing Committee: D. Lewis, chairman, J. Ax, P. Bateman, K. Iwasawa, A. Selberg

Editor: D. J. Lewis
Publication: PSPUM vol. 20 under title 1969 *Number Theory Institute.*

Algebraic Topology
University of Wisconsin, 25 June–14 July 1970
Organizing Committee: A. Liulevicius, chairman, W. Browder, E. Fadell, E. Floyd, Peter Hilton, R. Lashof, M. Mahowald, R. Milgram, F. Peterson, J. Stasheff, E. Thomas
Editor: A. Liulevicius
Publication: PSPUM vol. 22.

Partial Differential Equations
University of California at Berkeley, 9–28 August 1971
Organizing Committee: Louis Nirenberg, chairman, Alberto P. Calderón, Lars V. Hörmander, Charles B. Morrey, Jr., James B. Serrin, Isadore M. Singer, Donald C. Spencer
Editor: D. C. Spencer
Publication: PSPUM vol. 23.

Harmonic Analysis on Homogeneous Spaces
William College, 31 July–18 August 1972
Organizing Committee: C. C. Moore, chairman, H. Furstenberg, Sigurdur Helgason, G. Hunt, B. Kostant, Robert P. Langlands, G. Mackey, E. Stein
Editor: C. C. Moore
Publication: PSPUM vol. 26.

Differential Geometry
Stanford University, 30 July–17 August 1973
Organizing Committee: S. S. Chern, cochairman, R. Osserman, cochairman, R. Bott, Eugenio Calabi, L. Green, Shoshichi Kobayashi, T. Milnor, B. O'Neill, J. Simons, I. Singer
Editors: S. S. Chern and Robert Osserman
Publication: PSPUM vol. 27.

Algebraic Geometry
Humboldt State University, 29 July–16 August 1974
Organizing Committee: D. Mumford, chairman, M. Artin, P. Griffiths, Robia Hartshorne, H. Hironaka, N. Katz
Editor: R. Hartshorne
Publication: PSPUM vol. 29 under title *Algebraic Geometry*—Arcata 1974.

Functions of Several Complex Variables
Williams College, 28 July–15 August 1975

Organizing Committee: Robert C. Gunning, cochairman, H. Rossi, cochairman, I. Craw, H. Grauert, D. Lieberman, J. Morrow, Raghavan Narasimhan, Yum-Tong Siu, R. O. Wells, Jr.
Editor: R. O. Wells, Jr.
Publication: PSPUM vol. 30.

Algebraic and Geometric Topology
Stanford University, 2–21 August 1976
Organizing Committee: R. Milgram, chairman, W. Browder, cochairman, E. Thomas, cochairman, R. Bott, P. Conner, R. Lashof, Robion C. Kirby, D. Quillen, William P. Thurston
Editor: R. James Milgram
Publication: PSPUM vol. 32.

Automorphic Forms, Representations, and $L$-Functions
Oregon State University, 11 July–5 August 1977
Organizing Committee: A. Borel, cochairman, W. Casselman, cochairman, P. Deligne, H. Jacquet, R. Langlands, J. Tate
Editors: A. Borel and W. Casselman
Publication: PSPUM vol. 33.

Harmonic Analysis in Euclidean Spaces and Related Topics
Williams College, 10–28 July 1978
Organizing Committee: S. Wainger, cochairman, G. Weiss, cochairman, D. Burkholder, A. Calderón, Y. Meyer, E. Stein, A. Zygmund
Editors: Guido L. Weiss and Stephen Wainger
Publication: PSPUM vol. 35 under title *Harmonic Analysis in Euclidean Spaces.*

Finite Group Theory
University of California at Santa Cruz, 25 June–20 July 1979
Organizing Committee: D. Gorenstein, chairman, J. Alperin, M. Aschbacher, N. Burgoyne, B. Cooperstein, G. Mason
Editors: Bruce Cooperstein and Geoffrey Mason
Publication: PSPUM vol. 37 under title *The Santa Cruz Conference on Finite Groups.*

Operator Algebras and Applications
Queen's University, 14 July–2 August 1980
Organizing Committee: R. Kadison, chairman, R. Douglas, E. Effros, R. Powers, L. Pukanszky, E. Woods
Editor: Richard V. Kadison
Publication: PSPUM vol. 38.

Singularities
Humboldt State University, 20 July–7 August 1981

Organizing Committee: P. Orlik, chairman, P. Church, A. Durfee, Martin Golubitsky, Le Duc Trang, P. Wagreich
Editor: Peter Orlik
Publication: PSPUM vol. 40.

Recursion Theory
Cornell University, 28 June–17 July 1982
Organizing Committee: A. Nerode, chairman, R. Shore, cochairman, S. Feferman, Yiannis N. Moschovakis, H. Putnam, G. Sacks, J. Schoenfield, R. Soare
Editors: Anil Nerode and Richard A. Shore
Publication: PSPUM vol. 42.

Nonlinear functional analysis and its applications
University of California at Berkeley, 11–29 July 1983
Organizing Committee: F. Browder, chairman, H. Brezis, Tosio Kato, J. Lions, L. Nirenberg, P. Rabinowitz
Editor: Felix E. Browder
Publication: PSPUM vol. 45.

Geometric Measure Theory
Humboldt State University, 16 July–3 August 1984
Organizing Committee: W. Allard, cochairman, F. Almgren, cochairman, E. Bombieri, R. Hardt, H. Lawson, Jr., J. Pitts, R. Shoen, W. Ziemer
Editors: William K. Allard and Frederick J. Almgren, Jr.
Publication: PSPUM vol. 44.

Algebraic Geometry
Bowdoin College, 8–26 July 1985
Organizing Committee: D. Eisenbud, chairman, S. Bloch, W. Fulton, D. Gieseker, J. Harris, R. Hartshorne, S. Mori
Editor: Spencer J. Bloch
Publication: PSPUM vol. 46.

Representations of Finite Groups and Related Topics
Humboldt State University, 7–25 July 1986
Organizing Committee: Jonathan Alperin, chairman, Charles W. Curtis, W. Feit, P. Fong
Editor: Paul Fong
Publication: PSPUM vol. 47.

Theta Functions
Bowdoin College, 6–24 July 1987
Organizing Committee: L. Ehrenpreis, cochairman, R. Gunning, cochairman, E. Arbarello, D. Chudnovsky, G. Chudnovsky, T. Kawai, H. McKean
Editors: L. Ehrenpreis and R. Gunning

Publication: PSPUM vol. 49.

Operator Theory/Operator Algebras and Applications
University of New Hampshire, 3–23 July 1988
Organizing Committee: William B. Arveson, cochairman, Ronald G. Douglas, cochairman, Ciprian I. Foiaş, I. C. Gohberg, Peter D. Lax, Donald Sarason, Barry Simon, Dan-Virgil Voiculescu.

## Summer Seminars

The prototype of the Summer Seminar in Applied Mathematics was held at Brown University in 1941. In 1955 a similar event aimed at the immediate postdoctoral level was planned and the Society was asked to co-sponsor, at no expense, and to name a program committee. The Council agreed to the proposal including the naming of part of the program committee. In fact it developed that there was insufficient time to develop such a seminar for 1956. However the Council of 20 April 1956 voted to hold a Seminar on Mechanics in the Summer of 1957, consisting as initially proposed of two sessions of three weeks each. The level of participants was to be the Ph.D. The major objective was to be instructional. Nine lecturers were to give courses of about six lectures for three weeks while the second three weeks were to be devoted to individual lectures.

The Seminar as presented was shortened to four weeks. The topics were Fluid Mechanics, Solid Mechanics, Probability and Related Topics in the Physical Sciences, and Partial Differential Equations Including Numerical Methods. Support was obtained from the Air Force Office of Scientific Research, the Atomic Energy Commission, the National Science Foundation, the Office of Naval Research, and the Office of Ordnance Research, U. S. Army. The location was the University of Colorado.

Summer Seminars were held every two or three years until 1979 when they became an annual occurrence. Portions of many of the Summer Seminars in Applied Mathematics were published in the series *Lectures in Applied Mathematics* (LAM). Here is the list of Seminars:

Seminar in Applied Mathematics
Boulder, University of Colorado, 24 June–19 July 1957
Program Committee: M. H. Martin, chairman, Paul R. Garabedian, A. S. Householder, Mark Kac, R. E. Langer, C. C. Lin, William Prager, J. J. Stoker
Publications: LAM vols. 1A, 1B, 1C.

Modern Physical Theories and Associated Mathematical Developments
Boulder, University of Colorado, 24 July–19 August 1960
Organizing Committee: K. O. Friedrichs, chairman, M. Kac, M. M. Schiffer, G. E. Uhlenbeck, E. P. Wigner

Publications: LAM vols. 1, 2, 3, 4.

Space Mathematics
Ithaca, Cornell University, 1 July–9 August 1963
Organizing Committee: J. B. Rosser, chairman, D. Brouwer, M. S. Davis, W. R. Sears, V. T. Szebehely
Editor: J. B. Rosser
Publications: LAM vols. 5, 6, 7.

Relativity Theory and Astrophysics
Ithaca, Cornell University, 25 July–20 August 1965
Organizing Committee: A. H. Taub, chairman, S. Chandrasekhar, C. C. Lin, A. Schild, C. Misner
Editor: J. Ehlers
Publications: LAM vols. 8, 9.

Mathematics of the Decision Sciences
Stanford, Stanford University, 10 July–11 August 1967
Organizing Committee: G. B. Danzig, chairman, K. Arrow, R. H. Bush, R. Gomory, H. Kuhn, R. D. Luce, Robert Thrall, P. Wolfe
Editors: G. B. Danzig and A. F. Veinott, Jr.
Publications: LAM, vols. 11, 12.

Mathematical Problems in the Geophysical Sciences
Troy, Rensselaer Polytechnic Institute, 6–31 July 1970
Organizing Committee: W. H. Reid, chairman, H. Cohen, Richard C. DiPrima, D. Fultz, C. C. Lin
Editor: W. H. Reid
Publications: LAM vols. 13, 14.

Nonlinear Wave Motion
Potsdam, Clarkson College of Technology, 5–28 July 1972
Organizing Committee: Alan C. Newell, cochairman, C. Wilcox, cochairman, N. Bleistein, V. Barcilon, D. Hector
Editor: A. C. Newell
Publication: LAM vol. 15.

Inverse Problems
Los Angeles, University of California, Los Angeles, 5–16 August 1974
Organizing Committee: V. Barcilon, cochairman, J. D. Cole, cochairman, M. Crandall, F. Gilbert, L. Knopoff, R. G. Newton, J. Ralston, N. Grossman
No publication.

Modern Modeling of Continuum Phenomena
Troy, Rensselaer Polytechnic Institute, 7–18 July 1975
Organizing Committee: R. C. DiPrima, chairman, George F. Carrier, H. G. Cohen, S. H. Davis, J. B. Keller, L. A. Segal

Editor: R. C. DiPrima
Publication: LAM vol. 16.

Nonlinear Oscillations in Biology
Salt Lake City, University of Utah, 12–23 June 1978
Organizing Committee: Frank C. Hoppensteadt, chairman, W. S. Childress, D. S. Cohen, P. Waltman, S. Winfree
Editor: Frank C. Hoppensteadt
Publication: LAM vol. 17.

Algebraic and Geometric Methods in Linear Systems Theory
Cambridge, Harvard University, 19–30 June 1979
Organizing Committee: R. W. Brockett, C. I. Brynes, C. Martin, S. K. Mitter, H. H. Rosenbrock, J. C. Willems
Editors: Christopher I. Byrnes, Clyde F. Martin
Publication: LAM vol. 18.

Mathematical Aspects of Physiology
Salt Lake City, University of Utah, 15–27 June 1980
Organizing Committee: F. Hoppensteadt, chairman, J. Rinzel, P. W. Altman, S. Stephenson, J. B. Keller
Editor: Frank C. Hoppensteadt
Publication: LAM vol. 19.

Fluid Dynamical Problems in Astrophysics and Geophysics
Chicago, University of Chicago, 29 June–10 July 1981
Organizing Committee: N. Lebovitz, chairman, V. Barcilon, R. DiPrima, F. Goldreich, J. Pedlosky, A. Toomre
Editor: Norman R. Lebovitz
Publication: LAM vol. 20.

Applications of Group Theory in Physics and Mathematical Physics
Chicago, University of Chicago, 6–16 July 1982
Organizing Committee: P. Sally, chairman, M. Flato, C. Fronsdal, I. Kaplansky, Y. Nambu, I. Singer, J. Wolf, G. Zuckerman
Editors: Moshe Flato, Paul Sally, Greg Zuckerman
Publication: LAM vol. 21.

Large-scale Computations in Fluid Dynamics
LaJolla, Scrips Institution of Oceanography, 27 June–8 July 1983
Organizing Committee: R. Somerville, chairman, A. Chorin, B. Engquist, S. Osher
Editors: Bjorn E. Engquist, Stanley Osher, Richard C. J. Somerville
Publication: LAM vol. 22.

Nonlinear Systems of Partial Differential Equations
Sante Fe, College of Sante Fe, 8–21 July 1984

Organizing Committee: B. Nicolaenko, chairman, D. Holm, J. M. Hyman
Editor: Basil Nicolaenko
Publication: LAM vol. 23.

Reacting Flows: Combustion and Chemical Reactors
Ithaca, Cornell University, 30 June–13 July 1985
Organizing Committee: G. S. S. Ludford, chairman, D. S. Cohen, A. J. Majda, F. A. Williams
Editor: Geoffrey Ludford
Publication: LAM vol. 24.

Computational Solution of Nonlinear Systems Equations
Fort Collins, Colorado State University, 18–29 July 1988
Organizing Committee: E. L. Allgower, H. B. Keller, H. O. Peitgen, W. C. Rheinboldt, S. Smale.

## Symposia in Pure Mathematics

The Society had held symposia in pure mathematics sporadically almost from the beginning of its existence. These took the form of invitations to two or three people to lecture on closely related topics at the same meeting. A more formal arrangement of Symposia in Pure Mathematics was modeled on the Symposia in Applied Mathematics and began in 1959 with two symposia, one supported by the Institute for Defense Analyses. Proceedings of these symposia were frequently published in the series *Proceedings of Symposia in Pure Mathematics* (PSPUM).

Here is the list of symposia:

Lattice Theory
U.S. Naval Postgraduate School, 16–17 April 1960
Program Committee: R. P. Dilworth, chairman, G. Birkhoff, Alfred Tarski, R. S. Pierce
Editor: R. P. Dilworth
Publication: PSPUM vol. 2.

Finite Groups
New York, 23–24 April 1959
Program Committee: A. A. Albert, chairman, Walter Feit, Marshall Hall, Jr., Israel N. Herstein, Irving Kaplansky
Editors: A. A. Albert, I. Kaplansky
Publication: PSPUM vol. 1.

Differential Geometry
University of Arizona, 18–19 February 1960
Program Committee: C. B. Allendoerfer, chairman, Herbert Busemann, Hans Samelson, D. C. Spencer

Editor: C. B. Allendoerfer
Publication: PSPUM vol. 3.

Partial Differential Equations
University of California, Berkeley, 21–22 April 1960
Program Committee: C. B. Morrey, Jr., chairman, David Gilbarg, Louis Nirenberg, Paul C. Rosenbloom
Editor: C. B. Morrey, Jr.
Publication: PSPUM vol. 4.

Recursive Function Theory
New York, 6–7 April 1961, jointly with the Association for Symbolic Logic and the Association for Computing Machinery
Organizing Committee: S. C. Kleene, J.C.E. Dekker, John McCarthy, J. B. Rosser, J. R. Schoenfeld
Editor: J. C. E. Dekker
Publication: PSPUM vol. 5.

Convexity
University of Washington, 13–15 June 1961
Organizing Committee: Victor Klee, chairman, David Gale, Branko Grünbaum, Merle Andrew, AFOSR liaison
Editor: V. Klee
Publication: PSPUM vol. 7.

Recent Developments in the Theory of Numbers
California Institute of Technology, 21–22 November 1963
Program Committee: A. L. Whiteman, chairman, Leonard Carlitz, D. H. Lehmer, W. J. LeVeque
Editor: A. L. Whiteman
Publication: PSPUM vol. 8 titled *Theory of Numbers.*

Singular Integrals
University of Chicago, 20–22 April 1966
Invitations Committee: Alberto Calderón, chairman, K. O. Friederichs, Robert T. Seeley, Antoni Zygmund
Editor: A. P. Calderón
Publication: PSPUM vol. 10.

Combinatorics
University of California, Los Angeles, 21–22 March 1968
Organizing Committee: T. S. Motzkin, chairman, Marshall Hall, Jr., Gian-
Carlo Rota
Editor: T. S. Motzkin
Publication: PSPUM vol. 19.

Applications of Categorical Algebra
New York, 10–11 April 1968
Organizing Committee: Hyman Bass, Alex Heller, chairman, John Moore
Editor: A. Heller
Publication: PSPUM vol. 17.

Nonlinear Functional Analysis
Chicago, 16–19 April 1968
Organizing Committee: Felix E. Browder, chairman, James Eells, Jr., Tosio Kato, George J. Minty, Richard S. Palais, Jacob T. Schwartz, Stephen Smale
Editor: F. Browder
Publication: PSPUM vol. 18.

Representation Theory of Finite Groups
University of Wisconsin, 14–16 April 1968
Organizing Committee: Irving Reiner, chairman, Richard Brauer, Charles W. Curtis, Walter Feit, James A. Green
Editor: I. Reiner
Publication: PSPUM vol. 21 under title *Representation theory of finite groups and related topics.*

Analytic Number Theory
St. Louis University, 27–30 March 1972
Organizing Committee: Harold G. Diamond, chairman, Patrick S. Gallagher, Hugh L. Montgomery, Wolfgang M. Schmidt, Harold M. Stark
Editor: H. G. Diamond
Publication: PSPUM vol. 24.

Mathematical Developments Arising from the Hilbert Problems
Northern Illinois University, 13–17 May 1974
Organizing Committee: Felix E. Browder, chairman, Paul T. Bateman, R. Creighton Buck, Donald J. Lewis, Daniel Zelinsky
Editor: F. E. Browder
Publication: PSPUM vol. 28.

Probability
University of Illinois, 15–18 March 1976
Organizing Committee: Kai Lai Chung, Joseph L. Doob, chairman, Richard M. Dudley, Ronald K. Getoor, Frank B. Knight, Frank L. Spitzer
Editor: J. L. Doob
Publication: PSPUM vol. 31.

Relations between Combinatorics and Other Parts of Mathematics
Ohio State University, 20–23 March 1978

Organizing Committee: D. K. Ray-Chaudhuri, chairman, Marshall Hall, Jr., Peter J. Hilton, Gian-Carlo Rota, W. T. Tutte, Richard M. Wilson
Editor: Dijen K. Ray-Chaudhuri
Publication: PSPUM vol. 34.

Geometry of the Laplace Operator
University of Hawaii, 27–30 March 1979
Organizing Committee: Dalvid Bleecker and Robert Osserman, cochairmen, Victor Guillemin, Henry P. McKean, Jr., Karen Uhlenbeck, Joel Weiner, Alan Weinstein
Editors: Robert Osserman and Alan Weinstein
Publication: PSPUM vol. 36.

Mathematical Heritage of Henri Poincaré
Indiana University, 7–10 April 1980
Organizing Committee: Felix Browder, chairman, William Browder, Phillip A. Griffiths, Jürgen K. Moser, Stephen Smale, R. O. Wells, Jr.
Editor: Felix E. Browder
Publication: PSPUM vol. 39.

Several Complex Variables
University of Wisconsin, 12–15 April 1982
Organizing Committee: Yum-Tong Siu, chairman, Robert C. Gunning, F. Reese Harvey, Raghavan Narasimhan, Walter Rudin, Wilhelm F. Stoll, Shing-Tung Yau
Editor: Yum-Tong Siu
Publication: PSPUM vol. 41 under title *Complex analysis of several variables.*

Pseudodifferential Operators and Fourier Integral Operators with Applications to Partial Differential Equations
University of Notre Dame, 2–5 April 1984
Organizing Committee: Charles Fefferman, Victor W. Guillemin, Nancy K. Stanton, Michael E. Taylor, François Trèves
Editor: François Trèves
Publication: PSPUM vol. 43 under title *Pseudodifferential operators and applications.*

Mathematical Heritage of Hermann Weyl
Duke University, 12–16 May 1987
Organizing Committee: Michael F. Atiyah, Lipman Bers, Felix E. Browder, S. S. Chern, George D. Mostow, R. O. Wells, Jr., chairman, C. N. Yang
Editor: R. O. Wells, Jr.
Publication: PSPUM vol. 48.

## Symposia on Mathematical Questions in Biology

On 5–7 April 1961 there was a symposium on Mathematical Problems in the Biological Sciences as part of the Spring Meeting in New York. The Invitations and Steering Committee included S. M. Ulam, chairman, R. E. Bellman, secretary, Anthony Bartholomay, John Jacquez, Theodore Puck, and C. E. Shannon. This was an isolated event and resulted in no consolidated publication.

At the meeting of the American Association for the Advancement of Science in Washington in December 1966, the Society presented a Symposium on Some Mathematical Questions in Biology under the direction of Murray Gerstenhaber. This appeared to be well received and on a motion by Professor Gerstenhaber the Council of 23 January 1967 agreed that a Committee on Mathematics in the Life Sciences should be appointed to propose topics for symposia from time to time and to recommend the constitution of the organizing committee in each instance.

The symposia became an annual event at meetings of the AAAS for many years. Each gave rise to a publication in the series titled Mathematics in the Life Sciences. The one in Washington was titled Some Mathematical Problems in Biology. Those that followed bore the title Some Mathematical Questions in Biology with a roman numeral through number X. The next three were unnumbered. Those that followed carried subtitles.

Effective in 1974, the Committee on Mathematics in the Life Sciences became a joint Committee with the Society for Industrial and Applied Mathematics. The AAAS became a sponsor of the publication of the symposia in 1977.

By 1986 it appeared that the audience for these symposia at the meetings of AAAS was not large enough to justify program time in the eyes of the management of AAAS although the books continued to sell and there was a segment of the biological community interested in quantitative problems. In April 1987 the Board of Directors of the Society for Mathematical Biology (SMB) agreed unanimously to cosponsor the annual Symposium on Some Mathematical Questions in Biology, with the understanding that it be held in alternate years at meetings of the Federation of American Societies of Experimental Biology (FASEB) and the American Institute of Biological Sciences. The last of the Symposia held with AAAS was the one in February 1987 and the first of those under SMB sponsorship took place at the FASEB meeting in May 1988.

Here are the location and editors of the symposia:

Washington, December 1966. Editor: Murray Gerstenhaber

I. New York, December 1967. Editor: Murray Gerstenhaber

II. Boston, December 1969. Editor: J. D. Cowan

III. Chicago, December 1970. Editor: J. D. Cowan

IV. Philadelphia, December 1971. Editor: J. D. Cowan

V. Mexico City, June 1973, Editor: J. D. Cowan

VI. San Francisco, January 1974. Editor: Simon A. Levin

VII. New York, January 1975. Editor: Simon A. Levin

VIII. Boston, February 1976. Editor: Simon A. Levin

IX. Denver, February 1977. Editor: Simon A. Levin

X. Washington, February 1978. Editor: Simon A. Levin

Houston, January 1979. Editor: Simon A. Levin

San Francisco, January 1980. Editor George F. Oster

Toronto, January 1981. Editor: Stephen Childress

Washington, January 1982. Subtitle: *Neurobiology.* Editor: Robert M. Miura

Detroit, May 1983. Subtitle: *Muscle Physiology.* Editor: Robert M. Miura

New York, May 1984. Subtitle: *DNA Sequence Analysis.* Editor: Robert M. Miura

Los Angeles, May 1985. Subtitle: *Plant Biology.* Editors: Louis J. Cross and Robert M. Miura

Philadelphia, May 1986. Subtitle: *Circadian Rhythms.* Editor: Gail Carpenter

Chicago, February 1987. Subtitle: *Models in Population Biology.* Editor: Alan Hastings

Las Vegas, May 1988. Subtitle: *The Dynamics of Excitable Media.* Editor: Robert Boyd

## Summer Research Conferences

The Summer Research Conferences instituted in 1980 by the Society with the cooperation of the Society for Industrial and Applied Mathematics (SIAM) and the Institute of Mathematical Statistics (IMS) were a byproduct of a change in stance on financial support of mathematics by the National Science Foundation (NSF). The general issue will be described in brief outline as background.

The success of the Institute for Advanced Study (IAS) and the AMS Summer Institutes prompted proposals for bringing mathematicians together in an atmosphere conducive to research. A historical account in the *Notices* of August 1978, pp. 481–492, consisting of material compiled by J. A. Krumhansl, then assistant director of the National Science Foundation, and followed by

Letters to the Editor, pp. 489–494, by Saunders Mac Lane and Joseph J. Kohn, were helpful in compiling this section. As early as 1968–1970 the Conference Board of the Mathematical Sciences considered versions of a summer research institute but did not proceed because there was no evident source for financing it. In 1969 the idea of a more permanent institute, that is, a replica of the IAS, was considered by the Advisory Committee of the Division of Mathematical Sciences of the NSF. A pressing consideration was the nature of the job market, in which young mathematicians nurtured in research were being employed at institutions in which the research atmosphere was not the prevailing one and research contacts were limited.

Alternate modes of support (these were catch words) were widely discussed. The Committee on Science Policy, then consisting of William J. LeVeque, chairman, R H Bing, Garrett Birkhoff, Felix E. Browder, John W. Jewett, Anil Nerode, and Elias M. Stein, reported to the Council in April 1976. The committee considered as possibilities the IAS model, the peripatetic institute (with continuing existence but moving from time to time from one host location to another), a greatly enlarged post-doctoral fellowship program, and short lived single subject institutes at sponsoring universities. The committee recommendation was for institutes of limited duration (say two plus years) in a subject field of a host institution, to be awarded competitively. It was approved. However, higher authorities did not take it up, although the NSF was aware of the report and the recommendation.

The National Science Board of March 16–17, 1978 did in fact approve the establishment of a Mathematical Sciences Research Institute and the issuance of a Project Announcement, i.e., a call for proposals. This was the competition that resulted in the founding of the Mathematical Sciences Research Institute in Berkeley and the Institute for Mathematics and its Applications at the University of Minnesota.

There was resistance in a portion of the mathematical community to alternate modes of support. The prevailing mode was the research grant that supplied summer support to a single mathematician or a small group, possibly including some students. The fear was that any other mode of support would come not from additional funds but from funds taken from the pool for summer support. Saunders Mac Lane was then a member of the NSB and tried valiantly, but without success, to explain to the mathematical community that either of those two viewpoints represents too great a simplification of a complex budget procedure. The resistance was directed specifically against the establishment of a permanent research institute.

When the project announcement for the proposed institute was circulated, it contained "an explicit addition stating that proposals for an institute would be evaluated in direct competition with other modes of support of research in mathematics." Some thought that this statement was not sufficiently prominent but the word circulated.

The Council of 23 January 1979 set an order of preference on some possible alternate modes of support. On a motion by Elias M. Stein the Council agreed to "set up a Special Committee on Modes of Support of Research to collect, examine, formulate and circulate proposals from the mathematical community to foster progress in research in mathematics and to make recommendations for appropriate action."

The committee consisted of G. D. Mostow, chairman, Herbert B. Keller, Calvin C. Moore, Ralph S. Phillips, James D. Stasheff, Elias M. Stein, and Hans F. Weinberger. At the Council of 20 April 1979 it made several recommendations, of which the first was that the Society "should submit a proposal to NSF for administration of an Oberwolfach-type institute which would arrange ten one-week conferences in specialized areas for about 30 participants."

The recommendation was approved by the Council and the proposal was accepted by the NSF for six conferences in the summer of 1980. Since then the norm has been ten. Occasional conferences have been of two weeks duration. Numbers of participants have been rather larger than the 30 suggested by the Committee, frequently being 50 to 60. A major part of the funds has come from the NSF but other government agencies have given support as well.

By 1983, the Summer Research Conferences were a joint venture with IMS and SIAM, in that the committee selecting the topics was a joint committee, first effective for the conferences of 1984, and there was a rough quota of conferences in core and applied areas. This change was made partly at the request of the NSF for their convenience. The Society has continued to solicit and accept grants, to administer the conferences, and to publish such proceedings as are appropriate.

Inasmuch as they are research conferences, much of the material presented is in the process of development. Publication of a volume is not a necessary outcome. In many cases, the work presented at these conferences is refined and presented in individual journal papers. However some conferences have found it reasonable to produce a volume of papers in the series *Contemporary Mathematics* (CONM), which is a vehicle for research monographs and conference proceedings.

In the following list, the time and place of the conference is given along with the subject and the name of the organizer. If there were proceedings, the volume number is stated. The editor is the same person as the organizer unless an editor is named. Note that in 1987 the conferences were in two locations.

1982 SUMMER RESEARCH CONFERENCES, University of New Hampshire, June 6 to July 17, 1982

1. Probabilistic computational complexity, Albert R. Meyer, organizer.

2. Ergodic theory and applications, Roy L. Alder, organizer.
3. Nonlinear partial differential equations, Joel A. Smoller, organizer. CONM 17.
4. Values of $L$-series at special points, Harold M. Stark, organizer.
5. Four-manifold theory, Robion C. Kirby, organizer. CONM 35. Cameron Gordon and Robion C. Kirby, editors.
6. Quantum fields, probability and geometry, Arthur M. Jaffee, organizer.

1983 SUMMER RESEARCH CONFERENCES, University of Colorado, Boulder, June 5 to August 13, 1983

1. Combinatorics and algebra, Richard P. Stanley, organizer. CONM 34. Curtis Greene, editor.
2. Applications of algebraic $K$-theory to algebraic geometry and number theory, Keith Dennis, organizer. CONM 55, 2 vol. Spencer J. Bloch, R. Keith Dennis, Eric M. Friedlander, and Michael R. Stein, editors.
3. Axiomatic set theory, James E. Baumgartner, organizer. CONM 31. James E. Baumgartner, Donald A. Martin, and Saharon Shelah, editors.
4. Group actions on manifolds, Reinhard Schultz, organizer. CONM 36.
5. Ordered fields and real algebraic geometry, D. W. Dubois, organizer.
6. Microlocal analysis, Linda Preiss Rothschild, organizer. CONM 27. M. Salah Baouendi, Richard Beals, Linda Preiss Rothschild, editors.
7. Fluids and plasmas: geometry and dynamics, Jerrold E. Marsden, organizer. CONM 28.
8. Probability theory, partial differential equations and applications, Daniel Stroock, organizer.
9. Geometrical analysis of singularities, Jeff Cheeger, organizer.
10. Kleinian groups, Howard Masur, organizer.

1984 SUMMER RESEARCH CONFERENCES, Bowdoin College, June 10 to August 18, 1984

1. New multivariate methods in statistics, Peter Huber, organizer.
2. Random matrices and their applications, Joel Cohen, organizer. CONM 50. J. E. Cohen and H. Kesten, editors.
3. The mathematics of phase transitions, Richard Timothy Durrett, organizer.
4. Aspherical complexes, Kenneth Brown and F. T. Barrel, organizers.
5. Group actions on rings, M. Susan Montgomery, organizer. CONM 43.
6. Diophantine problems, including diophantine equations, diophantine approximation, and transcendency, D. J. Lewis and W. M. Schmidt, organizers.

7. The Selberg trace formula and related topics, Audrey Terras, organizer. CONM 53. Dennis A. Hejhal, Peter Sarnak, and Audrey Anne Terras, editors.
8. Linear algebra and its role in systems theory, Biswa Nath Datta, organizer. CONM 47.
9. Integral geometry, Robert L. Bryant, organizer. CONM 63. Robert L. Bryant, Victor Guilleman, Sigurdur Helgason, and R. O. Wells, Jr., editors.
10. Complex differential geometry and non-linear differential equations, Y.T. Siu, organizer. CONM 49.

1985 SUMMER RESEARCH CONFERENCES, Humboldt State University, Arcata, California, June 23 to August 31, 1985

1. Brown-Gitler spectra and applications, R. James Milgram, organizer.
2. Applications of Lie groups in differential geometry, Wolfgang Ziller, organizer.
3. Numerical simulations of fluid flow, Gregory Baker, organizer.
4. Multiparameter bifurcation theory, Martin Golubitsky and John Guckenheimer, organizers. CONM 56.
5. Harmonic analysis in $R^n$ , Elias M. Stein, organizer.
6. Function estimates, Murray Rosenblatt, organizer. CONM 59. J. S. Marron, editor.
7. Applications of mathematical logic to finite combinatorics, Stephen Simpson, organizer. CONM 65.
8. Combinatorics and ordered sets, Ivan Rival, organizer. CONM 57.
9. Current trends in arithmetical algebraic geometry, Kenneth A. Ribet, organizer. CONM 67.
10. Computational number theory, Andrew M. Odlyzko, organizer.

1986 SUMMER RESEARCH CONFERENCES, University of California, Santa Cruz, June 22 to August 2, 1986

1. Mathematics in general relativity, James Isenberg, organizer. CONM 71.
2. Large scale data analysis via computer graphics, Andreas Buja and Werner Stuetzle, organizers.
3. Time reversal of Markov processes and potential theory, Joseph Glover, organizer.
4. Artin's braid group, Joan S. Birman, organizer.
5. Discrete and computational geometry, Jacob E. Goodman and Richard Pollack, organizers.
6. Representation theory of Lie groups, Wilfried Schmid, organizer.

1987 SUMMER RESEARCH CONFERENCES

University of Colorado, Boulder, Colorado, June 14 to July 25 1987

1. Categories in computer sciences and logic, John W. Gray, organizer.
2. Hamiltonian dynamical systems, Kenneth Meyer and Don Saari, organizers.

3. Graphs and algorithms, Joseph P. Buhler and Phyllis Chinn, organizers.
4. Geometery of group representations, William Goldman and Andy Roy Magid, organizers. CONM 74.
5. The connection between infinite dimensional and finite dimensional dynamical systems, Basil Nicolaenko, organizer.

Cornell University, Ithaca, July 19 to August 15, 1987

6. Geometry of random motion, Richard Durrett and Mark Pinsky, organizers. CONM 73.
7. Crystal growth and pattern formation in phase transitions, Stuart P. Hastings and Nicholas D. Kazarinoff, organizers.
8. Complex analytic dynamics, John H. Hubbard, organizer.
9. Statistical inference from stochastic processes, Harahari U. Prabhu, organizer.

1988 SUMMER RESEARCH CONFERENCES, Bowdoin College, 11 June–5 August 1988

1. The mathematics and physics of order and disorder, Charles Radin, organizer.
2. Spatial statistics and imaging, Stuart Geman and Antonio Possolo, organizers.
3. Mathematical developments arising from linear programming, Jeffrey C. Lagarias and Michael J. Todd, organizers.
4. Geometric problems in Fourier analysis, William Beckner and Duong-Hong Phong, organizers.
5. Computational number theory, Carl Pomerance, organizer.
6. Current progress in hyperbolic systems, Riemann problems and computations, Barbara Lee Keyfitz and Brent Lindquist, organizers.
7. Mathematical problems posted by anistropic materials, Jean E. Taylor, organizer.
8. Geometric and topological invariants of elliptic operators, Jeff Cheeger and Alain Connes, organizers.
9. Elliptic genera and elliptic cohomology, Peter W. Landweber, organizer.
10. Control theory and multibody systems, Jerrold E. Marsden and J. C. Simo, organizers.

## The Financing of Conferences

Grants and contracts are the major source of the funds for conferences. A diversity of government agencies have given support. The National Science Foundation has been the largest and most frequent supplier of funds but the research supporting agencies of the Army, Navy, and Air Force have contributed as have other government groups including the National Security Agency, the Institute for Defense Analyses, the Atomic Energy Commission,

and the Department of Energy. Some funds have come from foundations as well, including the Sloan Foundation, the Vaughn Foundation, and the IBM Foundation.

Grant money sometimes does not quite pay the full costs of a conference. There are costs of proposal preparation, expenditures made prior to the effective date of a grant, and unrecoverable overhead or unallowed costs. It is sometimes possible to cover certain kinds of costs from registration fees but on other costs this route is effectively barred. On the other hand, conferences lead to publications and these can be priced so that a modest conference deficit is in effect recovered.

There is an occasional symposium for which finally no grant is obtained. On such a conference the cash outlay of a few thousand dollars has been all built into the cost of the book. This is entirely fair in that the readers of the book benefit from the conference because without it there would have been no book.

Grants have become less generous with the passage of time. Honoraria for principal speakers, as opposed to travel costs and subsistence, have vanished and some agencies, notably the NSF, no longer allow manuscript fees. The latter, if desired, are a natural cost of a publication.