

JOURNALS PUBLISHED BY THE AMERICAN MATHEMATICAL SOCIETY

TRANSLATION JOURNALS

Soviet Mathematics–Doklady is a bimonthly translation journal containing the entire pure mathematics section of the DOKLADY AKADEMII NAUK SSSR, the Reports of the Academy of Sciences in the USSR. DOKLADY publishes 500 articles a year, each about four pages long.

Mathematics of the USSR–Izvestija, a bimonthly journal is a cover-to-cover translation of IZVESTIJA AKADEMII NAUK SSSR SERIJA MATEMATICESKAJA, published by the Academy of Sciences of the USSR. This is a journal of current research in all fields of pure mathematics.

Mathematics of the USSR–Sbornik is a monthly journal and is a cover-to-cover translation of MATEMATICESKII SBORNIK (NOVAJA SERIJA), published by the Moscow Mathematical Society and the Academy of Sciences of the USSR. This is a journal of current research in all fields of pure mathematics.

Theory of Probability and Mathematical Statistics is the cover-to-cover translation into English of the TEORIJA VEROJATNOSTEĬ I MATEMATICESKAJA STATISTIKA published by Kiev University, beginning with the 1970 Soviet publication.

Vestnik of the Leningrad University (Mathematics) is the complete translation into English of the mathematics section of the VESTNIK LENINGRADSKOGO UNIVERSITETA, beginning with the Soviet publication of 1968. All fields of mathematics are covered.

Transactions of the Moscow Mathematical Society is a translation into English of TRUDY MOSKOVSKOGO MATEMATICESKOGO OBSČESTVA which contains the results of original research in pure mathematics.

Proceedings of the Steklov Institute of Mathematics is a translation of the PROCEEDINGS OF THE STEKLOV INSTITUTE OF MATHEMATICS IN THE ACADEMY OF SCIENCES OF THE USSR. Issues contain book length articles or collections of articles pertaining to the same topic.

CONTENT AND SUBMISSION INFORMATION FOR RESEARCH JOURNALS

Bulletin (New Series) of the American Mathematical Society. Contains Research-Expository Papers, Research Announcements and Reviews of Books on Advanced Mathematics. See inside front cover for submission information.

Mathematics of Computation is a quarterly journal devoted to original papers in numerical analysis, the application of numerical methods and high-speed calculator devices, the computation of mathematical tables, the theory of high-speed calculating devices, and other aids to computation. In addition, reviews and notes in these and related fields are published. Prospective publications should be sent to the Editor, JAMES H. BRAMBLE, Center for Applied Mathematics, 275 Olin Hall, Cornell University, Ithaca, NY 14853.

Memoirs of the American Mathematical Society is a bimonthly journal constituting a series of paperbound research tracts which are of the same general character as the papers published in the TRANSACTIONS. An issue of the MEMOIRS is made up of one or more numbers; a number contains either a single monograph or a group of cognate papers. Copy is supplied by the author; information on preparation of camera copy may be obtained by writing to the Editorial Department of the American Mathematical Society. Papers should be sent to the appropriate editor of TRANSACTIONS.

Proceedings of the American Mathematical Society is a monthly journal devoted entirely to research in pure and applied mathematics, principally to the publication of original papers of moderate length. A department called Shorter Notes was established for the purpose of publishing very short papers of an unusually elegant and polished character for which there is normally no other outlet.

Send papers directly to one of the editors listed under the subject field of the paper. The numbers in parentheses are the first two digits of major classifications from the 1980 Mathematics Subject Classification and describe the fields being handled by the editor.

LOGIC AND FOUNDATIONS (03 04)

Thomas J. Jech, Department of Mathematics, Pennsylvania State University, University Park, Pennsylvania 16802

COMBINATORICS AND DISCRETE MATHEMATICS (05 15)

Thomas H. Brylawski, Department of Mathematics, University of North Carolina, Chapel Hill, North Carolina 27514

COMMUTATIVE ALGEBRA (06 12 13 14 15 18)

David Eisenbud, Department of Mathematics, Brandeis University, Waltham, Massachusetts 02154

GENERAL ALGEBRA (16 17 18 08)

Robert L. Wilson, Department of Mathematics, Rutgers University, New Brunswick, New Jersey 08903

GROUP THEORY (20)

David M. Goldschmidt, Department of Mathematics, University of California at Berkeley, Berkeley, California 94720

ALGEBRAIC AND DIFFERENTIAL TOPOLOGY (55 57 58)

Reinhard E. Schultz, Department of Mathematics, Purdue University, West Lafayette, Indiana 47907

REAL VARIABLES (26 28 40)

J. Jerry Uhl, Jr., Department of Mathematics, University of Illinois, Urbana, Illinois 61801

COMPLEX VARIABLES AND NUMBER THEORY (10 30 32)

W. E. Kirwan, Department of Mathematics, University of Maryland, College Park, Maryland 20742

Lawrence A. Zalcman, Department of Mathematics, University of Maryland, College Park, Maryland 20742

DIFFERENTIAL EQUATIONS AND DYNAMICAL SYSTEMS (33, 34, 35, 39, 49, 58)

George R. Sell, Department of Mathematics, University of Southern California, Los Angeles, California 90007

GENERAL ANALYSIS (41 42 43 44 45)

Richard R. Goldberg, Department of Mathematics, Vanderbilt University, Nashville, Tennessee 37235

FUNCTIONAL ANALYSIS AND OPERATOR THEORY (46 47)

Catherine L. Olsen, Department of Mathematics, State University of New York at Buffalo, Buffalo, New York 14214

FUNCTIONAL ANALYSIS AND CONVEXITY (46 52)

Robert R. Phelps, Department of Mathematics GN-50, University of Washington, Seattle, Washington 98195

COMPLEX VARIABLES, FUNCTIONAL ANALYSIS AND OPERATOR THEORY (30 46 47)

Donald E. Sarason, Department of Mathematics, University of California at Berkeley, Berkeley, California 94720

LIE GROUPS AND GEOMETRY (22 51 53)

Jeff Cheeger, Department of Mathematics, State University of New York at Stony Brook, Stony Brook, New York 11794

GENERAL TOPOLOGY (54)

David J. Lutzer, Department of Mathematics, Texas Tech University, Lubbock, Texas 79409
Doug W. Curtis, Department of Mathematics, Louisiana State University, Baton Rouge, Louisiana 70803

PROBABILITY AND OTHER FIELDS (31 60–99 inclusive)

Thomas G. Kurtz, Department of Mathematics, University of Wisconsin, Madison, Wisconsin 53706

All other communications should be addressed to the Managing Editor, Richard R. Goldberg, at the above address.

Transactions of the American Mathematical Society is a monthly journal devoted entirely to research in pure and applied mathematics and, in general, includes longer papers than those in the PROCEEDINGS. Manuscripts should be submitted to one of the following editors.

Two copies of mathematical papers intended for publication in the TRANSACTIONS or the MEMOIRS should be addressed to one of the editors. Subjects, and the editors associated with them, follow:

Real analysis (excluding harmonic analysis) and applied mathematics to PAUL H. RABINOWITZ, Department of Mathematics, University of Wisconsin, Madison, WI 53706.

Harmonic and complex analysis to R. O. WELLS, JR., Department of Mathematics, Rice University, Houston, TX 77001.

Abstract analysis to W. A. J. LUXEMBURG, Department of Mathematics 253-37, California Institute of Technology, Pasadena, CA 91125.

Algebra and number theory (excluding universal algebras) to MICHAEL ARTIN, Department of Mathematics, Room 2-239, Massachusetts Institute of Technology, Cambridge, MA 02139.

- Logic, foundations, universal algebras and combinatorics to JAN MYCIELSKI, Department of Mathematics, University of Colorado, Boulder, CO 80309.

Topology to JAMES D. STASHEFF, Department of Mathematics, University of North Carolina, Chapel Hill, NC 27514.

Global analysis and differential geometry to ALAN D. WEINSTEIN, Department of Mathematics, University of California, Berkeley, CA 94720

Probability and statistics to STEVEN OREY, School of Mathematics, University of Minnesota, Minneapolis, MN 55455.

All other communications to the editors should be addressed to the Managing Editor, JAMES D. STASHEFF

BULLETIN (New Series) of the American Mathematical Society

EDITORIAL BOARD FOR RESEARCH-EXPOSITORY ARTICLES

Lipman Bers	Frederick W. Gehring
Felix E. Browder, Chairman	Donald S. Ornstein
Paul J. Cohen	James B. Serrin
Morton L. Curtis	Stephen Smale
	John T. Tate

EDITORIAL BOARD FOR RESEARCH ANNOUNCEMENTS

Charles L. Fefferman	David Mumford
Melvin Hochster	Julia B. Robinson
Robert P. Langlands	Gian-Carlo Rota
Richard K. Lashof	I. M. Singer
Henry P. McKean, Jr.	Chairman
Hugh L. Montgomery	François Trèves

BOOK REVIEW EDITOR:	Meyer Jerison
MANAGING EDITOR:	I. M. Singer

MANUSCRIPT, PROOF AND COPYING INFORMATION

SUBMISSION OF MANUSCRIPT

Articles submitted for publication should be typewritten and double spaced. The *Manual for Authors*, available from the Society, should be consulted for symbols and style conventions. Authors should take the greatest possible care in preparing the original manuscript. Hand drawn symbols are satisfactory, if clearly done; directions to the printer should be included where necessary on a separate sheet.

For Research-Expository Articles and Research Announcements, the first footnote should include *subject classification numbers* representing the primary and secondary subjects of the article. The 1980 Mathematics Subject Classification can be found in the December index volumes of *Mathematical Reviews*.

COPYRIGHT TRANSFER AGREEMENT

The signing of a Copyright Transfer Agreement is a requirement of publication in the BULLETIN. A copy of the agreement is sent to the authors upon receipt of a manuscript in the Providence Office of the Society; in case of joint authors, copies are sent to the author who is designated to receive galley proof. Authors are urged to return the form immediately to prevent delays in processing and publishing of the manuscript. The 1978 edition of the *Manual for Authors* has a description of Society policy concerning copyright and a copy of the agreement.

PUBLICATION CHARGES

Research Announcements carry a page charge of \$40.00 per page to help defray the cost of publication. This amount is charged to the institution or to a contract supporting the research reported in the published paper. The publication charge policy of the United States Federal Council for Science and Technology (FCST) is reported on page 112 of the February, 1975 issue of the NOTICES of the American Mathematical Society. In no case is the author personally responsible for paying the page charge, nor is acceptance of the author's paper for publication dependent upon payment of the page charge.

REPRINTS AND ADDRESS CHANGES

Any inquiries concerning a paper which has been accepted for publication, including information regarding reprints or changes of address for mailing proof, should be sent directly to the Editorial Department, American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02940.

GALLEY PROOF

When a paper with more than one author has been accepted for publication, only one set of galley proof will be sent. Joint authors should, therefore, indicate which of them should receive galley proof in the event that the manuscript is accepted for publication.

COPYING AND REPRINTING

Individual readers of this publication, and nonprofit libraries acting for them are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews provided the customary acknowledgement of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication (including abstracts) is permitted only under license from the American Mathematical Society. Requests for such permission should be addressed to the Executive Director, American Mathematical Society, Box 6248, Providence, Rhode Island 02940.

The appearance of the code on the first page of an article in this journal indicates the copyright owner's consent for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law, provided that the copier pay the stated per copy fee through the Copyright Clearance Center, Inc. (For details write Copyright Clearance Center, Inc., 21 Congress Street, Salem, Massachusetts 01970.)

RESEARCH – EXPOSITORY PAPERS

Bifurcation and symmetry breaking in applied mathematics *by D. H. Sattinger*..... 779
 On the role of the Heisenberg group in harmonic analysis *by Roger Howe*..... 821

RESEARCH ANNOUNCEMENTS

Levels in algebra and topology *by Z. D. Dai, T. Y. Lam and C. K. Peng*..... 845
 Riemann-Roch theorems for higher algebraic K -theory *by Henri Gillet*..... 849
 Spherical fibrations *by J. L. Noakes*..... 853
 Varieties and universal models in the theory of combinatorial geometries *by Jeff Kahn and Joseph P. S. Kung*..... 857
 Undecidable diophantine equations *by James P. Jones*..... 859
 SK_1 of p -adic group rings *by Robert Oliver*..... 863
 Blocks of rational representations of a semisimple algebraic group *by Stephen Donkin* 867

BOOK REVIEWS

Three-dimensional problems of the mathematical theory of elasticity and thermoelasticity *by V. D. Kupradze, T. G. Gegelia, M. O. Bacheleishvili, and T. V. Burchuladze*—Reviewed by *I. N. Sneddon*..... 870
 Analysis, manifolds and physics *by Yvonne Choquet-Bruhat, Cecile de Witt-Morette, and Margaret Dillard-Bleick*—Reviewed by *Bent Ørsted*..... 878
 Banach modules and functors on categories of Banach spaces *by Johann Cigler, Viktor Losert, and Peter Michor*—Reviewed by *B. E. Johnson*..... 885
 GO -spaces and generalizations of metrizable spaces *by J. M. van Wouwe*—Reviewed by *David J. Lutzer*..... 886
 Equations of evolution *by Hiroki Tanabe*—Reviewed by *Jerome A. Goldstein*..... 891
 Generalized inverses of linear transformations *by S. L. Campbell and C. D. Meyer, Jr.*—Reviewed by *Michael P. Drazin*..... 894
 Computers and intractability: A guide to the theory of NP -completeness *by Michael R. Garey and David S. Johnson*—Reviewed by *Ronald V. Book*..... 898
 The theory of Lie superalgebras; an introduction *by M. Scheunert*—Reviewed by *Lawrence J. Corwin*..... 904