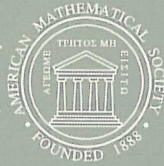

VOLUME 124 NUMBER 1



JANUARY 1996

WHOLE NUMBER 439

PROCEEDINGS

OF THE

A M E R I C A N M A T H E M A T I C A L S O C I E T Y

EDITED BY

William W. Adams
Dale Alspach
J. Marshall Ash
Albert Baernstein II
Eric Bedford
Andreas R. Blass
John A. Burns
Christopher Croke
Ron Donagi
Richard T. Durrett
Clifford J. Earle Jr.
Ronald A. Fintushel
Theodore W. Gamelin
James Glimm
Ken Goodearl
Roe Goodman
Thomas Goodwillie

Dennis A. Hejhal
Palle E. T. Jorgensen
Jeffrey N. Kahn
Linda Keen
Irwin Kra, Managing Editor
Peter Li
Wei Y. Loh
Jeffrey B. Rauch
Mary Rees
Leslie Saper
David Sharp
Lance W. Small
Hal L. Smith
Christopher D. Sogge
Ronald M. Solomon
Franklin D. Tall
Wolmer V. Vasconcelos

PROVIDENCE, RHODE ISLAND USA

ISSN 0002-9939

Proceedings of the American Mathematical Society

This journal is devoted entirely to research in pure and applied mathematics.

Subscription information. *Proceedings of the American Mathematical Society* is published monthly. Subscription prices for Volume 124 (1996) are as follows: for paper delivery, \$641 list, \$513 institutional member, \$577 corporate member, \$385 individual member; for electronic delivery, \$577 list, \$462 institutional member, \$519 corporate member, \$347 individual member; for combination paper and electronic delivery, \$737 list, \$590 institutional member, \$663 corporate member, \$442 individual member. If ordering the paper product, add \$15 for surface delivery outside the United States and India; \$38 to India. Expedited delivery to destinations in North America \$38; elsewhere \$91. For paper delivery a late charge of 10% of the subscription price will be imposed upon orders received from nonmembers after January 1 of the subscription year. Beginning January 1996 *Proceedings* is accessible from e-MATH via the World Wide Web at the URL <http://www.ams.org/publications/>.

Back number information. For back issues see the *AMS Catalog of Publications*.

Subscriptions and orders should be addressed to the American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904. *All orders must be accompanied by payment.* Other correspondence should be addressed to P.O. Box 6248, Providence, RI 02940-6248.

Copying and reprinting. Material in this journal may be reproduced by any means for educational and scientific purposes without fee or permission with the exception of reproduction by services that collect fees for delivery of documents and provided that the customary acknowledgment of the source is given. This consent does not extend to other kinds of copying for general distribution, for advertising or promotional purposes, or for resale. Requests for permission for commercial use of material should be addressed to the Assistant to the Publisher, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248. Requests can also be made by e-mail to reprint-permission@ams.org.

Excluded from these provisions is material in articles for which the author holds copyright. In such cases, requests for permission to use or reprint should be addressed directly to the author(s). (Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.)

Proceedings of the American Mathematical Society is published monthly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2213. Second-class postage is paid at Providence, Rhode Island. Postmaster: Send address changes to *Proceedings*, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248.

© 1996 by the American Mathematical Society. All rights reserved.

This journal is indexed in *SciSearch*[®], *Research Alert*[®], *CompuMath Citation Index*[®], and *Current Contents*[®]/*Physical, Chemical & Earth Sciences*.

Printed in the United States of America.

⊗ The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability.

♻ Printed on recycled paper.

10 9 8 7 6 5 4 3 2 1 01 00 99 98 97 96

Editorial Information

To be published in the *Proceedings*, a paper must be correct, new, nontrivial, and significant. Further, it must be well written and of interest to a substantial number of mathematicians. Piecemeal results, such as an inconclusive step toward an unproved major theorem or a minor variation on a known result, are in general not acceptable for publication. *Proceedings* Editors solicit and encourage publication of worthy papers of length not exceeding 10 published pages. Published pages are the same size as those generated in the style files provided for $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$ or $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$.

Very short notes not to exceed two printed pages are also accepted, and appear under the heading SHORTER NOTES. Items deemed suitable include an elegant new proof of an important and well-known theorem, an illuminating example or counterexample, or a new viewpoint on familiar results. New results, if of a brief and striking character, might also be acceptable, though in general a paper which is merely very short will not be suitable for the SHORTER NOTES department.

As of October 31, 1995, the backlog for this journal was approximately 9 issues. This estimate is the result of dividing the number of manuscripts for this journal in the Providence office that have not yet gone to the printer on the above date by the average number of articles per issue over the previous twelve months, reduced by the number of issues published in four months (the time necessary for editing and composing a typical issue).

A Copyright Transfer Agreement is required before a paper will be published in this journal. By submitting a paper to this journal, authors certify that the manuscript has not been submitted to nor is it under consideration for publication by another journal, conference proceedings, or similar publication.

Information for Authors and Editors

The first page of an article must consist of a *descriptive title*, followed by an *abstract* that summarizes the article in language suitable for workers in the general field (algebra, analysis, etc.). The *descriptive title* should be short, but informative; useless or vague phrases such as “some remarks about” or “concerning” should be avoided. The *abstract* should be at least one complete sentence, and at most 150 words. Included with the footnotes to the paper, there should be the 1991 *Mathematics Subject Classification* representing the primary and secondary subjects of the article. This may be followed by a list of *key words and phrases* describing the subject matter of the article and taken from it. A list of the numbers may be found in the annual index of *Mathematical Reviews*, published with the December issue starting in 1990, as well as from the electronic service e-MATH [telnet e-MATH.ams.org (or [telnet 130.44.1.100](telnet:130.44.1.100))]. Login and password are **e-math**. For journal abbreviations used in bibliographies, see the list of serials in the latest *Mathematical Reviews* annual index. When the manuscript is submitted, authors should supply the editor with electronic addresses if available. These will be printed after the postal address at the end of each article.

Two copies of the paper should be sent directly to the appropriate Editor and the author should keep one copy.

$\mathcal{T}\mathcal{E}\mathcal{X}$ files available upon request. Authors may request a copy of the $\mathcal{T}\mathcal{E}\mathcal{X}$ files of their papers by sending e-mail to file-request@ams.org or by contacting the Editorial Department, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248. The request should include the title of the paper, the name(s) of the author(s), the name of the publication in which the paper has or will appear, and the volume and issue numbers if known. The $\mathcal{T}\mathcal{E}\mathcal{X}$ file will be sent to the author making the request after the article goes to the printer. If the requestor can receive Internet e-mail, please include the e-mail address to which the file should be sent. Otherwise please indicate a diskette format and postal address to which a disk should be mailed. **Note:** Because $\mathcal{T}\mathcal{E}\mathcal{X}$ production at the AMS sometimes requires extra fonts and macros that are not yet publicly available, $\mathcal{T}\mathcal{E}\mathcal{X}$ files cannot be guaranteed to run through the author’s version of $\mathcal{T}\mathcal{E}\mathcal{X}$ without errors. The AMS regrets that it cannot provide support to eliminate such errors in the author’s $\mathcal{T}\mathcal{E}\mathcal{X}$ environment.

Electronically prepared manuscripts. The AMS encourages submission of electronically prepared manuscripts in $\mathcal{A}\mathcal{M}\mathcal{S}$ - TEX or $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\text{L}\text{A}\text{T}\text{E}\text{X}$ because properly prepared electronic manuscripts save the author proofreading time and move more quickly through the production process. To this end, the Society has prepared author packages for each AMS publication. Author packages include instructions for preparing electronic manuscripts, the *AMS Author Handbook*, samples, and a style file that generates the particular design specifications of that publication series for both $\mathcal{A}\mathcal{M}\mathcal{S}$ - TEX and $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\text{L}\text{A}\text{T}\text{E}\text{X}$.

Those authors who make use of these style files from the beginning of the writing process will further reduce their own efforts. Electronically submitted manuscripts prepared in plain TEX or $\text{L}\text{A}\text{T}\text{E}\text{X}$ are normally not acceptable due to the high amount of technical time required to insure that the file will run properly through the AMS in-house production system. Users of plain TEX should have little difficulty learning $\mathcal{A}\mathcal{M}\mathcal{S}$ - TEX , and $\text{L}\text{A}\text{T}\text{E}\text{X}$ users will find that $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\text{L}\text{A}\text{T}\text{E}\text{X}$ is the same as $\text{L}\text{A}\text{T}\text{E}\text{X}$ with additional commands to simplify the typesetting of mathematics.

Authors with FTP access may retrieve an author package from the Society's Internet node `e-math.ams.org` (130.44.1.100). For those without FTP access, the author package can be obtained free of charge by sending e-mail to `pub@ams.org` (Internet) or from the Publication Division, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248. When requesting an author package, please specify $\mathcal{A}\mathcal{M}\mathcal{S}$ - TEX or $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\text{L}\text{A}\text{T}\text{E}\text{X}$, Macintosh or IBM (3.5) format, and the publication in which your paper will appear. Please be sure to include your complete mailing address.

At the time of submission, authors should indicate if the paper has been prepared using $\mathcal{A}\mathcal{M}\mathcal{S}$ - TEX or $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\text{L}\text{A}\text{T}\text{E}\text{X}$ and provide the Editor with a paper manuscript that matches the electronic manuscript. The final version of the electronic manuscript should be sent to the Providence office immediately after the paper has been accepted for publication. The author should also send the final version of the paper manuscript to the Editor, who will forward a copy to the Providence office. Editors will require authors to send their electronically prepared manuscripts to the Providence office in a timely fashion. Electronically prepared manuscripts can be sent via e-mail to `pub-submit@ams.org` (Internet) or on diskette to the Editorial Department, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248. When submitting an electronic manuscript, please be sure to include a message indicating in which publication the paper has been accepted. No corrections will be accepted electronically. Authors must mark their changes on their proof copies and return them to the Providence office. Complete instructions on how to submit files are included in the author package.

Electronic graphics. Figures may be submitted to the AMS in an electronic format. The AMS recommends that graphics created electronically be saved in Encapsulated PostScript (EPS) format. This includes graphics originated via a graphics application as well as scanned photographs or other computer-generated images.

If the graphics package used does not support EPS output, the graphics file should be saved in one of the standard graphics formats—such as TIFF, PICT, GIF, etc.—rather than in an application-dependent format. Graphics files submitted in an application-dependent format are not likely to be used. No matter what method was used to produce the graphic, it is necessary to provide a paper copy to the AMS.

Authors using graphics packages for the creation of electronic art should also avoid the use of any lines thinner than 0.5 points in width. Many graphics packages allow the user to specify a “hairline” for a very thin line. Hairlines often look acceptable when proofed on a typical laser printer. However, when produced on a high-resolution laser imagesetter, hairlines become nearly invisible and will be lost entirely in the final printing process.

Screens should be set to values between 15% and 85%. Screens which fall outside of this range are too light or too dark to print correctly.

Any inquiries concerning a paper that has been accepted for publication should be sent directly to the Editorial Department, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248.

Editors

Authors are requested to send papers directly to the appropriate Editor (the one whose area of responsibility and expertise, as described below, most closely approximates the subject field of the manuscript). Only when in doubt about an appropriate Editor, should manuscripts be sent to the Coordinating Editor responsible for the area in mathematics most closely connected to the paper. If in doubt about the area, send the manuscript to the Managing Editor, to whom all other communication about the journal should also be addressed. (All addresses should include the line "Department of Mathematics", unless another department is indicated.)

Managing Editor: Irwin Kra, SUNY at Stony Brook, Stony Brook, NY 11794-3651; e-mail: irwin@math.sunysb.edu

1. ODE, PDE, GLOBAL ANALYSIS, AND DYNAMICAL SYSTEMS

Coordinating Editor: Linda Keen, CUNY-Lehman College, Bronx, NY 10468; e-mail: ljk1lc@cunyvm.cuny.edu or ljk1lc@cunyvm.bitnet

Partial differential equations, Jeffrey B. Rauch, University of Michigan, Angell Hall, Ann Arbor, MI 48109; e-mail: rauch@math.lsa.umich.edu

Dynamical systems and ergodic theory, Mary Rees, Department of Pure Mathematics, University of Liverpool, P.O. Box 147, Liverpool L69 3BX, United Kingdom; e-mail: maryrees@liverpool.ac.uk

Ordinary differential equations and special functions, Hal L. Smith, Arizona State University, Tempe, AZ 85287; e-mail: halsmith@math.la.asu.edu

Global analysis, Linda Keen

2. LIE GROUPS, TOPOLOGY, AND GEOMETRY

Coordinating Editor: Peter Li, University of California, Irvine, CA 92717; e-mail: pli@math.uci.edu

Topological groups and Lie groups (symmetric spaces), Roe Goodman, Rutgers University, New Brunswick, NJ 08903-2101; e-mail: goodman@math.rutgers.edu

Riemannian geometry (including affine, pseudo-Riemannian, contact, classical, and Lorentzian geometries), Christopher Croke, University of Pennsylvania, Philadelphia, PA 19104-6317; e-mail: ccroke@math.upenn.edu

Geometric analysis (geometric PDE, minimal surfaces, harmonic maps) and Kahler geometry, Peter Li

Algebraic topology (higher dimensional topology), Thomas Goodwillie, Brown University, Box 1917, Providence, RI 02912; e-mail: tong@gauss.math.brown.edu

Set-theoretic and general topology, Franklin D. Tall, University of Toronto, Toronto, Ontario, Canada M5S 1A1; e-mail: tall@math.toronto.edu

Low dimensional topology, gauge theory, 4-manifolds, Ronald A. Fintushel, Michigan State University, East Lansing, MI 48824-1027; e-mail: ronfint@math.msu.edu

Complex and Kähler geometry, Les Saper, Duke University, Durham, NC 27708-0320; e-mail: saper@math.duke.edu

3. ANALYSIS AND OPERATOR THEORY

Coordinating Editor: Clifford J. Earle, Jr., Cornell University, White Hall, Ithaca, NY 14853-7901; e-mail: cliff@math.cornell.edu

One complex variable and potential theory, Albert Baernstein II, Washington University, St. Louis, MO 63130-4899; e-mail: C31801AB@WUVM.D.BITNET

Several complex variables, Eric Bedford, Department of Mathematics, Indiana University, Bloomington, IN 47405; e-mail: BEDFORD@ucs.indiana.edu

Functional analysis, Dale Alspach, Oklahoma State University, Stillwater, OK 74078-0613; e-mail: alspach@hilbert.math.okstate.edu

Complex variables, functional analysis, and operator theory, Theodore W. Gamelin, University of California, Los Angeles, CA 90024; e-mail: twg@math.ucla.edu

Functional analysis and operator theory, Palle E. T. Jorgensen, University of Iowa, Iowa City, IA 52242

Classical and harmonic analysis, J. Marshall Ash, DePaul University, Chicago, IL 60614; e-mail: MATJMA@DEPAUL.BITNET

Classical and harmonic analysis, Christopher D. Sogge, University of California, Los Angeles, CA 90024; e-mail: sogge@math.ucla.edu

Analytic number theory and automorphic forms, Dennis A. Hejhal, School of Mathematics, University of Minnesota, Minneapolis, MN 55455-0488; e-mail: hejhal@math.umn.edu

4. ALGEBRA, NUMBER THEORY, AND COMBINATORICS

Coordinating Editor: Lance W. Small, University of California San Diego, La Jolla, CA 92093-0112; e-mail: lws@math.ucsd.edu

General number theory, William W. Adams, University of Maryland, College Park, MD 20742-4015; e-mail: wwa@math.umd.edu

General algebra, Lance W. Small

Commutative algebra, Wolmer V. Vasconcelos, Rutgers University, New Brunswick, NJ 08903-2101; e-mail: vasconce@rings.rutgers.edu

Group theory, Ronald M. Solomon, Ohio State University, Columbus, OH 43210-1101; e-mail: solomon@function.mps.ohio-state.edu

Algebraic geometry, Ron Donagi, University of Pennsylvania, Philadelphia, PA 19104-6395; e-mail: donagi@math.upenn.edu

Combinatorics, Jeffrey N. Kahn, Rutgers University, New Brunswick, NJ 08903-2101; e-mail: jkahn@math.rutgers.edu

Analytic number theory and automorphic forms, Dennis A. Hejhal, School of Mathematics, University of Minnesota, Minneapolis, MN 55455-0488; e-mail: hejhal@math.umn.edu

Logic and foundations, Andreas R. Blass, University of Michigan, Ann Arbor, MI 48109-1003; e-mail: ablass@umich.edu

Lie algebras and Lie groups, Roe Goodman, Rutgers University, New Brunswick, NJ 08903-2101; e-mail: goodman@math.rutgers.edu

Noncommutative rings, Ken Goodearl, University of California, Santa Barbara, CA 93106; e-mail: goodearl@math.ucsb.edu

5. APPLIED MATHEMATICS, PROBABILITY, AND STATISTICS

Coordinating Editor: James Glimm, Department of Applied Mathematics and Statistics, SUNY at Stony Brook, Stony Brook, NY 11794-3600; e-mail: glimm@ams.sunysb.edu

Probability, Richard T. Durrett, Cornell University, White Hall, Ithaca, NY 14853-7901; e-mail: rtd1@cornell.edu

Statistics, Wei Y. Loh, Department of Statistics, University of Wisconsin, Madison, WI 53706-1693; e-mail: loh@stat.wisc.edu

Applied mathematics, David Sharp, Theoretic Division, Los Alamos National Laboratory MSB285, Los Alamos, NM 87545; e-mail: dhs@lanl.gov

Control theory, John A. Burns, Interdisciplinary Center for Applied Mathematics, Virginia Polytech Institute, Blacksburg, VA 24061-0531; e-mail: burnsreg@vtvml.cc.vt.edu

| | |
|--|-----|
| Boris S. Mordukhovich and Yongheng Shao , Extremal characterizations of Asplund spaces | 197 |
| Cho-Ho Chu and Masaharu Kusuda , On factor states of C^* -algebras and their extensions | 207 |
| Kil-Woung Jun and Dal-Won Park , Almost linearity of ϵ -bi-Lipschitz maps between real Banach spaces | 217 |
| Deok H. Kim and Kil H. Kwon , On a conjecture by Karlin and Szegő | 227 |
| A. A. Giannopoulos , A proportional Dvoretzky-Rogers factorization result | 233 |
| Thomas Ransford , A Cartan theorem for Banach algebras | 243 |

C. APPLIED MATHEMATICS

| | |
|---|-----|
| Nelly Fayçal , On the classification of pyramidal central configurations | 249 |
|---|-----|

D. GEOMETRY

| | |
|---|-----|
| João F. Queiró and Eduardo M. Sà , On separation properties of finite dimensional compact convex sets | 259 |
| Kazuyuki Enomoto, Yoshihisa Kitagawa, and Joel L. Weiner , A rigidity theorem for the Clifford tori in S^3 | 265 |
| Aurel Bejancu and Sharief Deshmukh , Real hypersurfaces of CP^n with non-negative Ricci curvature | 269 |
| Shiu-Yuen Cheng, Luen-Fai Tam, and Tom Y.-H. Wan , Harmonic maps with finite total energy | 275 |

E. LOGIC AND FOUNDATIONS

| | |
|---|-----|
| Jörg Brendle , The additivity of porosity ideals | 285 |
| Jiří Witzany , Any behaviour of the Mitchell ordering of normal measures is possible | 291 |

F. STATISTICS AND PROBABILITY

| | |
|---|-----|
| C. R. Rao and D. N. Shanbhag , A note on a characteristic property based on order statistics | 299 |
|---|-----|

G. TOPOLOGY

| | |
|---|-----|
| Peter Nyikos and Leszek Piątkiewicz , Paracompact subspaces in the box product topology | 303 |
| Xingwang Xu , Integral estimates of conformal metrics | 315 |
| Desmond Robbie and Sergey Svetlichny , An answer to A.D.Wallace's question about countably compact cancellative semigroups | 325 |

PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY

CONTENTS

Vol. 124, No. 1

Whole No. 439

January 1996

A. ALGEBRA, NUMBER THEORY, AND COMBINATORICS

| | |
|--|----|
| James McCarron, Residually nilpotent one-relator groups with nontrivial centre | 1 |
| E. Ballico and C. Keem, On linear series on general k -gonal projective curves | 7 |
| Clifford S. Queen, Factorial domains | 11 |
| Zinovy Reichstein, On a question of Makar-Limanov | 17 |
| Makoto Nagata, Sequences of differential systems | 21 |
| Gene Freudenburg, A note on the kernel of a locally nilpotent derivation | 27 |
| James S. Kraft, Class numbers and Iwasawa invariants of quadratic fields | 31 |
| F. Thaine, Properties that characterize Gaussian periods and cyclotomic numbers | 35 |
| C. Krattenthaler, A new matrix inverse | 47 |
| A. V. Kelarev, Radicals of algebras graded by cancellative linear semigroups | 61 |
| D. J. Hartfiel, Proof of the Simon-Ando theorem | 67 |

B. ANALYSIS

| | |
|---|-----|
| Xiangrong Yin and Benjamin Muckenhoupt, Weighted inequalities for the maximal geometric mean operator | 75 |
| Chung-Cheng Kuo, On the solvability of a nonlinear second-order elliptic equation at resonance | 83 |
| Lawrence W. Baggett, Herbert A. Medina, and Kathy D. Merrill, On functions that are trivial cocycles for a set of irrationals. II | 89 |
| Albert J. L. Sheu, Symplectic leaves and deformation quantization | 95 |
| Peter Borwein and Tamás Erdélyi, The L_p version of Newman's Inequality for lacunary polynomials | 101 |
| Xiaofeng Ren and Juncheng Wei, Single-point condensation and least-energy solutions | 111 |
| Brian Jefferies, The Weyl calculus for hermitian matrices | 121 |
| Udayan B. Darji, Limits of differentiable functions | 129 |
| Jan Stochel, Seminormality of operators from their tensor product | 135 |
| Kôtarô Tanahashi, Best possibility of the Furuta inequality | 141 |
| Marie Choda, Conjugate but non inner conjugate subfactors | 147 |
| Alexander Koldobsky, A Banach subspace of $L_{1/2}$ which does not embed in L_1 (isometric version) | 155 |
| Joseph A. Cima and Alec Matheson, On weak* convergence in H^1 | 161 |
| Yunkang Liu, An integral generalization of the q -binomial theorem and an application | 165 |
| Lajos Molnár, Algebraic difference between p -classes of an H^* -algebra | 169 |
| Ping Li and Chung-Chun Yang, On the unique range set of meromorphic functions | 177 |
| James A. Jenkins, On comb domains | 187 |
| Yuji Takahashi, Inner invariant means and conjugation operators | 193 |

(Continued on inside back cover)



0002-9939(199601)124:1;1-0