
VOLUME 41 NUMBER 4



OCTOBER 2004

BULLETIN

(NEW SERIES)
OF THE

AMERICAN MATHEMATICAL SOCIETY

EDITORS

Bulletin Articles

Donald G. Saari
Chief Editor

Book Reviews

Robert L. Devaney

PROVIDENCE, RHODE ISLAND USA

ISSN 0273-0979

Available electronically at
www.ams.org/bull/

Bulletin (New Series) of the American Mathematical Society

This journal is devoted to articles of the following types:

Bulletin Articles

Two types of articles will be included in this section: (1) papers that present a clear and insightful exposition of significant aspects of contemporary mathematical research, including Gibbs Lectures, Progress in Mathematics Lectures, and Retiring Presidential Addresses; and (2) brief, timely reports on important mathematical developments, which are normally solicited and often written by a disinterested expert.

Book Reviews

Book Reviews are accepted for publication by invitation only. Unsolicited manuscripts will not be considered.

Submission information. See **Information for Authors** at the end of this issue.

Publisher Item Identifier. The Publisher Item Identifier (PII) appears at the top of the first page of each article published in this journal. This alphanumeric string of characters uniquely identifies each article and can be used for future cataloging, searching, and electronic retrieval.

Postings to the AMS website. Articles are posted to the AMS website individually after proof is returned from authors and before appearing in an issue.

Subscription information. *Bulletin (New Series) of the American Mathematical Society* is published quarterly. The *Bulletin* is also accessible electronically, starting with the January 1992 issue, from www.ams.org/journals/. For paper delivery, subscription prices for Volume 41 (2004) are \$375 list, \$300 institutional member, \$225 individual member. The subscription price for members is included in the annual dues. A late charge of 10% of the subscription price will be imposed upon orders received from nonmembers after January 1 of the subscription year. Subscribers outside the United States and India must pay a postage surcharge of \$8; subscribers in India must pay a postage surcharge of \$15. Expedited delivery to destinations in North America is \$12; elsewhere \$28.

Back number information. For back issues see www.ams.org/bookstore/.

Subscriptions and orders should be addressed to the American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904 USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

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 Acquisitions Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. 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.)

Bulletin (New Series) of the American Mathematical Society is published quarterly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2294 USA. Periodicals postage is paid at Providence, Rhode Island, and additional mailing offices. Postmaster: Send address changes to *Bulletin*, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

© 2004 American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews*, *Science Citation Index*[®], *Science Citation Index*TM-*Expanded*, *ISI Alerting Services*SM, *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.

10 9 8 7 6 5 4 3 2 1 09 08 07 06 05 04

BULLETIN OF THE AMERICAN MATHEMATICAL SOCIETY

CONTENTS

Vol. 41, No. 4

October 2004

BULLETIN ARTICLES

Lawrence C. Evans, A survey of entropy methods for partial differential equations	409
Gunnar Aronsson, Michael G. Crandall, and Petri Juutinen, A tour of the theory of absolutely minimizing functions	439
Henk W. Broer, KAM theory: The legacy of Kolmogorov's 1954 paper .	507

BOOK REVIEWS

Norbert Steinmetz (Reviewer), Painlevé differential equations in the complex plane , by V. I. Gromak, I. Laine, and S. Shimomura	523
Gabriele Nebe (Reviewer), Perfect lattices in Euclidean spaces , by Jacques Martinet	529
Nik Weaver (Reviewer), State spaces of operator algebras: Basic theory, orientations, and C*-products , by Erik M. Alfsen and Frederic W. Shultz; Geometry of state spaces of operator algebras , by Erik M. Alfsen and Frederic W. Shultz	535
Martin Schechter (Reviewer), Spectral theory of linear operators—and spectral systems in Banach algebras , by Vladimir Müller	541
Edward Nelson (Reviewer), Gnomes in the fog: The reception of Brouwer's intuitionism in the 1920s , by Dennis E. Hesselring	545
H. L. Smith (Reviewer), Spatial ecology via reaction-diffusion equations , by R. S. Cantrell and C. Cosner	551
James Sneyd (Reviewer), Nonlinear dynamics in physiology and medicine , edited by A. Beuter, L. Glass, M. C. Mackey, and M. S. Titcombe ...	559

INDEX TO VOLUME 41 (2004)

BULLETIN ARTICLES

- Aronsson, Gunnar, Crandall, Michael G., and Juutinen, Petri. *A tour of the theory of absolutely minimizing functions*, 439
- Atiyah, Michael. *The impact of Thom's cobordism theory*, 337
- Bourguignon, Jean-Pierre. *René Thom: "Mathématicien et apprenti philosophe"*, 273
- Broer, Henk W. *KAM theory: The legacy of Kolmogorov's 1954 paper*, 507
- Crandall, Michael G. *See Aronsson, Gunnar*
- Eisenbud, David. *Current events sessions*, 149
- Evans, Lawrence C. *A survey of entropy methods for partial differential equations*, 409
- Frenkel, Edward. *Recent advances in the Langlands Program*, 151
- Gelbart, Stephen S., and Miller, Stephen D. *Riemann's zeta function and beyond*, 59
- Juutinen, Petri. *See Aronsson, Gunnar*
- Mazur, B. *Perturbations, deformations, and variations (and "near-misses") in geometry, physics, and number theory*, 307
- Metsänkylä, Tauno. *Catalan's Conjecture: Another old Diophantine problem solved*, 43
- Miller, Stephen D. *See Gelbart, Stephen S.*
- Perthame, Benoît. *Mathematical tools for kinetic equations*, 205
- Pugh, Charles, Shub, Michael, and an appendix by Starkov, Alexander. *Stable ergodicity*, 1
- Ruelle, David. *Application of hyperbolic dynamics to physics: Some problems and conjectures*, 275
- Shub, Michael. *See Pugh, Charles*
- Smale, Steve, and Zhou, Ding-Xuan. *Shannon sampling and function reconstruction from point values*, 279
- Starkov, Alexander. *See Pugh, Charles*
- Sullivan, Dennis. *René Thom's work on geometric homology and bordism*, 341
- Tataru, Daniel. *The wave maps equation*, 185
- Zhou, Ding-Xuan. *See Smale, Steve*

BOOK REVIEWS

- Alfsen, Erik M., and Shultz, Frederic W. *Geometry of state spaces of operator algebras*, reviewed by Nik Weaver, 535
- . *State spaces of operator algebras: Basic theory, orientations, and C^* -products*, reviewed by Nik Weaver, 535
- Bernstein, J., and Gelbart, S. (eds.); with contributions by D. Bump, J. W. Cogdell, D. Gaitsgory, E. de Shalit, E. Kowalski, and S. S. Kudla. *Introduction to the Langlands program*, reviewed by Michael Harris, 257
- Beuter, A., Glass, L., Mackey, M. C., and Titcombe, M. S. (eds.) *Nonlinear dynamics in physiology and medicine*, reviewed by James Sneyd, 559
- Blake, Ian, Seroussi, Gadiel, and Smart, Nigel. *Elliptic curves in cryptography*, reviewed by Susan Landau, 357
- Bump, D. *See Bernstein, J.*
- Burde, G., and Zieschang, H. *Knots*, reviewed by Daniel S. Silver, 135
- Cabral, Hildeberto, and Diacu, Florin (eds.) *Classical and celestial mechanics, the Recife lectures*, reviewed by Richard Moeckel, 121
- Cantrell, R. S., and Cosner, C. *Spatial ecology via reaction-diffusion equations*, reviewed by H. L. Smith, 551
- Cherlin, Gregory, and Hrushovski, Ehud. *Finite structures with few types*, reviewed by John T. Baldwin, 391
- Cogdell, J. W. *See Bernstein, J.*
- Cosner, C. *See Cantrell, R. S.*
- Daemen, Joan, and Rijmen, Vincent. *The design of Rijndael: AES — the Advanced Encryption Standard*, reviewed by Susan Landau, 357
- Delfs, Hans, and Knebl, Helmut. *Introduction to cryptography*, reviewed by Susan Landau, 357
- Diacu, Florin. *See Cabral, Hildeberto*
- Dugundji, James. *See Granas, Andrzej*
- Dwyer, W. G., and Henn, H.-W. *Homotopy theoretic methods in group cohomology*, reviewed by J. P. C. Greenlees, 369

- Dynkin, E. B. *Diffusions, superdiffusions and partial differential equations*, reviewed by Donald Dawson, 245
- Gaitsgory, D. *See* Bernstein, J.
- Gelbart, S. *See* Bernstein, J.
- Glass, L. *See* Beuter, A.
- Granas, Andrzej, and Dugundji, James. *Fixed point theory*, reviewed by Robert F. Brown, 267
- Gromak, V. I., Laine, I., and Shimomura, S. *Painlevé differential equations in the complex plane*, reviewed by Norbert Steinmetz, 523
- Goldreich, Oded. *Foundations of cryptography: Basic tools*, reviewed by Susan Landau, 357
- . *Modern cryptography, probabilistic proofs, and pseudorandomness*, reviewed by Susan Landau, 357
- Henn, H.-W. *See* Dwyer, W. G.
- Hesseling, Dennis E. *Gnomes in the fog: The reception of Brouwer's intuitionism in the 1920s*, reviewed by Edward Nelson, 545
- Hillman, Jonathan. *Algebraic invariants of links*, reviewed by Daniel S. Silver, 135
- Hrushovski, Ehud. *See* Cherlin, Gregory
- Knebl, Helmut. *See* Delfs, Hans
- Koblitz, Neal. *Algebraic aspects of cryptography*, reviewed by Susan Landau, 357
- Kowalski, E. *See* Bernstein, J.
- Kudla, S. S. *See* Bernstein, J.
- Laine, I. *See* Gromak, V. I.
- Lubotzky, Alexander, and Segal, Dan. *Subgroup growth*, reviewed by Rostislav I. Grigorchuk, 253
- Mackey, M. C. *See* Beuter, A.
- Martinet, Jacques. *Perfect lattices in Euclidean spaces*, reviewed by Gabriele Nebe, 529
- Menezes, Alfred, van Oorschot, Paul, and Vanstone, Scott. *Handbook of applied cryptography*, reviewed by Susan Landau, 357
- Mikhalev, Alexander V., and Pilz, Günter F. (eds.) *The concise handbook of algebra*, reviewed by Earl Taft, 113
- Mollin, Richard. *RSA and public-key cryptography*, reviewed by Susan Landau, 357
- Mount, Kenneth R., and Reiter, Stanley. *Computation and complexity in economic behavior and organization*, reviewed by Stephen J. DeCanio, 117
- Müller, Vladimir. *Spectral theory of linear operators—and spectral systems in Banach algebras*, reviewed by Martin Schechter, 541
- Murota, Kazuo. *Discrete convex analysis*, reviewed by Alexander Barvinok, 395
- van Oorschot, Paul. *See* Menezes, Alfred
- Peller, Vladimir V. *Hankel operators and their applications*, reviewed by Donald Sarason, 401
- Pilz, Günter F. *See* Mikhalev, Alexander V.
- van der Put, Marius, and Singer, Michael. *Galois theory of linear differential equations*, reviewed by Juan J. Morales-Ruiz, 351
- Reiter, Stanley. *See* Mount, Kenneth R.
- Rijmen, Vincent. *See* Daemen, Joan
- Rosen, Michael. *Number theory in function fields*, reviewed by David Goss, 127
- Segal, Dan. *See* Lubotzky, Alexander
- Seroussi, Gadiel. *See* Blake, Ian
- de Shalit, E. *See* Bernstein, J.
- Shimomura, S. *See* Gromak, V. I.
- Shultz, Frederic W. *See* Alfsen, Erik M.
- Singer, Michael. *See* van der Put, Marius
- Smart, Nigel. *See* Blake, Ian
- Stinson, Douglas. *Cryptography: Theory and practice*, reviewed by Susan Landau, 357
- Titcombe, M. S. *See* Beuter, A.
- Vanstone, Scott. *See* Menezes, Alfred
- Washington, Lawrence. *Elliptic curves: Number theory and cryptography*, reviewed by Susan Landau, 357
- Zieschang, H. *See* Burde, G.
- Zygmund, Antoni. *Trigonometric series, Vols. I, II*, reviewed by Jean-Pierre Kahane, 377

VOLUME 41



2004

BULLETIN

(N E W S E R I E S)

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

EDITORS

Donald G. Saari, *Chief Editor*

Robert L. Devaney, *Book Reviews*

ASSOCIATE EDITORS

John C. Baez

William D. Blair

Martin R. Bridson

Lawrence C. Evans

Steven Krantz

Krystyna M. Kuperberg

John C. Mayer

Barry Mazur

Philip E. Protter

Paul H. Rabinowitz

Panagiotis E. Souganidis

Audrey A. Terras

Michael Wolf

PROVIDENCE, RHODE ISLAND USA

ISSN 0273-0979

Available electronically at
www.ams.org/bull/

Bulletin (New Series) of the American Mathematical Society

This journal is devoted to articles of the following types:

Bulletin Articles

Two types of articles will be included in this section: (1) papers that present a clear and insightful exposition of significant aspects of contemporary mathematical research, including Gibbs Lectures, Progress in Mathematics Lectures, and Retiring Presidential Addresses; and (2) brief, timely reports on important mathematical developments, which are normally solicited and often written by a disinterested expert.

Book Reviews

Book Reviews are accepted for publication by invitation only. Unsolicited manuscripts will not be considered.

Submission information. See **Information for Authors** at the end of this issue.

Publisher Item Identifier. The Publisher Item Identifier (PII) appears at the top of the first page of each article published in this journal. This alphanumeric string of characters uniquely identifies each article and can be used for future cataloging, searching, and electronic retrieval.

Postings to the AMS website. Articles are posted to the AMS website individually after proof is returned from authors and before appearing in an issue.

Subscription information. *Bulletin (New Series) of the American Mathematical Society* is published quarterly. The *Bulletin* is also accessible electronically, starting with the January 1992 issue, from www.ams.org/journals/. For paper delivery, subscription prices for Volume 41 (2004) are \$375 list, \$300 institutional member, \$225 individual member. The subscription price for members is included in the annual dues. A late charge of 10% of the subscription price will be imposed upon orders received from nonmembers after January 1 of the subscription year. Subscribers outside the United States and India must pay a postage surcharge of \$8; subscribers in India must pay a postage surcharge of \$15. Expedited delivery to destinations in North America is \$12; elsewhere \$28.

Back number information. For back issues see www.ams.org/bookstore/.

Subscriptions and orders should be addressed to the American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904 USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

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 Acquisitions Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. 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.)

Bulletin (New Series) of the American Mathematical Society is published quarterly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2294 USA. Periodicals postage is paid at Providence, Rhode Island, and additional mailing offices. Postmaster: Send address changes to *Bulletin*, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

© 2004 American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews*, *Science Citation Index*[®], *Science Citation Index*TM-*Expanded*, *ISI Alerting Services*SM, *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.

10 9 8 7 6 5 4 3 2 1 09 08 07 06 05 04

BULLETIN OF THE AMERICAN MATHEMATICAL SOCIETY
CONTENTS

Vol. 41, No. 1

January 2004

Bulletin Articles

Charles Pugh and Michael Shub, with an appendix by Alexander Starkov, Stable ergodicity	1
Tauno Metsänkylä, Catalan's Conjecture: Another old Diophantine problem solved	43
Stephen S. Gelbart and Stephen D. Miller, Riemann's zeta function and beyond	59

Book Reviews

Earl Taft (Reviewer), The concise handbook of algebra , edited by Alexander V. Mikhalev and Günter F. Pilz	113
Stephen J. DeCanio (Reviewer), Computation and complexity in economic behavior and organization , by Kenneth R. Mount and Stanley Reiter	117
Richard Moeckel (Reviewer), Classical and celestial mechanics, the Recife lectures , edited by Hildeberto Cabral and Florin Diacu	121
David Goss (Reviewer), Number theory in function fields , by Michael Rosen	127
Daniel S. Silver (Reviewer), Knots , by G. Burde and H. Zieschang; Algebraic invariants of links , by Jonathan Hillman	135

Vol. 41, No. 2

April 2004

Bulletin Articles

David Eisenbud, Current events sessions	149
Edward Frenkel, Recent advances in the Langlands Program	151
Daniel Tataru, The wave maps equation	185
Benoît Perthame, Mathematical tools for kinetic equations	205

Book Reviews

Donald Dawson (Reviewer), Diffusions, superdiffusions and partial differential equations , by E. B. Dynkin	245
Rostislav I. Grigorchuk (Reviewer), Subgroup growth , by Alexander Lubotzky and Dan Segal	253
Michael Harris (Reviewer), Introduction to the Langlands program , edited by J. Bernstein and S. Gelbart	257
Robert F. Brown (Reviewer), Fixed point theory , by Andrzej Granas and James Dugundji	267

Bulletin Articles

Jean-Pierre Bourguignon, René Thom: “Mathématicien et apprenti philosophe”	273
David Ruelle, Application of hyperbolic dynamics to physics: Some problems and conjectures	275
Steve Smale and Ding-Xuan Zhou, Shannon sampling and function reconstruction from point values	279
B. Mazur, Perturbations, deformations, and variations (and “near-misses”) in geometry, physics, and number theory	307
Michael Atiyah, The impact of Thom’s cobordism theory	337
Dennis Sullivan, René Thom’s work on geometric homology and bordism	341

Book Reviews

Juan J. Morales-Ruiz (Reviewer), Galois theory of linear differential equations, by Marius van der Put and Michael Singer	351
Susan Landau (Reviewer), RSA and Public-Key Cryptography, by Richard Mollin; Introduction to Cryptography, by Hans Delfs and Helmut Knebl; Cryptography: Theory and Practice, by Douglas Stinson; Algebraic Aspects of Cryptography, by Neal Koblitz; Elliptic Curves: Number Theory and Cryptography, by Lawrence Washington; Elliptic Curves in Cryptography, by Ian Blake, Gadiel Seroussi, and Nigel Smart; Modern Cryptography, Probabilistic Proofs, and Pseudorandomness, by Oded Goldreich; Foundations of Cryptography: Basic Tools, by Oded Goldreich; The Design of Rijndael: AES — the Advanced Encryption Standard, by Joan Daemen and Vincent Rijmen; Handbook of Applied Cryptography, by Alfred Menezes, Paul van Oorschot, and Scott Vanstone	357
J. P. C. Greenlees (Reviewer), Homotopy theoretic methods in group cohomology, by W. G. Dwyer and H.-W. Henn	369
Jean-Pierre Kahane (Reviewer), Trigonometric series, Vols. I, II, by Antoni Zygmund	377
John T. Baldwin (Reviewer), Finite structures with few types, by Gregory Cherlin and Ehud Hrushovski	391
Alexander Barvinok (Reviewer), Discrete convex analysis, by Kazuo Murota	395
Donald Sarason (Reviewer), Hankel operators and their applications, by Vladimir V. Peller	401

Bulletin Articles

Lawrence C. Evans, A survey of entropy methods for partial differential equations	409
--	-----

Gunnar Aronsson, Michael G. Crandall, and Petri Juutinen , A tour of the theory of absolutely minimizing functions	439
Henk W. Broer , KAM theory: The legacy of Kolmogorov's 1954 paper ..	507

Book Reviews

Norbert Steinmetz (Reviewer), Painlevé differential equations in the complex plane , by V. I. Gromak, I. Laine, and S. Shimomura	523
Gabriele Nebe (Reviewer), Perfect lattices in Euclidean spaces , by Jacques Martinet	529
Nik Weaver (Reviewer), State spaces of operator algebras: Basic theory, orientations, and C*-products , by Erik M. Alfsen and Frederic W. Shultz; Geometry of state spaces of operator algebras , by Erik M. Alfsen and Frederic W. Shultz	535
Martin Schechter (Reviewer), Spectral theory of linear operators—and spectral systems in Banach algebras , by Vladimir Müller	541
Edward Nelson (Reviewer), Gnomes in the fog: The reception of Brouwer's intuitionism in the 1920s , by Dennis E. Hesselring	545
H. L. Smith (Reviewer), Spatial ecology via reaction-diffusion equations , by R. S. Cantrell and C. Cosner	551
James Sneyd (Reviewer), Nonlinear dynamics in physiology and medicine , edited by A. Beuter, L. Glass, M. C. Mackey, and M. S. Titcombe ...	559

Editorial Board for Bulletin Articles

John C. Baez
Martin R. Bridson
Krystyna M. Kuperberg
Barry Mazur

Paul H. Rabinowitz
Donald G. Saari, Chair
Panagiotis E. Souganidis
Michael Wolf

Editorial Board for Book Reviews

William D. Blair
Robert L. Devaney, Chair
Lawrence C. Evans
Steven Krantz

John C. Mayer
Philip E. Protter
Audrey A. Terras

Chief Editor: Donald G. Saari

Editorial Information

Information on the backlog for this journal can be found on the AMS website starting from <http://www.ams.org/bull>.

In an effort to make articles available as quickly as possible, articles are posted to the AMS website individually after proof is returned from authors and before appearing in an issue.

A Consent to Publish and Copyright Agreement is required before a paper will be published in this journal. After a paper is accepted for publication, the Providence office will send a Consent to Publish and Copyright Agreement to all authors of the paper. By submitting a paper to this journal, authors certify that the results have not been submitted to nor are they under consideration for publication by another journal, conference proceedings, or similar publication.

Information for Authors

Bulletin Articles may be of two types: (1) reasonably broad expository surveys of a currently active area of mathematical research and (2) reports on a recent accomplishment in mathematical research. The first page 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 a brief technical description of the new material.

Both types of Bulletin Articles should be written so as to be understandable by graduate students or mathematicians who are not experts in the subject matter of the article. A well-written expository article will include motivating problems and examples, some indication of the historical development of the subject, and of course the results and open problems that make it an interesting and exciting area of mathematics. In most cases proofs should be at most briefly sketched, and there should be a good bibliography whose main aim is to help those wishing to pursue the subject further. Articles reporting on recent mathematical research should include an introductory section addressed to nonexperts describing the motivation, background, and significance of the results announced. Following the statement of results, there should be a sketch of proofs that may be addressed to experts, including elements of the proof which are novel. References should be given so that an interested reader can find the details.

Included with the footnotes in each paper should be the 2000 *Mathematics Subject Classification* representing the primary and secondary subjects of the article. The classifications are accessible from www.ams.org/msc/. The list of classifications is also available in print starting with the 1999 annual index of *Mathematical Reviews*. The Mathematics Subject Classification footnote may be followed by a list of *key words and phrases* describing the subject matter of the article and taken from it. Journal abbreviations used in bibliographies are listed in the latest *Mathematical Reviews* annual index. The series abbreviations are also accessible from www.ams.org/publications/. To help in preparing

and verifying references, the AMS offers MR Lookup, a Reference Tool for Linking, at www.ams.org/mrlookup/. 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.

Bulletin Articles are normally solicited by the Editorial Board, but unsolicited manuscripts will also be considered. In particular, those giving lectures (Gibbs Lectures, Colloquium Lectures, and Progress in Mathematics Lectures) or invited hour addresses at meetings of the Society are encouraged to write up their lectures in a manner that meets the requirements for expository articles described above and to submit their manuscripts for consideration by the Editorial Board for Bulletin Articles.

For Book Reviews the first page must include the title of the book being reviewed; the name(s) of the author(s); publisher; city of publication; year of publication; number of pages, including front matter; price if known; and ISBN. There should also be a footnote with the 2000 *Mathematics Subject Classification* representing the primary and secondary subjects of the book under review. The classifications are accessible from www.ams.org/msc/ and are also available in print starting with the 1999 annual index of *Mathematical Reviews*. To help in preparing and verifying references, the AMS offers MR Lookup, a Reference Tool for Linking, at www.ams.org/mrlookup/.

Initial submission. Bulletin Article authors may submit manuscripts for peer review as either PDF (strongly recommended) or PostScript files at <http://www.ams.org/peer-review/submission.pl>. Manuscripts must be a single file with images embedded. PostScript files will automatically be converted to PDF, and authors will have a chance to view the manuscript and data entered before releasing the manuscript into the system. Two-digit 2000 Mathematics Subject Classification numbers are included in a pull-down menu; classifications are accessible from <http://www.ams.org/msc/>. Complete author instructions are available at the site.

Authors who cannot supply PDF or PS files may submit paper copy of their manuscript to *Bulletin*/Peer-Review Submissions, 201 Charles Street, Providence, RI 02904-2294 USA. These submissions will be scanned into a PDF file and entered by AMS staff into the peer-review system. Please provide all the data required in the submission form to avoid delays in posting the manuscript.

Upon submission the manuscript will either move immediately into the AMS posting stream or go through conversion to PDF. The manuscript will then be placed in a secure area for the *Bulletin* Chief Editor, who will be notified weekly of new submissions. The Editor will collect these submissions and assign them to subject area specialists for peer review. Queries concerning the status of submissions should be sent to the Editor at bams@math.uci.edu.

Electronically prepared manuscripts. The AMS encourages electronically prepared manuscripts, with a strong preference for $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$. To this end, the Society has prepared $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ 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. Articles properly prepared using the $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ style file and the `\label` and `\ref` commands automatically enable extensive intra-document linking to the bibliography and other elements of the article for searching electronically on the Web. Because linking must often be added manually to electronically prepared manuscripts in other forms of $\mathcal{T}\mathcal{E}\mathcal{X}$, using $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ also reduces the amount of technical intervention once the files are received by the AMS. This results in fewer errors in processing and saves the author proofreading time. $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ papers also move more efficiently through the production stream, helping to minimize publishing costs.

$\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ is the highly preferred format of $\mathcal{T}\mathcal{E}\mathcal{X}$, but author packages are also available in $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$. Those authors who make use of these style files from the beginning of the writing process will further reduce their own efforts. Manuscripts prepared electronically in $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ or plain $\mathcal{T}\mathcal{E}\mathcal{X}$ 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. L^AT_EX users will find that $\mathcal{A}\mathcal{M}\mathcal{S}$ -L^AT_EX is the same as L^AT_EX with additional commands to simplify the typesetting of mathematics, and users of plain T_EX should have the foundation for learning $\mathcal{A}\mathcal{M}\mathcal{S}$ -L^AT_EX.

Authors may retrieve an author package from the AMS website starting from www.ams.org/tex/ or via FTP to [ftp.ams.org](ftp://ftp.ams.org) (login as `anonymous`, enter username as password, and type `cd pub/author-info`). The *AMS Author Handbook* and the *Instruction Manual* are available in PDF format following the author packages link from www.ams.org/tex/. The author package can also be obtained free of charge by sending email to pub@ams.org (Internet) or from the Publication Division, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. When requesting an author package, please specify $\mathcal{A}\mathcal{M}\mathcal{S}$ -L^AT_EX or $\mathcal{A}\mathcal{M}\mathcal{S}$ -T_EX, 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 $\mathcal{A}\mathcal{M}\mathcal{S}$ -L^AT_EX or $\mathcal{A}\mathcal{M}\mathcal{S}$ -T_EX. The final version of the electronic manuscript should be sent to the Providence office immediately after the paper has been accepted for publication. Authors should also send a paper manuscript that matches the electronic manuscript to Professor Donald G. Saari, Department of Mathematics, Multipurpose Science and Technology Building, University of California, Irvine, CA 92697-3875 USA. Electronically prepared manuscripts can be submitted via the Web at www.ams.org/submit-book-journal/, sent via email to pub-submit@ams.org (Internet), or sent on diskette to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. When sending a manuscript electronically via email or diskette, 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 send files are included in the author package.

Electronic graphics. Comprehensive instructions on preparing graphics are available from www.ams.org/jourhtml/authors.html. A few of the major requirements are given here.

Submit files for graphics as EPS (Encapsulated PostScript) files. This includes graphics originated via a graphics application as well as scanned photographs or other computer-generated images. If this is not possible, TIFF files are acceptable as long as they can be opened in Adobe Photoshop or Illustrator. 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 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. Variations of screens within a graphic should be no less than 10%.

AMS policy on making changes to articles after posting. Articles are posted to the AMS website individually after proof is returned from authors and before appearing in an issue. To preserve the integrity of electronically published articles, once an article is individually posted to the AMS website but not yet in an issue, changes cannot be made in place in the paper. However, an “Added after posting” section may be added to the paper right before the References when there is a critical error in the content of the paper. The “Added after posting” section gives the author an opportunity to correct this type of critical error before the article is put into an issue for printing and before it is then reposted with the issue. The “Added after posting” section remains a permanent part of the paper. The AMS does not keep author-related information, such as affiliation, current address, and email address, up to date after a paper is initially posted.

Once the article is assigned to an issue, even if the issue has not yet been posted to the AMS website, corrections may be made to the paper by submitting a traditional errata

article to the Editor. The errata article will appear in a future print issue and will link back and forth on the Web to the original article online.

Secure manuscript tracking on the Web and via email. Authors can track their manuscripts through the AMS journal production process using the personal AMS ID and Article ID printed in the upper right-hand corner of the Consent to Publish form sent to each author who publishes in AMS journals. Access to the tracking system is available from www.ams.org/mstrack/ or via email sent to mstrack-query@ams.org. To access by email, on the subject line of the message simply enter the AMS ID and Article ID. To track more than one manuscript by email, choose one of the Article IDs and enter the AMS ID and the Article ID followed by the word *all* on the subject line. An explanation of each production step is provided on the Web through links from the manuscript tracking screen. Questions can be sent to bull-query@ams.org.

T_EX files available. Beginning with the January 1992 issue of the *Bulletin* and the January 1996 issues of *Transactions*, *Proceedings*, *Mathematics of Computation*, and the *Journal of the AMS*, T_EX files can be downloaded from the AMS website, starting from www.ams.org/journals/. Authors without Web access may request their files at the address given below after the article has been published. For *Bulletin* papers published in 1987 through 1991 and for *Transactions*, *Proceedings*, *Mathematics of Computation*, and the *Journal of the AMS* papers published in 1987 through 1995, T_EX files are available upon request for authors without Web access by sending email to file-request@ams.org or by contacting the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. 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 T_EX file will be sent to the author making the request after the article goes to the printer. If the requestor can receive Internet email, please include the email 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 T_EX production at the AMS sometimes requires extra fonts and macros that are not yet publicly available, T_EX files cannot be guaranteed to run through the author's version of T_EX without errors. The AMS regrets that it cannot provide support to eliminate such errors in the author's T_EX environment.

Inquiries. Any inquiries concerning a paper that has been accepted for publication that cannot be answered via the manuscript tracking system mentioned above should be sent to bull-query@ams.org or directly to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

BULLETIN OF THE AMERICAN MATHEMATICAL SOCIETY
CONTENTS

Vol. 41, No. 4

October 2004

BULLETIN ARTICLES

Lawrence C. Evans , A survey of entropy methods for partial differential equations	409
Gunnar Aronsson, Michael G. Crandall, and Petri Juutinen , A tour of the theory of absolutely minimizing functions	439
Henk W. Broer , KAM theory: The legacy of Kolmogorov's 1954 paper	507

BOOK REVIEWS

Norbert Steinmetz (Reviewer), Painlevé differential equations in the complex plane, by V. I. Gromak, I. Laine, and S. Shimomura	523
Gabriele Nebe (Reviewer), Perfect lattices in Euclidean spaces, by Jacques Martinet	529
Nik Weaver (Reviewer), State spaces of operator algebras: Basic theory, orientations, and C^* -products, by Erik M. Alfsen and Frederic W. Shultz; Geometry of state spaces of operator algebras, by Erik M. Alfsen and Frederic W. Shultz	535
Martin Schechter (Reviewer), Spectral theory of linear operators—and spectral systems in Banach algebras, by Vladimir Müller	541
Edward Nelson (Reviewer), Gnomes in the fog: The reception of Brouwer's intuitionism in the 1920s, by Dennis E. Hesseling	545
H. L. Smith (Reviewer), Spatial ecology via reaction-diffusion equations, by R. S. Cantrell and C. Cosner	551
James Sneyd (Reviewer), Nonlinear dynamics in physiology and medicine, edited by A. Beuter, L. Glass, M. C. Mackey, and M. S. Titcombe ...	559



0273-0979(200410)41:4*;1-6

Bulletin (New Series) of the Amer. Math. Soc.

VOLUME 41

NUMBER 4

PAGES 409–564

OCTOBER 2004