
VOLUME 147

NUMBER 4

WHOLE NUMBER 718

APRIL 2019

PROCEEDINGS

OF THE

ISSN 0002-9939 (print)
ISSN 1088-6826 (online)

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

Ariel Barton
Mark Behrens
Harold P. Boas
Filippo Bracci
Alexander Braverman
Ken Bromberg
Benjamin Brubaker
Zhen-Qing Chen
Tanya Christiansen
Stephen Dilworth
Amanda Folsom
David Futer
Stephan Ramon Garcia
Patricia L. Hersh
Ryan Hynd
Adrian Ioana
Alexander Iosevich
Mourad Ismail

David Levin
Martin Liebeck
Heike Mildenberger
Matthew A. Papanikolas,
 Managing Editor
Claudia Polini
Rachel Pries
Nimish Shah
Romyar T. Sharifi
Wenxian Shen
Catherine Sulem
Jeremy Tyson
Jia-Ping Wang
Guofang Wei
Jerzy Weyman
Sarah Witherspoon
Yuan Xu
Deane Yang



AMERICAN
MATHEMATICAL
SOCIETY

Providence, Rhode Island USA

Proceedings of the American Mathematical Society

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

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

Publication on the AMS website. Articles are published on the AMS website individually after proof is returned from authors and before appearing in an issue.

Subscription information. *Proceedings of the American Mathematical Society* is published monthly and is also accessible electronically from www.ams.org/journals/. Subscription prices for Volume 147 (2019) are as follows: for paper delivery, US\$1738.00 list, US\$1390.40 institutional member, US\$1564.20 corporate member, US\$1042.80 individual member; for electronic delivery, US\$1529.00 list, US\$1223.20 institutional member, US\$1376.10 corporate member, US\$917.40 individual member. Upon request, subscribers to paper delivery of this journal are also entitled to receive electronic delivery. If ordering the paper version, add US\$9 for delivery within the United States; US\$54 for delivery outside the United States. Subscription renewals are subject to late fees. See www.ams.org/journal-faq for more journal subscription information.

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

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 201 Charles Street, Providence, RI 02904-2213 USA.

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 acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication is permitted only under license from the American Mathematical Society. Requests for permission to reuse portions of AMS publication content are handled by the Copyright Clearance Center. For more information, please visit www.ams.org/publications/pubpermissions.

Excluded from these provisions is material for which the author holds copyright. In such cases, requests for permission to reuse or reprint material 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 (ISSN 0002-9939 (print); ISSN 1088-6826 (online)) is published monthly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2213 USA. Periodicals postage is paid at Providence, Rhode Island. Postmaster: Send address changes to Proceedings, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213 USA.

© 2019 by the American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews*, *Zentralblatt MATH*, *Science Citation Index*[®], *Science Citation Index*TM-Expanded, *ISI Alerting Services*SM, *CompuMath Citation Index*[®], and *Current Contents*[®]/*Physical, Chemical & Earth Sciences*. This journal is archived in *Portico* and in *CLOCKSS*.

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 24 23 22 21 20 19

PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY
CONTENTS

Vol. 147, No. 4

Whole No. 718

April 2019

A. ALGEBRA, NUMBER THEORY, AND COMBINATORICS

J. Edson Sampaio, On Zariski's multiplicity problem at infinity	1367
Alejandro H. Morales, Igor Pak, and Greta Panova, Asymptotics of principal evaluations of Schubert polynomials for layered permutations	1377
Olivia Dumitrescu and Brian Osserman, An observation on (-1)-curves on rational surfaces	1391
Andrea Tirelli, Symplectic resolutions for Higgs moduli spaces	1399
Laurent Berger, Nonarchimedean dynamical systems and formal groups	1413

B. ANALYSIS

Xiaoxiao Zhang and Aijin Lin, Positive solutions of p-th Yamabe type equations on infinite graphs	1421
Nari Choi and Jongmin Han, Existence of non-topological multi-string solutions for a gravitational $O(3)$ gauge field model	1429
Rosemarie Bongers, Geometric bounds for Favard length	1447
Yuanyang Chang, Min Wu, and Wen Wu, Quantitative recurrence properties and homogeneous self-similar sets	1453
Jia-Bing Wang and Xiao-Qiang Zhao, Uniqueness and global stability of forced waves in a shifting environment	1467
Daniel Bartl and Michael Kupper, A pointwise bipolar theorem	1483
Jan Andres, The standard Sharkovsky cycle coexistence theorem applies to impulsive differential equations: Some notes and beyond	1497
Hideo Kubo, Takayoshi Ogawa, and Takeshi Suguro, Beckner type of the logarithmic Sobolev and a new type of Shannon's inequalities and an application to the uncertainty principle	1511
Alexander J. Izzo, Analytic discs and uniform algebras generated by real-analytic functions	1519
David Damanik and Jake Fillman, Limit-periodic Schrödinger operators with Lipschitz continuous IDS	1531
Geno Nikolov, New bounds for the extreme zeros of Jacobi polynomials	1541
Riccardo Piovani and Adriano Tomassini, Bott-Chern harmonic forms on Stein manifolds	1551
Congming Li and Wenxiong Chen, A Hopf type lemma for fractional equations	1565
Jeffrey S. Case, Jih-Hsin Cheng, and Paul Yang, An integral formula for the Q-prime curvature in 3-dimensional CR geometry	1577
Jun Hu and Yingqing Xiao, No Herman rings for regularly ramified rational maps	1587
Wen-Chi Kuo, David F. Rodda, and Bruce A. Watson, Strong sequential completeness of the natural domain of a conditional expectation operator in Riesz spaces	1597
Brian Hepler, Rational homology manifolds and hypersurface normalizations ...	1605
Ilaria Fragalà and Bozhidar Velichkov, Serrin-type theorems for triangles ...	1615
Bixiang Wang, Weak pullback attractors for stochastic Navier-Stokes equations with nonlinear diffusion terms	1627
Richard Lechner, Dimension dependence of factorization problems: Biparameter Hardy spaces	1639
J. P. Boroński, A note on fixed points of abelian actions in dimension one	1653

Si Duc Quang, Second main theorems for meromorphic mappings and moving hyperplanes with truncated counting functions	1657
Nikolaos Karamanlis, A characterization of the unit disk and the harmonic measure doubling condition	1671

D. GEOMETRY

Heyong Shin, Young Wook Kim, Sung-Eun Koh, Hyung Yong Lee, and Seong-Deog Yang, Schwarz' CLP-surfaces in Nil_3	1677
Tao Huang and Na Zhao, On the regularity of weak small solution of a gradient flow of the Landau–de Gennes energy	1687
Mohammad Ghomi, Torsion of locally convex curves	1699

E. LOGIC AND FOUNDATIONS

Márton Elekes and Juris Steprāns, Set-theoretical problems concerning Hausdorff measures	1709
Itay Kaplan, Nicholas Ramsey, and Saharon Shelah, Local character of Kim-independence	1719
Paul B. Larson and Jindřich Zapletal, Discontinuous homomorphisms, selectors, and automorphisms of the complex field	1733
Anton Bernshteyn, Michelle Delcourt, Henry Towsner, and Anush Tserunyan, A short nonalgorithmic proof of the containers theorem for hypergraphs	1739

G. TOPOLOGY

Sho Hasui, Daisuke Kishimoto, Tseleung So, and Stephen Theriault, Odd primary homotopy types of the gauge groups of exceptional Lie groups	1751
Gonzalo Martínez-Cervantes and Grzegorz Plebanek, The Mardešić Conjecture and free products of Boolean algebras	1763
Wenzhao Chen, A note on 0-bipolar knots of concordance order two	1773
Se-Goo Kim and Kwan Yong Lee, Concordance invariants of doubled knots and blowing up	1781
Rosona Eldred, Gijs Heuts, Akhil Mathew, and Lennart Meier, Monadicity of the Bousfield–Kuhn functor	1789
M. Cárdenas, F. F. Lasheras, A. Quintero, and R. Roy, Quasi-isometries and proper homotopy: The quasi-isometry invariance of proper 3-realizability of groups	1797
Xuwen Zhu, Spherical conic metrics and realizability of branched covers	1805
Xiaolong Han, Michael Murray, and Chuong Tran, Nodal lengths of eigenfunctions in the disc	1817

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 15 published pages**. Published pages are the same size as those generated in the style files provided for $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$.

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

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

A Consent to Publish is required before we can begin processing your paper. After a paper is accepted for publication, the Providence office will send a Consent to Publish 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

Initial submission. All articles submitted to this journal are peer reviewed. The AMS has a single blind peer-review process in which the reviewers know who the authors of the manuscript are, but the authors do not have access to the information on who the peer reviewers are. The AMS uses Centralized Manuscript Processing for initial submission. Authors should submit a PDF file using the Initial Manuscript Submission form found at www.ams.org/submission/proc or send one copy of the manuscript to the following address: Centralized Manuscript Processing, PROCEEDINGS OF THE AMS, 201 Charles Street, Providence, RI 02904-2213 USA. If a paper copy is being forwarded to the AMS, indicate that it is for *Proceedings* and include the name of the corresponding author, contact information such as email address or mailing address, and the name of an appropriate Editor to review the paper (see the list of Editors below).

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 should be the 2010 *Mathematics Subject Classification* representing the primary and secondary subjects of the article. The classifications are accessible from www.ams.org/msc/. 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/msnhtml/serials.pdf. To help in preparing and verifying references, the AMS offers MR Lookup, a Reference Tool for Linking, at www.ams.org/mrlookup/.

Electronically prepared manuscripts. Manuscripts should be electronically prepared in $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$. To this end, the Society has prepared $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ author packages for each AMS publication. Author packages include instructions for preparing electronic manuscripts, samples, and a style file that generates the particular design specifications of that publication series. Articles properly prepared using the $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ 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.

Authors may retrieve an author package for *Proceedings of the AMS* from www.ams.org/proc/procauthorpac.html. The *AMS Author Handbook* is available in PDF format from the author package link. The author package can also be obtained free of charge by sending email to tech-support@ams.org or from the Publication Division, American Mathematical

Society, 201 Charles Street, Providence, RI 02904-2213 USA. When requesting an author package, please specify the publication in which your paper will appear. Please be sure to include your complete email address.

After acceptance. The source files for 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 submit a PDF of the final version of the paper to the Editor, who will forward a copy to the Providence office. Accepted electronically prepared manuscripts can be submitted via the Web at www.ams.org/submit-book-journal/, sent via email to pub-submit@ams.org, or sent on CD to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213 USA. When sending a manuscript electronically via email or CD, please be sure to include a message indicating in which publication the paper has been accepted. Complete instructions on how to send files are included in the author package.

Electronic graphics. Comprehensive instructions on preparing graphics are available starting from www.ams.org/authors/journals.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.

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. Variations of screens within a graphic should be no less than 10%.

Any graphics created in color will be rendered in grayscale for the printed version unless color printing is authorized by the Managing Editor and the Publisher. In general, color graphics will appear in color in the online version.

AMS policy on making changes to articles after publication. Articles are published on 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 published to the AMS website, changes cannot be made in place in 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 electronically published.

Corrections of critical errors may be made to the paper by submitting an errata article to the Editor. The errata article will be published electronically, will appear in a future print issue, and will link back and forth on the Web with the original article.

Secure manuscript tracking on the Web. 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/. An explanation of each production step is provided on the Web through links from the manuscript tracking screen. Questions can be sent to proc-query@ams.org.

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 proc-query@ams.org or directly to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213 USA.

Editors

The AMS uses Centralized Manuscript Processing for initial submissions to AMS journals. Authors should follow instructions listed on the Initial Submission page found at www.ams.org/proc/procsubmit.html.

Managing Editor: Matthew Papanikolas, Texas A&M University, College Station, TX 77843-3368 USA; e-mail: papanikolas@tamu.edu

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

Coordinating Editor: Nimish Shah, The Ohio State University, Columbus, OH 43210 USA; e-mail: shah@math.osu.edu

Ergodic theory and dynamical systems, Nimish Shah

Global analysis, Guofang Wei, University of California, Santa Barbara, Santa Barbara, CA 93106-3080 USA; e-mail: wei@math.ucsb.edu

Ordinary differential equations and dynamical systems, Wenxian Shen, Auburn University, Auburn, AL 36849-5310 USA; e-mail: wensexsh@auburn.edu

Partial differential equations, Ryan Hynd, University of Pennsylvania, Philadelphia, PA 19104 USA; e-mail: rhynd@math.upenn.edu

Representation theory and algebraic geometry, Alexander Braverman, University of Toronto, Toronto, ON, Canada; and Perimeter Institute, Waterloo, ON, Canada; e-mail: bravala@math.toronto.edu

2. TOPOLOGY AND GEOMETRY

Coordinating Editor: David Futer, Temple University, Philadelphia, PA 19122 USA; e-mail: dfuter@temple.edu

Algebraic topology, Mark Behrens, University of Notre Dame, Notre Dame, IN, 46556 USA; e-mail: mbehren1@nd.edu

Convex geometric analysis, Deane Yang, New York University, New York, NY 10012 USA; e-mail: deane.yang@courant.nyu.edu

Differential geometry, Jia-Ping Wang, University of Minnesota, Minneapolis, MN 55455 USA; e-mail: jiaping@math.umn.edu

Geometric topology, Ken Bromberg, University of Utah, Salt Lake City, UT 84112, USA; e-mail: bromberg@math.utah.edu

Geometric topology and knot theory, David Futer, Temple University, Philadelphia, PA 19122, USA; e-mail: dfuter@temple.edu

3. ANALYSIS

Coordinating Editor: Alexander Iosevich, University of Rochester, Rochester, NY 14627 USA; e-mail: iosevich@math.rochester.edu

Banach spaces, Stephen Dilworth, University of South Carolina, Columbia, SC 29208 USA; e-mail: dilworth@math.sc.edu

Geometric function theory, Jeremy Tyson, University of Illinois, Urbana, IL 61801 USA; e-mail: tyson@math.uiuc.edu

Harmonic analysis and linear partial differential equations, Ariel Barton, University of Arkansas, Fayetteville, Arkansas 72701 USA; e-mail: aeb019@uark.edu

Holomorphic functions, holomorphic dynamics, and several complex variables, Filippo Bracci, Università di Roma "Tor Vergata", via della Ricerca Scientifica 1, 00133 Rome, Italy; e-mail: fbracci@mat.uniroma2.it

Operator algebras, Adrian Ioana, University of California, San Diego, La Jolla, CA 92093 USA; e-mail: aioana@math.ucsd.edu

Operator theory and spaces of holomorphic functions, Stephan Ramon Garcia, Pomona College, Claremont, CA 91711 USA; e-mail: stephan.garcia@pomona.edu

Several complex variables, Harold P. Boas, Texas A&M University, College Station, TX, 77843-3368 USA; e-mail: boas@math.tamu.edu

Spectral and scattering theory, microlocal analysis, Tanya Christiansen, University of Missouri-Columbia, Columbia, Missouri 65211-0001 USA; e-mail: christiansent@missouri.edu

4. ALGEBRA, NUMBER THEORY, COMBINATORICS, AND LOGIC

Coordinating Editor: Heike Mildenerger, University of Freiburg, 79104 Freiburg im Breisgau, Germany; e-mail: heike.mildenerger@math.uni-freiburg.de

Algebraic number theory and arithmetic geometry, Romyar T. Sharifi, University of California, Los Angeles, Los Angeles, CA 90095 USA; e-mail: sharifi@math.ucla.edu

Analytic number theory and modular forms, Amanda Folsom, Amherst College, Amherst, MA 01002 USA; e-mail: afolsom@amherst.edu

Arithmetic geometry, algebraic geometry and number theory, Rachel Pries, Colorado State University, Fort Collins, CO 80523-1874 USA; e-mail: pries@math.colostate.edu

Combinatorics, Patricia L. Hersh, North Carolina State University, Raleigh, NC 27695-8205 USA; e-mail: plhersh@ncsu.edu

Commutative algebra, Claudia Polini, University of Notre Dame, Notre Dame, IN 46556 USA; e-mail: cpolini@nd.edu

Commutative algebra, noncommutative algebra and invariant theory, Jerzy Weyman, University of Connecticut, Storrs, CT 06269 USA; e-mail: jerzy.weyman@uconn.edu

Group theory, Martin Liebeck, Imperial College, London, SW7 2AZ, United Kingdom; e-mail: m.liebeck@imperial.ac.uk

Logic and foundations, Heike Mildenerger

Noncommutative algebra, homological algebra, and representation theory, Sarah Witherspoon, Texas A&M University, College Station, TX 77843-3368 USA; e-mail: sjw@math.tamu.edu

Representation theory, automorphic forms, number theory, algebraic combinatorics, Benjamin Brubaker, University of Minnesota, Minneapolis, MN 55455 USA; e-mail: brubaker@math.umn.edu

5. APPLIED MATHEMATICS, PROBABILITY, AND STATISTICS

Coordinating Editor: Zhen-Qing Chen, University of Washington, Seattle, Washington 98195, USA; e-mail: zqchen@uw.edu

Applied probability and statistics, David Levin, University of Oregon, Eugene, OR 97043-1221 USA; e-mail: dlevin@uoregon.edu

Integrable systems and special functions, Mourad Ismail, University of Central Florida, Orlando, FL 32816 USA; and King Saud University, Riyadh, Saudi Arabia; e-mail: mourad.eh.ismail@gmail.com

Nonlinear partial differential equations, Catherine Sulem, University of Toronto, 40 St. George Street, Bahen Center, Toronto, ON, Canada; e-mail: sulem@math.toronto.edu

Probability, Zhen-Qing Chen

Special functions and approximation theory, Yuan Xu, University of Oregon, Eugene, OR 97403-1205 USA; e-mail: yuan@uoregon.edu

(Continued from back cover)

Brian Hepler , Rational homology manifolds and hypersurface normalizations ...	1605
Ilaria Fragalà and Bozhidar Velichkov , Serrin-type theorems for triangles ...	1615
Bixiang Wang , Weak pullback attractors for stochastic Navier-Stokes equations with nonlinear diffusion terms	1627
Richard Lechner , Dimension dependence of factorization problems: Biparameter Hardy spaces	1639
J. P. Boroński , A note on fixed points of abelian actions in dimension one	1653
Si Duc Quang , Second main theorems for meromorphic mappings and moving hyperplanes with truncated counting functions	1657
Nikolaos Karamanlis , A characterization of the unit disk and the harmonic measure doubling condition	1671

D. GEOMETRY

Heayong Shin, Young Wook Kim, Sung-Eun Koh, Hyung Yong Lee, and Seong-Deog Yang , Schwarz' CLP-surfaces in Nil_3	1677
Tao Huang and Na Zhao , On the regularity of weak small solution of a gradient flow of the Landau–de Gennes energy	1687
Mohammad Ghomi , Torsion of locally convex curves	1699

E. LOGIC AND FOUNDATIONS

Márton Elekes and Juris Steprāns , Set-theoretical problems concerning Hausdorff measures	1709
Itay Kaplan, Nicholas Ramsey, and Saharon Shelah , Local character of Kim-independence	1719
Paul B. Larson and Jindřich Zapletal , Discontinuous homomorphisms, selectors, and automorphisms of the complex field	1733
Anton Bernshteyn, Michelle Delcourt, Henry Towsner, and Anush Tserunyan , A short nonalgorithmic proof of the containers theorem for hypergraphs	1739

G. TOPOLOGY

Sho Hasui, Daisuke Kishimoto, Tseleung So, and Stephen Theriault , Odd primary homotopy types of the gauge groups of exceptional Lie groups	1751
Gonzalo Martínez-Cervantes and Grzegorz Plebanek , The Mardešić Conjecture and free products of Boolean algebras	1763
Wenzhao Chen , A note on 0-bipolar knots of concordance order two	1773
Se-Goo Kim and Kwan Yong Lee , Concordance invariants of doubled knots and blowing up	1781
Rosona Eldred, Gijs Heuts, Akhil Mathew, and Lennart Meier , Monadicity of the Bousfield–Kuhn functor	1789
M. Cárdenas, F. F. Lasheras, A. Quintero, and R. Roy , Quasi-isometries and proper homotopy: The quasi-isometry invariance of proper 3-realizability of groups	1797
Xuwen Zhu , Spherical conic metrics and realizability of branched covers	1805
Xiaolong Han, Michael Murray, and Chuong Tran , Nodal lengths of eigenfunctions in the disc	1817

PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY
CONTENTS

Vol. 147, No. 4

Whole No. 718

April 2019

A. ALGEBRA, NUMBER THEORY, AND COMBINATORICS

J. Edson Sampaio, <i>On Zariski's multiplicity problem at infinity</i>	1367
Alejandro H. Morales, Igor Pak, and Greta Panova, <i>Asymptotics of principal evaluations of Schubert polynomials for layered permutations</i>	1377
Olivia Dumitrescu and Brian Osserman, <i>An observation on (-1)-curves on rational surfaces</i>	1391
Andrea Tirelli, <i>Symplectic resolutions for Higgs moduli spaces</i>	1399
Laurent Berger, <i>Nonarchimedean dynamical systems and formal groups</i>	1413

B. ANALYSIS

Xiaoxiao Zhang and Aijin Lin, <i>Positive solutions of p-th Yamabe type equations on infinite graphs</i>	1421
Nari Choi and Jongmin Han, <i>Existence of non-topological multi-string solutions for a gravitational $O(3)$ gauge field model</i>	1429
Rosemarie Bongers, <i>Geometric bounds for Favard length</i>	1447
Yuanyang Chang, Min Wu, and Wen Wu, <i>Quantitative recurrence properties and homogeneous self-similar sets</i>	1453
Jia-Bing Wang and Xiao-Qiang Zhao, <i>Uniqueness and global stability of forced waves in a shifting environment</i>	1467
Daniel Bartl and Michael Kupper, <i>A pointwise bipolar theorem</i>	1483
Jan Andres, <i>The standard Sharkovsky cycle coexistence theorem applies to impulsive differential equations: Some notes and beyond</i>	1497
Hideo Kubo, Takayoshi Ogawa, and Takeshi Suguro, <i>Beckner type of the logarithmic Sobolev and a new type of Shannon's inequalities and an application to the uncertainty principle</i>	1511
Alexander J. Izzo, <i>Analytic discs and uniform algebras generated by real-analytic functions</i>	1519
David Damanik and Jake Fillman, <i>Limit-periodic Schrödinger operators with Lipschitz continuous IDS</i>	1531
Geno Nikolov, <i>New bounds for the extreme zeros of Jacobi polynomials</i>	1541
Riccardo Piovani and Adriano Tomassini, <i>Bott-Chern harmonic forms on Stein manifolds</i>	1551
Congming Li and Wenxiong Chen, <i>A Hopf type lemma for fractional equations</i>	1565
Jeffrey S. Case, Jih-Hsin Cheng, and Paul Yang, <i>An integral formula for the Q-prime curvature in 3-dimensional CR geometry</i>	1577
Jun Hu and Yingqing Xiao, <i>No Herman rings for regularly ramified rational maps</i>	1587
Wen-Chi Kuo, David F. Rodda, and Bruce A. Watson, <i>Strong sequential completeness of the natural domain of a conditional expectation operator in Riesz spaces</i>	1597

(Continued on inside back cover)



0002-9939(201904)147:4;1-C

