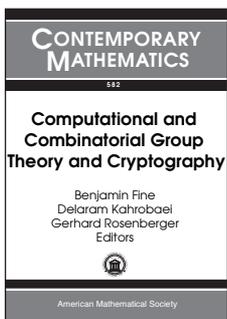


# New Publications Offered by the AMS

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## Algebra and Algebraic Geometry



### Computational and Combinatorial Group Theory and Cryptography

**Benjamin Fine**, *Fairfield University, CT*, **Delaram Kahrobaei**, *CUNY Graduate Center, New York, NY*, and **Gerhard Rosenberger**, *University of Hamburg, Germany*, Editors

This volume contains the proceedings of the AMS Special Session on Computational Algebra, Groups, and Applications, held April 30–May 1, 2011, at the University of Nevada, Las Vegas, Nevada, and the AMS Special Session on the Mathematical Aspects of Cryptography and Cyber Security, held September 10–11, 2011, at Cornell University, Ithaca, New York.

Over the past twenty years combinatorial and infinite group theory has been energized by three developments: the emergence of geometric and asymptotic group theory, the development of algebraic geometry over groups leading to the solution of the Tarski problems, and the development of group-based cryptography. These three areas in turn have had an impact on computational algebra and complexity theory.

The papers in this volume, both survey and research, exhibit the tremendous vitality that is at the heart of group theory in the beginning of the twenty-first century as well as the diversity of interests in the field.

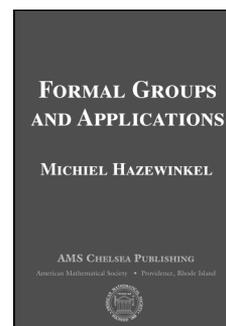
*This item will also be of interest to those working in applications.*

**Contents:** **R. Ali** and **M. Kreuzer**, Weyl Gröbner basis cryptosystems; **G. Baumslag**, **R. Mikhailov**, and **K. E. Orr**, A new look at finitely generated metabelian groups; **M. Bonanome**, **M. H. Dean**, and **M. Zyman**,  $IA$ -automorphisms of groups with almost constant upper central series; **C. S. Chum**, **B. Fine**, **G. Rosenberger**, and **X. Zhang**, A proposed alternative to the Shamir secret sharing scheme; **C. S. Chum** and **X. Zhang**, Improving Latin square based secret sharing schemes; **A. E. Clement**, A hand-computation involving surface groups, the Reidemeister-Schreier rewriting process and Kurosh subgroup theorem; **M. H. Dean**, **S. Majewicz**, and **M. Zyman**, Adjunction of roots in exponential  $A$ -groups; **V. Diekert**, **J. Kausch**, and **M. Lohrey**,

Logspace computations in Coxeter groups and graph groups; **B. Eick**, Collection by polynomials in finite  $p$ -groups; **B. Fine**, **A. Hulpke**, and **G. Rosenberger**, All finite generalized tetrahedon groups II; **B. Fine** and **G. Rosenberger**, The classification of one relator limit groups and the surface group conjecture; **A. M. Gaglione**, **S. Lipschutz**, and **D. Spellman**, Discrimination and separation in the metabelian variety; **M. Habeeb**, **D. Kahrobaei**, and **V. Shpilrain**, A secret sharing scheme based on group presentations and the word problem; **S. Jarecki** and **N. Saxena**, Authenticated key agreement with key re-use in the short authenticated strings model; **D. Kahrobaei** and **E. Vidaurre**, Publicly verifiable secret sharing using non-abelian groups; **M. Neumann-Brosig**, A note on the hyperbolicity of strict Pride groups; **E. Ziliak**, An algorithm to express words as a product of conjugates of relators.

**Contemporary Mathematics**, Volume 582

December 2012, 199 pages, Softcover, ISBN: 978-0-8218-7563-6, LC 2012023441, 2010 *Mathematics Subject Classification*: 20-XX, 68-XX, **AMS members US\$59.20**, List US\$74, Order code CONM/582



### Formal Groups and Applications

**Michiel Hazewinkel**

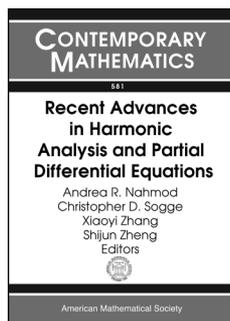
This book is a comprehensive treatment of the theory of formal groups and its numerous applications in several areas of mathematics. The seven chapters of the book present basics and main results of the theory, as well as very important applications in algebraic topology, number theory, and algebraic geometry. Each

chapter ends with several pages of historical and bibliographic summary. One prerequisite for reading the book is an introductory graduate algebra course, including certain familiarity with category theory.

**Contents:** Methods for constructing one-dimensional formal groups; Methods for constructing higher dimensional formal group laws; Curves,  $p$ -typical formal group laws, and lots of Witt vectors; Homomorphisms, endomorphisms, and the classification of formal groups by power series methods; Cartier-Dieudonné modules; Applications of formal groups in algebraic topology, number theory, and algebraic geometry; Formal groups and bialgebras; On power series rings; Brief notes on further applications of formal group (law) theory; Bibliography; Notation; Index.

AMS Chelsea Publishing, Volume 375

December 2012, 573 pages, Hardcover, ISBN: 978-0-8218-5349-8, 2010 *Mathematics Subject Classification*: 14L05; 16Txx, 05Exx, 11Fxx, 11Sxx, 12Fxx, 13F35, 55N22, **AMS members US\$64.80**, List US\$72, Order code CHEL/375.H



## Recent Advances in Harmonic Analysis and Partial Differential Equations

**Andrea R. Nahmod**, *University of Massachusetts, Amherst, MA*, **Christopher D. Sogge**, *Johns Hopkins University, Baltimore, MD*, **Xiaoyi Zhang**, *University of Iowa, Iowa City, IA*, and **Shijun Zheng**, *Georgia Southern University, Statesboro, GA*, Editors

This volume is based on the AMS Special Session on Harmonic Analysis and Partial Differential Equations and the AMS Special Session on Nonlinear Analysis of Partial Differential Equations, both held March 12–13, 2011, at Georgia Southern University, Statesboro, Georgia, as well as the JAMI Conference on Analysis of PDEs, held March 21–25, 2011, at Johns Hopkins University, Baltimore, Maryland. These conferences all concentrated on problems of current interest in harmonic analysis and PDE, with emphasis on the interaction between them.

This volume consists of invited expositions as well as research papers that address prospects of the recent significant development in the field of analysis and PDE. The central topics mainly focused on using Fourier, spectral and geometrical methods to treat wellposedness, scattering and stability problems in PDE, including dispersive type evolution equations, higher-order systems and Sobolev spaces theory that arise in aspects of mathematical physics.

The study of all these problems involves state-of-the-art techniques and approaches that have been used and developed in the last decade. The interrelationship between the theory and the tools reflects the richness and deep connections between various subjects in both classical and modern analysis.

*This item will also be of interest to those working in differential equations.*

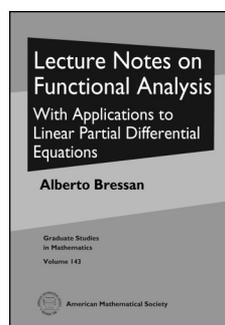
**Contents:** **A. Bulut**, The defocusing cubic nonlinear wave equation in the energy-supercritical regime; **K. Brewster**, **I. Mitrea**, and **M. Mitrea**, Stein’s extension operator on weighted Sobolev spaces on Lipschitz domains and applications to interpolation; **T. Chen**, **N. Pavlović**, and **N. Tzirakis**, Multilinear Morawetz identities for the Gross-Pitaevskii hierarchy; **X. Chen**, Elementary proofs for Kato smoothing estimates of Schrödinger-like dispersive equations; **H. Dong** and **D. Kim**, The conormal derivative problem for higher order elliptic systems with irregular coefficients; **M. Filoche**, **S. Mayboroda**, and **B. Patterson**, Localization of eigenfunctions of a one-dimensional elliptic operator; **C. Guevara** and **F. Carreon**, Scattering and blow up for the two dimensional focusing quintic nonlinear Schrödinger equation; **C. Klein** and **C. Sparber**, Transverse stability of periodic traveling waves in Kadomtsev-Petviashvili equations: A numerical study; **J.-E. Lin**, Time decay for the solutions of a fourth-order nonlinear Schrödinger equation; **O. Milatovic**, Self-adjoint realizations of

Schrödinger operators on vector bundles over Riemannian manifolds; **I. Mitrea**, **K. Ott**, and **E. Stachura**, Spectral properties of the reflection operator in two dimensions; **N. Pennington**, Recent local and global solutions to the Lagrangian averaged Navier-Stokes equation; **C. Wang** and **X. Yu**, Recent works on the Strauss conjecture; **D. Li** and **X. Zhang**, Wave operators for nonlinear wave equations with null structures; **S. Zheng**, Fractional regularity for nonlinear Schrödinger equations with magnetic fields.

**Contemporary Mathematics**, Volume 581

December 2012, 285 pages, Softcover, ISBN: 978-0-8218-6921-5, LC 2012023439, 2010 *Mathematics Subject Classification*: 42B37, 35J10, 35K52, 35Q55, 35L70, 58J45; 74J30, 76D05, **AMS members US\$77.60**, List US\$97, Order code CONM/581

## Analysis



## Lecture Notes on Functional Analysis

With Applications to Linear Partial Differential Equations

**Alberto Bressan**, *Pennsylvania State University, University Park, PA*

This textbook is addressed to graduate students in mathematics or other disciplines who wish to understand the essential concepts of functional analysis and their applications to partial differential equations.

The book is intentionally concise, presenting all the fundamental concepts and results but omitting the more specialized topics. Enough of the theory of Sobolev spaces and semigroups of linear operators is included as needed to develop significant applications to elliptic, parabolic, and hyperbolic PDEs. Throughout the book, care has been taken to explain the connections between theorems in functional analysis and familiar results of finite-dimensional linear algebra.

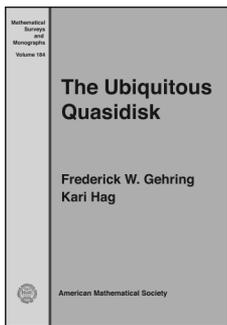
The main concepts and ideas used in the proofs are illustrated with a large number of figures. A rich collection of homework problems is included at the end of most chapters. The book is suitable as a text for a one-semester graduate course.

*This item will also be of interest to those working in differential equations.*

**Contents:** Introduction; Banach spaces; Spaces of continuous functions; Bounded linear operators; Hilbert spaces; Compact operators on a Hilbert space; Semigroups of linear operators; Sobolev spaces; Linear partial differential equations; Background material; Summary of notation; Bibliography; Index.

**Graduate Studies in Mathematics**, Volume 143

January 2013, approximately 250 pages, Hardcover, ISBN: 978-0-8218-8771-4, 2010 *Mathematics Subject Classification*: 46-01; 35-01, **AMS members US\$51.20**, List US\$64, Order code GSM/143



## The Ubiquitous Quasidisk

Frederick W. Gehring, and  
Kari Hag, *Norwegian University  
of Science and Technology,  
Trondheim, Norway*

This book focuses on gathering the numerous properties and many different connections with various topics in geometric function theory that quasidisks

possess. A quasidisk is the image of a disk under a quasiconformal mapping of the Riemann sphere. In 1981 Frederick W. Gehring gave a short course of six lectures on this topic in Montreal and his lecture notes "Characteristic Properties of Quasidisks" were published by the University Press of the University of Montreal. The notes became quite popular and within the next decade the number of characterizing properties of quasidisks and their ramifications increased tremendously. In the late 1990s Gehring and Hag decided to write an expanded version of the Montreal notes. At three times the size of the original notes, it turned into much more than just an extended version. New topics include two-sided criteria. The text will be a valuable resource for current and future researchers in various branches of analysis and geometry, and with its clear and elegant exposition the book can also serve as a text for a graduate course on selected topics in function theory.

Frederick W. Gehring (1925–2012) was a leading figure in the theory of quasiconformal mappings for over fifty years. He received numerous awards and shared his passion for mathematics generously by mentoring twenty-nine Ph.D. students and more than forty postdoctoral fellows.

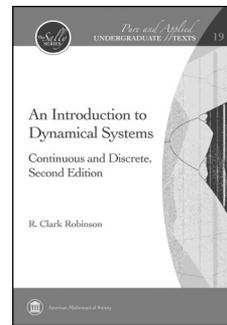
Kari Hag received her Ph.D. under Gehring's direction in 1972 and worked with him on the present text for more than a decade.

**Contents:** *Properties of quasidisks:* Preliminaries; Geometric properties; Conformal invariants; Injectivity criteria; Criteria for extension; Two-sided criteria; Miscellaneous properties; *Some proofs of these properties:* First series of implications; Second series of implications; Third series of implications; Fourth series of implications; Bibliography; Index.

**Mathematical Surveys and Monographs, Volume 184**

December 2012, approximately 169 pages, Hardcover, ISBN: 978-0-8218-9086-8, 2010 *Mathematics Subject Classification:* 30C62; 30C20, 30C45, 30C65, 30F45, **AMS members US\$59.20**, List US\$74, Order code SURV/184

## Differential Equations



## An Introduction to Dynamical Systems

Continuous and Discrete,  
Second Edition

R. Clark Robinson, *Northwestern  
University, Evanston, IL*

This book gives a mathematical treatment of the introduction to qualitative differential equations and discrete

dynamical systems. The treatment includes theoretical proofs, methods of calculation, and applications. The two parts of the book, continuous time of differential equations and discrete time of dynamical systems, can be covered independently in one semester each or combined together into a year-long course.

The material on differential equations introduces the qualitative or geometric approach through a treatment of linear systems in any dimensions. There follows chapters where equilibria are the most important feature, where scalar (energy) functions is the principal tool, where periodic orbits appear, and finally chaotic systems of differential equations. The many different approaches are systematically introduced through examples and theorems.

The material on discrete dynamical systems starts with maps of one variable and proceeds to systems in higher dimensions. The treatment starts with examples where the periodic points can be found explicitly and then introduces symbolic dynamics to analyze where they can be shown to exist but not given in explicit form. Chaotic systems are presented both mathematically and more computationally using Lyapunov exponents. With the one-dimensional maps as models, the multidimensional maps cover the same material in higher dimensions. This higher dimensional material is less computational and more conceptual and theoretical. The final chapter on fractals introduces various dimensions which is another computational tool for measuring the complexity of a system. It also treats iterated function systems which give examples of complicated sets.

In the second edition of the book, much of the material has been rewritten to clarify the presentation. Also, some new material has been included in both parts of the book.

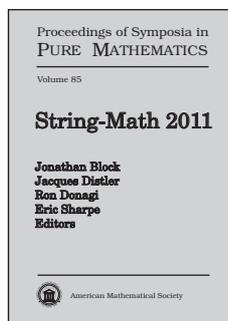
This book can be used as a textbook for an advanced undergraduate course on ordinary differential equations and/or dynamical systems. Prerequisites are standard courses in calculus (single variable and multivariable), linear algebra, and introductory differential equations.

**Contents:** *Systems of nonlinear differential equations:* Geometric approach to differential equations; Linear systems; The flow; Solutions of nonlinear equations; Phase portraits with emphasis on fixed points; Phase portraits using Scalar functions; Periodic orbits; Chaotic attractors; *Iteration of functions:* Iteration of functions as dynamics; Periodic points of one-dimensional maps; Itineraries for one-dimensional maps; Invariant sets for one-dimensional maps; Periodic points of higher dimensional maps; Invariant sets for higher dimensional maps; Fractals; Background and terminology; Generic properties; Bibliography; Index.

**Pure and Applied Undergraduate Texts, Volume 19**

January 2013, 760 pages, Hardcover, ISBN: 978-0-8218-9135-3, LC 2012025520, 2010 *Mathematics Subject Classification:* 34Cxx, 37Cxx, 37Dxx, 37Exx, 37Nxx, 70Kxx, **AMS members US\$74.40**, List US\$93, Order code AMSTEXT/19

# Mathematical Physics



## String-Math 2011

**Jonathan Block**, *University of Pennsylvania, Philadelphia, PA*, **Jacques Distler**, *University of Texas at Austin, TX*, **Ron Donagi**, *University of Pennsylvania, Philadelphia, PA*, and **Eric Sharpe**, *Virginia Polytech Institute & State University, Blacksburg, VA*, Editors

The nature of interactions between mathematicians and physicists has been thoroughly transformed in recent years. String theory and quantum field theory have contributed a series of profound ideas that gave rise to entirely new mathematical fields and revitalized older ones. The influence flows in both directions, with mathematical techniques and ideas contributing crucially to major advances in string theory. A large and rapidly growing number of both mathematicians and physicists are working at the string-theoretic interface between the two academic fields.

The String-Math conference series aims to bring together leading mathematicians and mathematically minded physicists working in this interface.

This volume contains the proceedings of the inaugural conference in this series, String-Math 2011, which was held June 6–11, 2011, at the University of Pennsylvania.

**Contents:** *Plenary talks:* **M. Aganagic** and **S. Shakirov**, Refined Chern-Simons theory and knot homology; **P. S. Aspinwall** and **M. R. Plesser**, Elusive worldsheet instantons in heterotic string compactifications; **M. C. N. Cheng** and **J. F. R. Duncan**, The largest Mathieu group and (mock) automorphic forms; **R. Donagi**, **J. Guffin**, **S. Katz**, and **E. Sharpe**,  $(0,2)$  quantum cohomology; **M. R. Douglas**, Foundations of quantum field theory; **S. Gukov** and **M. Stošić**, Homological algebra of knots and BPS states; **M. Marcolli**, Motivic structures in quantum field theory; **G. W. Moore** and **Y. Tachikawa**, On 2d TQFTs whose values are holomorphic symplectic varieties; **Y. Ruan**, The Witten equation and the geometry of the Landau-Ginzburg model; **L.-S. Tseng** and **S.-T. Yau**, Non-Kähler Calabi-Yau manifolds; **S. Schäfer-Nameki**, F-theory GUTs: Global aspects and phenomenology; **M. Wijnholt**, Higgs bundles and string phenomenology; *Contributed talks:* **D. Baraglia**, Topological T-duality with monodromy; **N. Behr** and **S. Fredenhagen**, Variable transformation defects; **E. A. Bergshoeff** and **F. Riccioni**, The D-brane U-scan; **N. Carqueville** and **M. M. Kay**, An invitation to algebraic topological string theory; **A. Francis**, **T. Jarvis**, **D. Johnson**, and **R. Suggs**, Landau-Ginzburg mirror symmetry for orbifolded Frobenius algebras; **J. Fullwood** and **M. van Hoeij**, On Hirzebruch invariants of elliptic fibrations; **S. Grigorian**,  $G_2$ -structure deformations and warped products; **M. Hamanaka**, Non-commutative solitons and quasi-determinants; **B. Jurke**, Computing cohomology on toric varieties; **T. Kragh**, Fibrancy of symplectic homology in cotangent bundles; **D. Pomerleano**, Curved string topology and tangential Fukaya categories; **T. Rahn**, Target space dualities of heterotic grand unified theories; **F. F. Ruffino**, Freed-Witten anomaly and D-brane gauge theories; **J. Seo**, Singularity structure and massless dyons of pure Seiberg-Witten theories with SU and Sp gauge groups; **A. Sheshmani**, An introduction to the theory of higher rank stable pairs and virtual localization; **N. Sibilla**, HMS for

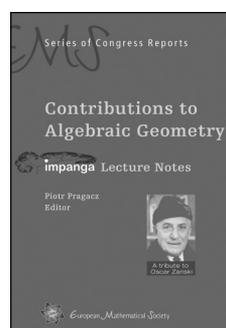
punctured tori and categorical mapping class group actions; **J. Yagi**, Vanishing chiral algebras and Höhn-Stolz conjecture.

**Proceedings of Symposia in Pure Mathematics**, Volume 85

November 2012, approximately 479 pages, Hardcover, ISBN: 978-0-8218-7295-6, 2010 *Mathematics Subject Classification*: 14-XX, 18-XX, 19-XX, 22-XX, 53-XX, 58-XX, 81-XX, 81Txx, 83-XX, 83Exx, 83E30, **AMS members US\$90.40**, List US\$113, Order code PSPUM/85

# New AMS-Distributed Publications

## Number Theory



## Contributions to Algebraic Geometry

Impanga Lecture Notes

**Piotr Pragacz**, *Polish Academy of Sciences, Warsaw, Poland*, Editor

The articles in this volume are the outcome of the Impanga Conference on Algebraic Geometry in 2010 at the Banach Center in Będlewo. The following spectrum of topics is covered:

- K3 surfaces and Enriques surfaces
- Prym varieties and their moduli
- invariants of singularities in birational geometry
- differential forms on singular spaces
- Minimal Model Program
- linear systems
- toric varieties
- Seshadri and packing constants
- equivariant cohomology
- Thom polynomials
- arithmetic questions

The main purpose of the volume is to give comprehensive introductions to the above topics, starting from an elementary level and ending with a discussion of current research.

The first four topics are represented by the notes from the mini courses held during the conference. In the articles, the reader will find classical results and methods, as well as modern ones.

This book is addressed to researchers and graduate students in algebraic geometry, singularity theory, and algebraic topology. Most of the material in this volume has not yet appeared in book form.

*This item will also be of interest to those working in algebra and algebraic geometry.*

A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

**Contents:** **P. Blass**, The influence of Oscar Zariski on algebraic geometry; **K. Altmann**, **N. O. Ilten**, **L. Petersen**, **H. Süß**, and

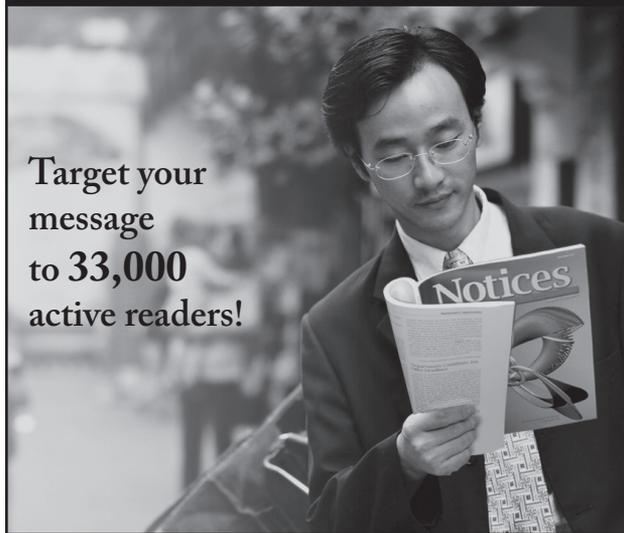
R. Vollmert, The geometry of  $T$ -varieties; D. Anderson, Introduction to equivariant cohomology in algebraic geometry; T. Bauer, C. Bocci, S. Cooper, S. Di Rocco, M. Dumnicki, B. Harbourne, K. Jabbusch, A. L. Knutsen, A. Küronya, R. Miranda, J. Roé, H. Schenck, T. Szemberg, and Z. Teitler, Recent developments and open problems in linear series; G. Bérczi, Moduli of map germs, Thom polynomials and the Green–Griffiths conjecture; P. Cascini and V. Lazić, The Minimal Model Program revisited; S. Cynk and S. Rams, Invariants of hypersurfaces and logarithmic differential forms; G. Farkas, Prym varieties and their moduli; L. Gatto and I. Scherbak, On generalized Wrońskians; K. Hutchinson and M. Vlasenko, Lines crossing a tetrahedron and the Bloch group; A. Hochenegger and F. Witt, On complex and symplectic toric stacks; C. Jörder and S. Kebekus, Deformation along subsheaves, II; M. Kapustka, Some degenerations of  $G_2$  and Calabi–Yau varieties; M. Michałek, Notes on Kebekus’ lectures on differential forms on singular spaces; S. Mukai, Lecture notes on  $K3$  and Enriques surfaces; M. Mustață, IMPANGA lecture notes on log canonical thresholds; O. Öztürk and P. Pragacz, On Schur function expansions of Thom polynomials; M. Szyjewski, A note on the kernel of the norm map; H. Tutaj-Gasińska, Seshadri and packing constants; List of contributors.

EMS Series of Congress Reports, Volume 6

August 2012, 516 pages, Hardcover, ISBN: 978-3-03719-114-9, 2010  
*Mathematics Subject Classification*: 14-06, AMS members US\$102.40,  
List US\$128, Order code EMSSCR/6

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