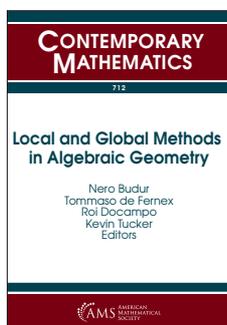


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Algebra and Algebraic Geometry



Local and Global Methods in Algebraic Geometry

Nero Budur, *KU Leuven, Belgium*,
Tommaso de Fernex, *University
of Utah, Salt Lake City, UT*,
Roi Docampo, *University of
Oklahoma, Norman, OK*, and
Kevin Tucker, *University of
Illinois at Chicago, IL*, Editors

This volume contains the proceedings of the conference Local and Global Methods in Algebraic Geometry, held from May 12–15, 2016, at the University of Illinois at Chicago, in honor of Lawrence Ein's 60th birthday.

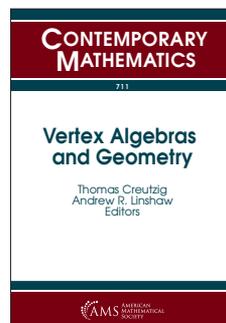
The articles cover a broad range of topics in algebraic geometry and related fields, including birational geometry and moduli theory, analytic and positive characteristic methods, geometry of surfaces, singularity theory, hyper-Kähler geometry, rational points, and rational curves.

Contents: **R. Lazarsfeld**, Some remarks on the work of Lawrence Ein; **A. Calabri** and **C. Ciliberto**, Contractible curves on a rational surface; **F. Catanese**, On the canonical map of some surfaces isogenous to a product; **C. Ciliberto**, **F. Flamini**, **C. Galati**, and **A. L. Knutsen**, Degeneration of differentials and moduli of nodal curves on $K3$ surfaces; **I. Coskun** and **J. Huizenga**, Weak Brill-Noether for rational surfaces; **R. Datta** and **K. E. Smith**, Excellence in prime characteristic; **M. González Villa**, **A. Libgober**, and **L. Maxim**, Motivic zeta functions and infinite cyclic covers; **C. Hacon**, **M. Popa**, and **C. Schnell**, Algebraic fiber spaces over abelian varieties: Around a recent theorem by Cao and Păun; **S. Ishii** and **W. Niu**, A strongly geometric general residual intersection; **J. Kollár**, Quadratic solutions of quadratic forms; **S. J. Kovács**, Non-Cohen-Macaulay canonical singularities; **N. Mok**, Full cones swept out by minimal rational curves on irreducible Hermitian symmetric spaces as examples of varieties underlying geometric substructures; **M. Mustață** and **Y. Nakamura**, A boundedness conjecture for minimal log discrepancies on a fixed germ;

E. Sernesi, The Wahl map of one-nodal curves on $K3$ surfaces; **Y.-T. Siu**, Skoda's ideal generation from vanishing theorem for semipositive Nakano curvature and Cauchy-Schwarz inequality for tensors; **C. Voisin**, Hyper-Kähler compactification of the intermediate Jacobian fibration of a cubic fourfold: The twisted case.

Contemporary Mathematics, Volume 712

August 2018, 368 pages, Softcover, ISBN: 978-1-4704-3488-5, LC 2018003650, 2010 *Mathematics Subject Classification*: 13A35, 13C40, 14B05, 14D06, 14G05, 14J25, 14J60, 32S55, 53B21, **AMS members US\$93.60**, List US\$117, Order code CONM/712



Vertex Algebras and Geometry

Thomas Creutzig, *University of
Alberta, Edmonton, AB, Canada*,
and **Andrew R. Linshaw**,
University of Denver, CO, Editors

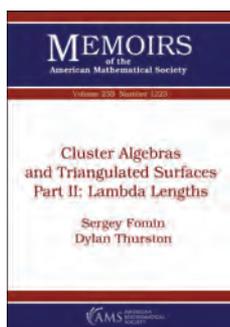
This book contains the proceedings of the AMS Special Session on Vertex Algebras and Geometry, held from October 8–9, 2016, and the mini-conference on Vertex Algebras, held from October 10–11, 2016, in Denver, Colorado.

The papers cover vertex algebras in connection with geometry and tensor categories, with topics in vertex rings, chiral algebroids, the Higgs branch conjecture, and applicability and use of vertex tensor categories.

Contents: **F. Malikov**, Strongly homotopy chiral algebroids; **T. Arakawa**, Associated varieties and Higgs branches (a survey); **G. Mason**, Vertex rings and their Pierce bundles; **T. Creutzig** and **A. R. Linshaw**, Cosets of the $\mathcal{W}^k(\mathfrak{sl}_4, f_{\text{subreg}})$ -algebra; **J. Yang**, A sufficient condition for convergence and extension property for strongly graded vertex algebras; **J. Auger** and **M. Rupert**, On infinite order simple current extensions of vertex operator algebras.

Contemporary Mathematics, Volume 711

August 2018, approximately 174 pages, Softcover, ISBN: 978-1-4704-3717-6, LC 2018003590, 2010 *Mathematics Subject Classification*: 81R10, 17B69, **AMS members US\$93.60**, List US\$117, Order code CONM/711



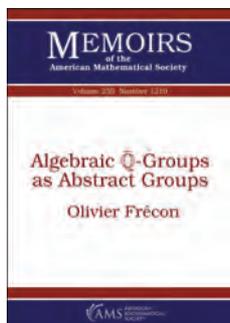
Cluster Algebras and Triangulated Surfaces Part II: Lambda Lengths

Sergey Fomin, *University of Michigan, Ann Arbor, MI*, and Dylan Thurston, *Indiana University, Bloomington, IN*

Contents: Introduction; Non-normalized cluster algebras; Rescaling and normalization; Cluster algebras of geometric type and their positive realizations; Bordered surfaces, arc complexes, and tagged arcs; Structural results; Lambda lengths on bordered surfaces with punctures; Lambda lengths of tagged arcs; Opened surfaces; Lambda lengths on opened surfaces; Non-normalized exchange patterns from surfaces; Laminations and shear coordinates; Shear coordinates with respect to tagged triangulations; Tropical lambda lengths; Laminated Teichmüller spaces; Topological realizations of some coordinate rings; Principal and universal coefficients; Appendix A. Tropical degeneration and relative lambda lengths; Appendix B. Versions of Teichmüller spaces and coordinates; Bibliography.

Memoirs of the American Mathematical Society, Volume 255, Number 1223

August 2018, 101 pages, Softcover, ISBN: 978-1-4704-2967-6, 2010 *Mathematics Subject Classification*: 13F60; 30F60, 57M50, **Individual member US\$46.80**, List US\$78, Institutional member US\$62.40, Order code MEMO/255/1223



Algebraic $\overline{\mathbb{Q}}$ -Groups as Abstract Groups

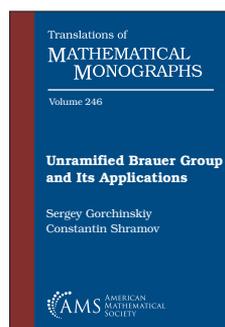
Olivier Frécon, *Laboratoire de Mathématiques et Applications, Université de Poitiers, France*

This item will also be of interest to those working in logic and foundations.

Contents: Introduction; Background material; Expanded pure groups; Unipotent groups over \mathbb{Q} and definable linearity; Definably affine groups; Tori in expanded pure groups; The definably linear quotients of an ACF-group; The group D_G and the Main Theorem for $K = \mathbb{Q}$; The Main Theorem for $K \neq \mathbb{Q}$; Bi-interpretability and standard isomorphisms; Acknowledgements; Bibliography; Index of notations; Index.

Memoirs of the American Mathematical Society, Volume 255, Number 1219

August 2018, 99 pages, Softcover, ISBN: 978-1-4704-2923-2, 2010 *Mathematics Subject Classification*: 20F11; 03C60, 14L17, 20E36, 20G15, **Individual member US\$46.80**, List US\$78, Institutional member US\$62.40, Order code MEMO/255/1219



Unramified Brauer Group and Its Applications

Sergey Gorchinskiy, *Steklov Mathematical Institute of Russian Academy of Sciences, Moscow, Russia*, and Constantin Shramov, *Steklov Mathematical Institute of Russian Academy of Sciences, Moscow, Russia*

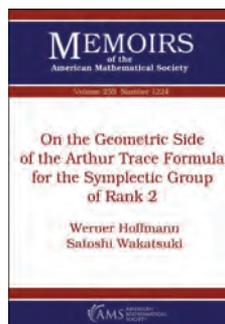
This book is devoted to arithmetic geometry with special attention given to the unramified Brauer group of algebraic varieties and its most striking applications in birational and Diophantine geometry. The topics include Galois cohomology, Brauer groups, obstructions to stable rationality, Weil restriction of scalars, algebraic tori, the Hasse principle, Brauer-Manin obstruction, and étale cohomology. The book contains a detailed presentation of an example of a stably rational but not rational variety, which is presented as series of exercises with detailed hints. This approach is aimed to help the reader understand crucial ideas without being lost in technical details. The reader will end up with a good working knowledge of the Brauer group and its important geometric applications, including the construction of unirational but not stably rational algebraic varieties, a subject which has become fashionable again in connection with the recent breakthroughs by a number of mathematicians.

This item will also be of interest to those working in number theory.

Contents: *Preliminaries on Galois cohomology:* Group Cohomology; Galois Cohomology; *Brauer group:* Brauer Group of a Field; Residue Map on a Brauer Group; *Applications to rationality problems:* Example of a Unirational Non-rational Variety; Arithmetic of Two-dimensional Quadratics; Non-rational Double Covers of \mathbb{P}^3 ; Weil Restriction and Algebraic Tori; Example of a Non-rational Stably Rational Variety; *Hasse principle and its failure:* Minkowski-Hasse Theorem; Brauer-Manin Obstruction; Étale Cohomology; Bibliography; Index.

Translations of Mathematical Monographs, Volume 246

August 2018, 200 pages, Hardcover, ISBN: 978-1-4704-4072-5, 2010 *Mathematics Subject Classification*: 16K50, 14E08; 14M20, 14G05, 20J06, 12G05, **AMS members US\$100.80**, List US\$126, Order code MMONO/246



On the Geometric Side of the Arthur Trace Formula for the Symplectic Group of Rank 2

Werner Hoffmann, *Universität Bielefeld, Germany*, and Satoshi Wakatsuki, *Institute of Science and Engineering, Kanazawa University, Japan*

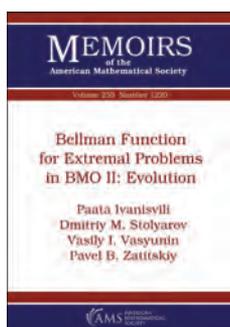
This item will also be of interest to those working in number theory.

Contents: Introduction; Preliminaries; A formula of Labesse and Langlands; Shintani zeta function for the space of binary quadratic forms; Structure of $\mathrm{GSp}(2)$; The geometric side of the trace formula for $\mathrm{GSp}(2)$; The geometric side of the trace formula for $\mathrm{Sp}(2)$; Appendix A. The group $\mathrm{GL}(3)$; Appendix B. The group $\mathrm{SL}(3)$; References.

Memoirs of the American Mathematical Society, Volume 255, Number 1224

August 2018, 88 pages, Softcover, ISBN: 978-1-4704-3102-0, 2010 *Mathematics Subject Classification*: 11F72, 11S90; 11R42, 11E45, 22E30, 22E35, **Individual member US\$46.80**, List US\$78, Institutional member US\$62.40, Order code MEMO/255/1224

Analysis



Bellman Function for Extremal Problems in BMO II: Evolution

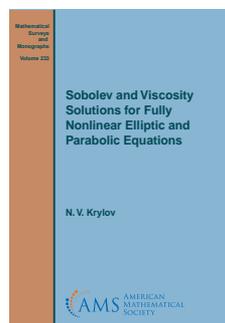
Paata Ivanisvili, *Kent State University, OH*, **Dmitriy M. Stolyarov**, *St. Petersburg State University, Russia*, **Vasily I. Vasyunin**, *Steklov Mathematical Institute, Russian Academy of Sciences, St. Petersburg, Russia*, and **Pavel B. Zatitskiy**, *St. Petersburg State University, Russia*

Contents: Introduction; Setting and sketch of proof; Patterns for Bellman candidates; Evolution of Bellman candidates; Optimizers; Related questions and further development; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 255, Number 1220

August 2018, 136 pages, Softcover, ISBN: 978-1-4704-2954-6, 2010 *Mathematics Subject Classification*: 42B35, 26D07, 52A10, 35E10, **Individual member US\$46.80**, List US\$78, Institutional member US\$62.40, Order code MEMO/255/1220

Differential Equations



Sobolev and Viscosity Solutions for Fully Nonlinear Elliptic and Parabolic Equations

N. V. Krylov, *University of Minnesota, Minneapolis, MN*

This book concentrates on first boundary-value problems for fully nonlinear second-order uniformly elliptic

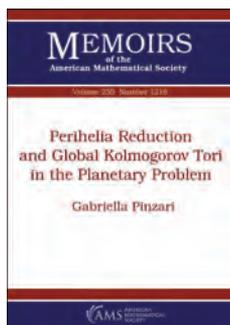
and parabolic equations with discontinuous coefficients. We look for solutions in Sobolev classes, local or global, or for viscosity solutions. Most of the auxiliary results, such as Aleksandrov's elliptic and parabolic estimates, the Krylov-Safonov and the Evans-Krylov theorems, are taken from old sources, and the main results were obtained in the last few years.

Presentation of these results is based on a generalization of the Fefferman-Stein theorem, on Fang-Hua Lin's like estimates, and on the so-called "ersatz" existence theorems, saying that one can slightly modify "any" equation and get a "cut-off" equation that has solutions with bounded derivatives. These theorems allow us to prove the solvability in Sobolev classes for equations that are quite far from the ones which are convex or concave with respect to the Hessians of the unknown functions. In studying viscosity solutions, these theorems also allow us to deal with classical approximating solutions, thus avoiding sometimes heavy constructions from the usual theory of viscosity solutions.

Contents: Bellman's equations with constant "coefficients" in the whole space; Estimates in L_p for solutions of the Monge-Ampère type equations; The Aleksandrov estimates; First results for fully nonlinear equations; Finite-difference equations of elliptic type; Elliptic differential equations of cut-off type; Finite-difference equations of parabolic type; Parabolic differential equations of cut-off type; A priori estimates in C^α for solutions of linear and nonlinear equations; Solvability in $W_{p,loc}^2$ of fully nonlinear elliptic equations; Nonlinear elliptic equations in $C_{loc}^{2+\alpha}(\Omega) \cap C(\bar{\Omega})$; Solvability in $W_{p,loc}^{1,2}$ of fully nonlinear parabolic equations; Elements of the $C^{2+\alpha}$ -theory of fully nonlinear elliptic and parabolic equations; Nonlinear elliptic equations in $W_p^2(\Omega)$; Nonlinear parabolic equations in $W_p^{1,2}$; $C^{1+\alpha}$ -regularity of viscosity solutions of general parabolic equations; $C^{1+\alpha}$ -regularity of L_p -viscosity solutions of the Isaacs parabolic equations with almost VMO coefficients; Uniqueness and existence of extremal viscosity solutions for parabolic equations; Appendix A. Proof of Theorem 6.2.1; Appendix B. Proof of Lemma 9.2.6; Appendix C. Some tools from real analysis; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 233

September 2018, 456 pages, Hardcover, ISBN: 978-1-4704-4740-3, 2010 *Mathematics Subject Classification*: 35-02; 35J60, 35K55, **AMS members US\$97.60**, List US\$122, Order code SURV/233



Perihelia Reduction and Global Kolmogorov Tori in the Planetary Problem

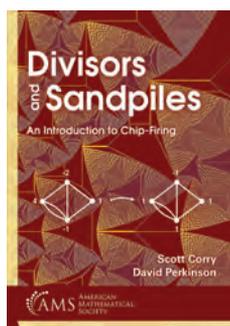
Gabriella Pinzari, *Università di Napoli, Italy*

Contents: Background and results; Kepler maps and the Perihelia reduction; The P-map and the planetary problem; Global Kolmogorov tori in the planetary problem; Proofs; Appendix A. Computing the domain of holomorphy; Appendix B. Proof of Lemma 3.2; Appendix C. Checking the non-degeneracy condition; Appendix D. Some results from perturbation theory; Appendix E. More on the geometrical structure of the P-coordinates, compared to Deprit's coordinates; Bibliography.

Memoirs of the American Mathematical Society, Volume 255, Number 1218

August 2018, 92 pages, Softcover, ISBN: 978-1-4704-4102-9, 2010 *Mathematics Subject Classification*: 34C20, 70F10, 37J10, 37J15, 37J40; 34D10, 70F07, 70F15, 37J25, 37J45, **Individual member US\$46.80**, List US\$78, Institutional member US\$62.40, Order code MEMO/255/1218

Discrete Mathematics and Combinatorics



Divisors and Sandpiles

An Introduction to Chip-Firing

Scott Corry, *Lawrence University, Appleton, WI*, and David Perkinson, *Reed College, Portland, OR*

Divisors and Sandpiles provides an introduction to the combinatorial theory

of chip-firing on finite graphs. Part 1 motivates the study of the discrete Laplacian by introducing the dollar game. The resulting theory of divisors on graphs runs in close parallel to the geometric theory of divisors on Riemann surfaces, and Part 1 culminates in a full exposition of the graph-theoretic Riemann-Roch theorem due to M. Baker and S. Norine. The text leverages the reader's understanding of the discrete story to provide a brief overview of the classical theory of Riemann surfaces.

Part 2 focuses on sandpiles, which are toy models of physical systems with dynamics controlled by the discrete Laplacian of the underlying graph. The text provides a careful introduction to the sandpile group and the abelian sandpile model, leading ultimately to L. Levine's threshold density theorem for the fixed-energy sandpile Markov chain. In a precise sense, the theory of sandpiles is dual to the theory of divisors, and there are many beautiful connections between the first two parts of the book.

Part 3 addresses various topics connecting the theory of chip-firing to other areas of mathematics, including the matrix-tree theorem, harmonic morphisms, parking functions, M -matrices, matroids, the Tutte polynomial, and simplicial homology. The text is suitable for advanced undergraduates and beginning graduate students.

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

Contents: *Divisors:* The dollar game; The Laplacian; Algorithms for winning; Acyclic orientations; Riemann-Roch; *Sandpiles:* The sandpile group; Burning and duality; Threshold density; *Topics:* Trees; Harmonic morphisms; Divisors on complete graphs; More about sandpiles; Cycles and cuts; Matroids and the Tutte polynomial; Higher dimensions; *Appendices:* Appendix A; Appendix B; Glossary of symbols; Bibliography; Index.

August 2018, 329 pages, Softcover, ISBN: 978-1-4704-4218-7, LC 2018008412, 2010 *Mathematics Subject Classification*: 05C25, 05C50, 05C99, **AMS members US\$63.20**, List US\$79, Order code MBK/114



Extremal Problems for Finite Sets

Peter Frankl, *Rényi Institute, Budapest, Hungary*, and Norihide Tokushige, *Ryukyu University, Okinawa, Japan*

One of the great appeals of Extremal Set Theory as a subject is that the statements are easily accessible without a lot of mathematical background, yet the proofs

and ideas have applications in a wide range of fields including combinatorics, number theory, and probability theory. Written by two of the leading researchers in the subject, this book is aimed at mathematically mature undergraduates, and highlights the elegance and power of this field of study.

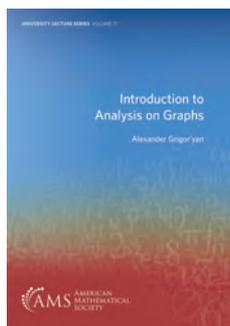
The first half of the book provides classic results with some new proofs including a complete proof of the Ahlswede-Khachatrian theorem as well as some recent progress on the Erdős matching conjecture. The second half presents some combinatorial structural results and linear algebra methods including the Deza-Erdős-Frankl theorem, application of Rödl's packing theorem, application of semidefinite programming, and very recent progress (obtained in 2016) on the Erdős-Szemerédi sunflower conjecture and capset problem. The book concludes with a collection of challenging open problems.

Contents: Introduction; Operations on sets and set systems; Theorems on traces; The Erdős-Ko-Rado theorem via shifting; Katona's circle; The Kurskal-Katona theorem; Kleitman theorem for no s pairwise disjoint sets; The Hilton-Milner theorem; The Erdős matching conjecture; The Ahswede-Khachatrian theorem; Pushing-pulling method; Uniform measure versus product measure; Kleitman's correlation inequality; r -cross union families; Random walk method; L -systems; Exponent of $(10, \{0, 1, 3, 6\})$ -system; The Deza-Erdős-Frankl theorem; Füredi's structure theorem; Rödl's packing theorem; Upper bounds using multilinear polynomials; Application to discrete geometry; Upper bounds using inclusion matrices; Some algebraic constructions for L -systems; Oddtown and eventown problems; Tensor product method; The ratio bound; Measures of cross independent sets; Application of semidefinite programming; A cross intersection

problem with measures; Capsets and sunflowers; Challenging open problems; Bibliography; Index.

Student Mathematical Library, Volume 86

August 2018, 224 pages, Softcover, ISBN: 978-1-4704-4039-8, 2010 *Mathematics Subject Classification*: 05-01, 05D05, **All Individuals US\$41.60**, List US\$52, Institutional member US\$41.60, Order code STML/86



Introduction to Analysis on Graphs

Alexander Grigor'yan,
University of Bielefeld, Germany

A central object of this book is the discrete Laplace operator on finite and infinite graphs. The eigenvalues of the discrete Laplace operator have long been used in graph theory as a convenient tool for understanding the structure of

complex graphs. They can also be used in order to estimate the rate of convergence to equilibrium of a random walk (Markov chain) on finite graphs. For infinite graphs, a study of the heat kernel allows to solve the type problem—a problem of deciding whether the random walk is recurrent or transient.

This book starts with elementary properties of the eigenvalues on finite graphs, continues with their estimates and applications, and concludes with heat kernel estimates on infinite graphs and their application to the type problem.

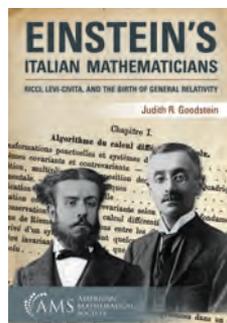
The book is suitable for beginners in the subject and accessible to undergraduate and graduate students with a background in linear algebra I and analysis I. It is based on a lecture course taught by the author and includes a wide variety of exercises. The book will help the reader to reach a level of understanding sufficient to start pursuing research in this exciting area.

Contents: The Laplace operator on graphs; Spectral properties of the Laplace operator; Geometric bounds for the eigenvalues; Eigenvalues on infinite graphs; Estimates of the heat kernel; The type problem; Exercises; Bibliography; Index.

University Lecture Series, Volume 71

September 2018, 168 pages, Softcover, ISBN: 978-1-4704-4397-9, 2010 *Mathematics Subject Classification*: 05C50, 05C63, 05C76, 05C81, 60J10, **AMS members US\$39.20**, List US\$49, Order code ULECT/71

General Interest



Einstein's Italian Mathematicians

Ricci, Levi-Civita, and the Birth of General Relativity

Judith R. Goodstein, *California Institute of Technology, Pasadena, CA*

In the first decade of the twentieth century as Albert Einstein began

formulating a revolutionary theory of gravity, the Italian mathematician Gregorio Ricci was entering the later stages of what appeared to be a productive if not particularly memorable career, devoted largely to what his colleagues regarded as the dogged development of a mathematical language he called the absolute differential calculus. In 1912, the work of these two dedicated scientists would intersect—and physics and mathematics would never be the same. *Einstein's Italian Mathematicians* chronicles the lives and intellectual contributions of Ricci and his brilliant student Tullio Levi-Civita, including letters, interviews, memoranda, and other personal and professional papers, to tell the remarkable, little-known story of how two Italian academicians, of widely divergent backgrounds and temperaments, came to provide the indispensable mathematical foundation—today known as the tensor calculus—for general relativity.

A wonderfully written chronicle of the lives of two great mathematicians and how their work shaped Einstein's masterpiece as well as ushering in new fields of mathematics. The book is also an intriguing and insightful portrait of Italy during the period from Italian independence in 1870 until the onset of World War II.

—**Gino Segre**, *Physics Department, University of Pennsylvania*

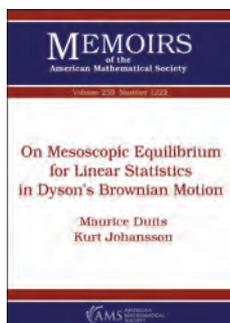
Galileo said that mathematics is the language of nature. Einstein might have found himself mute when it came to describing gravity if it weren't for the mathematics of covariant derivatives developed by Galileo's countrymen Gregorio Ricci-Curbastro and Tullio Levi-Civita. Judy Goodstein tells their stories and their connection to Einstein with clarity and grace in a most readable book.

—**Barry Simon**, *California Institute of Technology*

Contents: The Ricci of Lugo; The making of a mathematician; Munich; Padua; Math and marriage; A promotion that wasn't; The absolute differential calculus; The alter ego; Intermezzo; The indispensable mathematical tool; "Write to me next time in Italian"; Parallel displacements; From Ricci's absolute differential calculus to Einstein's theorem for general relativity; T. Levi-Civita, "Gregorio Ricci-Curbastro"; Obituary of Tullio Levi-Civita; Selected references; Notes; Index.

August 2018, approximately 227 pages, Softcover, ISBN: 978-1-4704-2846-4, 2010 *Mathematics Subject Classification*: 01-02, 01A55, 01A60, 01A70, 83-03, **AMS members US\$28**, List US\$35, Order code MBK/113

Mathematical Physics



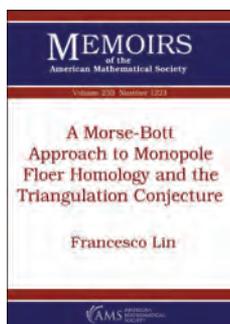
On Mesoscopic Equilibrium for Linear Statistics in Dyson's Brownian Motion

Maurice Duits, *Royal Institute of Technology, Stockholm, Sweden*, and Kurt Johansson, *Royal Institute of Technology, Stockholm, Sweden*

Contents: Introduction; Statement of results; Proof of Theorem 2.1; Proof of Theorem 2.3; Asymptotic analysis of K_n and R_n ; Proof of Proposition 2.4 ; Proof of Lemma 4.3; Random initial points; Proof of Theorem 2.6: the general case; Appendix A. Appendix; Bibliography.

Memoirs of the American Mathematical Society, Volume 255, Number 1222

August 2018, 114 pages, Softcover, ISBN: 978-1-4704-2964-5, **Individual member US\$46.80**, List US\$78, Institutional member US\$62.40, Order code MEMO/255/1222



A Morse-Bott Approach to Monopole Floer Homology and the Triangulation Conjecture

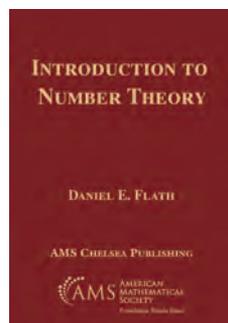
Francesco Lin, *Massachusetts Institute of Technology, Cambridge, MA*

Contents: Introduction; Basic setup; The analysis of Morse-Bott singularities; Floer homology for Morse-Bott singularities; Pin(2)-monopole Floer homology; Bibliography.

Memoirs of the American Mathematical Society, Volume 255, Number 1221

August 2018, 162 pages, Softcover, ISBN: 978-1-4704-2963-8, **Individual member US\$46.80**, List US\$78, Institutional member US\$62.40, Order code MEMO/255/1221

Number Theory



Introduction to Number Theory

Daniel E. Flath

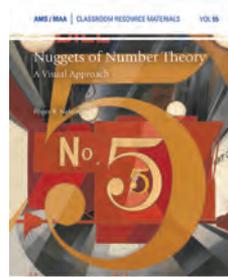
Growing out of a course designed to teach Gauss's *Disquisitiones Arithmeticae* to honors-level undergraduates, Flath's *Introduction to Number Theory* focuses on Gauss's theory of binary quadratic forms. It is suitable for use as a textbook in a course or self-study by advanced undergraduates or graduate students who possess a basic familiarity with abstract algebra. The text treats a variety of topics from elementary number theory including the distribution of primes, sums of squares, continued fractions, the Legendre, Jacobi and Kronecker symbols, the class group and genera. But the focus is on quadratic reciprocity (several proofs are given including one that highlights the $p - q$ symmetry) and binary quadratic forms. The reader will come away with a good understanding of what Gauss intended in the *Disquisitiones* and Dirichlet in his *Vorlesungen*. The text also includes a lovely appendix by J. P. Serre titled $\Delta = b^2 - 4ac$.

The clarity of the author's vision is matched by the clarity of his exposition. This is a book that reveals the discovery of the quadratic core of algebraic number theory. It should be on the desk of every instructor of introductory number theory as a source of inspiration, motivation, examples, and historical insight.

Contents: Prime numbers and unique factorization; Sums of two squares; Quadratic reciprocity; Indefinite forms; The class group and genera; $\Delta = b^2 - 4ac^*$; Tables; Errata to "Introduction to number theory"; Bibliography; Subject index; Notation index.

AMS Chelsea Publishing, Volume 384

August 2018, 212 pages, Hardcover, ISBN: 978-1-4704-4694-9, LC 2018014214, 2010 *Mathematics Subject Classification*: 11-01, **AMS members US\$42.40**, List US\$53, Order code CHEL/384.H



Nuggets of Number Theory

A Visual Approach

Roger B. Nelsen, *Lewis & Clark College, Portland, OR*

Nuggets of Number Theory will attract fans of visual thinking, number theory, and surprising connections. This book contains hundreds of visual explanations of results from elementary number theory. Figurate numbers and Pythagorean triples feature prominently, of course, but there are also proofs of Fermat's Little and Wilson's Theorems. Fibonacci and perfect numbers, Pell's equation, and continued fractions all find visual representation in this charming collection. It will be a rich source of visual inspiration for anyone teaching, or learning, number theory and will provide endless pleasure to those interested in looking at number theory with new eyes. Author Roger Nelsen is a long-time contributor of "Proofs Without Words"

in the MAA's *Mathematics Magazine* and *College Mathematics Journal*. This is his twelfth book with MAA Press.

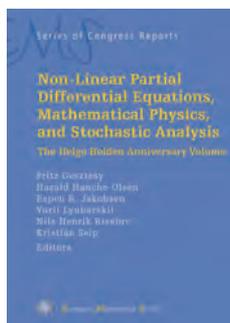
Contents: Figurate numbers; Congruence; Diophantine equations; Pythagorean triples; Irrational numbers; Fibonacci and Lucas numbers; Perfect numbers; Solutions to the exercises; Bibliography; Index.

Classroom Resource Materials, Volume 55

September 2018, 153 pages, Softcover, ISBN: 978-1-4704-4398-6, LC 2018000043, 2010 *Mathematics Subject Classification*: 11-01; 11A07, 11B39, 11D04, **Individual member US\$33.75**, List US\$45, Institutional member US\$36, Order code CLRM/55

New AMS-Distributed Publications

Algebra and Algebraic Geometry



Non-Linear Partial Differential Equations, Mathematical Physics, and Stochastic Analysis

The Helge Holden Anniversary Volume

Fritz Gesztesy, *Baylor University, Waco, Texas*, **Harald Hanche-Olsen**, **Espen R. Jakobsen**, **Yurii Lyubarskii**, *Norwegian University of Science and Technology, Trondheim, Norway*, **Nils Henrik Risebro**, *University of Oslo, Norway*, and **Kristian Seip**, *Norwegian University of Science and Technology, Trondheim, Norway*, Editors

This volume is dedicated to Helge Holden on the occasion of his 60th anniversary. It collects contributions by numerous scientists with expertise in non-linear partial differential equations (PDEs), mathematical physics, and stochastic analysis, reflecting to a large degree Helge Holden's longstanding research interests.

Accordingly, the problems addressed in the contributions deal with a large range of topics, including, in particular, infinite-dimensional analysis, linear and nonlinear PDEs, stochastic analysis, spectral theory, completely integrable systems, random matrix theory, and chaotic dynamics and sestina

poetry. They represent to some extent the lectures presented at the conference *Non-linear PDEs, Mathematical Physics and Stochastic Analysis*, held at the Norwegian University of Science and Technology, Trondheim, July 4–7, 2016.

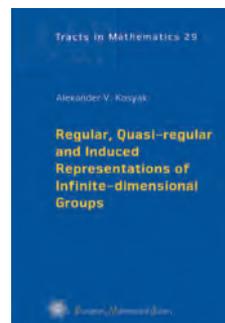
The mathematical tools involved draw from a wide variety of techniques in functional analysis, operator theory, and probability theory. This collection of research papers will be of interest to any active scientist working in one of the above-mentioned areas.

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

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

EMS Series of Congress Reports, Volume 14

June 2018, 436 pages, Hardcover, ISBN: 978-3-03719-186-6, 2010 *Mathematics Subject Classification*: 15B52, 35J10, 35L65, 35Q41, 35Q51, 35Q53, 37K10, 42B20, 46N20, 46N30, 46T12, 47B36, 47F05, 60H20, 68N30, 76S05; 33C45, 35A01, 35A02, 35L80, 37D45, 39A12, 47A10, 47N20, 60B20, **AMS members US\$94.40**, List US\$118, Order code EMSSCR/14



Regular, Quasi-regular and Induced Representations of Infinite-dimensional Groups

Alexander V. Kosyak, *National Academy of Science of Ukraine, Kiev, Ukraine*

Almost all harmonic analysis on locally compact groups is based on the existence (and uniqueness) of a Haar measure. Therefore, it is very natural to attempt a similar construction for non-locally compact groups. The essential idea is to replace the non-existing Haar measure on an infinite-dimensional group by a suitable quasi-invariant measure on an appropriate completion of the initial group or on the completion of a homogeneous space.

The aim of the book is a systematic development, by example, of noncommutative harmonic analysis on infinite-dimensional (non-locally compact) matrix groups. We generalize the notion of regular, quasiregular and induced representations for arbitrary infinite-dimensional groups. The central idea to verify the irreducibility is the Ismagilov conjecture. The author also extends the Kirillov orbit method for the group of upper triangular matrices of infinite order.

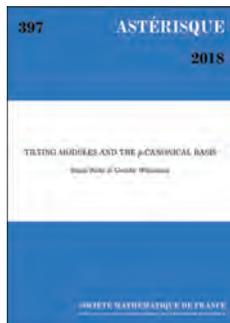
In order to make the content accessible to a wide audience of nonspecialists, the exposition is essentially self-contained and very few prerequisites are needed. The book is aimed at graduate and advanced undergraduate students, as well as mathematicians looking for an introduction to representations of infinite-dimensional groups.

This item will also be of interest to those working in probability and statistics.

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

EMS Tracts in Mathematics, Volume 29

June 2018, 587 pages, Hardcover, ISBN: 978-3-03719-181-1, 2010 *Mathematics Subject Classification*: 22E66, 22E65; 60B15, 28C20, **AMS members US\$94.40**, List US\$118, Order code EMSTM/29



Tilting Modules and the p -Canonical Basis

Simon Riche, *Université Clermont Auvergne, Clermont-Ferrand, France*, and **Geordie Williamson**, *University of Sydney, Australia*

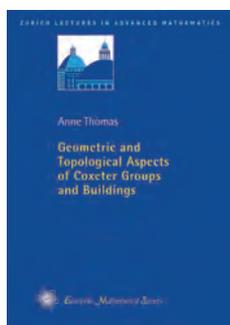
In this book, the authors propose a new approach to tilting modules for reductive algebraic groups in positive characteristic. They conjecture that translation functors give an action of the (diagrammatic) Hecke category of the affine Weyl group on the principal block. Their conjecture implies character formulas for the simple and tilting modules in terms of the p -canonical basis, as well as a description of the principal block as the antispherical quotient of the Hecke category. The authors prove their conjecture for $GL_n(k)$ using the theory of 2-Kac-Moody actions.

Finally, the authors prove that the diagrammatic Hecke category of a general crystallographic Coxeter group may be described in terms of parity complexes on the flag variety of the corresponding Kac-Moody group.

A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Astérisque, Number 397

May 2018, 184 pages, Softcover, ISBN: 978-2-85629-880-0, 2010 *Mathematics Subject Classification*: 17B10, 20G15, 14F05, **AMS members US\$53.60**, List US\$67, Order code AST/397



Geometric and Topological Aspects of Coxeter Groups and Buildings

Anne Thomas, *University of Sydney, Australia*

Coxeter groups are groups generated by reflections. They appear throughout mathematics. Tits developed the general theory of Coxeter groups in order to develop the theory of buildings. Buildings have interrelated algebraic, combinatorial and geometric structures and are powerful tools for understanding the groups which act on them.

These notes focus on the geometry and topology of Coxeter groups and buildings, especially nonspherical cases. The emphasis is on geometric intuition, and there are many examples and illustrations. Part I describes Coxeter groups and their geometric realizations, particularly the Davis complex, and Part II gives a concise introduction to buildings.

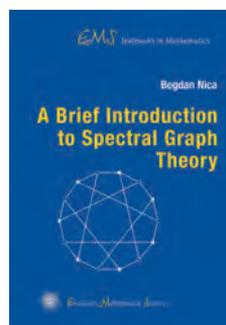
This book will be suitable for graduate students and researchers in geometric group theory, as well as algebra and combinatorics. The assumed background is basic group theory, including group actions, and basic algebraic topology, together with some knowledge of Riemannian geometry.

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

Zurich Lectures in Advanced Mathematics, Volume 24

June 2018, 160 pages, Softcover, ISBN: 978-3-03719-189-7, 2010 *Mathematics Subject Classification*: 20F55; 20E42, 51E24, 57M07, **AMS members US\$31.20**, List US\$39, Order code EMSZLEC/24

Discrete Mathematics and Combinatorics



A Brief Introduction to Spectral Graph Theory

Bogdan Nica, *McGill University, Montreal, Canada*

Spectral graph theory starts by associating matrices to graphs—notably, the adjacency matrix and the Laplacian matrix. The general theme is then, first, to compute or estimate the eigenvalues of such matrices, and, second, to relate

the eigenvalues to structural properties of graphs. As it turns out, the spectral perspective is a powerful tool. Some of its loveliest applications concern facts that are, in principle, purely graph theoretic or combinatorial.

This text is an introduction to spectral graph theory, but it could also be seen as an invitation to algebraic graph theory. The first half is devoted to graphs, finite fields, and how they come together. This part provides an appealing motivation and context for the second spectral half. The text is enriched by many exercises and their solutions.

The target audience is students at the upper undergraduate level and above. The book only assumes a familiarity with linear algebra and basic group theory. Graph theory, finite fields, and character theory for abelian groups receive a concise overview and render the text essentially self-contained.

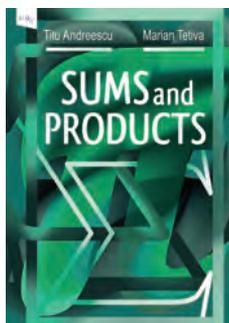
This item will also be of interest to those working in number theory.

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

EMS Textbooks in Mathematics, Volume 21

June 2018, 168 pages, Hardcover, ISBN: 978-3-03719-188-0, 2010 *Mathematics Subject Classification*: 05-01, 05C50; 05C25, 11T24, 15A42, **AMS members US\$38.40**, List US\$48, Order code EMSTEXT/21

Math Education



Sums and Products

Titu Andreescu, *University of Texas at Dallas, TX*, and **Marian Tetiva**, *Rosca Codreanu National College, Barlad, Romania*

The main areas covered are:
(1) telescoping sums and products in algebra and trigonometry; (2) the use of complex numbers and de Moivre's formula; (3) Abel's summation formula;

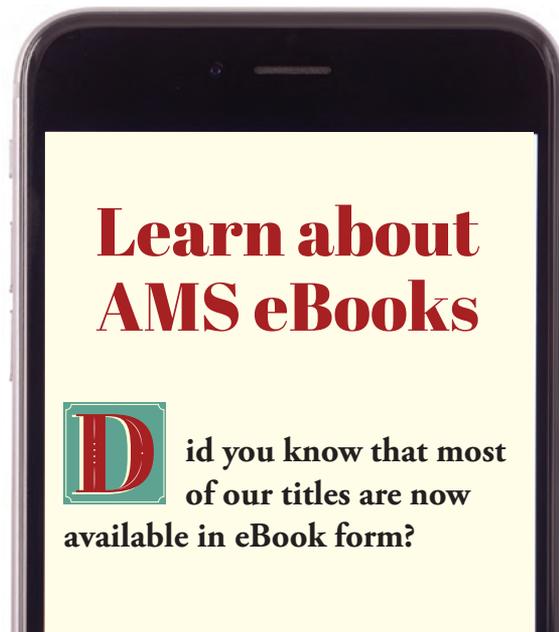
(4) mathematical induction; (5) combinatorial identities; and (6) multiplicative functions and the use of Möbius function.

The theory is presented together with rich examples. At the end, readers are invited to solve problems from a list of 125 questions divided into three levels.

A publication of XYZ Press. Distributed in North America by the American Mathematical Society.

XYZ Series, Volume 31

April 2018, 340 pages, Hardcover, ISBN: 978-0-9993428-1-7, 2010 *Mathematics Subject Classification*: 00A05, 00A07, 97U40, 97D50, AMS members US\$47.96, List US\$59.95, Order code XYZ/31



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