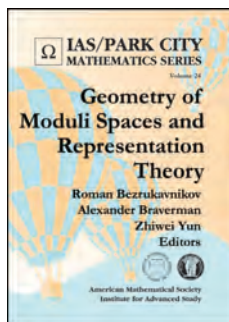


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Algebra and Algebraic Geometry



Geometry of Moduli Spaces and Representation Theory

Roman Bezrukavnikov,
*Massachusetts Institute of
Technology, Cambridge,
MA, Alexander Braverman*,
*University of Toronto, ON,
Canada, Perimeter Institute for
Theoretical Physics, Waterloo,
ON, Canada, and Skolkovo
Institute for Science and
Technology, Moscow, Russia, and
Zhiwei Yun*, *Yale University,
New Haven, CT*, Editors

This book is based on lectures given at the Graduate Summer School of the 2015 Park City Mathematics Institute program “Geometry of moduli spaces and representation theory”, and is devoted to several interrelated topics in algebraic geometry, topology of algebraic varieties, and representation theory.

Geometric representation theory is a young but fast developing research area at the intersection of these subjects. An early profound achievement was the famous conjecture by Kazhdan–Lusztig about characters of highest weight modules over a complex semi-simple Lie algebra, and its subsequent proof by Beilinson–Bernstein and Brylinski–Kashiwara. Two remarkable features of this proof have inspired much of subsequent development: intricate algebraic data turned out to be encoded in topological invariants of singular geometric spaces, while proving this fact required deep general theorems from algebraic geometry.

Another focus of the program was enumerative algebraic geometry. Recent progress showed the role of Lie theoretic structures in problems such as calculation of quantum cohomology, K-theory, etc. Although the motivation and technical background of these

constructions is quite different from that of geometric Langlands duality, both theories deal with topological invariants of moduli spaces of maps from a target of complex dimension one. Thus they are at least heuristically related, while several recent works indicate possible strong technical connections.

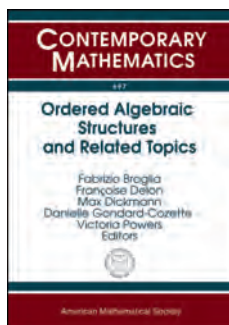
The main goal of this collection of notes is to provide young researchers and experts alike with an introduction to these areas of active research and promote interaction between the two related directions.

Titles in this series are co-published with the Institute for Advanced Study/Park City Mathematics Institute. Members of the Mathematical Association of America (MAA) and the National Council of Teachers of Mathematics (NCTM) receive a 20% discount from list price. *NOTE: This discount does not apply to volumes in this series co-published with the Society for Industrial and Applied Mathematics (SIAM).*

Contents: **M. A. de Cataldo**, Perverse sheaves and the topology of algebraic varieties; **X. Zhu**, An introduction to affine Grassmannians and the geometric Satake equivalence; **Z. Yun**, Lectures on Springer theories and orbital integrals; **N. G. Ch au**, Perverse sheaves and fundamental lemmas; **A. Okounkov**, Lectures on K -theoretic computations in enumerative geometry; **H. Nakajima**, Lectures on perverse sheaves on instanton moduli spaces.

IAS/Park City Mathematics Series, Volume 24

November 2017, 448 pages, Hardcover, ISBN: 978-1-4704-3574-5, LC 2017018956, 2010 *Mathematics Subject Classification*: 14N35, 14M17, 14D24, 22E57, 22E67, **AMS members US\$83.20**, List US\$104, Order code PCMS/24



Ordered Algebraic Structures and Related Topics

Fabrizio Broglia, *Università di Pisa, Italy*, **Françoise Delon**, *Université Paris Diderot, France*, **Max Dickmann**, *Université Paris Diderot, France*, **Danielle Gondard-Cozette**, *Université Pierre et Marie Curie, Paris, France*, and **Victoria Ann Powers**, *Emory University, Atlanta, Ga*, Editors

This volume contains the proceedings of the international conference “Ordered Algebraic Structures and Related Topics”, held from October 12–16, 2015, at CIRM, Luminy, Marseilles, France.

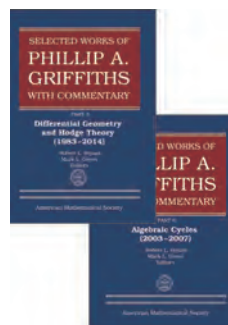
Papers contained in this volume cover topics in real analytic geometry, real algebra, and real algebraic geometry including complexity issues, model theory of various algebraic and differential structures, Witt equivalence of fields, and the moment problem.

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

Contents: F. Acquistapace, F. Broglia, and J. F. Fernando, Some results on global real analytic geometry; M. Aschenbrenner, L. van den Dries, and J. van der Hoeven, Dimension in the realm of transseries; V. Astier and T. Unger, Stability index of algebras with involution; S. Basu and C. Riener, Efficient algorithms for computing the Euler-Poincaré characteristic of symmetric semi-algebraic sets; L. Chua, D. Plaumann, R. Sinn, and C. Vinzant, Gram spectrahedra; M. Dickmann, F. Miraglia, and A. Petrovich, Constructions in the category of real semigroups; A. Fehm and F. Jahnke, Recent progress on definability of Henselian valuations; J. F. Fernando, M. Gamboa, and C. Ueno, Polynomial, regular and Nash images of Euclidean spaces; P. Gładki, Witt equivalence of fields: A survey with a special emphasis on applications of hyperfields; M. Infusino and S. Kuhlmann, Infinite dimensional moment problem: Open questions and applications; T.-L. Kriel, A new proof for the existence of degree bounds for Putinar’s Positivstellensatz; F.-V. Kuhlmann, K. Kuhlmann, and F. Sonaallah, Coincidence point theorems for ball spaces and their applications; F.-V. Kuhlmann and S. Kuhlmann, Valuation theory of exponential Hardy fields II: Principal parts of germs in the Hardy field of \mathcal{O} -minimal exponential expansions of the reals; H. Lombardi and A. Mahboubi, Théories géométriques pour l’algèbre des nombres réels; V. Mantova and M. Matusinski, Surreal numbers with derivation, Hardy fields and transseries: A survey; C. Scheiderer and S. Wenzel, Polynomials nonnegative on the cylinder; N. Schwartz, Positive semifields and their ideals; M. Tressl, On the strength of some topological lattices; D. Trotman and G. Valette, On the local geometry of definably stratified sets.

Contemporary Mathematics, Volume 697

October 2017, 384 pages, Softcover, ISBN: 978-1-4704-2966-9, LC 2017015042, 2010 *Mathematics Subject Classification*: 03Cxx, 06Fxx, 11Exx, 12-XX, 14Pxx, 14Qxx, 32Sxx, 44A60, 54C30, 58A07, **AMS members US\$88.80**, List US\$111, Order code CONM/697



Selected Works of Philip A. Griffiths with Commentary (The Set)

Robert L. Bryant, *Duke University, Durham, NC*, and **Mark L. Green**, *University of California, Los Angeles, CA*, Editors

In the period since the original four volumes of Phillip Griffiths’s *Selecta* were published (*Selected Works of Phillip A. Griffiths with Commentary*, Parts 1–4, *Collected Works*, Volume 18), Griffiths has continued to produce beautiful and important work. The current two-part publication brings Griffiths’s *Selecta* up to date by including the majority of his recent articles, as well as two older papers on differential geometry whose length had precluded their inclusion in the original *Selecta*.

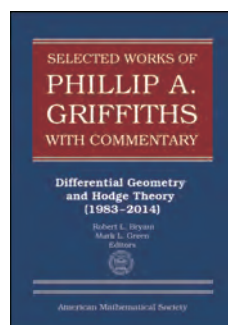
The papers are organized along the three main topics: Differential Geometry and Hodge Theory (Part 5) and Algebraic Cycles (Part 6). In addition to his papers, Griffiths has been an author of a number of research monographs. To give the reader an overview of what these monographs contain, introductions to some of these are also included.

This item will also be of interest to those working in geometry and topology.

Each volume in this set is sold separately. For a description of each volume, see the New Publication entries that follow.

Collected Works, Volume 26

Set: November 2017, 785 pages, Hardcover, ISBN: 978-1-4704-3655-1, LC 2017010885, 2010 *Mathematics Subject Classification*: 14C15, 14C25, 14C30, 14D07, 20G05, 32G20, 32M10, 32S35, 58C15, 53B25, 53C42, 58A15, **AMS members US\$200**, List US\$250, Order code CWORKS/26



Selected Works of Philip A. Griffiths with Commentary

Differential Geometry and Hodge Theory (1983–2014)

Robert L. Bryant, *Duke University, Durham, NC*, and **Mark L. Green**, *University of California, Los Angeles, CA*, Editors

In the period since the original four volumes of Phillip Griffiths’s *Selecta* were published (*Selected Works of Phillip A. Griffiths with Commentary*, Parts 1–4, *Collected Works*, Volume 18), Griffiths has continued to produce beautiful and important work. The current two-part publication brings Griffiths’s *Selecta* up to date by including the majority of his recent articles, as well as two older papers on differential geometry whose length had precluded their inclusion in the original *Selecta*.

The papers are organized along the three main topics, with Part 5 containing papers on Differential Geometry and Hodge Theory and Part 6 containing papers on Algebraic Cycles. In addition

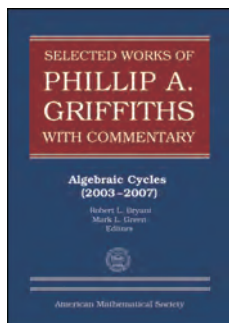
to his papers, Griffiths has been an author of a number of research monographs. To give the reader an overview of what these monographs contain, introductions to some of these are also included.

This item will also be of interest to those working in geometry and topology.

Contents: J. Carlson, M. Green, and P. Griffiths, Variations of Hodge structure considered as an exterior and differential system: Old and new results; M. Green and M. Kerr, Introduction from Mumford-Tate groups and domains: Their geometry and arithmetic; M. Green and M. Kerr, Introduction from Introduction to Hodge theory, complex geometry, and representation theory; E. Berger, R. Bryant, and P. Griffiths, The Gauss equations and rigidity of isometric embeddings; R. L. Bryant, P. A. Griffiths, and D. Yang, Characteristics and existence of isometric embeddings; M. Green, P. Griffiths, and C. Robles, Extremal degenerations of polarized Hodge structures; P. Griffiths, C. Robles, and D. Toledo, Quotients of non-classical flag domains are not algebraic; M. Green, P. Griffiths, and M. Kerr, Néron models and boundary components for degenerations of Hodge structure of mirror quintic type; M. Green, P. Griffiths, and M. Kerr, Néron models and limits of Abel-Jacobi mappings.

Collected Works, Volume 26, Part 1

November 2017, 489 pages, Hardcover, ISBN: 978-1-4704-3656-8, LC 2017010885, 2010 *Mathematics Subject Classification*: 14C15, 14C25, 14C30, 14D07, 20G05, 32G20, 32M10, 32S35, 58C15, 53B25, 53C42, 58A15, **AMS members US\$126.40**, List US\$158, Order code CWORKS/26.1



Selected Works of Phillip A. Griffiths with Commentary

Algebraic Cycles (2003–2007)

Robert L. Bryant, *Duke University, Durham, NC*, and Mark L. Green, *University of California, Los Angeles, CA*, Editors

In the period since the original four volumes of Phillip Griffiths's *Selecta* were published (*Selected Works of Phillip A. Griffiths with Commentary*, Parts 1–4, *Collected Works*, Volume 18), Griffiths has continued to produce beautiful and important work. The current two-part publication brings Griffiths's *Selecta* up to date by including the majority of his recent articles, as well as two older papers on differential geometry whose length had precluded their inclusion in the original *Selecta*.

The papers are organized along the three main topics, with Part 6 containing papers on Algebraic Cycles and Part 5 containing papers on Differential Geometry and Hodge Theory. In addition to his papers, Griffiths has been an author of a number of research monographs. To give the reader an overview of what these monographs contain, introductions to some of these are also included.

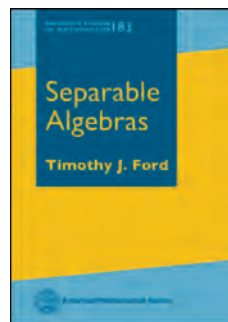
This item will also be of interest to those working in geometry and topology.

Contents: M. Green, P. A. Griffiths, and K. H. Paranjape, Cycles over fields of transcendence degree 1; M. Green and P. Griffiths,

Hodge-theoretic invariants for algebraic cycles; M. Green and P. Griffiths, An interesting 0-cycle; M. Green and P. Griffiths, Formal deformation of Chow groups; M. Green and P. Griffiths, On the tangent space to the space of algebraic cycles on a smooth algebraic variety; M. Green and P. Griffiths, Algebraic cycles and singularities of normal functions, I; M. Green and P. Griffiths, Algebraic cycles and singularities of normal functions, II.

Collected Works, Volume 26, Part 2

November 2017, 296 pages, Hardcover, ISBN: 978-1-4704-3657-5, LC 2017010885, 2010 *Mathematics Subject Classification*: 14C15, 14C25, 14C30, 14D07, 20G05, 32G20, 32M10, 32S35, **AMS members US\$126.40**, List US\$158, Order code CWORKS/26.2



Separable Algebras

Timothy J. Ford, *Florida Atlantic University, Boca Raton, FL*

This book presents a comprehensive introduction to the theory of separable algebras over commutative rings. After a thorough introduction to the general theory, the fundamental roles played by separable algebras are explored.

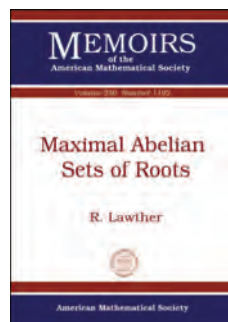
For example, Azumaya algebras, the henselization of local rings, and Galois theory are rigorously introduced and treated. Interwoven throughout these applications is the important notion of étale algebras. Essential connections are drawn between the theory of separable algebras and Morita theory, the theory of faithfully flat descent, cohomology, derivations, differentials, reflexive lattices, maximal orders, and class groups.

The text is accessible to graduate students who have finished a first course in algebra, and it includes necessary foundational material, useful exercises, and many nontrivial examples.

Contents: Background material on rings and modules; Modules over commutative rings; The Wedderburn-Artin theorem; Separable algebras, definition and first properties; Background material on homological algebra; The divisor class group; Azumaya algebras, I; Derivations, differentials and separability; Étale algebras; Henselization and splitting rings; Azumaya algebras, II; Galois extensions of commutative rings; Crossed products and Galois cohomology; Further topics; Acronyms; Glossary of notation; Bibliography; Index.

Graduate Studies in Mathematics, Volume 183

October 2017, 637 pages, Hardcover, ISBN: 978-1-4704-3770-1, LC 2017013677, 2010 *Mathematics Subject Classification*: 16H05, 15B05, 13A15, 13C20, 14F20, 14B25, 16-01, 13-01, **AMS members US\$75.20**, List US\$94, Order code GSM/183



Maximal Abelian Sets of Roots

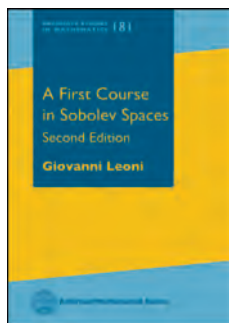
R. Lawther, *Centre for Mathematical Sciences, Cambridge University, United Kingdom*

Contents: Introduction; Root systems of classical type; The strategy for root systems of exceptional type; The root system of type G_2 ; The root system of

type F_4 ; The root system of type E_6 ; The root system of type E_7 ; The root system of type E_8 ; Tables of maximal abelian sets; Appendix A. Root trees for root systems of exceptional type; Bibliography.

Memoirs of the American Mathematical Society, Volume 250, Number 1192

October 2017, 219 pages, Softcover, ISBN: 978-1-4704-2679-8, 2010 *Mathematics Subject Classification*: 17B22, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/250/1192



A First Course in Sobolev Spaces Second Edition

Giovanni Leoni, *Carnegie Mellon University, Pittsburgh, PA*

This book is about differentiation of functions. It is divided into two parts, which can be used as different textbooks, one for an advanced undergraduate

course in functions of one variable and one for a graduate course on Sobolev functions. The first part develops the theory of monotone, absolutely continuous, and bounded variation functions of one variable and their relationship with Lebesgue–Stieltjes measures and Sobolev functions. It also studies decreasing rearrangement and curves. The second edition includes a chapter on functions mapping time into Banach spaces.

The second part of the book studies functions of several variables. It begins with an overview of classical results such as Rademacher’s and Stepanoff’s differentiability theorems, Whitney’s extension theorem, Brouwer’s fixed point theorem, and the divergence theorem for Lipschitz domains. It then moves to distributions, Fourier transforms and tempered distributions.

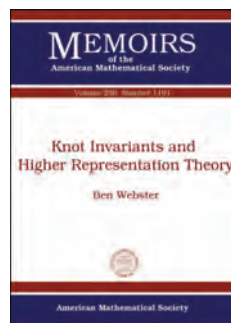
The remaining chapters are a treatise on Sobolev functions. The second edition focuses more on higher order derivatives and it includes the interpolation theorems of Gagliardo and Nirenberg. It studies embedding theorems, extension domains, chain rule, superposition, Poincaré’s inequalities and traces.

A major change compared to the first edition is the chapter on Besov spaces, which are now treated using interpolation theory.

Contents: *Part 1. Functions of one variable:* Monotone functions; Functions of bounded pointwise variation; Absolutely continuous functions; Decreasing rearrangement; Curves; Lebesgue–Stieltjes measures; Functions of bounded variation and Sobolev functions; The infinite-dimensional case; *Part 2. Functions of several variables:* Change of variables and the divergence theorem; Distributions; Sobolev spaces; Sobolev spaces: Embeddings; Sobolev spaces: Further properties; Functions of bounded variation; Sobolev spaces: Symmetrization; Interpolation of Banach spaces; Besov spaces; Sobolev spaces: Traces; Appendix A. Functional analysis; Appendix B. Measures; Appendix C. The Lebesgue and Hausdorff measures; Appendix D. Notes; Appendix E. Notation and list of symbols; Bibliography; Index.

Graduate Studies in Mathematics, Volume 181

November 2017, approximately 731 pages, Hardcover, ISBN: 978-1-4704-2921-8, LC 2017009991, 2010 *Mathematics Subject Classification*: 46E35; 26A27, 26A30, 26A42, 26A45, 26A46, 26A48, 26B30, 30H25, **AMS members US\$75.20**, List US\$94, Order code GSM/181



Knot Invariants and Higher Representation Theory

Ben Webster, *University of Virginia, Charlottesville, VA*

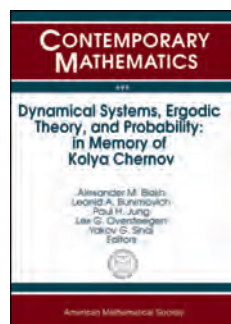
This item will also be of interest to those working in geometry and topology.

Contents: Introduction; Categorification of quantum groups; Cyclotomic quotients; The tensor product algebras; Standard modules; Braiding functors; Rigidity structures; Knot invariants; Comparison to category \mathcal{O} and other knot homologies; Bibliography.

Memoirs of the American Mathematical Society, Volume 250, Number 1191

October 2017, 133 pages, Softcover, ISBN: 978-1-4704-2650-7, 2010 *Mathematics Subject Classification*: 16G99, 17B37, 18D10, 57M25, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/250/1191

Analysis



Dynamical Systems, Ergodic Theory, and Probability: in Memory of Kolya Chernov

Alexander M. Blokh, *University of Alabama at Birmingham, AL*, **Leonid A. Bunimovich**, *Georgia Institute of Technology, Atlanta, GA*, **Paul H. Jung**, *Korea Advanced Institute of Science and Technology, Daejeon, South Korea*, **Lex G. Oversteegen**, *University of Alabama at Birmingham, AL*, and **Yakov G. Sinai**, *Princeton University, NJ*, Editors

This volume contains the proceedings of the Conference on Dynamical Systems, Ergodic Theory, and Probability, which was dedicated to the memory of Nikolai Chernov, held from May 18–20, 2015, at the University of Alabama at Birmingham, Birmingham, Alabama.

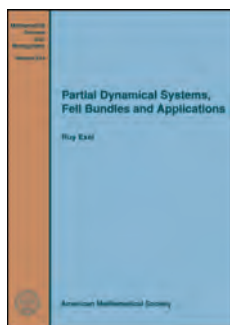
The book is devoted to recent advances in the theory of chaotic and weakly chaotic dynamical systems and its applications to statistical mechanics. The papers present new original results as well as comprehensive surveys.

Contents: **L. Bunimovich**, N. I. Chernov (1956–2014); **T. Adams** and **J. Rosenblatt**, Joint coboundaries; **P. Bálint**, **N. Chernov**,

and **D. Dolgopyat**, Convergence of moments for dispersing billiards with cusps; **E. Catsigeras**, **M. Cerminara**, and **H. Enrich**, Weak pseudo-physical measures and Pesin's entropy formula for Anosov C^1 -diffeomorphisms; **C. Cox** and **R. Feres**, No-slip billiards in dimension two; **C. P. Dettmann**, How sticky is the chaos/order boundary?; **G. Galperin** and **M. Levi**, Bouncing in gravitational field; **N. T. A. Haydn** and **F. Yang**, A derivation of the Poisson law for returns of smooth maps with certain geometrical properties; **K. Khanin** and **S. Kocić**, Rigidity for a class of generalized interval exchange transformations; **C. C. Moxley** and **N. J. Simanyi**, Homotopical complexity of a 3D billiard flow; **M. Jakobson**, Mixing properties of some maps with countable Markov partitions; **Ya. G. Sinai** and **I. Vinogradov**, Eigenfunctions of Laplacians in some two-dimensional domains; **D. Szász**, Multidimensional hyperbolic billiards; **X. Xia** and **P. Zhang**, Homoclinic intersections for geodesic flows on convex spheres; **H. Zhang**, Decay of correlations for billiards with flat points I: Channel effects; **H. Zhang**, Decay of correlations for billiards with flat points II: Cusps effect.

Contemporary Mathematics, Volume 698

October 2017, 328 pages, Softcover, ISBN: 978-1-4704-2773-3, 2010 *Mathematics Subject Classification*: 11J70, 37A25, 37A35, 37A50, 37A60, 37C20, 37C29, 37D50, 37E10, **AMS members US\$88.80**, List US\$111, Order code CONM/698



Partial Dynamical Systems, Fell Bundles and Applications

Ruy Exel, *Universidade Federal de Santa Catarina, Florianópolis-SC, Brazil*

Partial dynamical systems, originally developed as a tool to study algebras of operators in Hilbert spaces, has recently become an important branch of algebra. Its most powerful results allow for understanding structural properties of algebras, both in the purely algebraic and in the C^* -contexts, in terms of the dynamical properties of certain systems which are often hiding behind algebraic structures. The first indication that the study of an algebra using partial dynamical systems may be helpful is the presence of a grading. While the usual theory of graded algebras often requires gradings to be saturated, the theory of partial dynamical systems is especially well suited to treat nonsaturated graded algebras which are in fact the source of the notion of "partiality". One of the main results of the book states that every graded algebra satisfying suitable conditions may be reconstructed from a partial dynamical system via a process called the partial crossed product.

Running in parallel with partial dynamical systems, partial representations of groups are also presented and studied in depth.

In addition to presenting main theoretical results, several specific examples are analyzed, including Wiener-Hopf algebras and graph C^* -algebras.

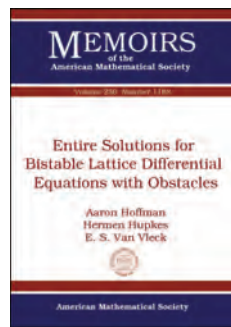
Contents: Introduction; *Partial actions*: Partial actions; Restriction and globalization; Inverse semigroups; Topological partial dynamical systems; Algebraic partial dynamical systems; Multipliers; Crossed products; Partial group representations; Partial group algebras; C^* -algebraic partial dynamical systems; Partial isometries; Covariant representations of C^* -algebraic

dynamical systems; Partial representations subject to relations; Hilbert modules and Morita-Rieffel-equivalence; *Fell bundles*: Fell bundles; Reduced cross-sectional algebras; Fell's absorption principle; Graded C^* -algebras; Amenability for Fell bundles; Functoriality for Fell bundles; Functoriality for partial actions; Ideals in graded algebras; Pre-Fell-bundles; Tensor products of Fell bundles; Smash product; Stable Fell bundles as partial crossed products; Globalization in the C^* -context; Topologically free partial actions; *Applications*: Dilating partial representations; Semigroups of isometries; Quasi-lattice ordered groups; C^* -algebras generated by semigroups of isometries; Wiener-Hopf C^* -algebras; The Toeplitz C^* -algebra of a graph; Path spaces; Graph C^* -algebras; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 224

October 2017, 321 pages, Hardcover, ISBN: 978-1-4704-3785-5, LC 2017013411, 2010 *Mathematics Subject Classification*: 46L55, 46L45, 37A55, 16S35, 16S40, **AMS members US\$92.80**, List US\$116, Order code SURV/224

Differential Equations



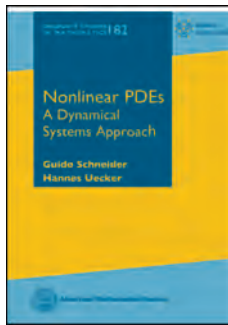
Entire Solutions for Bistable Lattice Differential Equations with Obstacles

Aaron Hoffman, *Franklin W. Olin College of Engineering, Needham, MA*, **Hermes Hupkes**, *Mathematisch Instituut, Universiteit Leiden, The Netherlands*, and **E. S. Van Vleck**, *University of Kansas, Lawrence, KS*

Contents: Introduction; Main results; Preliminaries; Spreading speed; Large disturbances; The entire solution; Various limits; Proof of Theorem 2.3; Discussion; Acknowledgments; Bibliography.

Memoirs of the American Mathematical Society, Volume 250, Number 1188

October 2017, 117 pages, Softcover, ISBN: 978-1-4704-2201-1, 2010 *Mathematics Subject Classification*: 34K31, 37L15, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/250/1188



Nonlinear PDEs

A Dynamical Systems Approach

Guido Schneider, *Universität Stuttgart, Germany*, and **Hannes Uecker**, *Carl von Ossietzky Universität Oldenburg, Germany*

This is an introductory textbook about nonlinear dynamics of PDEs, with a focus on problems over unbounded domains and modulation equations. The presentation is example-oriented, and new mathematical tools are developed step by step, giving insight into some important classes of nonlinear PDEs and nonlinear dynamics phenomena which may occur in PDEs.

The book consists of four parts. Parts I and II are introductions to finite- and infinite-dimensional dynamics defined by ODEs and by PDEs over bounded domains, respectively, including the basics of bifurcation and attractor theory. Part III introduces PDEs on the real line, including the Korteweg-de Vries equation, the Nonlinear Schrödinger equation and the Ginzburg-Landau equation. These examples often occur as simplest possible models, namely as amplitude or modulation equations, for some real world phenomena such as nonlinear waves and pattern formation. Part IV explores in more detail the connections between such complicated physical systems and the reduced models. For many models, a mathematically rigorous justification by approximation results is given.

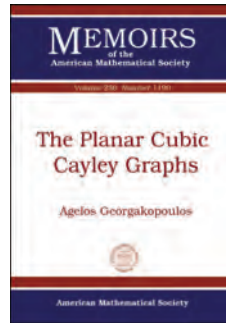
The parts of the book are kept as self-contained as possible. The book is suitable for self-study, and there are various possibilities to build one- or two-semester courses from the book.

Contents: Basic ODE dynamics; Dissipative dynamics; Hamiltonian dynamics; PDEs on an interval; The Navier-Stokes equations; Some dissipative PDE models; Three canonical modular equations; Reaction-diffusion systems; Dynamics of pattern and the GL equation; Wave packets and the NLS equation; Long waves and their modular equations; Center manifold reduction and spatial dynamics; Diffusive stability; Bibliography; Index; List of symbols.

Graduate Studies in Mathematics, Volume 182

November 2017, 584 pages, Hardcover, ISBN: 978-1-4704-3613-1, LC 2017012328, 2010 *Mathematics Subject Classification*: 35-01, 35Bxx, 35Qxx, 37Kxx, 37Lxx, **AMS members US\$79.20**, List US\$99, Order code GSM/182

Discrete Mathematics and Combinatorics



The Planar Cubic Cayley Graphs

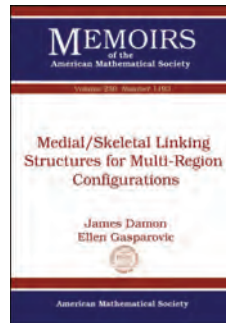
Agelos Georgakopoulos, *Mathematics Institute, University of Warwick, United Kingdom*

Contents: Introductory material and basic facts; The finite and 1-ended cubic planar Cayley graphs; The planar multi-ended Cayley graphs with 2 generators; The planar multi-ended Cayley graphs generated by 3 involutions; Outlook; Bibliography.

Memoirs of the American Mathematical Society, Volume 250, Number 1190

October 2017, 82 pages, Softcover, ISBN: 978-1-4704-2644-6, 2010 *Mathematics Subject Classification*: 05C25, 20F65, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/250/1190

Geometry and Topology



Medial/Skeletal Linking Structures for Multi-Region Configurations

James Damon, *University of North Carolina, Chapel Hill, NC*, and **Ellen Gasparovic**, *Union College, Schenectady, NY*

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

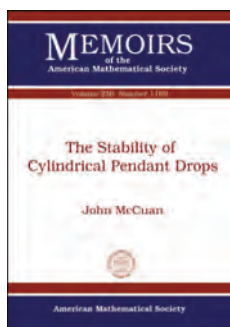
Contents: Introduction; *Part 1. Medial/Skeletal Linking Structures:* Multi-region configurations in \mathbb{R}^{n+1} ; Skeletal linking structures for multi-region configurations in \mathbb{R}^{n+1} ; Blum medial linking structure for a generic multi-region configuration; Retracting the full Blum medial structure to a skeletal linking structure; *Part 2. Positional Geometry of Linking Structures:* Questions involving positional geometry of a multi-region configuration; Shape operators and radial flow for a skeletal structure; Linking flow and curvature conditions; Properties of regions defined using the linking flow; Global geometry via medial and skeletal linking integrals; Positional geometric properties of multi-region configurations; *Part 3. Generic Properties of Linking Structures via Transversality Theorems:* Multi-distance and height-distance functions and partial multi-jet spaces; Generic Blum linking properties via transversality theorems; Generic properties of Blum linking structures; Concluding generic properties of Blum linking structures; *Part 4. Proofs and Calculations for the Transversality Theorems:* Reductions of the proofs of the transversality theorems;

Families of perturbations and their infinitesimal properties; Completing the proofs of the transversality theorems; Appendix A. List of frequently used notation; Bibliography.

Memoirs of the American Mathematical Society, Volume 250, Number 1193

October 2017, 163 pages, Softcover, ISBN: 978-1-4704-2680-4, 2010 *Mathematics Subject Classification*: 53A07, 58A35; 68U05, **Individual member** US\$45, List US\$75, Institutional member US\$60, Order code MEMO/250/1193

Mathematical Physics



The Stability of Cylindrical Pendant Drops

John McCuan, *Georgia Institute of Technology, Atlanta, GA*

Contents: Introduction; Normalization, stability condition, and elementary properties; One Parameter Families; Definition of s_2 ; Stability; Infinitely long

drops; Zero gravity and soap bubbles; Open problems; Appendix 1: Explicit formulas; Appendix 2: Sturm-Liouville theory; Appendix 3: Elliptic integrals; Acknowledgement; Bibliography.

Memoirs of the American Mathematical Society, Volume 250, Number 1189

October 2017, 111 pages, Softcover, ISBN: 978-1-4704-0938-8, **Individual member** US\$45, List US\$75, Institutional member US\$60, Order code MEMO/250/1189

Probability and Statistics



Markov Chains and Mixing Times

Second Edition

David A. Levin, *University of Oregon, Eugene, OR*, and **Yuval Peres**, *Microsoft Research, Redmond, WA*

Markov Chains and Mixing Times is a magical book, managing to be both friendly and deep. It gently introduces probabilistic techniques so that an outsider can follow. At the same time, it is the first book covering the geometric theory of Markov chains and has much that will be new to experts. It is certainly THE book that I will use to teach from. I recommend it to all comers, an amazing achievement.

—*Persi Diaconis, Mary V. Sunseri Professor of Statistics and Mathematics, Stanford University*

Mixing times are an active research topic within many fields from statistical physics to the theory of algorithms, as well as having intrinsic interest within mathematical probability and exploiting discrete analogs of important geometry concepts. The first edition became an instant classic, being accessible to advanced undergraduates and yet bringing readers close to current research frontiers. This second edition adds chapters on monotone chains, the exclusion process and hitting time parameters. Having both exercises and citations to important research papers it makes an outstanding basis for either a lecture course or self-study.

—*David Aldous, University of California, Berkeley*

Mixing time is the key to Markov chain Monte Carlo, the queen of approximation techniques. With new chapters on monotone chains, exclusion processes, and set-hitting, Markov Chains and Mixing Times is more comprehensive and thus more indispensable than ever. Prepare for an eye-opening mathematical tour!

—*Peter Winkler, Dartmouth College*

The study of finite Markov chains has recently attracted increasing interest from a variety of researchers. This is the second edition of a very valuable book on the subject. The main focus is on the mixing time of Markov chains, but there is a lot of additional material.

In this edition, the authors have taken the opportunity to add new material and bring the reader up to date on the latest research. I have used the first edition in a graduate course and I look forward to using this edition for the same purpose in the near future.

—*Alan Frieze, Carnegie Mellon University*

This book is an introduction to the modern theory of Markov chains, whose goal is to determine the rate of convergence to the stationary distribution, as a function of state space size and geometry. This topic has important connections to combinatorics, statistical physics, and theoretical computer science. Many of the techniques presented originate in these disciplines.

The central tools for estimating convergence times, including coupling, strong stationary times, and spectral methods, are developed. The authors discuss many examples, including card shuffling and the Ising model, from statistical mechanics, and present the connection of random walks to electrical networks and apply it to estimate hitting and cover times.

The first edition has been used in courses in mathematics and computer science departments of numerous universities. The second edition features three new chapters (on monotone chains, the exclusion process, and stationary times) and also includes smaller additions and corrections throughout. Updated notes at the end of each chapter inform the reader of recent research developments.

Contents: *Basic methods and examples:* Introduction to finite Markov chains; Classical (and useful) Markov chains; Markov chain Monte Carlo: Metropolis and Glauber chains; Introduction to Markov chain mixing; Coupling; Strong stationary times; Lower bounds on mixing times; The symmetric group and shuffling cards; Random walks on networks; Hitting times; Cover times; Eigenvalues; *The plot thickens:* Eigenfunctions and comparison of chains; The transportation metric and path coupling; The Ising model; From shuffling cards to shuffling genes; Martingales and evolving sets; The cutoff phenomenon; Lamplighter walks; Continuous-time chains; Countable state space chains; Monotone chains; The exclusion process; Cesàro mixing time, stationary times, and hitting large sets; Coupling from the past; Open problems; Background material; Introduction to simulation; Ergodic theorem; Solutions to selected exercises; Bibliography; Notation index; Index.

November 2017, 464 pages, Hardcover, ISBN: 978-1-4704-2962-1, LC 2017017451, 2010 *Mathematics Subject Classification*: 60J10, 60J27, 60B15, 60C05, 65C05, 60K35, 68W20, 68U20, 82C22, **AMS members US\$67.20**, List US\$84, Order code MBK/107

New AMS-Distributed Publications

Differential Equations



The Cubic Szegő Equation and Hankel Operators

Patrick Gérard, *Université Paris-Sud, Orsay, France*, and **Sandrine Grellier**, *Université d'Orléans, France*

This monograph is devoted to the dynamics on Sobolev spaces of the cubic

Szegő equation on the circle \mathbb{S}^1 , $i\partial_t u = \Pi(|u|^2 u)$. Here Π denotes the orthogonal projector from $L^2(\mathbb{S}^1)$ onto the subspace $L_+^2(\mathbb{S}^1)$ of functions with nonnegative Fourier modes. The authors construct a nonlinear Fourier transformation on $H^{1/2}(\mathbb{S}^1) \cap L_+^2(\mathbb{S}^1)$, allowing them to describe explicitly the solutions of this equation with data in $H^{1/2}(\mathbb{S}^1) \cap L_+^2(\mathbb{S}^1)$.

This explicit description implies almost-periodicity of every solution in this space. Furthermore, it allows the authors to display the following turbulence phenomenon. For a dense G_δ subset of initial data in $C^\infty(\mathbb{S}^1) \cap L_+^2(\mathbb{S}^1)$, the solutions tend to infinity in H^s for every $s > \frac{1}{2}$ with super-polynomial growth on some sequence of times, while they go back to their initial data on another sequence of times tending to infinity.

This transformation is defined by solving a general inverse spectral problem involving singular values of a Hilbert-Schmidt Hankel operator and of its shifted Hankel operator.

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

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 389

May 2017, 114 pages, Softcover, ISBN: 978-2-85629-854-1, 2010 *Mathematics Subject Classification*: 35B15, 47B35, 37K15, **AMS members US\$41.60**, List US\$52, Order code AST/389

Discrete Mathematics and Combinatorics



PDEs, Dispersion, Scattering Theory and Control Theory

Kais Ammari, *Université de Monastir, Tunisie*, and **Gilles Lebeau**, *Université de Nice, Sophia Antipolis, France*

This book results from notes of the lectures given in Monastir from June

10-14, 2013 during the workshop about the dispersion and scattering theory and control theory of partial differential equations. This volume contains surveys of active research topics, along with original research papers containing exciting new results on PDEs, dispersion, scattering and control theory. It will, therefore, benefit both graduate students and researchers.

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

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.

Séminaires et Congrès, Number 30

July 2017, 153 pages, Softcover, ISBN: 978-2-85629-858-9, 2010 *Mathematics Subject Classification*: 35Q40, 35B65, 35J10, 35P20, 47A10, 35Q55, 35B40, 34B45, 39A10, 35R01, 35A17, 35A18, 35B45, 35L20, 93B28, 93B07, 47A05, 65J10, 35Q30, 35A02, 35B30, 76D05, 49N35, 49J20, 35P25, **AMS members US\$41.60**, List US\$52, Order code SECO/30

General Interest



Séminaire Bourbaki: Volume 2015/2016 Exposés 1104-1119

The 68th volume of Bourbaki Seminar contains the texts of the sixteen survey lectures done during the year 2015/2016: analytic number theory, binormal flow and the Schrödinger equation, combinatorics and the independence property in model theory, formal moduli

problems, geometric Landlands program, Hilbert-Smith conjecture in differential geometry, Hodge theory of the decomposition theorem, Monge-Ampère equation in complex algebraic geometry, motives and periods, resolution of underdetermined linear systems, sofic entropy, subriemannian geometry, and spectral theory.

Math in the Media

A survey of math in the news



“Math Games of Martin Gardner Still Spur Innovation”

Scientific American

“A safer world through disease mathematics”

Santa Fe New Mexican

“Together and Alone, Closing the Prime Gap”

Quanta Magazine

“Math Might Help Nail Oceans’ Plastic ‘Garbage Patch’ Polluters”

NBC News

“Wheels when you need them”

Science

“Top Math Prize Has Its First Female Winner”

The New York Times

See the current **Math in the Media** and explore the archive at www.ams.org/mathmedia



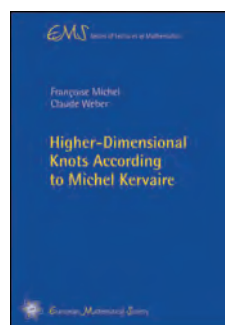
New AMS-Distributed Publications

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 390

June 2017, 533 pages, Softcover, ISBN: 978-2-85629-855-8, 2010 *Mathematics Subject Classification*: 11H99, 14C30, 14F42, 18G55, 19E15, 32G20, 14E20, 14D22, 57S10, 57M60, 57S05, 57N10, 54H15, 55M35, 35P20, 35P25, 37A35, 37A15, 20E15, 14F05, 14H60, 11S37, 14D24, 22E55, 22E57, 14B12, 14A20, 53C55, 32J27, 32P05, 53C17, 49K21, 28A15, 03C68, 03C45, 03C98, 05C69, 05D10, 28E05, 58A14, 32S60, 32S35, 55N33, 60G15, 60G60, 35B05, 34L20, 58J40, 52B55, 62H12, 42B05, 35Q55, 35C06, 35B35, 76B47, 76B03, 11N25, 11N64, **AMS members US\$77.60**, List US\$97, Order code AST/390

Geometry and Topology



Higher-Dimensional Knots According to Michel Kervaire

Françoise Michel, *Université Paul Sabatier, Toulouse, France*, and **Claude Weber**, *Université de Genève, Switzerland*

Michel Kervaire wrote six papers which can be considered fundamental to the

development of higher-dimensional knot theory. They are not only of historical interest but naturally introduce some of the essential techniques in this fascinating theory.

This book is written to provide graduate students with the basic concepts necessary to read texts in higher-dimensional knot theory and its relations with singularities. The first chapters are devoted to a presentation of Pontrjagin’s construction, surgery, and the work of Kervaire and Milnor on homotopy spheres. The authors explore Kervaire’s fundamental work on the group of a knot, knot modules, and knot cobordism and then consider developments due to Levine. Tools such as open books, handlebodies, and plumbings, which are often used but hard to find in original articles, are presented in appendices.

The authors conclude with a description of the Kervaire invariant and the consequences of the Hill-Hopkins-Ravenel results in knot theory.

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 Lectures in Mathematics, Volume 28

July 2017, 144 pages, Softcover, ISBN: 978-3-03719-180-4, 2010 *Mathematics Subject Classification*: 57Q45, 57R65, 32S55, **AMS members US\$30.40**, List US\$38, Order code EMSSERLEC/28