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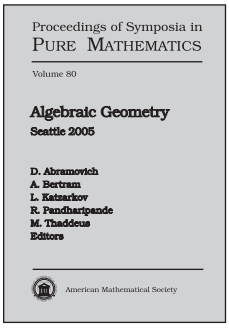
Algebra and Algebraic Geometry



Algebraic Geometry

Seattle 2005

D. Abramovich, *Brown University, Providence, RI*, **A. Bertram**, *University of Utah, Salt Lake City, UT*, **L. Katzarkov**, *University of Miami, Coral Gables, FL*, **R. Pandharipande**, *Princeton University, NJ*, and **M. Thaddeus**, *Columbia University, New York, NY*, Editors

The 2005 AMS Summer Institute on Algebraic Geometry in Seattle was an enormous event. With over 500 participants, including many of the world's leading experts, it was perhaps the largest conference on algebraic geometry ever held. These two proceedings volumes present research and expository papers by some of the most outstanding speakers at the meeting, vividly conveying the grandeur and vigor of the subject.

The most exciting topics in current algebraic geometry research receive very ample treatment. For instance, there is enlightening information on many of the latest technical tools, from jet schemes and derived categories to algebraic stacks. Numerous papers delve into the geometry of various moduli spaces, including those of stable curves, stable maps, coherent sheaves, and abelian varieties. Other papers discuss the recent dramatic advances in higher-dimensional birational geometry, while still others trace the influence of quantum field theory on algebraic geometry via mirror symmetry, Gromov–Witten invariants, and symplectic geometry.

The proceedings of earlier algebraic geometry AMS Institutes, held at Woods Hole, Arcata, Bowdoin, and Santa Cruz, have become classics. The present volumes promise to be equally influential. They present the state of the art in algebraic geometry in papers that will have broad interest and enduring value.

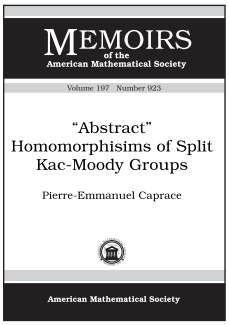
Contents: Part I: T. Bridgeland, Spaces of stability conditions; **J. Bryan** and **T. Graber**, The crepant resolution conjecture; **R. L. Cohen** and **I. Madsen**, Surfaces in a background space and the homology of mapping class groups; **I. Coskun** and **R. Vakil**, Geometric positivity in the cohomology of homogeneous spaces and generalized Schubert calculus; **G. Farkas**, The global geometry of the moduli space of curves; **M. Gross**, The Strominger-Yau-Zaslow conjecture: From torus fibrations to degenerations; **S. Grushevsky**, Geometry of $\mathcal{A}_g$ and its compactifications; **D. Huybrechts**, The global Torelli theorem: classical, derived, twisted; **A. Kresch**, On the geometry of Deligne-Mumford stacks; **A. Langer**, Moduli spaces of sheaves and principal G-bundles; **Y.-P. Lee**, Notes on axiomatic Gromov-Witten theory and applications; **A. Okounkov** and **R. Pandharipande**, Gromov-Witten theory, Hurwitz numbers, and matrix models; **P. Seidel**, Symplectic homology as Hochschild homology; **B. Toën**, Higher and derived stacks: a global overview; **Part II: M. A. A. De Cataldo** and **L. Migliorini**, Hodge-theoretic aspects of the decomposition theorem; **L. Ein** and **M. Mustaţă**, Jet schemes and singularities; **H. Gangl**, **A. B. Goncharov**, and **A. Levin**, Multiple polylogarithms, polygons, trees and algebraic cycles; **D. Kaledin**, Geometry and topology of symplectic resolutions; **S. Kaliman**, Actions of $\mathbb{C}^*$ and $\mathbb{C}_+$ on affine algebraic varieties; **Y. Kawamata**, Derived categories and birational geometry; **K. S. Kedlaya**, p-adic cohomology; **S. A. Kovács**, Subvarieties of moduli stacks of canonically polarized varieties: generalizations of Shafarevich's conjecture; **S. J. Kovács**, Young person's guide to moduli of higher dimensional varieties; **F. Loeser**, Seattle lectures on motivic integration; **M. Manetti**, Differential graded Lie algebras and formal deformation theory; **M. C. Olsson**, On Faltings' method of almost étale extensions; **B. Hassett** and **Y. Tschinkel**, Weak approximation for hypersurfaces of low degree; **J. Włodarczyk**, Simple constructive weak factorization.

Proceedings of Symposia in Pure Mathematics, Volume 80

Part 1: March 2009, approximately 478 pages, Hardcover, ISBN: 978-0-8218-4702-2, LC 2008044494, 2000 *Mathematics Subject Classification:* 14-XX; 14-06, 11Gxx, 18E30, 32Cxx, 32Gxx, 32Sxx, 53Dxx, 55U35, Order code PSPUM/80.1

Part 2: March 2009, approximately 520 pages, Hardcover, ISBN: 978-0-8218-4703-9, LC 2008044494, 2000 *Mathematics Subject Classification:* 14-XX; 14-06, 11Gxx, 18E30, 32Cxx, 32Gxx, 32Sxx, 53Dxx, 55U35, Order code PSPUM/80.2

Set: March 2009, approximately 998 pages, Hardcover, ISBN: 978-0-8218-4057-3, LC 2008044494, 2000 *Mathematics Subject Classification:* 14-XX; 14-06, 11Gxx, 18E30, 32Cxx, 32Gxx, 32Sxx, 53Dxx, 55U35, **AMS members US$139**, List US$174, Order code PSPUM/80



"Abstract" Homomorphisms of Split Kac-Moody Groups

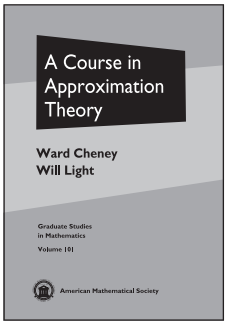
Pierre-Emmanuel Caprace, *Université Libre de Bruxelles, Belgium*

Contents: The objects: Kac-Moody groups, root data and Tits buildings; Basic tools from geometric group theory; Kac-Moody groups and algebraic groups; Isomorphisms of Kac-Moody groups: an overview; Isomorphisms of Kac-Moody groups in characteristic zero; Isomorphisms of Kac-Moody groups in positive characteristic; Homomorphisms of Kac-Moody groups to algebraic groups; Unitary forms of Kac-Moody groups; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 198, Number 924

March 2009, 84 pages, Softcover, ISBN: 978-0-8218-4258-4, LC 2008047593, 2000 *Mathematics Subject Classification:* 17B40, 20E36, 20E42, 20G15, 22E65, 51E24, **Individual member US$39**, List US$65, Institutional member US$52, Order code MEMO/198/924

COURSE ADOPTION



A Course in Approximation Theory

Ward Cheney, *University of Texas at Austin, TX*, and **Will Light**

This textbook is designed for graduate students in mathematics, physics, engineering, and computer science. Its purpose is to guide the reader in exploring contemporary approximation theory. The emphasis is on multi-variable approximation theory, i.e., the approximation of functions in several variables, as opposed to the classical theory of functions in one variable.

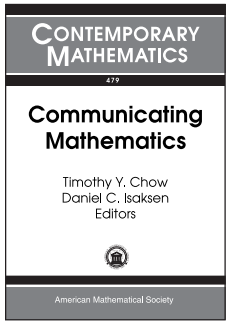
Most of the topics in the book, heretofore accessible only through research papers, are treated here from the basics to the currently active research, often motivated by practical problems arising in diverse applications such as science, engineering, geophysics, and business and economics. Among these topics are projections, interpolation paradigms, positive definite functions, interpolation theorems of Schoenberg and Micchelli, tomography, artificial neural networks, wavelets, thin-plate splines, box splines, ridge functions, and convolutions.

An important and valuable feature of the book is the bibliography of almost 600 items directing the reader to important books and research papers. There are 438 problems and exercises scattered through the book allowing the student reader to get a better understanding of the subject.

Contents: Introductory discussion of interpolation; Linear interpolation operators; Optimization of the Lagrange operator; Multivariate polynomials; Moving the nodes; Projections; Tensor-product interpolation; The Boolean algebra of projections; The Newton paradigm for interpolation; The Lagrange paradigm for interpolation; Interpolation by translates of a single function; Positive definite functions; Strictly positive definite functions; Completely monotone functions; The Schoenberg interpolation theorem; The Micchelli interpolation theorem; Positive definite functions on spheres; Approximation by positive definite functions; Approximate reconstruction of functions and tomography; Approximation by convolution; The good kernels; Ridge functions; Ridge function approximation via convolutions; Density of ridge functions; Artificial neural networks; Chebyshev centers; Optimal reconstruction of functions; Algorithmic orthogonal projections; Cardinal B-splines and the sinc function; The Golomb-Weinberger theory; Hilbert function spaces and reproducing kernels; Spherical thin-plate splines; Box splines; Wavelets, I; Wavelets, II; Quasi-interpolation; Bibliography; Index; Index of symbols.

Graduate Studies in Mathematics, Volume 101

March 2009, 359 pages, Hardcover, ISBN: 978-0-8218-4798-5, LC 2008047417, 2000 *Mathematics Subject Classification:* 41-01, **AMS members US$55**, List US$69, Order code GSM/101



Communicating Mathematics

Timothy Y. Chow, *Center for Communications Research, Princeton, NJ*, and **Daniel C. Isaksen**, *Wayne State University, Detroit, MI*, Editors

This volume contains the proceedings of a conference held in July, 2007 at the University of Minnesota, Duluth, in honor of Joseph A. Gallian's 65th birthday and the 30th anniversary of the Duluth Research Experience for Undergraduates.

In keeping with Gallian's extraordinary expository ability and broad mathematical interests, the articles in this volume span a wide variety of mathematical topics, including algebraic topology, combinatorics, design theory, forcing, game theory, geometry, graph theory, group theory, optimization, and probability.

Some of the papers are purely expository while others are research articles. The papers are intended to be accessible to a general mathematics audience, including first-year or second-year graduate students. This volume should be especially useful for mathematicians seeking a new research area, as well as those looking to enrich themselves and their research programs by learning about problems and techniques used in other areas of mathematics.

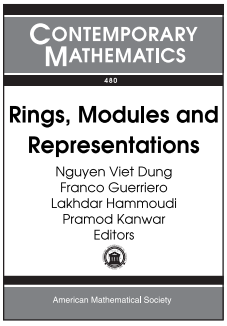
This item will also be of interest to those working in discrete mathematics and combinatorics and geometry and topology.

Contents: S. S. Adams, A journey of discovery: Orthogonal matrices and wireless communications; **J. Beam**, Probabilistic expectations on unstructured spaces; **T. Y. Chow**, A beginner's guide to forcing; **E. Constantin**, Higher order necessary conditions in smooth constrained optimization; **D. Dunham**, Hamiltonian paths and hyperbolic patterns; **J. S. Foisy** and **L. D. Ludwig**, When graph theory meets knot theory; **J. Friedman** and **C. Parker**, Can an asymmetric power structure always be achieved?; **S. G. Hartke** and **A. J. Radcliffe**, McKay's canonical graph labeling algorithm; **P. Hersh** and **R. Kleinberg**, A multiplicative deformation of the Möbius function for the poset of partitions of a multiset; **A. Higgins**,

Communicating, mathematics, communicating mathematics–Joe Gallian style; **D. Housman**, Fair allocation methods for coalition games; **D. C. Isaksen**, Sums-of-squares formulas; **K. S. Kedlaya**, Product-free subsets of groups, then and now; **K. S. Kedlaya** and **X. Shao**, Generalizations of product-free subsets; **D. W. Morris**, What is a supergrid subgroup?; **D. P. Moulton**, Averaging points two at a time; **M. M. Patnaik**, Vertex algebras as twisted bialgebras: On a theorem of Borcherds.

Contemporary Mathematics, Volume 479

March 2009, 238 pages, Softcover, ISBN: 978-0-8218-4345-1, LC 2008036377, 2000 *Mathematics Subject Classification:* 00B20, 00B30, **AMS members US$63**, List US$79, Order code CONM/479



Rings, Modules and Representations

Nguyen Viet Dung, *Ohio University, Zanesville, OH*, **Franco Guerriero**, *Ohio University, Lancaster, OH*, **Lakhdar Hammoudi**, *Ohio University, Chillicothe, OH*, and **Pramod Kanwar**, *Ohio University, Zanesville, OH*, Editors

This volume originated from talks given at the International Conference on Rings and Things held in June, 2007 at Ohio University–Zanesville.

The papers in this volume contain the latest results in current active research areas in the theory of rings and modules, including noncommutative and commutative ring theory, module theory, representation theory, and coding theory. In particular, papers in this volume deal with topics such as decomposition theory of modules, injectivity and generalizations, tilting theory, rings and modules with chain conditions, Leavitt path algebras, representations of finite dimensional algebras, and codes over rings. While most of these papers are original research articles, some are expository surveys.

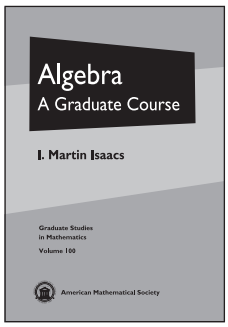
This book is suitable for graduate students and researchers interested in noncommutative ring and module theory, representation theory, and applications.

Contents: D. D. Anderson and **V. Camillo**, Subgroups of direct products of groups, ideals and subrings of direct products of rings, and Goursat's lemma; **G. F. Birkenmeier**, **J. K. Park**, and **S. T. Rizvi**, An example of Osofsky and essential overrings; **W. D. Burgess** and **R. Raphael**, On commutative clean rings and pm rings; **E. S. Campos** and **P. F. Smith**, Modules satisfying the ascending chain condition on submodules with bounded uniform dimension; **J. Dauns**, Relative purity, flatness, and injectivity; **H. Q. Dinh**, Repeated-root constacyclic codes of prime power length; **A. N. Duca**, The socle series of indecomposable injective modules over a principal left and right ideal domain; **N. Er**, Some remarks on a question of Faith; **A. Facchini**, Subdirect representations of categories of modules; **J. L. Gómez Pardo** and **P. A. Guil Asensio**, Fitting's lemma for modules with well-behaved clones; **K. R. Goodearl**, Leavitt path algebras and direct limits; **D. Herbera**, Simple modules over small rings; **B. Huisgen-Zimmermann**, A hierarchy of parametrizing varieties for representations; **D. V. Huynh**, **D. D. Tai**, and **L. V. An**, On the CS condition and rings with chain conditions; **S. K. Jain**, **T. Y. Lam**, and **A. Leroy**, Ore extensions and V-domains; **T. Y. Lam** and **M. L. Reyes**, Oka and Ako ideal families in commutative rings; **S. López-Permouth** and **S. Szabo**, Matrix representations of skew polynomial rings with semisimple coefficient rings; **P. Pappas**, Topological representations of von Neumann regular algebras; **E. R. Puczylowski**, A unified approach to some results on one-sided ideals and matrix rings of associative rings; **J. Trlifaj** and **D. Pospıšil**, Tilting and cotilting classes over Gorenstein rings; **R. Wiegand** and **S. Wiegand**, Semigroups of modules: A survey; **R. Wisbauer**, Generators in module and commodule categories.

Contemporary Mathematics, Volume 480

March 2009, 361 pages, Softcover, ISBN: 978-0-8218-4370-3, LC 2008039856, 2000 *Mathematics Subject Classification:* 13-XX, 16-XX, 18-XX, **AMS members US$79**, List US$99, Order code CONM/480

COURSE ADOPTION



Algebra

A Graduate Course

I. Martin Isaacs, *University of Wisconsin, Madison, WI*

This book, based on a first-year graduate course the author taught at the University of Wisconsin, contains more than enough material for a two-semester graduate-level abstract algebra course, including groups, rings and modules, fields and Galois theory, an introduction to algebraic number theory, and the rudiments of algebraic geometry. In addition, there are some more specialized topics not usually covered in such a course. These include transfer and character theory of finite groups, modules over artinian rings, modules over Dedekind domains, and transcendental field extensions.

This book could be used for self study as well as for a course text, and so full details of almost all proofs are included, with nothing being relegated to the chapter-end problems. There are, however, hundreds of problems, many being far from trivial. The book attempts to capture some of the informality of the classroom, as well as the excitement the author felt when taking the corresponding course as a student.

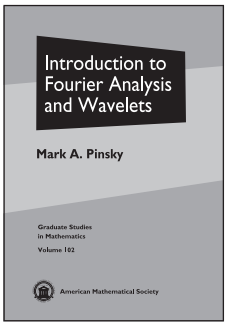
Contents: *Part One, Noncommutative Algebra:* Definitions and examples of groups; Subgroups and cosets; Homomorphisms; Group actions; The Sylow theorems and p-groups; Permutation groups; New groups from old; Solvable and nilpotent groups; Transfer; Operator groups and unique decompositions; Module theory without rings; Rings, ideals, and modules; Simple modules and primitive rings; Artinian rings and projective modules; An introduction to character theory; *Part Two, Commutative Algebra:* Polynomial rings, PIDs, and UFDs; Field extensions; Galois theory; Separability and inseparability; Cyclotomy and geometric constructions; Finite fields; Roots, radicals, and real numbers; Norms, traces, and discriminants; Transcendental extensions; The Artin-Schreier theorem; Ideal theory; Noetherian rings; Integrality; Dedekind domains; Algebraic sets and the nullstellensatz; Index.

Graduate Studies in Mathematics, Volume 100

January 2009, 516 pages, Hardcover, ISBN: 978-0-8218-4799-2, LC 2008047416, 2000 *Mathematics Subject Classification:* 00A05; 12-01, 13-01, 16-01, 20-01, **AMS members US$63**, List US$79, Order code GSM/100

Analysis

COURSE ADOPTION



Introduction to Fourier Analysis and Wavelets

Mark A. Pinsky, *Northwestern University, Evanston, IL*

This book provides a concrete introduction to a number of topics in harmonic analysis, accessible at the early graduate level or, in some cases, at an upper undergraduate level. Necessary prerequisites to using the text are rudiments of the Lebesgue measure and integration on the real line. It begins with a thorough treatment of Fourier series on the circle and their applications to approximation theory, probability, and plane geometry (the isoperimetric theorem). Frequently, more than one proof is offered for a given theorem to illustrate the multiplicity of approaches.

The second chapter treats the Fourier transform on Euclidean spaces, especially the author's results in the three-dimensional piecewise smooth case, which is distinct from the classical Gibbs–Wilbraham phenomenon of one-dimensional Fourier analysis. The Poisson summation formula treated in Chapter 3 provides an elegant connection between Fourier series on the circle and Fourier transforms on the real line, culminating in Landau's asymptotic formulas for lattice points on a large sphere.

Much of modern harmonic analysis is concerned with the behavior of various linear operators on the Lebesgue spaces $L^p(\mathbb{R}^n)$. Chapter 4 gives a gentle introduction to these results, using the Riesz–Thorin theorem and the Marcinkiewicz interpolation formula. One of the long-time users of Fourier analysis is probability theory. In Chapter 5 the central limit theorem, iterated log theorem, and Berry–Esseen theorems are developed using the suitable Fourier-analytic tools.

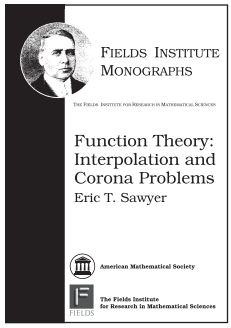
The final chapter furnishes a gentle introduction to wavelet theory, depending only on the L_2 theory of the Fourier transform (the Plancherel theorem). The basic notions of scale and location parameters demonstrate the flexibility of the wavelet approach to harmonic analysis.

The text contains numerous examples and more than 200 exercises, each located in close proximity to the related theoretical material.

Contents: Fourier series on the circle; Fourier transforms on the line and space; Fourier analysis in L^p spaces; Poisson summation formula and multiple Fourier series; Applications to probability theory; Introduction to wavelets; References; Notations; Index.

Graduate Studies in Mathematics, Volume 102

February 2009, 376 pages, Hardcover, ISBN: 978-0-8218-4797-8, LC 2008047419, 2000 *Mathematics Subject Classification:* 42-02; 42C40, **AMS members US$55**, List US$69, Order code GSM/102



Function Theory: Interpolation and Corona Problems

Eric T. Sawyer, *McMaster University, Hamilton, ON, Canada*

These lecture notes take the reader from Lennart Carleson's first deep results on interpolation and corona problems in the unit disk to modern analogues in the disk and ball. The emphasis is on introducing the diverse array of techniques needed to attack these problems rather than producing an encyclopedic summary of achievements. Techniques from classical analysis and operator theory include duality, Blaschke product constructions, purely Hilbert space arguments, bounded mean oscillation, best approximation, boundedness of the Beurling transform, estimates on solutions to the $\bar{\partial}$ equation, the Koszul complex, use of trees, the complete Pick property, and the Toeplitz corona theorem. An extensive appendix on background material in functional analysis and function theory on the disk is included for the reader's convenience.

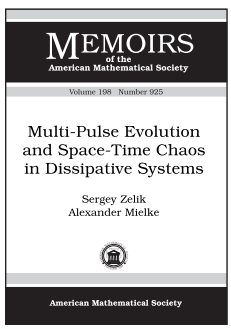
Titles in this series are co-published with The Fields Institute for Research in Mathematical Sciences (Toronto, Ontario, Canada).

Contents: Preliminaries; The interpolation problem; The corona problem; Toeplitz and Hankel operators; Hilbert function spaces and Nevanlinna-Pick kernels; Carleson measures for the Hardy-Sobolev spaces; Functional analysis; Weak derivatives and Sobolev spaces; Function theory on the disk; Spectral theory for normal operators; Bibliography; Index.

Fields Institute Monographs, Volume 25

February 2009, 203 pages, Hardcover, ISBN: 978-0-8218-4734-3, LC 2008047418, 2000 *Mathematics Subject Classification:* 30-02, 30H05, 32A35; 32A38, 42B30, 46J10, **AMS members US$52**, List US$65, Order code FIM/25

Differential Equations



Multi-Pulse Evolution and Space-Time Chaos in Dissipative Systems

Sergey Zelik, *University of Surrey, Guildford, United Kingdom*, and **Alexander Mielke**, *Weierstrass Institut für Angewandte Analysis und Stochastik, Berlin, Germany*

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

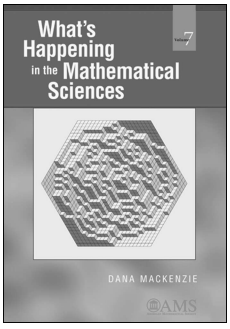
Contents: Introduction; Assumptions and preliminaries; Weighted Sobolev spaces and regularity of solutions; The multi-pulse manifold: general structure; The multi-pulse manifold: projectors and tangent spaces; The multi-pulse manifold: differential equations and the cut off procedure; Slow evolution of multi-pulse profiles: linear case; Slow evolution of multi-pulse structures: center manifold reduction; Hyperbolicity and stability; Multi-pulse

evolution equations: asymptotic expansions; An application: spatio-temporal chaos in periodically perturbed Swift-Hohenberg equation; Bibliography; Nomenclature.

Memoirs of the American Mathematical Society, Volume 198, Number 925

March 2009, 97 pages, Softcover, ISBN: 978-0-8218-4264-5, LC 2008047916, 2000 *Mathematics Subject Classification:* 35Q30, 37L30, **Individual member US$39**, List US$65, Institutional member US$52, Order code MEMO/198/925

General and Interdisciplinary



What's Happening in the Mathematical Sciences

Dana Mackenzie

Since 1993, the AMS has been publishing *What's Happening in the Mathematical Sciences*, a series of lively and highly readable accounts of the latest developments in mathematics. This seventh volume describes some genuine surprises, such as the recent discovery that coin tosses are inherently unfair; a mathematical theory of invisibility that was soon followed by the creation of a prototype "invisibility cloak"; and an ultra-efficient approach to image sensing that led to the development of a single-pixel camera.

The past few years have also seen deep results on some classical mathematics problems. For example, this volume describes a proof of the Sato–Tate Conjecture in number theory and a major advance in the Minimal Model Program of algebraic geometry. The computation of the character table of the exceptional Lie group E_8 brings "the most beautiful structure in mathematics" to public attention, and proves that human persistence is just as important as gigabytes of RAM. The amazing story of the Archimedes Palimpsest shows how the modern tools of high-energy physics uncovered the centuries-old secrets of the mathematical writings of Archimedes.

Dana Mackenzie, a science writer specializing in mathematics, makes each of these topics accessible to all readers, with a style that is friendly and at the same time attentive to the nuances that make mathematics fascinating. Anyone with an interest in mathematics, from high school teachers and college students to engineers and computer scientists, will find something of interest here. The stories are well told and the mathematics is compelling.

Praise for Earlier Volumes:

One can say without overstatement that the standards in these volumes are very high indeed.

The articles are very well written, and usually include quotes from the mathematicians who were involved in the work in question, giving the whole thing a more "human" feel. This book offers professionals a way to keep abreast of what's going on in the field and also gives us a way to share with our students and colleagues some of the excitement of doing mathematics. Don't miss it.

—***MAA Online***

…an excellent series transferring contemporary mathematical research in a delightful and exact manner to both non-mathematicians and mathematicians.

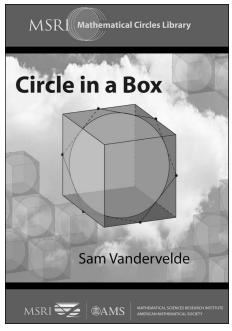
The mixture of hot topics and profiles of outstanding mathematicians proves a good choice. …Hopefully it will reach teachers and educators in order to make mathematics more visible and perhaps a bit more understandable to the general public.

—***Zentralblatt MATH***

Contents: Introduction; A new twist in knot theory; Error-term roulette and the Sato-Tate conjecture; The fifty-one percent solution; Dominos, anyone?; Not seeing is believing; Getting with the (Mori) program; The book that time couldn't erase; Charting a 248-dimensional world; Compressed sensing makes every pixel count.

What's Happening in the Mathematical Sciences, Volume 7

February 2009, 127 pages, Softcover, ISBN: 978-0-8218-4478-6, 2000 *Mathematics Subject Classification:* 00A06, **AMS members US$15.95**, List US$19.95, Order code HAPPENING/7



Circle in a Box

Sam Vandervelde, *St. Lawrence University, Canton, NY*

Math circles provide a setting in which mathematicians work with secondary school students who are interested in mathematics. This form of outreach, which has existed for decades in Russia, Bulgaria, and other countries, is now rapidly spreading across the United States as well. The first part of this book offers helpful advice on all aspects of math circle operations, culled from conversations with over a dozen directors of successful math circles. Topics include creative means for getting the word out to students, sound principles for selecting effective speakers, guidelines for securing financial support, and tips for designing an exciting math circle session. The purpose of this discussion is to enable math circle coordinators to establish a thriving group in which students can experience the delight of mathematical investigation. The second part of the book outlines ten independent math circle sessions, covering a variety of topics and difficulty levels. Each chapter contains detailed presentation notes along with a useful collection of problems and solutions. This book will be an indispensable resource for any individual involved with a math circle or anyone who would like to see one begin in his or her community.

Sam Vandervelde teaches at St. Lawrence University. He launched the Stanford Math Circle and also writes and coordinates the Mandelbrot Competition, a math contest for high schools.

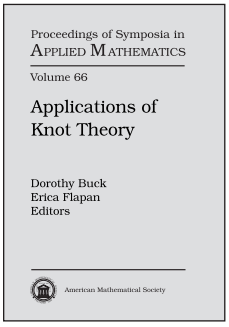
Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI).

Contents: *Oversight:* Molding a math circle; Supporting a math circle; Sustaining a math circle; Leading a math circle; *Presentations:* The game of Criss-Cross; Double time; King chickens; Into the unknown; Sneaky segments; Heads or tails; Circling the square; Making change; Square dance; Reflection in a circle; *Appendices:* Sample documents; Warm-ups; Sample grant proposal; Sample grant report; Acknowledgments.

MSRI Mathematical Circles Library, Volume 2

February 2009, 217 pages, Softcover, ISBN: 978-0-8218-4752-7, 2000 *Mathematics Subject Classification:* 97D50; 97U40, 97A20, **AMS members US$31**, List US$39, Order code MCL/2

Geometry and Topology



Applications of Knot Theory

Dorothy Buck, *Imperial College London, England*, and **Erica Flapan**, *Pomona College, Claremont, CA*, Editors

Over the past 20–30 years, knot theory has rekindled its historic ties with biology, chemistry, and physics as a means of creating more sophisticated descriptions of the entanglements and properties of natural phenomena—from strings to organic compounds to DNA.

This volume is based on the 2008 AMS Short Course, *Applications of Knot Theory*. The aim of the Short Course and this volume, while not covering all aspects of applied knot theory, is to provide the reader with a mathematical appetizer, in order to stimulate the mathematical appetite for further study of this exciting field.

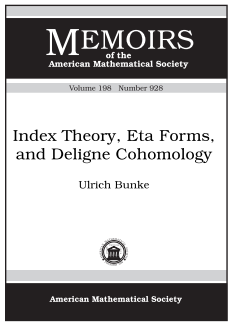
No prior knowledge of topology, biology, chemistry, or physics is assumed. In particular, the first three chapters of this volume introduce the reader to knot theory (by Colin Adams), topological chirality and molecular symmetry (by Erica Flapan), and DNA topology (by Dorothy Buck). The second half of this volume is focused on three particular applications of knot theory. Louis Kauffman discusses applications of knot theory to physics, Nadrian Seeman discusses how topology is used in DNA nanotechnology, and Jonathan Simon discusses the statistical and energetic properties of knots and their relation to molecular biology.

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

Contents: C. Adams, A brief introduction to knot theory from the physical point of view; **E. Flapan**, Topological chirality and symmetries of non-rigid molecules; **D. Buck**, DNA topology; **L. H. Kauffman**, Knots and physics; **N. C. Seeman**, Synthetic single-stranded DNA topology; **J. Simon**, Long tangled filaments.

Proceedings of Symposia in Applied Mathematics, Volume 66

March 2009, approximately 187 pages, Hardcover, ISBN: 978-0-8218-4466-3, LC 2008044393, 2000 *Mathematics Subject Classification:* 53A04, 57M25, 57M27, 81T45, 82D60, 92C40, 92E10, **AMS members US$39**, List US$49, Order code PSAPM/66



Index Theory, Eta Forms, and Deligne Cohomology

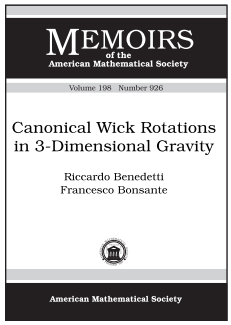
Ulrich Bunke, *Universität Regensburg, Germany*

Contents: Introduction; Index theory for families with corners; Analytic obstruction theory; Deligne cohomology valued index theory; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 198, Number 928

March 2009, 120 pages, Softcover, ISBN: 978-0-8218-4284-3, LC 2008047669, 2000 *Mathematics Subject Classification:* 58J28, 55S35, **Individual member US$40**, List US$67, Institutional member US$54, Order code MEMO/198/928

Mathematical Physics



Canonical Wick Rotations in 3-Dimensional Gravity

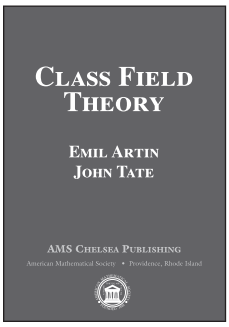
Riccardo Benedetti, *Università di Pisa, Italy*, and **Francesco Bonsante**, *Università degli Studi di Pavia, Italy*

Contents: General view on themes and contents; Geometry models; Flat globally hyperbolic spacetimes; Flat Lorentzian vs hyperbolic geometry; Flat vs de Sitter Lorentzian geometry; Flat vs AdS Lorentzian geometry; $\mathcal{QD}$-spacetimes; Complements; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 198, Number 926

March 2009, 164 pages, Softcover, ISBN: 978-0-8218-4281-2, LC 2008047655, 2000 *Mathematics Subject Classification:* 53C50, 57M50, **Individual member US$43**, List US$72, Institutional member US$58, Order code MEMO/198/926

Number Theory



Class Field Theory

Emil Artin, and **John Tate**, *University of Texas at Austin, TX*

This classic book, originally published in 1968, is based on notes of a year-long seminar the authors ran at Princeton University. The primary goal of the book was to give a rather complete presentation of algebraic aspects of global class field theory, and the authors accomplished this goal spectacularly: for more than 40 years since its first publication, the book has served as an ultimate source for many generations of mathematicians.

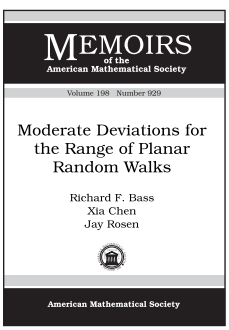
In this revised edition, two mathematical additions complementing the exposition in the original text are made. The new edition also contains several new footnotes, additional references, and historical comments.

Contents: Preliminaries; The first fundamental inequality; Second fundamental inequality; Reciprocity law; The existence theorem; Connected component of idèle classes; The Grunwald–Wang theorem; Higher ramification theory; Explicit reciprocity laws; Group extensions; Abstract class field theory; Weil groups; Bibliography.

AMS Chelsea Publishing, Volume 366

January 2009, 192 pages, Hardcover, ISBN: 978-0-8218-4426-7, LC 2008042201, 2000 *Mathematics Subject Classification:* 11R37; 11-01, 11R34, **AMS members US$32**, List US$35, Order code CHEL/366.H

Probability



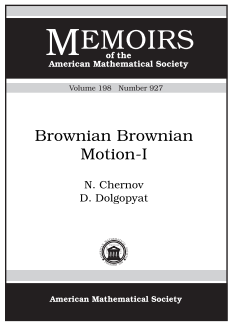
Moderate Deviations for the Range of Planar Random Walks

Richard F. Bass, *University of Connecticut, Storrs, CT*, **Xia Chen**, *University of Tennessee, Knoxville, TN*, and **Jay Rosen**, *CUNY, College of Staten Island, NY*

Contents: Introduction; History; Overview; Preliminaries; Moments of the range; Moderate deviations for $R_n - \mathbb{E}R_n$; Moderate deviations for $\mathbb{E}R_n - R_n$; Exponential asymptotics for the smoothed range; Exponential approximation; Laws of the iterated logarithm; Bibliography.

Memoirs of the American Mathematical Society, Volume 198, Number 929

March 2009, 82 pages, Softcover, ISBN: 978-0-8218-4287-4, LC 2008047917, 2000 *Mathematics Subject Classification:* 60F10, 60G50, 60J55, **Individual member US$37**, List US$62, Institutional member US$50, Order code MEMO/198/929



Brownian Brownian Motion-I

N. Chernov, *University of Alabama, Birmingham, AL*, and **D. Dolgopyat**, *University of Maryland, College Park, MD*

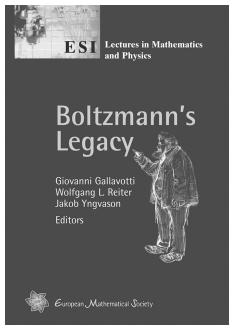
Contents: Introduction; Statement of results; Plan of the proofs; Standard pairs and equidistribution; Regularity of the diffusion matrix; Moment estimates; Fast slow particle; Small large particle; Open problems; Appendix A. Statistical properties of dispersing billiards; Appendix B. Growth and distortion properties of dispersing billiards; Appendix C. Distortion bounds for two particle system; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 198, Number 927

March 2009, 193 pages, Softcover, ISBN: 978-0-8218-4282-9, LC 2008047662, 2000 *Mathematics Subject Classification:* 37D50; 34C29, 60F17, **Individual member US$47**, List US$78, Institutional member US$62, Order code MEMO/198/927

New AMS-Distributed Publications

Mathematical Physics



Boltzmann's Legacy

Giovanni Gallavotti, *University of Rome I, Italy*, and **Wolfgang L. Reiter** and **Jakob Yngvason**, *University of Vienna, Austria*, Editors

Ludwig Eduard Boltzmann (1844–1906) was an Austrian physicist famous for his founding contributions in the fields of statistical mechanics and statistical thermodynamics. He was one of the most important advocates for atomic theory when that scientific model was still highly controversial. To commemorate the 100th anniversary of his death in Duino, the International Symposium "Boltzmann's Legacy" was held at the Erwin Schrödinger International Institute for Mathematical Physics in June 2006.

This text covers a broad spectrum of topics ranging from equilibrium statistical and nonequilibrium statistical physics, ergodic theory and chaos to basic questions of biology and

historical accounts of Boltzmann's work. Besides the lectures presented at the symposium the volume also contains contributions specially written for this occasion. The articles give a broad overview of Boltzmann's legacy to the sciences from the standpoint of some of today's leading scholars in the field.

The book addresses students and researchers in mathematics, physics, and the history of science.

This item will also be of interest to those working in general and interdisciplinary areas.

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

Contents: G. Gallavotti, Introduction; **J. Renn**, Boltzmann and the end of the mechanistic worldview; **E. H. Lieb**, What if Boltzmann had known about quantum mechanics; **G. Gallavotti**, Entropy, nonequilibrium, chaos and infinitesimals; **J. L. Lebowitz**, From time-symmetric microscopic dynamics to time-asymmetric macroscopic behavior: An overview; **D. Ruelle**, What physical quantities make sense in nonequilibrium statistical mechanics?; **D. S. Ornstein**, Boltzmann, ergodic theory, and chaos; **C. Cercignani**, 134 years of Boltzmann equation; **C. Villani**, *H*-theorem and beyond: Boltzman's entropy in today's mathematics; **H. Spohn**, On the Boltzmann equation for weakly nonlinear wave equations; **E. G. Cohen**, Entropy, probability and dynamics; **C. Dellago** and **H. A. Posch**, Realizing Boltzmann's dream: computer simulations in modern statistical mechanics; **A. Gabrielov**, **V. Keilis-Borok**, **Ya. Sinai**, and **I. Zaliapin**, Statistical properties of the cluster dynamics of the systems of statistical mechanics; **P. Schuster**, Boltzmann and evolution: some basic questions of biology seen with atomistic glasses; **W. L. Reiter**, Ludwig Boltzmann—the restless prophet; Chronology; List of contributors; Name index; Subject index.

ESI Lectures in Mathematics and Physics, Volume 5

October 2007, 284 pages, Hardcover, ISBN: 978-3-03719-057-9, 2000 *Mathematics Subject Classification:* 01-02, 82-02, 82C03, 82B40, **AMS members US$62**, List US$78, Order code EMSESILEC/5