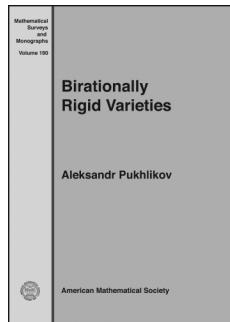


# New Publications Offered by the AMS

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## Algebra and Algebraic Geometry



### Birationally Rigid Varieties

Aleksandr Pukhlikov, University of Liverpool, United Kingdom

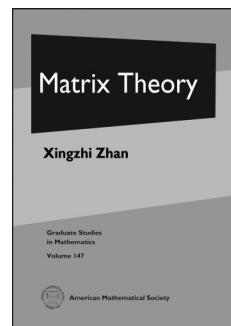
Birational rigidity is a striking and mysterious phenomenon in higher-dimensional algebraic geometry. It turns out that certain natural families of algebraic varieties (for example, three-dimensional quartics) belong to the same classification type as the projective space but have radically different birational geometric properties. In particular, they admit no non-trivial birational self-maps and cannot be fibred into rational varieties by a rational map. The origins of the theory of birational rigidity are in the work of Max Noether and Fano; however, it was only in 1970 that Iskovskikh and Manin proved birational superrigidity of quartic three-folds. This book gives a systematic exposition of, and a comprehensive introduction to, the theory of birational rigidity, presenting in a uniform way, ideas, techniques, and results that so far could only be found in journal papers.

The recent rapid progress in birational geometry and the widening interaction with the neighboring areas generate the growing interest to the rigidity-type problems and results. The book brings the reader to the frontline of current research. It is primarily addressed to algebraic geometers, both researchers and graduate students, but is also accessible for a wider audience of mathematicians familiar with the basics of algebraic geometry.

**Contents:** Introduction; The rationality problem; The method of maximal singularities; Hypertangent divisors; Rationally connected fibre spaces; Fano fibre spaces of  $\mathbb{P}^1$ ; Del Pezzo fibrations; Fano direct products; Double spaces of index two; Bibliography; Index.

**Mathematical Surveys and Monographs**, Volume 190

July 2013, approximately 368 pages, Hardcover, ISBN: 978-0-8218-9476-7, LC 2013001454, 2010 Mathematics Subject Classification: 14E05, 14E07, 14J45, 14E08, 14E30, 14M22, 14M10, 14M20, 14J30, 14J40, **AMS members US\$78.40**, List US\$98, Order code SURV/190



### Matrix Theory

Xingzhi Zhan, East China Normal University, Shanghai, China

Matrix theory is a classical topic of algebra that had originated, in its current form, in the middle of the 19th century. It is remarkable that for more than 150 years it continues to be an active area of research full of new discoveries and new applications.

This book presents modern perspectives of matrix theory at the level accessible to graduate students. It differs from other books on the subject in several aspects. First, the book treats certain topics that are not found in the standard textbooks, such as completion of partial matrices, sign patterns, applications of matrices in combinatorics, number theory, algebra, geometry, and polynomials. There is an appendix of unsolved problems with their history and current state. Second, there is some new material within traditional topics such as Hopf's eigenvalue bound for positive matrices with a proof, a proof of Horn's theorem on the converse of Weyl's theorem, a proof of Camion-Hoffman's theorem on the converse of the diagonal dominance theorem, and Audenaert's elegant proof of a norm inequality for commutators. Third, by using powerful tools such as the compound matrix and Gröbner bases of an ideal, much more concise and illuminating proofs are given for some previously known results. This makes it easier for the reader to gain basic knowledge in matrix theory and to learn about recent developments.

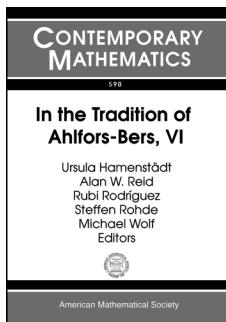
**Contents:** Preliminaries; Tensor products and compound matrices; Hermitian matrices and majorization; Singular values and unitarily invariant norms; Perturbation of matrices; Nonnegative matrices; Completion of partial matrices; Sign patterns; Miscellaneous topics; Applications of matrices; Unsolved problems; Bibliography; Notation; Index.

**Graduate Studies in Mathematics**, Volume 147

July 2013, approximately 254 pages, Hardcover, ISBN: 978-0-8218-9491-0, 2010 Mathematics Subject Classification: 15-01, 15A18, 15A21, 15A60, 15A83, 15A99, 15B35, 05B20, 47A63, **AMS members US\$52**, List US\$65, Order code GSM/147

# Analysis

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## In the Tradition of Ahlfors-Bers, VI

**Ursula Hamenstädt, University of Bonn, Germany, Alan W. Reid, University of Texas at Austin, TX, Rubi Rodríguez, Pontificia University Catholic of Chile, Santiago, Chile, Steffen Rohde, University of Washington, Seattle, WA, and Michael Wolf, Rice University, Houston, TX, Editors**

The Ahlfors-Bers Colloquia commemorate the mathematical legacy of Lars Ahlfors and Lipman Bers. The core of this legacy lies in the fields of geometric function theory, Teichmüller theory, hyperbolic geometry, and partial differential equations. However, the work of Ahlfors and Bers has impacted and created interactions with many other fields of mathematics, such as algebraic geometry, dynamical systems, topology, geometric group theory, mathematical physics, and number theory. Recent years have seen a flowering of this legacy with an increased interest in their work.

This current volume contains articles on a wide variety of subjects that are central to this legacy. These include papers in Kleinian groups, classical Riemann surface theory, translation surfaces, algebraic geometry and dynamics. The majority of the papers present new research, but there are survey articles as well.

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

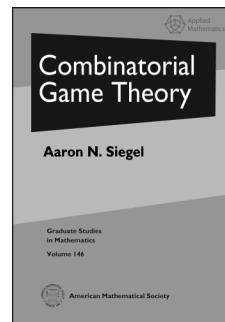
**Contents:** S. Dowdall, M. Duchin, and H. Masur, Spheres in the curve complex; C. Florentino and S. Lawton, Character varieties and moduli of quiver representations; E. Fujikawa, Periodicity of asymptotic Teichmüller modular transformation; Z. Ibragimov, Hyperbolization of locally compact non-complete metric spaces; A. Isopoussu, K. Peltonen, and J. T. Tyson, Quasiregular maps and the conductivity equation in the Heisenberg group; C. Judge, Pushing points on pillowcase covers; T. Koberda, Entropy of automorphisms, homology and the intrinsic polynomial structure of nilpotent groups; G. F. Lawler, Continuity of radial and two-sided radial SLE at the terminal point; M. Matsuzaki and Y. Yabuki, No proper conjugation for quasiconvex cocompact groups of Gromov hyperbolic spaces; H. Miyachi, A differential formula for extremal length; O. Ostapyuk, On convergence to the Denjoy-wolff point in the parabolic case; S. Pal, Construction of a closed hyperbolic surface of arbitrarily small eigenvalue of prescribed serial number; J. Paupert, A simple method to compute volumes of even-dimensional Coxeter polyhedra; P. Poggi-Corradini, Some remarks about analytic functions defined on an annulus; H. Shiga, On injectivity radius in configuration space and in moduli space.

**Contemporary Mathematics, Volume 590**

May 2013, approximately 190 pages, Softcover, ISBN: 978-0-8218-7427-1, 2010 *Mathematics Subject Classification*: 20-XX, 30-XX, 31-XX, 32-XX, 33-XX, 42-XX, 51-XX, 53-XX, 57-XX, 58-XX, **AMS members US\$60.80**, List US\$76, Order code CONM/590

# Applications

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## Combinatorial Game Theory

**Aaron N. Siegel, San Francisco, CA**

Combinatorial game theory is the study of two-player games with no hidden information and no chance elements. The theory assigns algebraic values to positions in such games and seeks to quantify the algebraic and combinatorial structure of their interactions. Its modern form was

introduced thirty years ago, with the publication of the classic *Winning Ways for Your Mathematical Plays* by Berlekamp, Conway, and Guy, and interest has rapidly increased in recent decades.

This book is a comprehensive and up-to-date introduction to the subject, tracing its development from first principles and examples through many of its most recent advances. Roughly half the book is devoted to a rigorous treatment of the classical theory; the remaining material is an in-depth presentation of topics that appear for the first time in textbook form, including the theory of misère quotients and Berlekamp's generalized temperature theory.

Packed with hundreds of examples and exercises and meticulously cross-referenced, *Combinatorial Game Theory* will appeal equally to students, instructors, and research professionals. More than forty open problems and conjectures are mentioned in the text, highlighting the many mysteries that still remain in this young and exciting field.

Aaron Siegel holds a Ph.D. in mathematics from the University of California, Berkeley and has held positions at the Mathematical Sciences Research Institute and the Institute for Advanced Study. He was a partner at Berkeley Quantitative, a technology-driven hedge fund, and is presently employed by Twitter, Inc.

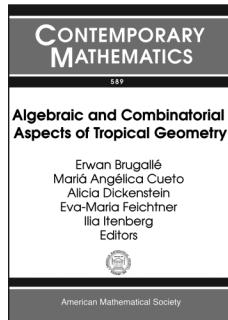
*This item will also be of interest to those working in discrete mathematics and combinatorics.*

**Contents:** Combinatorial games; Short games; The structure of  $\mathbb{G}$ ; Impartial games; Misère play; Loopy games; Temperature theory; Transfinite games; Open problems; Mathematical prerequisites; A finite loopfree history; Bibliography; Glossary of notation; Author index; Index of games; Index.

**Graduate Studies in Mathematics, Volume 146**

July 2013, approximately 527 pages, Hardcover, ISBN: 978-0-8218-5190-6, LC 2012043675, 2010 *Mathematics Subject Classification*: 91A46, **AMS members US\$71.20**, List US\$89, Order code GSM/146

## Discrete Mathematics and Combinatorics



### Algebraic and Combinatorial Aspects of Tropical Geometry

**Erwan Brugallé**, *Université Pierre et Marie Curie (Paris 6), France*,  
**Mariá Angélica Cueto**, *Columbia University, New York, NY, and Goethe-Universität Frankfurt, Frankfurt am Main, Germany*,  
**Alicia Dickenstein**, *Universidad de Buenos Aires, Argentina*,  
**Eva-Maria Feichtner**, *University of Bremen, Germany*, and  
**Ilia Itenberg**, *Université Pierre et Marie Curie (Paris 6), France*, Editors

This volume contains the proceedings of the CIEM workshop on Tropical Geometry, held December 12–16, 2011, at the International Centre for Mathematical Meetings (CIEM), Castro Urdiales, Spain.

Tropical geometry is a new and rapidly developing field of mathematics which has deep connections with various areas of mathematics and physics, such as algebraic geometry, symplectic geometry, complex analysis, dynamical systems, combinatorics, statistical physics, and string theory. As reflected by the content of this volume, this meeting was mainly focused on the geometric side of the tropical world with an emphasis on relations between tropical geometry, algebraic geometry, and combinatorics.

This volume provides an overview of current trends concerning algebraic and combinatorial aspects of tropical geometry through eleven papers combining expository parts and development of modern techniques and tools.

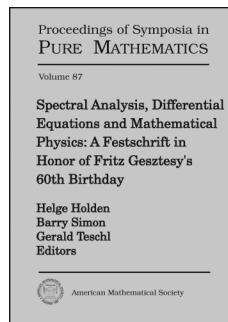
*This item will also be of interest to those working in algebra and algebraic geometry.*

**Contents:** B. Bertrand and F. Bihan, Intersection multiplicity numbers between tropical hypersurfaces; B. Bertrand, L. L. de Medrano, and J.-J. Risler, On the total curvature of tropical hypersurfaces; M. Chan, M. Melo, and F. Viviani, Tropical Teichmüller and Siegel spaces; M. Chan and B. Sturmfels, Elliptic curves in honeycomb form; J. Draisma and B. Frenk, Tropically unirational varieties; W. Gubler, A guide to tropicalizations; Z. Izhakian, M. Knebusch, and L. Rowen, Categorical notions of layered tropical algebra and geometry; E. Katz, Tropical realization spaces for polyhedral complexes; P. Popescu-Pampu and D. Stepanov, Local tropicalization; F. Santos, Some acyclic systems of permutations are not realizable by triangulations of a product of simplices; K. M. Shaw, Tropical (1, 1)-homology for floor decomposed surfaces.

**Contemporary Mathematics**, Volume 589

May 2013, approximately 350 pages, Softcover, ISBN: 978-0-8218-9146-9, 2010 *Mathematics Subject Classification*: 14T05, 14T99, 51M20, 12J20, 14M25, 32P05; 14C30, 05E45, 14H52, 32S05, AMS members US\$88.80, List US\$111, Order code CONM/589

## Mathematical Physics



### Spectral Analysis, Differential Equations and Mathematical Physics: A Festschrift in Honor of Fritz Gesztesy's 60th Birthday

**Helge Holden**, *Norwegian University of Science and Technology, Trondheim, Norway*, **Barry Simon**, *California Institute of Technology, Pasadena, CA*, and **Gerald Teschl**, *University of Vienna, Austria*, Editors

This volume contains twenty contributions in the area of mathematical physics where Fritz Gesztesy made profound contributions.

There are three survey papers in spectral theory, differential equations, and mathematical physics, which highlight, in particular, certain aspects of Gesztesy's work. The remaining seventeen papers contain original research results in diverse areas reflecting his interests. The topics of these papers range from stochastic differential equations; operators on graphs; elliptic partial differential equations; Sturm-Liouville, Jacobi, and CMV operators; semigroups; to inverse problems.

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

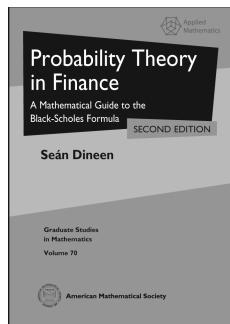
**Contents:** S. Albeverio, E. Mastrogiamomo, and L. Di Persio, Invariant measures for stochastic differential equations on networks; D. Bollé, F. L. Metz, and I. Neri, On the spectra of large sparse graphs with cycles; K. Brewster, D. Mitrea, I. Mitrea, and M. Mitrea, Jones' extension operator on Sobolev spaces with partially vanishing traces; B. M. Brown, W. D. Evans, and I. G. Wood, Some spectral properties of rooms and passages domains and their skeletons; J. S. Christiansen, B. Simon, and M. Zinchenko, Finite gap Jacobi matrices: A review; P. Exner, Momentum operators on graphs; G. Fragnelli, G. R. Goldstein, J. A. Goldstein, and S. Romanelli, Asymptotic parabolicity for strongly damped wave equations; A. Gomilko and Y. Tomilov, On rates in Euler's formula for  $C_0$ -semigroups; H. Grosse and R. Wulkenhaar, Construction of a noncommutative quantum field theory; K. Grunert, H. Holden, and X. Raynaud, Periodic conservative solutions for the two-component Camassa-Holm system; G. A. Hagedorn, A minimal uncertainty product for one-dimensional semiclassical wave packets; E. M. Harrell, II and M. L. Wong, On a transformation of Bohr and its discrete analogue; C. K. R. T. Jones, Y. Latushkin, and R. Marangell, The Morse and Maslov indices for matrix Hill's equations; A. Kostenko and M. Malamud, 1-D Schrödinger operators with local point interactions: A review; Y. I. Lyubarskii and V. A. Marchenko, Inverse problem for small oscillations; K. A. Makarov and E. Tsekanovskii, On the Weyl-Titchmarsh and Livšic functions; R. Shterenberg, R. Weikard, and M. Zinchenko, Stability for the inverse resonance problem for the CMV operator; F. A. Sukochev,

On a conjecture of A. Bikchentaev; **G. Teschl** and **K. Unterkoferl**, Spectral theory as influenced by Fritz Gesztesy; **M. Ünal** and **A. Zafer**, Prescribed asymptotic behavior for nonlinear second-order dynamic equations.

#### Proceedings of Symposia in Pure Mathematics, Volume 87

June 2013, approximately 389 pages, Hardcover, ISBN: 978-0-8218-7574-2, 2010 *Mathematics Subject Classification*: 34N05, 34L05, 35P05, 35L45, 46E35, 47A05, 47B36, 81T08, 81Q10, 93E03, **AMS members** US\$79.20, List US\$99, Order code PSPUM/87

## Probability and Statistics



### Probability Theory in Finance

A Mathematical Guide to the Black-Scholes Formula, Second Edition

**Séán Dineen**, University College Dublin, Ireland

The use of the Black-Scholes model and formula is pervasive in financial markets. There are very few undergraduate textbooks available on the subject and, until now, almost none written by mathematicians. Based on a course given by the author, the goal of this book is to introduce advanced undergraduates and beginning graduate students studying the mathematics of finance to the Black-Scholes formula. The author uses a first-principles approach, developing only the minimum background necessary to justify mathematical concepts and placing mathematical developments in context.

The book skillfully draws the reader toward the art of thinking mathematically and then proceeds to lay the foundations in analysis and probability theory underlying modern financial mathematics. It rigorously reveals the mathematical secrets of topics such as abstract measure theory, conditional expectations, martingales, Wiener processes, the Itô calculus, and other ingredients of the Black-Scholes formula. In explaining these topics, the author uses examples drawn from the universe of finance. The book also contains many exercises, some included to clarify simple points of exposition, others to introduce new ideas and techniques, and a few containing relatively deep mathematical results.

The second edition contains numerous revisions and additional material designed to enhance the book's usability as a classroom text. These changes include insights gleaned by the author after teaching from the text, as well as comments and suggestions made by others who used the book. Whereas the revised edition maintains the original approach, format, and list of topics, most chapters are modified to some extent; in addition, the rearrangement of material resulted in a new chapter (Chapter 9).

With the modest prerequisite of a first course in calculus, the book is suitable for undergraduates and graduate students in mathematics, finance, and economics and can be read, using appropriate selections, at a number of levels.

**Contents:** Money and markets; Fair games; Set theory; Measurable functions; Probability spaces; Expected values; Continuity

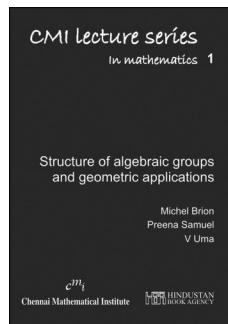
and integrability; Conditional expectation; Lebesgue measure; Martingales; The Black-Scholes formula; Stochastic integration; Solutions; Bibliography; Index.

#### Graduate Studies in Mathematics, Volume 70

July 2013, 304 pages, Hardcover, ISBN: 978-0-8218-9490-3, 2010 *Mathematics Subject Classification*: 60-01, 91Bxx, **AMS members** US\$52, List US\$65, Order code GSM/70.R

## New AMS-Distributed Publications

### Algebra and Algebraic Geometry



### Structure of Algebraic Groups and Geometric Applications

**Michael Brion**, University of Grenoble I, Martin d'Heres, France, **Preema Samuel**, Institute of Mathematical Science, Tamilnadu, India, and **V. Uma**, Indian Institute of Technology, Chennai, India

This book originates from a series of 10 lectures given by Michel Brion at the Chennai Mathematical Institute during January 2011. The book presents Chevalley's theorem on the structure of connected algebraic groups, over algebraically closed fields, as the starting point of various other structure results developed in the recent past.

Chevalley's structure theorem states that any connected algebraic group over an algebraically closed field is an extension of an abelian variety by a connected affine algebraic group. This theorem forms the foundation for the classification of anti-affine groups which plays a central role in the development of the structure theory of homogeneous bundles over abelian varieties and for the classification of complete homogeneous varieties. All these results are presented in this book.

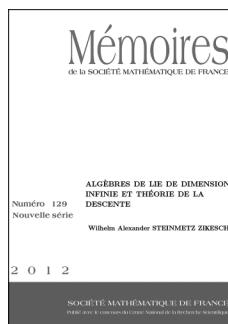
The book begins with an overview of the results, the proofs of which constitute the rest of the book. Various open questions also have been indicated in the course of the exposition. This book assumes certain preliminary knowledge of linear algebraic groups, abelian varieties, and algebraic geometry.

A publication of Hindustan Book Agency; distributed within the Americas by the American Mathematical Society. Maximum discount of 20% for all commercial channels.

**Contents:** Overview; Proof of Chevalley's theorem; Applications and developments; Complete homogeneous varieties; Anti-affine groups; Homogeneous vector bundles; Homogeneous principal bundles; Bibliography.

Hindustan Book Agency

November 2012, 128 pages, Softcover, ISBN: 978-93-80250-46-5,  
 2010 Mathematics Subject Classification: 20G15, 14L10, 14L15, 14L17,  
 14L30, 14L40, AMS members US\$36, List US\$45, Order code HIN/55



## Algèbres de Lie de Dimension Infinie et Théorie de la Descente

Wilhelm Alexander Steinmetz  
 Zikesch, Université Paris-Sud XI,  
 Orsay, France

**A note to readers:** This book is in French.

Let  $k$  be an algebraically closed field of characteristic zero and let  $R$  be the Laurent polynomial ring in two variables over  $k$ . The main motivation behind this work is a class of infinite dimensional Lie algebras over  $k$ , called *extended affine Lie algebras* (EALAs). These algebras correspond to torsors under algebraic groups over  $R$ .

In this work the author classifies  $R$ -torsors under classical groups of large enough rank for outer type  $A$  and types  $B, C, D$ , as well as for inner type  $A$  under stronger hypotheses. The author can thus deduce results on EALAs and also obtain a positive answer to a variant of Serre's Conjecture II for the ring  $R$ : every smooth  $R$ -torsor under a semi-simple simply connected  $R$ -group of large enough rank of classical type  $B, C, D$  is trivial.

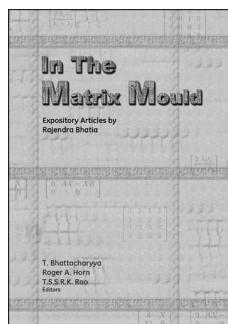
*This item will also be of interest to those working in number theory.*

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.

**Contents:** Introduction; Généralités et préliminaires; Les conjectures; Le cas  $^1 A_{n-1}$  et les groupes orthogonaux; Le cas  $C_n$ , les autres groupes du type  $D_n$  et le cas  $^2 A_n$ ; La conjecture B; Bibliographie.

Mémoires de la Société Mathématique de France, Number 129

December 2012, 99 pages, Softcover, ISBN: 978-2-85629-349-2, 2010 Mathematics Subject Classification: 17B67, 14L15, 11E57, 11E72, 11E39, 11E81, 19G12, 18E30, Individual member US\$43.20, List US\$48, Order code SMFMEM/129



## In the Matrix Mould

Expository Articles by  
 Rajendra Bhatia

Tirthankar Bhattacharyya, Indian Institute of Sciences, Karnataka, India, Roger A. Horn, University of Utah, Salt Lake City, Utah, and T. S. S. R. K. Rao, Indian Statistical Institute, Bangalore, India, Editors

Rajendra Bhatia has written several expository articles for renowned journals such as *The American Mathematical Monthly*, *Mathematical Intelligencer*, and *Resonance*. These elementary articles have often spurred research papers by other authors. On the other hand, some of

his research articles present major ideas in such a simple way that they can be profitably read by beginners. This volume contains a selection of such articles compiled by the editors.

The articles, on a variety of topics in analysis and linear algebra, can be read as introductions to interesting ideas. They can also be used as a basis for projects and master's dissertations and for workshops and refresher courses for college teachers.

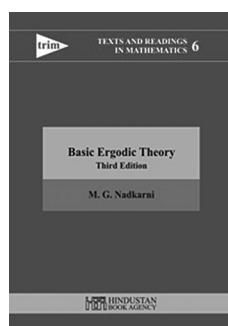
A publication of Hindustan Book Agency; distributed within the Americas by the American Mathematical Society. Maximum discount of 20% for all commercial channels.

**Contents:** with T. Ando, Eigenvalue inequalities associated with the Cartesian decomposition; with M.D. Choi and C. Davis, Comparing a matrix to its off-diagonal part; Matrix factorisations and their perturbations; with P. Rosenthal, How and why to solve the operator equation  $AX - XB = Y$ ; with P. Semrl, Approximate isometries on Euclidean spaces; with K. R. Parthasarathy, Positive definite functions and operator inequalities; with C. Davis, A better bound on the variance; Pinching, trimming, truncating, and averaging of matrices; Linear algebra to quantum cohomology: The story of Alfred Horn's inequalities; Partial traces and entropy inequalities; On the exponential metric increasing property; Infinitely divisible matrices; with J. Holbrook, Noncommutative geometric means; Spectral variation, normal matrices, and Finsler geometry; with J. A. Dias da Silva, Infinite divisibility of GCD matrices; with M. Uchiyama, The operator equation  $\sum_{i=0}^n A^{n-i}XB^i = Y$ ; Modulus of continuity of the matrix absolute value; Min matrices and mean matrices; The work of W. T. Gowers; Orthogonalisation of vectors; with R. Mohan, Triangularization of a matrix; Eigenvalues of  $AB$  and  $BA$ ; The unexpected appearance of  $\pi$  in diverse problems; Calculus of operator functions; A conversation with S. R. S. Varadhan.

Hindustan Book Agency

December 2012, 362 pages, Hardcover, ISBN: 978-93-80250-47-2, 2010 Mathematics Subject Classification: 15-XX, 15Axx, 15-02, 15-06, AMS members US\$44, List US\$55, Order code HIN/57

## Analysis



## Basic Ergodic Theory

Third Edition

M. G. Nadkarni, University of Mumbai, India

This is an introductory text on ergodic theory. The presentation has a slow pace, and the book can be read by anyone with a background in basic measure theory and metric topology. A new feature of the book is that the basic topics of ergodic theory such as the Poincaré recurrence lemma, induced automorphisms and Kakutani towers, compressibility and E. Hopf's theorem, and the theorem of Ambrose on representation of flows, are treated at the descriptive set-theoretic level before their measure-theoretic or topological versions are presented. In addition, topics centering around the Glimm-Effros theorem, which have so far not found a place in texts on ergodic theory, are discussed in this book.

The third edition has, among other improvements, a new chapter on additional topics that include Liouville's theorem of classical

mechanics, the basics of Shannon Entropy and the Kolmogorov-Sinai theorem, and van der Waerden's theorem on arithmetical progressions.

A publication of Hindustan Book Agency; distributed within the Americas by the American Mathematical Society. Maximum discount of 20% for all commercial channels.

**Contents:** The Poincaré recurrence lemma; Ergodic theorems of Birkhoff and von Neumann; Ergodicity; Mixing conditions and their characterisations; Bernoulli shift and related concepts; Discrete spectrum theorem; Induced automorphisms and related concepts; Borel automorphisms are Polish homeomorphisms; The Glimm-Effros theorem; Hopf's theorem; H. Dye's theorem; Flows and their representations; Additional topics; Bibliography; Index.

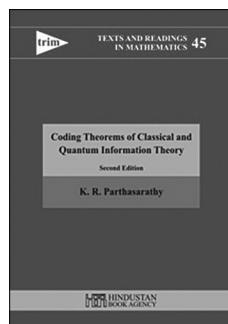
#### Hindustan Book Agency

January 2013, 196 pages, Hardcover, ISBN: 978-93-80250-43-4, 2010 *Mathematics Subject Classification*: 28Dxx, 60Bxx, **AMS members US\$38.40**, List US\$48, Order code HIN/58

equations; Integral equations; Partial differential equations; Appendix A: Answers and hints; Index.

#### Hindustan Book Agency

December 2012, 888 pages, Hardcover, ISBN: 978-93-80250-40-3, 2010 *Mathematics Subject Classification*: 65-00, 65-01, 65-04, **AMS members US\$76**, List US\$95, Order code HIN/56



## Coding Theorems of Classical and Quantum Information Theory

Second Edition

**K. R. Parthasarathy**, Indian Statistical Institute, New Delhi, India

The aim of this little book is to convey three principal developments in the evolution of modern information theory: Shannon's initiation of a revolution in 1948 by his interpretation of the Boltzmann entropy as a measure of information yielded by an elementary statistical experiment and basic coding theorems on storage and optimal transmission of messages through noisy communication channels; the influence of ergodic theory in the enlargement of the scope of Shannon's theorems through the works of McMillan, Feinstein, Wolfowitz, Breiman, and others, and its impact on the appearance of the Kolmogorov-Sinai invariant for elementary dynamical systems; and finally, the more recent work of Schumacher, Holevo, Winter, and others on the role of von Neumann entropy in the quantum avatar of the basic coding theorems when messages are encoded as quantum states, transmitted through noisy quantum channels and retrieved by generalized measurements.

This revised second edition has a chapter devoted to quantum error correction theory that shows how information in the form of quantum states can be made to tunnel through a noisy environment.

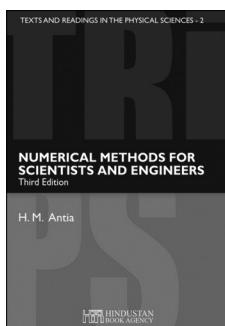
A publication of Hindustan Book Agency; distributed within the Americas by the American Mathematical Society. Maximum discount of 20% for all commercial channels.

**Contents:** Entropy of elementary information; Stationary information sources; Communication in the presence of noise; Quantum coding; Quantum error correction; Bibliography; Index.

#### Hindustan Book Agency

January 2013, 186 pages, Hardcover, ISBN: 978-93-80250-41-0, 2010 *Mathematics Subject Classification*: 94A15, 94-02, 94A24, 37A35, 37A99, 81P68, **AMS members US\$38.40**, List US\$48, Order code HIN/59

## Applications



## Numerical Methods for Scientists and Engineers

Third Edition

**H. M. Antia**, Tata Institute of Fundamental Research, Mumbai, India

Computation is an indispensable tool in the analysis and exploration of a wide range of physical phenomena. This book presents an exhaustive exposition of the various numerical methods used in scientific and engineering applications. It emphasizes the practical aspects of numerical computation and discusses various techniques in sufficient detail to enable their implementation in solving a wide range of problems. An important addition in this revised third edition is a chapter on basic statistics.

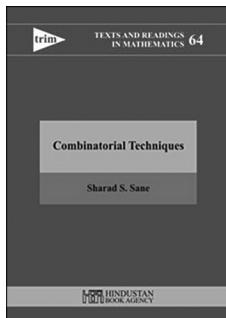
More than 100 worked-out examples illustrate a variety of numerical algorithms. The limitations of the algorithms are also discussed, as are pitfalls in numerical computations. A special feature is the inclusion of a discussion of techniques for error-estimation. In addition, more than 500 unsolved problems (with answers) of varying difficulty are included, and more than 200 computer programs in FORTRAN and C, covering all topics, are provided as supplementary material online. These give the book a strong pedagogic focus. Examples and exercises are drawn from areas as diverse as fluid mechanics, celestial mechanics, and seismology.

This book will be extremely useful for graduate students and researchers in all branches of science and engineering.

A publication of Hindustan Book Agency; distributed within the Americas by the American Mathematical Society. Maximum discount of 20% for all commercial channels.

**Contents:** Introduction; Roundoff error; Linear algebraic equations; Interpolation; Differentiation; Integration; Nonlinear algebraic equations; Optimisation; Statistical inferences; Functional approximations; Algebraic eigenvalue problem; Ordinary differential

# Discrete Mathematics and Combinatorics



## Combinatorial Techniques

**Sharad S. Sane**, Michigan Technological University, Houghton, MI

This is a basic text on combinatorics that deals with all three aspects of the discipline: tricks, techniques and theory, and attempts to blend them.

The book has several distinctive features. Probability and random variables with their interconnections to permutations are discussed. The theme of parity has been specially included, and it covers applications ranging from solving the Nim game to the quadratic reciprocity law. Chapters related to geometry include triangulations and Sperner's theorem, classification of regular polytopes, tilings, and an introduction to the Euclidean Ramsey theory. Material on group actions covers Sylow theory, automorphism groups, and a classification of finite subgroups of orthogonal groups.

All chapters have a large number of exercises with varying degrees of difficulty, ranging from material suitable for Mathematical Olympiads to research.

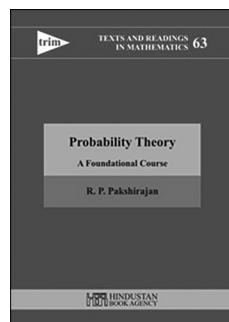
A publication of Hindustan Book Agency; distributed within the Americas by the American Mathematical Society. Maximum discount of 20% for all commercial channels.

**Contents:** Basic counting; Listing combinatorial objects; Permutations; The inclusion-exclusion principle; Basic probability; Random variables; Parity; Pigeonhole principle; Some geometry; Advanced counting numbers; Recurrence relations; Generating functions; Partition theory of integers; Group action on a set; Polya theory of enumeration; Systems of distinct representatives; References; Index.

### Hindustan Book Agency

January 2013, 482 pages, Hardcover, ISBN: 978-93-80250-48-9, 2010 *Mathematics Subject Classification*: 05-01, 05A10, 05A05, 05D10, **AMS members US\$52**, List US\$65, Order code HIN/61

# Probability and Statistics



## Probability Theory

A Foundational Course

**R. P. Pakshirajan**, University of Mysore, India

This book shares the dictum of J. L. Doob in treating probability theory as a branch of measure theory and establishes this relationship early. Probability measures in product spaces are introduced right at the start as a way of laying the groundwork to later claim the existence of stochastic processes with prescribed finite-dimensional distributions.

Other topics analyzed in the book include supports of probability measures, zero-one laws in product measure spaces, the Erdős-Kac invariance principle, functional central limit theorem and functional law of the iterated logarithm for independent variables, Skorohod embedding, and the use of analytic functions of a complex variable in the study of geometric ergodicity in Markov chains.

This book is offered as a textbook for students pursuing graduate programs in mathematics and/or statistics. The book aims to help teachers present the theory with ease and to help students sustain their interest and joy in learning the subject.

A publication of Hindustan Book Agency; distributed within the Americas by the American Mathematical Society. Maximum discount of 20% for all commercial channels.

**Contents:** Probability measures in product spaces; Weak convergence of probability measures; Characteristic functions; Independence; The central limit theorem and its ramifications; The law of the iterated logarithm; Discrete time Markov chains; Index.

### Hindustan Book Agency

January 2013, 564 pages, Hardcover, ISBN: 978-93-80250-44-1, 2010 *Mathematics Subject Classification*: 60-01, 60B05, 60B10, 60F05, 60F17, 60J10, 60J65, **AMS members US\$54.40**, List US\$68, Order code HIN/60