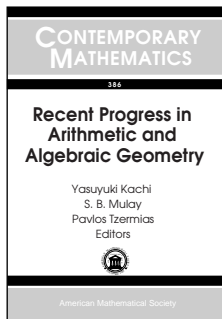


New Publications Offered by the AMS

Algebra and Algebraic Geometry



Recent Progress in Arithmetic and Algebraic Geometry

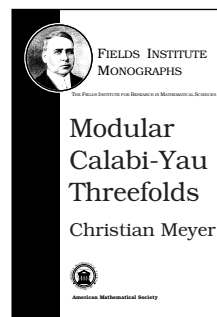
Yasuyuki Kachi, *University of Kansas, Lawrence, KS*, and **S. B. Mulay** and **Pavlos Tzermias**, *University of Tennessee, Knoxville, TN*,
Editors

This proceedings volume resulted from the John H. Barrett Memorial Lecture Series held at the University of Tennessee (Knoxville). The articles reflect recent developments in algebraic geometry. It is suitable for graduate students and researchers interested in algebra and algebraic geometry.

Contents: **F. Campana** and **Q. Zhang**, Compact Kähler threefolds of π_1 -general type; **S. D. Cutkosky** and **L. Ghezzi**, Completions of valuation rings; **A. Ebin**, **D. Hur**, **A. Katz**, and **V. Shchogolev**, A new construction of maximal curves; **S. J. Kovács**, Strong non-isotriviality and rigidity; **S. J. Kovács**, Spectral sequences associated to morphisms of locally free sheaves; **T. Luo** and **Q. Zhang**, Holomorphic forms on threefolds; **K. Matsuki**, A note on toroidalization: The problem of resolution of singularities of morphisms in the logarithmic category; **R. J. Pries**, Jacobians of quotients of Artin-Schreier curves; **K. Schwede**, Gluing schemes and a scheme without closed points.

Contemporary Mathematics, Volume 386

November 2005, 172 pages, Softcover, ISBN 0-8218-3401-0, LC 2005052406, 2000 *Mathematics Subject Classification*: 14-XX, **All AMS members US\$47**, List US\$59, Order code CONM/386



Modular Calabi-Yau Threefolds

Christian Meyer, *Johannes Gutenberg University, Mainz, Germany*

This book discusses the connection between Calabi-Yau threefolds and modular forms. It presents the general theory and brings together the known results. Hundreds of new examples are given of rigid and non-rigid Calabi-

Yau threefolds, and the construction of correspondences between them leads to conjectures about the modular forms involved. The author has compiled tables of newforms of weight four and large levels, which are included in the appendix.

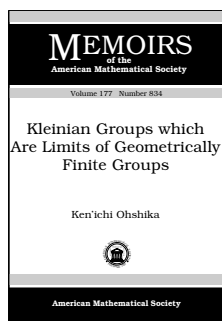
The great variety of new examples as well as the tables of newforms makes this volume a valuable resource for graduate students and researchers interested in algebraic geometry and arithmetic algebraic geometry.

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

Contents: Arithmetic on Calabi-Yau threefolds; Fibre products of elliptic surfaces; Quintics in \mathbb{P}^4 ; Double octics; Other examples; Tables, correspondences, conclusions; Arrangements of eight planes; Modular double octics; Tables of weight two and weight four newforms; Bibliography; Index.

Fields Institute Monographs, Volume 22

November 2005, 194 pages, Hardcover, ISBN 0-8218-3908-X, 2000 *Mathematics Subject Classification*: 14J32, 14G10, 11G25; 14E05, 14G15, 11G40, **All AMS members US\$47**, List US\$59, Order code FIM/22



Kleinian Groups which Are Limits of Geometrically Finite Groups

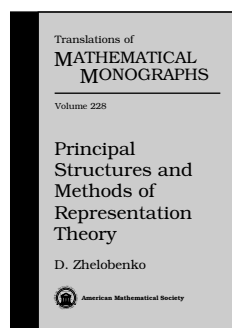
Ken'ichi Ohshika, *Osaka University, Japan*

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

Contents: Preliminaries; Statements of theorems; Characteristic compression bodies; The Masur domain and Ahlfors' conjecture; Branched covers and geometric limit; Non-realizable measured laminations; Strong convergence of function groups; Proof of the main theorem; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 177, Number 834

August 2005, 116 pages, Softcover, ISBN 0-8218-3772-9, LC 2005048026, 2000 *Mathematics Subject Classification*: 57M50, 30F40, **Individual member US\$35**, List US\$58, Institutional member US\$46, Order code MEMO/177/834



Principal Structures and Methods of Representation Theory

D. Zhelobenko, *Moscow, Russia*

The main topic of this book can be described as the theory of algebraic and topological structures admitting natural representations by operators

in vector spaces. These structures include topological algebras, Lie algebras, topological groups, and Lie groups.

The book is divided into three parts. Part I surveys general facts for beginners, including linear algebra and functional analysis. Part II considers associative algebras, Lie algebras, topological groups, and Lie groups, along with some aspects of ring theory and the theory of algebraic groups. The author provides a detailed account of classical results in related branches of mathematics, such as invariant integration and Lie's theory of connections between Lie groups and Lie algebras. Part III discusses semisimple Lie algebras and Lie groups, Banach algebras, and quantum groups.

This is a useful text for a wide range of specialists, including graduate students and researchers working in mathematical physics and specialists interested in modern representation theory. It is suitable for independent study or supplementary reading.

Also available from the AMS by this acclaimed author is *Compact Lie Groups and Their Representations*.

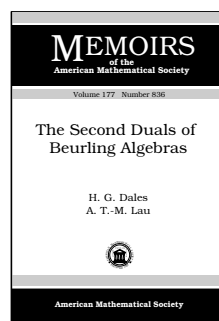
Contents: *Introduction:* Basic notions; *General theory:* Associative algebras; Lie algebras; Topological groups; Lie groups; *Special topics:* Semisimple Lie algebras; Semisimple Lie

groups; Banach algebras; Quantum groups; Root systems; Banach spaces; Convex sets; The algebra $B(H)$; Bibliography; Index.

Translations of Mathematical Monographs, Volume 228

September 2005, approximately 448 pages, Hardcover, ISBN 0-8218-3731-1, 2000 *Mathematics Subject Classification*: 20-01, 20Cxx; 17B10, 20G05, 20G42, **All AMS members US\$103**, List US\$129, Order code MMONO/228

Analysis



The Second Duals of Beurling Algebras

H. G. Dales, *University of Leeds, England*, and A. T.-M. Lau, *University of Alberta, Edmonton, Alberta, Canada*

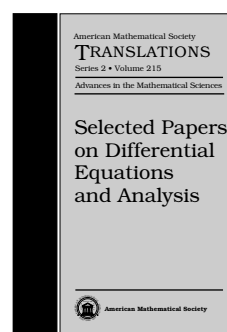
Contents: Introduction; Definitions and preliminary results; Repeated limit conditions; Examples; Inverted subspaces; Banach algebras of operators; Beurling algebras; The

second dual of $\ell^1(G, \omega)$; Algebras on discrete, Abelian groups; Beurling algebras on \mathbb{F}_2 ; Topological centres of duals of inverted subspaces; The second dual of $L^1(G, \omega)$; Derivations into second duals; Open questions; Bibliography; Index; Index of symbols.

Memoirs of the American Mathematical Society, Volume 177, Number 836

August 2005, 191 pages, Softcover, ISBN 0-8218-3774-5, LC 2005048020, 2000 *Mathematics Subject Classification*: 43A10, 43A20; 46J10, **Individual member US\$40**, List US\$66, Institutional member US\$53, Order code MEMO/177/836

Differential Equations



Selected Papers on Differential Equations and Analysis

This volume contains translations of papers that originally appeared in the Japanese journal *Sūgaku*. The papers range over a variety of topics, including differential equations with free boundary, singular integral operators, operator algebras, and

relations between the Brownian motion on a manifold with function theory.

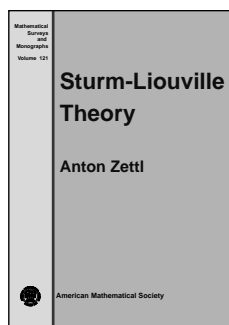
The volume is suitable for graduate students and research mathematicians interested in analysis and differential equations.

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

Contents: G. S. Weiss, Regularity in free boundary problems; S. Sakaguchi, Behavior of spatial critical points and zeros of solutions of diffusion equations; H. Aikawa, Martin boundary and boundary Harnack principle for non-smooth domains; S. Sato, Singular integrals and Littlewood-Paley functions; A. Kasue, Convergence of metric measure spaces and energy forms; Y. Kawahigashi, Subfactor theory and its applications: Operator algebras and quantum field theory; A. Atsuji, Brownian motion and value distribution theory of holomorphic maps and harmonic maps; M. Aoshima, Statistical inference in two-stage sampling.

American Mathematical Society Translations—Series 2, Volume 215

November 2005, 145 pages, Hardcover, ISBN 0-8218-3927-6, 2000 *Mathematics Subject Classification:* 46L37, 81T05, 60J65, 31A05, 31B05, 31B25, 31C35, 58Jxx, 62D05, 35K57, 35R35, 42B25, **All AMS members US\$55**, List US\$69, Order code TRANS2/215



Sturm-Liouville Theory

Anton Zettl, *Northern Illinois University, DeKalb, IL*

In 1836 and 1837, Sturm and Liouville published a series of papers on second order linear ordinary differential operators, which began the subject now known as the Sturm-Liouville theory. In 1910, Hermann Weyl published an article

which started the study of singular Sturm-Liouville problems. Since then, Sturm-Liouville theory has remained an intensely active field of research with many applications in mathematics and mathematical physics.

The purpose of the present book is (a) to provide a modern survey of some of the basic properties of Sturm-Liouville theory and (b) to bring the reader to the forefront of research on some aspects of this theory. Prerequisites for using the book are a basic knowledge of advanced calculus and a rudimentary knowledge of Lebesgue integration and operator theory. The book has an extensive list of references and examples and numerous open problems. Examples include classical equations and functions associated with Bessel, Fourier, Heun, Ince, Jacobi, Jörgens, Latzko, Legendre, Littlewood-McLeod, Mathieu, Meissner, and Morse; also included are examples associated with the harmonic oscillator and the hydrogen atom. Many special functions of applied mathematics and mathematical physics occur in these examples.

This book offers a well-organized viewpoint on some basic features of Sturm-Liouville theory. With many useful examples treated in detail, it will make a fine independent study text and is suitable for graduate students and researchers interested in differential equations.

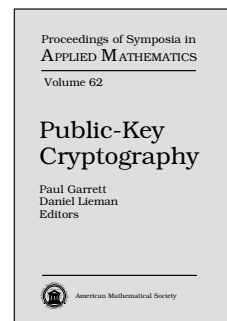
This item will also be of interest to those working in analysis.

Contents: Part 1. Existence and uniqueness problems: First order systems; Scalar initial value problems; Part 2. Regular boundary value problems: Two-point regular boundary value problems; Regular self-adjoint problems; Regular left-definite and indefinite problems; Part 3. Oscillation and singular existence problems: Oscillation; The limit-point, limit-circle dichotomy; Singular initial value problems; Part 4. Singular boundary value problems: Two-point singular boundary value problems; Singular self-adjoint problems; Singular indefinite problems; Singular left-definite problems; Part 5. Examples and other topics: Two intervals; Examples; Notation; Comments on some topics not covered; Open problems; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 121

September 2005, 328 pages, Hardcover, ISBN 0-8218-3905-5, LC 2005048214, 2000 *Mathematics Subject Classification:* 34B20, 34B24; 47B25, **All AMS members US\$67**, List US\$84, Order code SURV/121

Discrete Mathematics and Combinatorics



Public-Key Cryptography

Paul Garrett, *University of Minnesota, Minneapolis, MN*, and Daniel Lieman, *Fidelity Investments, Merrimack, NH*, Editors

This collection of articles grew out of an expository and tutorial conference on public-key cryptography held at the Joint Mathematics Meetings (Baltimore).

The book provides an introduction and survey on public-key cryptography for those with considerable mathematical maturity and general mathematical knowledge. Its goal is to bring visibility to the cryptographic issues that fall outside the scope of standard mathematics.

These mathematical expositions are intended for experienced mathematicians who are not well acquainted with the subject. The book is suitable for graduate students, researchers, and engineers interested in mathematical aspects and applications of public-key cryptography.

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

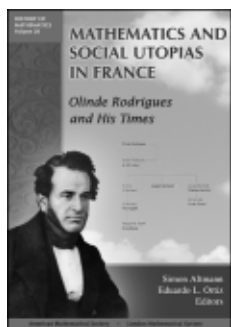
Contents: P. Garrett, Cryptographic primitives; D. Lieman, Cryptography in the real world today; N. Howgrave-Graham, Public-key cryptography and proofs of security; J. H. Silverman, Elliptic curves and cryptography; W. Whyte, Towards faster cryptosystems I; W. D. Banks, Towards faster cryptosystems, II; I. E. Shparlinski, Playing "hide-and-seek"

with numbers: The hidden number problem, lattices and exponential sums; Index.

Proceedings of Symposia in Applied Mathematics, Volume 62

November 2005, approximately 192 pages, Hardcover, ISBN 0-8218-3365-0, 2000 *Mathematics Subject Classification*: 54C40, 14E20, 14G50, 11G20, 11T71, 11Yxx, 94Axx, 46E25, 20C20, **All AMS members US\$31**, List US\$39, Order code PSAPM/62

General and Interdisciplinary



Mathematics and Social Utopias in France

Olinde Rodrigues and His Times

Simon Altmann, *Brasenose College, Oxford University, England*, and **Eduardo L. Ortiz**, *Imperial College of Science & Technology, London, England*, Editors

Social reformer, banker, and mathematician, Olinde Rodrigues is a fascinating figure of nineteenth-century Paris. Information about him is obscure—scattered in publications on history, mathematics, and the social sciences—and often inaccurate. Rodrigues left no papers or archives. Here, for the first time, is an authoritative account of his family history, education, and important mathematical works. Written by a team of prominent mathematicians and historians, the book comprises the interests and associations that make Rodrigues such a remarkable character in the history of mathematics. This is a superb panorama of nineteenth-century France, portrayed through the life and work of Olinde Rodrigues.

The beginning chapters attempt to recreate the scientific and social background of nineteenth-century Paris and Rodrigues's place in it. The following chapters discuss his contributions to a variety of mathematical fields (e.g., orthogonal polynomials, combinatorics, and rotations). The final chapters discuss contemporary reactions to his mathematical work. Sufficient background is given to make it accessible to readers familiar with basic college mathematics. The book is suitable for specialists in the history of mathematics and/or science, graduate students, and mathematicians.

Copublished with the London Mathematical Society beginning with Volume 4. Members of the LMS may order directly from the AMS at the AMS member price. The LMS is registered with the Charity Commissioners.

Contents: **S. Altmann** and **E. L. Ortiz**, Introduction; **S. Altmann**, **D. Siminovitch**, and **B. M. Ratcliffe**, Olinde Rodrigues and his times; **B. M. Ratcliffe**, Towards a better understanding of Olinde Rodrigues and his circle: Family and

faith in his life and career; **P. Ferruta**, Euphrasie and Olinde Rodrigues: The 'woman question' within Saint-Simonism; **I. Grattan-Guinness**, Rodrigues's early work in mathematics, 1813–1816; **R. Askey**, The 1839 paper on permutations: Its relation to the Rodrigues formula and further developments; **U. Tamm**, Olinde Rodrigues and combinatorics; **J. Gray**, Olinde Rodrigues's paper of 1840 on a group of transformations; **E. L. Ortiz**, After Rodrigues: From rotations to quaternions; Index.

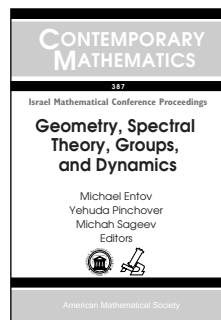
History of Mathematics, Volume 28

November 2005, approximately 184 pages, Hardcover, ISBN 0-8218-3860-1, LC 2005048180, 2000 *Mathematics Subject Classification*: 01A55, **All AMS members US\$39**, List US\$49, Order code HMATH/28

Geometry and Topology

Geometry, Spectral Theory, Groups, and Dynamics

Michael Entov, **Yehuda Pinchover**, and **Michah Sageev**, *Technion - Israel Institute of Technology, Haifa, Israel*, Editors



This volume contains articles based on talks given at the Robert Brooks Memorial Conference on Geometry

and Spectral Theory and the Workshop on Groups, Geometry and Dynamics held at Technion - the Israel Institute of Technology (Haifa).

Robert Brooks' (1952–2002) broad range of mathematical interests is represented in the volume, which is devoted to various aspects of global analysis, spectral theory, the theory of Riemann surfaces, Riemannian and discrete geometry, and number theory. A survey of Brooks' work has been written by his close colleague, Peter Buser.

Also included in the volume are articles on analytic topics, such as Szegő's theorem, and on geometric topics, such as isoperimetric inequalities and symmetries of manifolds.

The book is suitable for graduate students and researchers interested in various aspects of geometry and global analysis.

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

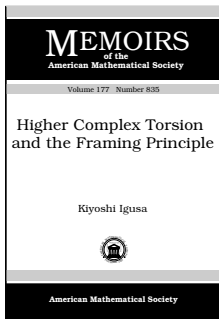
This book is copublished with Bar-Ilan University.

Contents: **P. Buser**, On the mathematical work of Robert Brooks; **D. Blanc**, Moduli spaces of homotopy theory; **R. Brooks** and **M. Monastyrsky**, K -regular graphs and Hecke surfaces; **P. Buser** and **K.-D. Semmler**, Isospectrality and spectral rigidity of surfaces with small topology; **I. Chavel**, Topics in isoperimetric inequalities; **B. Farb** and **S. Weinberger**, Hidden symmetries and arithmetic manifolds; **H. M. Farkas**, Variants of the $3N + 1$ conjecture and multiplicative semigroups; **U. Frauenfelder**, **V. Ginzburg**, and

F. Schlenk, Energy capacity inequalities via an action selector; **K. Fujiwara**, On non-bounded generation of discrete subgroups in rank-1 Lie group; **C. Gordon, P. Perry**, and **D. Schueth**, Isospectral and isoscattering manifolds: A survey of techniques and examples; **M. G. Katz** and **C. Lescop**, Filling area conjecture, optimal systolic inequalities, and the fiber class in abelian covers; **E. Leichtnam**, An invitation to Deninger's work on arithmetic zeta functions; **A. Lubotzky**, Some more non-arithmetic rigid groups; **R. G. Pinsky**, On domain monotonicity for the principal eigenvalue of the Laplacian with a mixed Dirichlet-Neumann boundary condition; **B. Simon**, The sharp form of the strong Szegő theorem.

Contemporary Mathematics, Volume 387

November 2005, 275 pages, Softcover, ISBN 0-8218-3710-9, LC 2005053006, 2000 *Mathematics Subject Classification*: 58-06, 53-06, 37-06; 11-06, 20-06, 55-06, **All AMS members US\$63**, List US\$79, Order code CONM/387



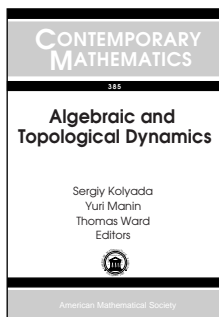
Higher Complex Torsion and the Framing Principle

Kiyoshi Igusa, *Brandeis University, Waltham, MA*

Contents: Complex torsion; Definition of higher FR-torsion; Properties of higher FR-torsion; The framing principle; Proof of the framing principle; Applications of the framing principle; The stability theorem; Bibliography.

Memoirs of the American Mathematical Society, Volume 177, Number 835

August 2005, 94 pages, Softcover, ISBN 0-8218-3773-7, LC 2005048025, 2000 *Mathematics Subject Classification*: 57R45; 57R50, 19J10, **Individual member US\$34**, List US\$56, Institutional member US\$45, Order code MEMO/177/835



Algebraic and Topological Dynamics

Sergiy Kolyada, *National Academy of Sciences, Kiev, Ukraine*, **Yuri Manin**, *Max-Planck-Institut für Mathematik, Bonn, Germany*, and **Thomas Ward**, *University of East Anglia, Norwich, UK*, Editors

This volume contains a collection of articles from the special program on algebraic and topological dynamics and a workshop on dynamical systems held at the Max-Planck Institute (Bonn, Germany). It reflects the extraordinary vitality of dynamical systems in its interaction with a broad range of mathematical subjects.

Topics covered in the book include asymptotic geometric analysis, transformation groups, arithmetic dynamics, complex dynamics, symbolic dynamics, statistical properties of dynamical systems, and the theory of entropy and chaos.

The book is suitable for graduate students and researchers interested in dynamical systems.

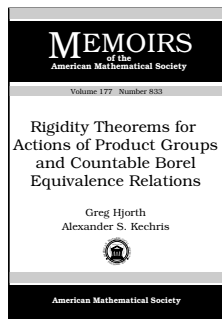
This item will also be of interest to those working in differential equations.

Contents: **M. Misiurewicz**, Ergodic natural measures; **T. Downarowicz**, Survey of odometers and Toeplitz flows; **S. Bezuglyi, J. Kwiatkowski**, and **K. Medynets**, Approximation in ergodic theory, Borel, and Cantor dynamics; **A. H. Dooley**, The critical dimension: An approach to non-singular entropy; **J. Aaronson** and **M. Lemańczyk**, Exactness of Rokhlin endomorphisms and weak mixing of Poisson boundaries; **M. Barge** and **J. Kwapisz**, Elements of the theory of unimodular Pisot substitutions with an application to β -shifts; **W. Huang, S. Shao**, and **X. Ye**, Mixing via sequence entropy; **V. Baladi**, Anisotropic Sobolev spaces and dynamical transfer operators: C^∞ foliations; **D. Mayer** and **T. Mühlenbruch**, From the transfer operator for geodesic flows on modular surfaces to the Hecke operators on period functions of $\Gamma_0(n)$; **S. Koch** and **M. Denker**, Hausdorff dimension for Martin metrics; **M. C. Sullivan**, Twistwise flow equivalence and beyond; **A. Fel'shtyn**, Dynamical zeta functions and symplectic Floer homology; **Y. Vorobets**, Periodic geodesics on generic translation surfaces; **S. Albeverio** and **A. Kosyak**, Group action, quasi-invariant measures and quasiregular representations of the infinite-dimensional nilpotent group; **D. Kleinbock** and **B. Weiss**, Friendly measures, homogeneous flows and singular vectors; **G. Everest, V. Stangoe**, and **T. Ward**, Orbit counting with an isometric direction; **M. Schmoll**, Spaces of elliptic differentials; **K. Thomsen**, On the structure of beta shifts; **V. Berthé, S. Ferenczi**, and **L. Q. Zamboni**, Interactions between dynamics, arithmetic and combinatorics: The good, the bad, and the ugly.

Contemporary Mathematics, Volume 385

November 2005, 364 pages, Softcover, ISBN 0-8218-3751-6, LC 2005049859, 2000 *Mathematics Subject Classification*: 37-02, 28-02, 60-02, **All AMS members US\$79**, List US\$99, Order code CONM/385

Logic and Foundations



Rigidity Theorems for Actions of Product Groups and Countable Borel Equivalence Relations

Greg Hjorth, *University of California, Los Angeles, CA*, and Alexander S. Kechris, *Caltech, Pasadena, CA*

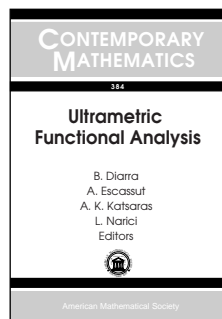
This item will also be of interest to those working in algebra and algebraic geometry.

Contents: Introduction; Preliminaries; Actions of free groups and treeable equivalence relations; A cocycle reduction result; Some applications; Factoring homomorphisms; Further applications; Product actions, I; Product actions, II; A Final application; Appendix A. Strong notions of ergodicity; Appendix B. Cocycles and cocycle-invariant functions; Appendix C. Actions on boundaries; Appendix D. \mathcal{K} -structured Equivalence relations; Appendix E. Proof of the general case of Theorem 4.4; Bibliography.

Memoirs of the American Mathematical Society, Volume 177, Number 833

August 2005, 109 pages, Softcover, ISBN 0-8218-3771-0, LC 2005044096, 2000 *Mathematics Subject Classification*: 03E15, 28D15, 37A15, 37A20, **Individual member US\$34**, List US\$57, Institutional member US\$46, Order code MEMO/177/833

Number Theory



Ultrametric Functional Analysis

B. Diarra and A. Escassut, *Université Blaise Pascal, Aubière, France*, A. K. Katsaras, *University of Ioannina, Greece*, and L. Narici, *St. John's University, Jamaica, NY*, Editors

With contributions by leading mathematicians, this proceedings

volume reflects the program of the Eighth International Conference on p -adic Functional Analysis held at Blaise Pascal University (Clermont-Ferrand, France).

Articles in the book offer a comprehensive overview of research in the area. A wide range of topics are covered, including basic ultrametric functional analysis, topological vector spaces, measure and integration, Choquet theory, Banach and topological algebras, analytic functions (in particular, in connection with algebraic geometry), roots of rational functions and Frobenius structure in p -adic differential equations, and q -ultrametric calculus.

The material is suitable for graduate students and researchers interested in number theory, functional analysis, and algebra.

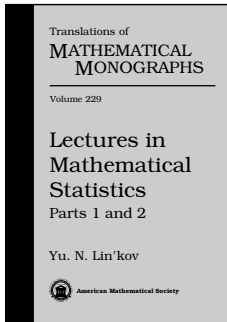
This item will also be of interest to those working in analysis.

Contents: J. Aguayo, Vector measures and integral operators in the nonarchimedean setting; J. Aguayo, A. K. Katsaras, and S. Navarro, On the dual space for the strict topology β_1 and the space $M(X)$ in function space; J. Aguayo, J. Gómez, M. Saavedra, and M. Wallace, Perturbation of a p -adic dynamical system in two variables; J. Araujo, Isomorphisms with small bound between spaces of p -adic continuous functions II; B. Diarra, Ultrametric q -calculus; N. De Grande-De Kimpe and C. Perez-Garcia, Strictness and closedness in p -adic inductive limits; P.-C. Hu and C.-C. Yang, A note on Browkin-Brzeziński conjecture; A. K. Katsaras, Non-Archimedean integration and strict topologies; H. A. Keller and H. O. A., Non-Archimedean orthomodular spaces and their residual spaces; A. N. Kochubei, Polylogarithms and a zeta function for finite places of a function field; A. Kubzdela, On finite-dimensional normed spaces over C_p ; L. Narici and E. Beckenstein, A non-Archimedean inner product; H. Ochsenius and W. H. Schikhof, Lipschitz operators on Banach spaces over Krull valued fields; S. Priess-Crampe, Remarks on some theorems of functional analysis; A. Pulita, Frobenius structure for rank one p -adic differential equations; A. Salinier, The ultrametric spectrum as an ordered set; M.-C. Sarmant, Analytic roots of rational functions whose poles are on the unit circle; W. H. Schikhof, p -adic Choquet theory; E. Schörner, The spherical completion of normed vector spaces over fields with valuations of arbitrary rank; W. Śliwa, On Köthe quotients of non-Archimedean Fréchet spaces; T. T. H. An and J. T.-Y. Wang, Unique range sets for non-Archimedean entire functions in positive characteristic fields; F. Tangara, Some continuous linear operators and orthogonal q -bases on the space of p -adic continuous functions defined on \mathbb{Z}_p ; J. T.-Y. Wang, Uniqueness polynomials, unique range sets and other uniqueness theorems.

Contemporary Mathematics, Volume 384

October 2005, 369 pages, Softcover, ISBN 0-8218-3684-6, LC 2005047820, 2000 *Mathematics Subject Classification*: 11S80, 12J25, 16W30, 30G35, 37A45, 46H40, 46S10, 47S10, 54E35, 60B99, **All AMS members US\$79**, List US\$99, Order code CONM/384

Probability



Lectures in Mathematical Statistics

Parts 1 and 2

Yu. N. Lin'kov

This volume is intended for the advanced study of several topics in mathematical statistics. The first part of the book is devoted to sampling theory (from one-dimensional and

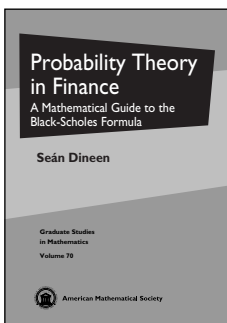
multidimensional distributions), asymptotic properties of sampling, parameter estimation, sufficient statistics, and statistical estimates. The second part is devoted to hypothesis testing and includes the discussion of families of statistical hypotheses that can be asymptotically distinguished. In particular, the author describes goodness-of-fit and sequential statistical criteria (Kolmogorov, Pearson, Smirnov, and Wald) and studies their main properties.

The book is suitable for graduate students and researchers interested in mathematical statistics. It is useful for independent study or supplementary reading.

Contents: Samples from one-dimensional distributions; Samples from multidimensional distributions; Estimation of unknown parameters of distributions; Sufficient statistics; General methods for constructing estimators; References; General theory of hypotheses testing; Asymptotic distinguishability of simple hypotheses; Goodness-of-fit tests; Sequential tests; References; Index.

Translations of Mathematical Monographs, Volume 229

November 2005, approximately 336 pages, Hardcover, ISBN 0-8218-3732-X, 2000 *Mathematics Subject Classification*: 62-01, **All AMS members US\$79**, List US\$99, Order code MMONO/229



Probability Theory in Finance

A Mathematical Guide to the Black-Scholes Formula

Seán 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.

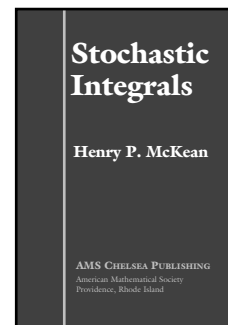
The book skillfully draws the reader toward the art of thinking mathematically and then proceeds to lay the foundations in analysis and probability theory underlying modern financial mathematics. It rigorously reveals the mathematical secrets of topics such as abstract measure theory, conditional expectations, 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.

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; Martingales; The Black-Scholes formula; Stochastic integration; Solutions; Bibliography; Index.

Graduate Studies in Mathematics, Volume 70

December 2005, 294 pages, Hardcover, ISBN 0-8218-3951-9, LC 2005053572, 2000 *Mathematics Subject Classification*: 60-01, 91Bxx, **All AMS members US\$44**, List US\$55, Order code GSM/70



Stochastic Integrals

Henry P. McKean

The AMS is excited to bring this volume, originally published in 1969, back into print. This well-written book has been used for many years to learn about stochastic integrals.

The author starts with the presentation of Brownian motion, then deals with stochastic integrals and differentials, including the famous Itô lemma. The rest of the book is devoted to various

topics of stochastic integral equations and stochastic integral equations on smooth manifolds.

E. B. Dynkin wrote about the original edition in *Mathematical Reviews*: "This little book is a brilliant introduction to an important boundary field between the theory of probability and that of differential equations ... differential and integral calculus based upon Brownian motion." These words continue to ring true today.

This classic book is ideal for supplementary reading or independent study. It is suitable for graduate students and researchers interested in probability, stochastic processes, and their applications.

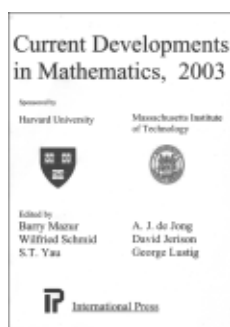
Contents: Brownian motion; Stochastic integrals and differentials; Stochastic integral equations ($d = 1$); Stochastic integral equations ($d \geq 2$); References; Subject index; Errata.

AMS Chelsea Publishing

October 2005, 141 pages, Hardcover, ISBN 0-8218-3887-3, LC 2005048187, 2000 *Mathematics Subject Classification*: 60-01, 60H05, **All AMS members US\$23**, List US\$25, Order code CHEL/353.H

New AMS-Distributed Publications

Algebra and Algebraic Geometry



Current Developments in Mathematics, 2003

Barry Mazur, Wilfried Schmid, and S. T. Yau, Harvard University, Cambridge, MA, and A. J. de Jong, David Jerison, and George Lustig, Massachusetts Institute of Technology, Cambridge, MA, Editors

These are the proceedings of the joint seminar by M.I.T. and Harvard on the current developments in mathematics for the year 2003.

The organizing committee for the seminar consisted of distinguished mathematicians from the mathematics departments of both institutions: Barry Mazur, Wilfried Schmid, and S. T. Yau from Harvard, and A. J. de Jong, David Jerison, and George Lustig from M.I.T.

This item will also be of interest to those working in mathematical physics, number theory, geometry and topology, and probability.

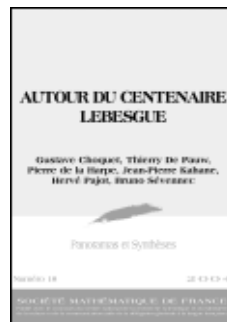
A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: **S. Fomin** and **A. Zelevinsky**, Cluster algebras: Notes for the CDM-03 conference; **H. Iwaniec**, Automorphic number theory; **C. Voisin**, On some problems of Kobayashi and Lang; algebraic approaches.

International Press

April 2003, 125 pages, Hardcover, ISBN 1-57146-103-5, **All AMS members US\$52**, List US\$65, Order code INPR/65

Analysis



Autour du centenaire Lebesgue

Gustave Choquet, University of Paris VI, France, Thierry De Pauw, Université Catholique de Louvain, Louvain-la-Neuve, Belgique, Pierre de la Harpe, University of Geneva, Switzerland, Jean-Pierre Kahane, University of Paris XI, France, Hervé Pajot, Université de Grenoble I, St Martin,

France, and Bruno Sévenec, Ecole Normale Supérieure de Lyon, France

This volume was written on the occasion of the centennial of Lebesgue's Publication in 1901 of his famous Note introducing his integral. It results from a day of celebration at the École normale supérieure de Lyon and provides various viewpoints on Lebesgue's heritage. Gustave Choquet gives a vivid testimony about mathematics and mathematicians of Lebesgue's era. Contributions by Pierre de la Harpe and by Bruno Sévenec on finitely additive measures analyze their paradoxes and their relationship with amenability or equipartition. Hervé Pajot relates the recent and considerable progress made in understanding the notion of rectifiability, in relation with the analytic capacity or with the Cauchy operator. Thierry de Pauw, starting from Henstock and Kurzweil's integral, studies possibilities of generalizing the divergence formula. A preface by Jean-Pierre Kahane synthesizes these viewpoints and highlights Lebesgue's influence in the course of the twentieth century.

The volume is suitable for graduate students and research mathematicians interested in analysis.

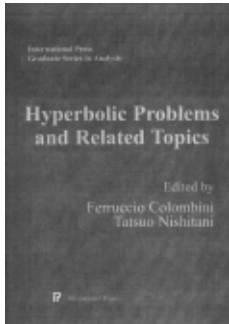
A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: **J.-P. Kahane**, L'intégrale de Lebesgue au cours du vingtième siècle; **G. Choquet**, Borel, Baire, Lebesgue; **P. de la Harpe**, Mesures finiment additives et paradoxes; **B. Sévenec**, Mesure invariante et équirépartition dans les groupes compacts; **T. De Pauw**, Autour du Théorème de la divergence; **H. Pajot**, Le problème géométrique du voyageur de commerce, et ses applications à l'analyse complexe et harmonique.

Panoramas et Synthèses, Number 18

May 2005, 156 pages, Softcover, ISBN 2-85629-170-8, 2000 *Mathematics Subject Classification:* 01A60, 11K36, 22C05, 26A39, 26A42, 26B15, 26B20, 28-03, 28A75, 28C10, 30C85, 37A30, 42B20, 43A07, 49Q15, 51-03, 60-03, **Individual member US\$33**, List US\$37, Order code PASY/18

Applications



Hyperbolic Problems and Related Topics

Ferruccio Colombini,
University of Pisa, Italy, and
Tatsuo Nishitani, *Osaka*
University, Japan, Editors

On September 10 to 14, 2002, a Scientific Conference on “Hyperbolic Problems and Related Topics” was held at the “Palazzone” in Cortona under the auspices of Istituto Nazionale di Alta Matematica

“Francesco Severi” of Roma.

Three courses were given: by Serge Alinhac on blowup at infinity for quasi-linear Wave equations, by Jean-Michel Bony on microlocal analysis applied to evolution equations, and by Luc Robbiano and Claude Zuily on analytic scattering wave front set and applications to Schrödinger equation.

Lectures in a variety of topics were also given. They include: the Cauchy problem for strictly or weakly hyperbolic operators and their applications; semilinear, quasilinear or fully nonlinear equations; the Navier-Stokes and Schrödinger equations. Other topics discussed were the Sine-Gordon Hierarchy, oscillatory integrals and unique continuation problems, local solvability for differential or pseudodifferential operators, lower bounds of pseudodifferential systems. The most frequently occurring theme was perhaps the use of microlocal analysis, which is now a cornerstone in the study of linear and also nonlinear equations.

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

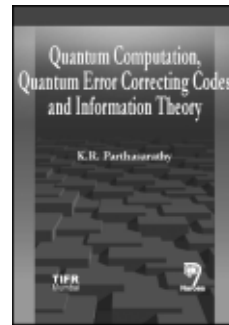
A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: **S. Alinhac**, The global existence of smooth solutions to quasilinear wave equations. A very short course; **J.-M. Bony**, Evolution equations and microlocal analysis; **A. Bove** and **T. Nishitani**, Necessary conditions for the well posedness of the Cauchy problem for hyperbolic systems; **N. Burq**, **P. Gérard**, and **N. Tzvetkov**, An example of singular dynamics for the nonlinear Schrödinger equation on bounded domains; **F. Colombini** and **K. Kajitani**, The Cauchy problem for some nonstrictly hyperbolic equations with nonregular coefficients and its applications; **F. Colombini**, **T. Nishitani**, and **G. Tagliabata**, The Cauchy problem for semilinear second order equations with finite degeneracy; **F. Colombini**, **L. Pernazza**, and **F. Treves**, Solvability and nonsolvability of second-order evolution equations; **R. Danchin**, Navier-Stokes Equations with variable density; **P. D’Ancona** and **V. Georgiev**, Recent ill-posedness results for the wave map system in critical spaces; **D. Del Santo**, Some results on the Cauchy problem for hyperbolic operators with non-regular coefficients; **N. Dencker**, The question of solvability; **S. Doi**, Singularities of solutions of Schrödinger equations for perturbed harmonic oscillators; **H. Koch** and **D. Tataru**, Dispersive estimates for principally normal operators and

applications to unique continuation; **H. Kubo**, On the small data global existence and scattering for systems of semilinear wave equations; **L. Mencherini** and **S. Spagnolo**, Well posedness of 2×2 systems with C^∞ -coefficients; **G. Métivier** and **K. Zumbrun**, Large viscous boundary layers for noncharacteristic nonlinear hyperbolic problems; **M. K. Venkatesha Murthy**, Scalar local covariant fields on a family of globally hyperbolic manifolds; **A. Parmeggiani**, On lower bounds of pseudodifferential systems; **M. Reissig**, A refined diagonalization procedure to handle fast oscillations in degenerate hyperbolic problems; **L. Robbiano** and **C. Zuily**, Analytic theory for the quadratic scattering, wave front set and application to the Schrödinger equation; **Y. Shibata**, On some stability theorem of the steady flow of compressible viscous fluid with respect to the initial disturbance; **M. Takayama**, Initial boundary value problem for the equations of ideal magnetohydrodynamics in a half space; **F. Treves**, Differential algebra and completely integrable systems; **J. Vaillant**, Diagonalizable complex systems, reduced dimension and Hermitian systems I; **S. Wakabayashi**, The Cauchy problem for hyperbolic operators dominated by time functions.

International Press

April 2003, 444 pages, Hardcover, ISBN 1-57146-150-7, 2000 *Mathematics Subject Classification*: 35A05, 35A07, 35A18, 35A20, 35A21, 35A27, 35A30, 35B05, 35B30, 35B40, 35B65, 35F05, 35G05, 35J10, 35K50, 35L10, 35L15, 35L30, 35L40, 35L45, 35L50, 35L67, 35L70, 35L80, 35P15, 35P25, 35Q30, 35Q35, 35Q53, 35S05, 35S30, 35S50, 37K10, 46E35, 47F05, 47G30, 58J35, 58J40, 58J45, 76D03, 76D05, 76N10, 81T20, **All AMS members US\$52**, List US\$65, Order code INPR/66



Quantum Computation, Quantum Error Correcting Codes and Information Theory

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

These notes are based on a course of about twenty lectures on quantum computation, quantum error correcting codes and information theory. The topics include a comparative description of the basic features of classical probability theory on finite sample spaces and quantum probability theory on finite dimensional complex Hilbert spaces, quantum gates and circuits, simple examples of circuits arising from quantum teleportation, communication through EPR pairs and arithmetical computations on a quantum computer, more sophisticated examples of such circuits in the context of Fourier transform and phase estimation, a detailed account of the order finding algorithm as well as the celebrated Shor’s algorithm for factorising a positive integer into its prime factors.

There is a leisurely discussion of quantum error correcting codes with the Knill-Laflamme criterion for error correction and a number of examples of such codes whose construction

is based on the Weyl commutation relations for finite abelian groups. The reader may find here a brief introduction to the basic ideas of classical information theory as developed by Shannon, properties of von Neumann's quantum entropy and relative entropy as well as a proof of Schumacher's noiseless quantum coding theorem. The Holevo bound for transmission of classical information through encoding by quantum states followed by measurements is derived.

The only background assumed of the reader is linear algebra on finite dimensional complex vector spaces and elementary classical probability theory on finite sample spaces. These notes are aimed at mathematicians and computer scientists who are curious to know the "mystery" behind a quantum computer and the possibility of communicating information using the principles of elementary quantum theory.

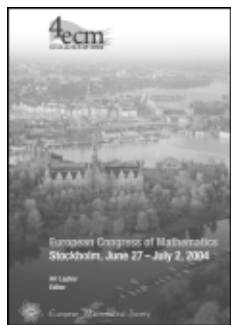
A publication of the Narosa Publishing House for Tata Institute of Fundamental Research. Distributed worldwide except in India, Bangladesh, Bhutan, Maldives, Nepal, Pakistan, and Sri Lanka.

Contents: Quantum probability; Quantum gates and circuits; Universal quantum gates; The Fourier transform and an application; Order finding; Shor's algorithm; Quantum error correcting codes; Classical information theory; Quantum information theory.

Tata Institute of Fundamental Research

February 2005, 120 pages, Softcover, ISBN 81-7319-688-5, 2000 *Mathematics Subject Classification*: 81P68; 68-01, 68-02, 68Q05, 81-02, **All AMS members US\$16**, List US\$20, Order code TIFR/7

General and Interdisciplinary



European Congress of Mathematics Stockholm, June 27- July 2, 2004

Ari Laptev, *Royal Institute of Technology, Stockholm, Sweden*, Editor

The European Congress of Mathematics, held every four years, has established itself as a major

international mathematical event. Following those in Paris, 1992, Budapest, 1996, and Barcelona, 2000, the Fourth European Congress of Mathematics took place in Stockholm, Sweden, June 27 to July 2, 2004, with 913 participants from 65 countries. Apart from seven plenary and thirty three invited lectures, there were six "Science Lectures" covering the most relevant aspects of mathematics in science and technology. Moreover, twelve projects of the EU Research Training Networks in Mathematics and Information Sciences, as well as Programmes from the European Science Foundation in Physical and Engineering Sciences, were presented. Ten EMS Prizes were awarded to young European mathematicians who

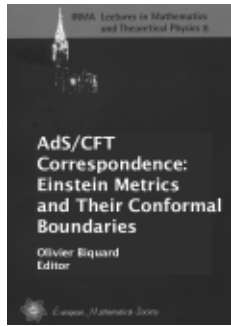
have made a particular contribution to the progress of mathematics. Five of the prizewinners were independently chosen by the 4ECM Scientific Committee as plenary or invited speakers. The other five prizewinners gave their lectures in parallel sessions. Most of these contributions are now collected in this volume, providing a permanent record of so much that is best in mathematics today.

Contents: *Invited Speakers:* **G. Alberti**, **M. Csörnyei**, and **D. Preiss**, Structure of null sets in the plane and applications; **D. Auroux**, Some open questions about symplectic 4-manifolds, singular plane curves and braid group factorizations; **D. Beliaev** and **S. Smirnov**, Harmonic measure on fractal sets; **S. Bianchini**, Singular approximations to hyperbolic systems of conservation laws in one space dimension; **A. Borodin** and **G. Olshanski**, Representation theory and random point processes; **F. Bouchut**, Stability of relaxation models for conservation laws; **B. H. Bowditch**, Hyperbolic 3-manifolds and the geometry of the curve complex; **E. Friedgut**, Proof of an intersection theorem via Fourier analysis; **P. Gérard**, Nonlinear Schrödinger equations on compact manifolds; **A. Guionnet**, A probabilistic approach to some problems in von Neumann algebras; **S. Helmke** and **P. Slodowy**, Singular elements of affine Kac-Moody groups; **H. Holden**, On the Camassa-Holm and Hunter-Saxton equations; **R. Klein**, **E. Mikusky**, and **A. Owinoh**, Multiple scales asymptotics for atmospheric flows; **J. Krajicek**, Proof complexity; **D. Kramer**, Horizontal configurations of points in link complements; **E. Lindenstrauss**, Invariant measures for multiparameter diagonalizable algebraic actions - A short survey; **T. Luczak**, Phase transition phenomena in random discrete structures; **T. Lyons**, Systems controlled by rough paths; **I. Madsen** and **M. Weiss**, The stable mapping class group and stable homotopy theory; **P. Massart**, A non-asymptotic theory for model selection; **P. Mihailescu**, Reflection, Bernoulli numbers and the proof of Catalan's conjecture; **M. Mustata**, **S. Takagi**, and **K. Watanabe**, F -thresholds and Bernstein-Sato polynomials; **K. G. O'Grady**, Hyperkähler manifolds and algebraic geometry; **I. Z. Ruzsa**, Sumsets; **Y. Shalom**, Measurable group theory; **M. Shcherbina**, Some mathematical problems of Neural networks theory; **M. Sodin**, Zeroes of Gaussian analytic functions; **X. Tolsa**, Painlevé's problem, analytic capacity and curvature of measures; **A.-K. Tornberg**, Regularization techniques for singular source terms in differential equations; **V. Totik**, Equilibrium measures and polynomials; **W. Werner**, SLE, conformal restriction, loops; **U. Zannier**, On the integral points on certain algebraic varieties; *Network Lectures:* **A. Bonami**, Some problems related with holomorphic functions on tube domains over light cones; **Y. Brenier**, Hyperbolic PDEs, kinetic formulation and geometric measure theory; **F. den Hollander**, Random dynamics in spatially extended systems; **J. Esterle**, Analysis and operators 2000-2004. Four years of network activity; **B. Helffer**, Analysis of the bottom of the spectrum of Schrödinger operators with magnetic potentials and applications; **J. P. Keating**, Mathematical aspects of quantum chaos; **C. Krattenthaler**, The research training network "Algebraic Combinatorics in Europe"; **M. Monsurro**, Algebras with involution and adjoint groups; **M. Reid**, Constructing algebraic varieties via commutative algebra; **J. P. Solovej**, Mathematical problems of large quantum systems; **J. Stix**, The Grothendieck-Teichmüller group and Galois theory of the rational numbers - European network GTEM; *Plenary Speakers:* **F. Golse**, Hydrodynamic limits; **F. Guerra**, Mathematical aspects of mean field spin glass theory; **J. Hastad**, Complexity theory, proofs and approximation; **A. Okounkov**, Random

surfaces enumerating algebraic curves; **P. Ozsvath** and **Z. Szabo**, On Heegaard diagrams and holomorphic disks; **O. Schramm**, Emergence of symmetry: Conformal invariance in scaling limits of random systems; **C. Voisin**, Recent progresses in Kähler and complex algebraic geometry; *Prize Lectures*: **F. Barthe**, Isoperimetric inequalities, probability measures and convex geometry; **P. Biran**, Symplectic topology and algebraic families; **S. Serfaty**, Vortices in the Ginzburg–Landau model of superconductivity; **W. Tucker**, Validated numerics for pedestrians; **O. Venjakob**, From classical to non-commutative Iwasawa theory: An introduction to the GL_2 main conjecture; Index of authors.

June 2005, 900 pages, Hardcover, ISBN 3-03719-009-4, 2000 *Mathematics Subject Classification*: 00Bxx, **All AMS members US\$110**, List US\$138, Order code EMSEMC/2004

Geometry and Topology



AdS/CFT Correspondence: Einstein Metrics and Their Conformal Boundaries

Olivier Biquard, *Université Louis Pasteur, Strasbourg, France*, Editor

Since its discovery in 1997 by Maldacena, AdS/CFT correspondence has become one of the prime subjects of interest in string theory, as well as one of the main meeting points between theoretical physics and mathematics. On the physical side, it provides a duality between a theory of quantum gravity and a field theory. The mathematical counterpart is the relation between Einstein metrics and their conformal boundaries. The correspondence has been intensively studied, and a lot of progress emerged from the confrontation of viewpoints between mathematics and physics.

Written by leading experts and directed at research mathematicians and theoretical physicists as well as graduate students, this volume gives an overview of this important area both in theoretical physics and in mathematics. It contains survey articles giving a broad overview of the subject and of the main questions, as well as more specialized articles providing new insight both on the Riemannian side and on the Lorentzian side of the theory.

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

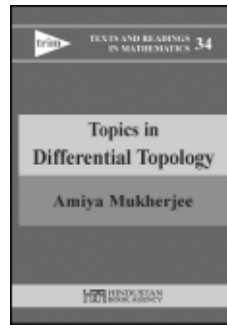
A publication of the European Mathematical Society. Distributed within the Americas by the American Mathematical Society.

Contents: **M. T. Anderson**, Geometric aspects of the AdS/CFT correspondence; **J. de Boer**, **L. Maoz**, and **A. Naqvi**, Some aspects of the AdS/CFT correspondence; **C. R. Graham** and **K. Hirachi**, The ambient obstruction tensor and Q -curvature; **I. Papadimitriou** and **K. Skenderis**, AdS/CFT correspondence

and geometry; **M. Herzlich**, Mass formulae for asymptotically hyperbolic manifolds; **S. N. Solodukhin**, Reconstructing Minkowski space-time; **M. T. Anderson**, **P. T. Chruściel**, and **E. Delay**, Non-trivial, static, geodesically complete space-times with a negative cosmological constant II. $n \geq 5$; **C. Frances**, The conformal boundary of anti-de Sitter space-times; **J. P. Gauntlett**, **D. Martelli**, **J. Sparks**, and **D. Waldram**, Supersymmetric AdS backgrounds in string and M-theory.

IRMA Lectures in Mathematics and Theoretical Physics, Volume 8

May 2005, 260 pages, Softcover, ISBN 3-03719-013-2, 2000 *Mathematics Subject Classification*: 53Cxx, 81Txx, 53A30, 58J60, 83D05, **All AMS members US\$36**, List US\$45, Order code EMSILMTP/8



Topics in Differential Topology

Amiya Mukherjee, *Indian Statistical Institute, Calcutta, India*

Aimed at those who have an elementary knowledge of linear algebra, general topology, multivariate calculus, analysis, and algebraic topology, this book gives an introduction to some fundamental

tools of differential topology. The first part, comprising chapters 1 to 4, is foundational. It will be useful to general students of pure mathematics and can be used to design a course at the M.Sc. level in Indian universities. The second part, consisting of chapters 5 to 8, caters to researchers in the areas of topology, differential or algebraic geometry and global analysis, and touches on advanced topics of general interest in these areas. Finally, the third part is meant for those who want to work in the field of differential topology itself.

Some of the highlights of the book are Thom transversality, Morse theory, Theory of handle presentation, h -cobordism theorem and generalized Poincaré conjecture, and Gromov theory of homotopy principle of certain partial differential relations. The intention is to acquaint the reader with some epochal discoveries in the field of manifolds, mainly the earlier works of Stephen Smale for which he was awarded the Fields Medal.

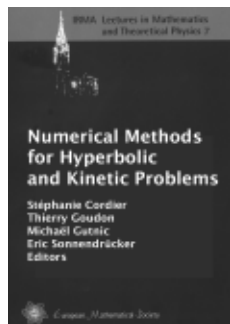
A publication of Hindustan Book Agency. Distributed on an exclusive basis by the AMS in North America. Online bookstore rights worldwide.

Contents: Basic concepts of manifolds; Approximation theorems and Whitney's embedding; Linear structures on manifolds; Riemannian manifolds; Vector bundles on manifolds; Transversality; Tubular neighbourhoods; Spaces of smooth maps; Morse theory; Theory of handle presentations; Homotopy classification of regular sections; Bibliography; Index.

Hindustan Book Agency

June 2005, 454 pages, Hardcover, ISBN 81-85931-56-9, 2000 *Mathematics Subject Classification*: 58A05, 58-01, 58-02, 58A10, 58A20, 58D10, 58Dxx, 57R12, 57R65, 57R60, 57R70, 57R80, 57R17, **All AMS members US\$38**, List US\$48, Order code HIN/25

Mathematical Physics



Numerical Methods for Hyperbolic and Kinetic Problems

Stéphane Cordier, *Université d'Orléans, France*, **Thierry Goudon**, *Université Lille I, Villeneuve d'Ascq, France*, and **Michael Gutnic** and **Eric Sonnendrücker**, *Université Louis Pasteur, Strasbourg, France*, Editors

Hyperbolic and kinetic equations arise in a large variety of industrial problems. For this reason, the Summer Mathematical Research Center on Scientific Computing and its Applications (CEMRACS), held at the Center of International Research in Mathematics (CIRM) in Luminy, was devoted to this topic. During a six-week period, junior and senior researchers worked full time on several projects proposed by industry and academia. Most of this work was completed later on, and the present book reflects these results.

The articles address modelling issues as well as the development and comparisons of numerical methods in different situations. The applications include multi-phase flows, plasma physics, quantum particle dynamics, radiative transfer, sprays, and aeroacoustics.

The text is aimed at researchers and engineers interested in applications arising from modelling and numerical simulation of hyperbolic and kinetic problems.

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

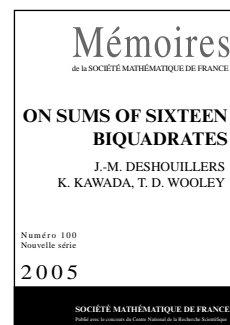
Contents: *Kinetic Problems:* **S. Cordier**, **T. Goudon**, and **E. Sonnendrücker**, Introduction; **R. Barthelmé** and **C. Parzani**, Numerical charge conservation in Particle-In-Cell; **J.-P. Chehab**, **A. Cohen**, **D. Jennequin**, **J. J. Nieto**, **Ch. Roland**, and **J. Roche**, An adaptive Particle-In-Cell method using multi-resolution analysis; **M. Campos Pinto** and **M. Mehrenberger**, Adaptive numerical resolution of the Vlasov equation; **N. Crouseilles** and **F. Filbet**, A conservative and entropic method for the Vlasov-Fokker-Planck-Landau equation; **C. Besse**, **N. J. Mauser**, and **H. P. Stimming**, Numerical studies for nonlinear Schrödinger equations: the Schrödinger-Poisson- X α model and Davey-Stewartson system; **C. Besse**, **J. Claudel**, **P. Degond**, **F. Deluzet**, **G. Gallice**, and **C. Tessieras**, Ionospheric plasmas: model derivation, stability analysis and numerical simulations; **L. Gosse**, A case study on the reliability of multiphase WKB approximation for the one-dimensional Schrödinger equation; *Hyperbolic Problems:* **B. Després**, Introduction; **C. Baranger**, **G. Baudin**, **L. Boudin**, **B. Després**, **F. Lagoutière**, **E. Lapébie**, and **T. Takahashi**, Liquid jet generation and break-up; **B. Després**, **S. Jaouen**, **C. Mazeran**, and **T. Takahashi**, Numerical study of a conservative bifluid model with interpenetration; **F. Caro**, **F. Coquel**, **D. Jamet**, and **S. Kokh**, DINMOD: A diffuse interface model for two-phase flows modelling; **F. Coquel**, **D. Diehl**, **C. Merkle**, and **C. Rohde**, Sharp and diffuse interface methods for phase transition

problems in liquid-vapour flows; **J. Cartier** and **A. Munnier**, Geometric Eddington factor for radiative transfer problems; **M. Dumbser** and **C.-D. Munz**, Arbitrary high order discontinuous Galerkin schemes; **C.-D. Munz**, **M. Dumbser**, and **M. Zucchini**, The multiple pressure variables method for fluid dynamics and aeroacoustics at low Mach numbers.

IRMA Lectures in Mathematics and Theoretical Physics, Volume 7

May 2005, 368 pages, Softcover, ISBN 3-03719-012-4, 2000 *Mathematics Subject Classification:* 65Mxx, 76-XX, 82-XX, **All AMS members US\$39**, List US\$49, Order code EMSILMTP/7

Number Theory



On Sums of Sixteen Biquadrates

J.-M. Deshouillers, *University of Bordeaux II, France*, **K. Kawada**, *Iwate University, Morioka, Japan*, and **T. D. Wooley**, *University of Michigan, Ann Arbor, MI*

By 1939 it was known that 13,792 cannot be expressed as a sum of sixteen biquadrates (folklore), that there exist infinitely many natural numbers which cannot be written as sums of fifteen biquadrates (Kempner) and that every sufficiently large integer is a sum of sixteen biquadrates (Davenport).

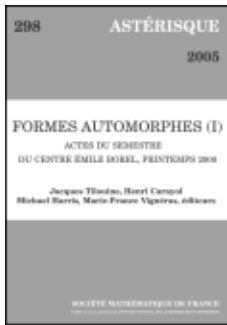
In this memoir it is shown that every integer larger than 10^{216} and not divisible by 16 can be represented as a sum of sixteen biquadrates. Combined with a numerical study by Deshouillers, Hennecart and Landreau, this result implies that every integer larger than 13,792 is a sum of sixteen biquadrates.

The volume is suitable for graduate students and research mathematicians interested in number theory.

Contents: Introduction; Outline of the proof of theorem 2; The cardinality of the sets $\mathcal{M}\eta(X)$; An auxiliary singular integral; Estimates for complete exponential sums; The singular series; The major arc contribution; An explicit version of Weyl's inequality; An auxiliary bound for the divisor function; An investigation of certain congruences; Mean value estimates; Appendix: Sums of nineteen biquadrates; Bibliography.

Number 100

April 2005, 120 pages, Softcover, ISBN 2-85629-171-6, 2000 *Mathematics Subject Classification:* 11P05, 11P55; 11D45, 11D85, 11L15, 11N56, **Individual member US\$34**, List US\$38, Order code SMFMEM/100



Formes Automorphes (I)

Actes du Semestre du Centre Émile Borel, printemps 2000

Jacques Tilouine, *Université Paris XIII, Villetaneuse, France*,
Henri Carayol, *Université Louis Pasteur 7, Strasbourg, France*,
and Michael Harris and Marie-

France Vignéras, *Université Paris VII, France*,
Editors

This volume is the first of a series of two devoted to automorphic forms from a geometric and arithmetic point of view. They also deal with certain parts of the Langlands program. The themes treated in this volume include p -adic modular forms, the local Langlands correspondence for $GL(n)$, the cohomology of Shimura varieties, their reduction modulo p , and their stratification by Newton polygons.

The book is suitable for graduate students and research mathematicians interested in number theory, algebra, and algebraic geometry.

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

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: K. Buzzard, Questions about slopes of modular forms; M. Harris, The local Langlands correspondence: Notes of (half) a course at the IHP Spring 2000; H. Hida, p -adic automorphic forms on reductive groups; F. Oort, Newton polygons and p -divisible groups: a conjecture by Grothendieck; M. Rapoport, A guide to the reduction modulo p of Shimura varieties; L. Saper, \mathcal{L} -modules and the conjecture of Rapoport and Goresky-MacPherson; D. Soudry, On Langlands functoriality from classical groups to GL_n ; M. Strauch, On the Jacquet-Langlands correspondence in the cohomology of the Lubin-Tate deformation tower.

Astérisque, Number 298

February 2005, 410 pages, Softcover, ISBN 2-85629-172-4, 2000 *Mathematics Subject Classification*: 11-04, 11F03, 11F11, 11F30, 11F33, 11F41, 11F60, 11F70, 11F72, 11F75, 11G15, 11G18, 11G40, 11R39, 11S37, 14G15, 14G22, 14G35, 14K15, 14L05, 22E40, 22E45, 22E50, 32S60, 55N33, **Individual member US\$112**, List US\$124, Order code AST/298

Probability

Probability Measures on Groups: Recent Directions and Trends

S. G. Dani, *Tata Institute of Fundamental Research, Mumbai, India*, and P. Graczyk, *University of Angers, France*, Editors

Many aspects of the classical probability theory based on vector spaces were generalized in the second half of the twentieth century to measures on groups, especially Lie groups. The subject of probability measures on groups that emerged out of this research has continued to grow and many interesting new developments have occurred in the area in recent years.

A School was organized jointly with CIMPA, France and the Tata Institute of Fundamental Research entitled "Probability Measures on Groups: Recent Directions and Trends" in Mumbai. Lecture courses were given at the School by M. Babillot (Orlean, France), D. Bakry (Toulouse, France), S.G. Dani (Tata Institute, Mumbai), J. Faraut (Paris), Y. Guivarc'h (Rennes, France) and M. McCrudden (Manchester, U.K.), aimed at introducing various advanced topics on the theme to students as well as teachers and practicing mathematicians who wanted to get acquainted with the area. The prerequisite for the courses was a basic background in measure theory, harmonic analysis and elementary Lie group theory.

The courses were well-received. Notes were prepared and distributed to the participants during the courses. The present volume represents improved, edited, and refereed versions of the notes, published for dissemination of the topics to the wider community. It is suitable for graduate students and researchers interested in probability, algebra, and algebraic geometry.

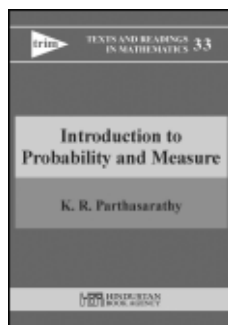
This item will also be of interest to those working in algebra and algebraic geometry.

A publication of the Narosa Publishing House for Tata Institute of Fundamental Research. Distributed worldwide except in India, Bangladesh, Bhutan, Maldives, Nepal, Pakistan, and Sri Lanka.

Contents: M. Babillot, An introduction to Poisson boundaries of Lie groups; D. Bakry, Functional inequalities for Markov semigroups; S. G. Dani, Asymptotic behaviour of measures under automorphisms; J. Faraut, Infinite dimensional harmonic analysis and probability; Y. Guivarc'h, Limit theorems for random walks and products of random matrices; M. McCrudden, The embedding problem for probabilities on locally compact groups.

Tata Institute of Fundamental Research

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Introduction to Probability and Measure



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

According to a remark attributed to M. Kac, probability theory is measure theory with a soul. Furthermore, measure theory has its own ramifications in topics such as

function spaces, operator theory, generalized functions, ergodic theory, group representations, quantum probability, etc. On the other hand, recent explosive developments in the applications of probability theory have imposed the need for a good grasp of measure theory among a wide spectrum of scholars ranging from economists to engineers and physicists to psychologists. This book, with its choice of proofs, remarks, examples, and exercises, has been prepared by taking both these aesthetic and practical aspects into account. Courses based on this book will help undergraduate and graduate students in getting a firm grasp of the fundamentals in the twin themes of probability and measure theory.

This is a revised version of the book published in 1977.

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Contents: Probability of Boolean algebras; Extension of measures; Borel maps; Integration; Measures on product spaces; Hilbert space and conditional expectation; Weak convergence of probability measures; Invariant measures on groups.

Hindustan Book Agency

May 2005, 354 pages, Softcover, ISBN 81-85931-55-0, 2000 *Mathematics Subject Classification*: 60-01, 28-01, 60A10, 28C99, **All AMS members US\$29**, List US\$36, Order code HIN/24