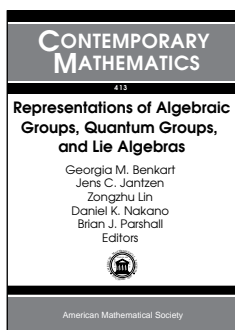


New Publications Offered by the AMS

Algebra and Algebraic Geometry



Representations of Algebraic Groups, Quantum Groups, and Lie Algebras

Georgia Benkart, *University of Wisconsin, Madison, WI*, Jens C. Jantzen, *Aarhus University, Denmark*, Zongzhu Lin, *Kansas State University, Manhattan, KS*, Daniel K.

Nakano, *University of Georgia, Athens, GA*, and Brian J. Parshall, *University of Virginia, Charlottesville, VA*, Editors

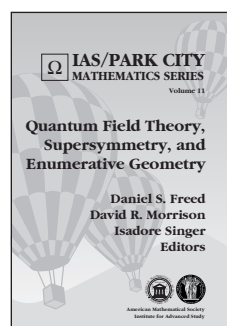
The book contains several well-written accessible survey papers in many interrelated areas of current research. These areas cover various aspects of the representation theory of Lie algebras, finite groups of Lie types, Hecke algebras, and Lie superalgebras. Geometric methods have been instrumental in representation theory, and these proceedings include surveys on geometric as well as combinatorial constructions of the crystal basis for representations of quantum groups. Humphreys' paper outlines intricate connections among irreducible representations of certain blocks of reduced enveloping algebras of semi-simple Lie algebras in positive characteristic, left cells in two sided cells of affine Weyl groups, and the geometry of the nilpotent orbits. All these papers provide the reader with a broad picture of the interaction of many different research areas and should be helpful to those who want to have a glimpse of current research involving representation theory.

Contents: C. P. Bendel, D. K. Nakano, and C. Pillen, Extensions for finite groups of Lie type II: Filtering the truncated induction functor; B. Deng and J. Du, Algebras, representations and their derived categories over finite fields; Y. Hashimoto, M. Kaneda, and D. Rumynin, On localization of D -modules; J. E. Humphreys, Representations of reduced enveloping algebras and cells in the affine Weyl group; S-

J. Kang, J.-A. Kim, and D.-U. Shin, Nakajima's monomials and crystal bases; G. Karaali, A new Lie bialgebra structure on $sl(2, 1)$; J. Kujawa, The Steinberg tensor product theorem for $GL(m|n)$; Z. Lin and H. Rui, Cyclotomic q -Schur algebras and Schur-Weyl duality; T. Nakashima, Geometric crystals and affine crystals; C. Pillen, Self-extensions for finite symplectic groups via algebraic groups; A. Premet and H. Strade, Classification of finite dimensional simple Lie algebras in prime characteristics; E. C. Rowell, From quantum groups to unitary modular tensor categories; J. Xiao and G. Zhang, A trip from representations of the Kronecker quiver to canonical bases of quantum affine algebras.

Contemporary Mathematics, Volume 413

October 2006, 254 pages, Softcover, ISBN-10: 0-8218-3924-1, ISBN-13: 978-0-8218-3924-9, LC 2006045952, 2000 *Mathematics Subject Classification*: 05E10, 14L17, 16G20, 17Bxx, 20C08, 20Gxx, All AMS members US\$63, List US\$79, Order code CONM/413



Quantum Field Theory, Supersymmetry, and Enumerative Geometry

Daniel S. Freed, *University of Texas, Austin, TX*, David R. Morrison, *Duke University, Durham, NC*, and Isadore

Singer, *Massachusetts Institute of Technology, Cambridge, MA*, Editors

Each summer the IAS/Park City Mathematics Institute Graduate Summer School gathers some of the best researchers and educators in a particular field to present diverse sets of lectures. This volume presents three weeks of lectures given at the Summer School on Quantum Field Theory, Supersymmetry, and Enumerative Geometry, three very active research areas in mathematics and theoretical physics.

With this volume, the Park City Mathematics Institute returns to the general topic of the first institute: the interplay between quantum field theory and mathematics. Two major themes at this institute were supersymmetry and algebraic geometry,

particularly enumerative geometry. The volume contains two lecture series on methods of enumerative geometry that have their roots in QFT. The first series covers the Schubert calculus and quantum cohomology. The second discusses methods from algebraic geometry for computing Gromov-Witten invariants. There are also three sets of lectures of a more introductory nature: an overview of classical field theory and supersymmetry, an introduction to supermanifolds, and an introduction to general relativity.

This volume is recommended for independent study and is suitable for graduate students and researchers interested in geometry and physics.

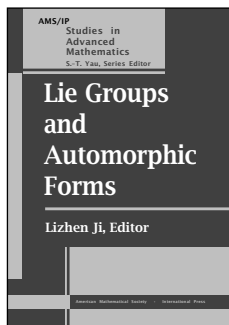
This item will also be of interest to those working in geometry and topology and mathematical physics.

Titles in this series are copublished with the Institute for Advanced Study/Park City Mathematics Institute. Members of the Mathematical Association of America (MAA) and the National Council of Teachers of Mathematics (NCTM) receive a 20% discount from list price.

Contents: *W. Fulton, Enumerative geometry (with notes by Alastair Craw):* Enumerative geometry (with notes by Alastair Craw); Bibliography; *A. Bertram, Computing Gromov-Witten invariants with algebraic geometry:* Introduction and motivation; Localization; J -functions; An alternative to WDVV; Bibliography; *D. S. Freed, Classical field theory and supersymmetry:* Introduction; Classical mechanics; Lagrangian field theory and symmetries; Classical bosonic theories on Minkowski spacetime; Fermions and the supersymmetric particle; Free theories, quantization, and approximation; Supersymmetric field theories; Supersymmetric σ -models; Bibliography; *J. W. Morgan, Introduction to supermanifolds:* Introduction to supermanifolds; Bibliography; *C. V. Johnson, Notes on introductory general relativity:* Notes on introductory general relativity; Bibliography.

IAS/Park City Mathematics Series, Volume 11

November 2006, 285 pages, Hardcover, ISBN-10: 0-8218-3431-2, ISBN-13: 978-0-8218-3431-2, LC 2006047633, 2000 *Mathematics Subject Classification:* 81Qxx, 81Txx, 14-02, 83-02; 81Sxx, 14N35, 83Cxx, **All AMS members US\$44**, List US\$55, Order code PCMS/11



Lie Groups and Automorphic Forms

Lizhen Ji, Managing Editor, *University of Michigan, Ann Arbor*, **Jian-Shu Li**, *Hong Kong University of Science and Technology, Kowloon*, **H. W. Xu**, *Zhejiang University, Hangzhou, China*, and **Shing-Tung Yau**, *Harvard*

University, Cambridge, MA, Editors

Lie groups are fundamental objects in mathematics. They occur naturally in differential geometry, algebraic geometry, representation theory, number theory, and other areas. Closely related are arithmetic subgroups, locally symmetric spaces and the spectral theory of automorphic forms.

This book consists of five chapters which give comprehensive introductions to Lie groups, Lie algebras, arithmetic groups

and reduction theories, cohomology of arithmetic groups, and the Petersson and Kuznetsov trace formulas.

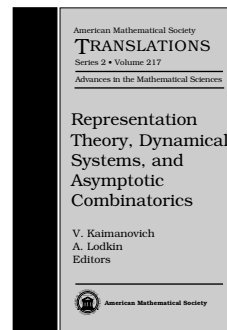
This item will also be of interest to those working in geometry and topology.

Titles in this series are copublished with International Press, Cambridge, MA.

Contents: **A. Borel**, Lie groups and linear algebraic groups I. Complex and real groups; **A. Borel**, Introduction to the cohomology of arithmetic groups; **L. Ji**, Lectures on locally symmetric spaces and arithmetic groups; **J. Liu** and **Y. Ye**, Petersson and Kuznetsov trace formulas; **L. Saper**, On the cohomology of locally symmetric spaces and of their compactifications.

AMS/IP Studies in Advanced Mathematics, Volume 37

October 2006, 239 pages, Softcover, ISBN-10: 0-8218-4198-X, ISBN-13: 978-0-8218-4198-3, 2000 *Mathematics Subject Classification:* 20Gxx, 22Exx, 11-XX, 55Nxx, **All AMS members US\$47**, List US\$59, Order code AMSIP/37



Representation Theory, Dynamical Systems, and Asymptotic Combinatorics

V. Kaimanovich, *International University, Bremen, Germany*, and **A. Lodkin**, *St. Petersburg State University, Russia*, Editors

This volume, devoted to the 70th birthday of the well-known St. Petersburg mathematician A. M. Vershik, contains a collection of articles by participants in the conference "Representation Theory, Dynamical Systems, and Asymptotic Combinatorics", held in St. Petersburg in June of 2004. The book is suitable for graduate students and researchers interested in combinatorial and dynamical aspects of group representation theory.

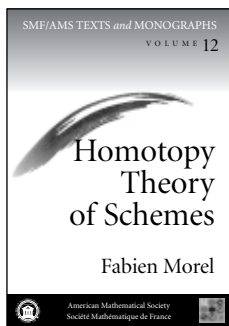
This item will also be of interest to those working in discrete mathematics and combinatorics.

Contents: **V. Arnold**, Statistics of the symmetric group representations as a natural science question on asymptotics of Young diagrams; **A. Borodin** and **G. Olshanski**, Stochastic dynamics related to Plancherel measure on partitions; **A. Bufetov**, **Y. G. Sinai**, and **C. Ulcigrai**, A condition for continuous spectrum of an interval exchange transformation; **I. Fesenko**, Several nonstandard remarks; **G. A. Freiman** and **A. A. Yudin**, The interface between probability theory and additive number theory (local limit theorems and structure theory of set addition); **V. Ivanov**, Plancherel measure on shifted Young diagrams; **A. Joseph**, Results and problems in enveloping algebras arising from quantum groups; **V. Malyshev** and **A. Manita**, Asymptotic behaviour in the time synchronization model; **Y. A. Neretin**, Stable densities and operators of fractional differentiation; **W. Parry** and **M. Pollicott**, Skew products and Livsic theory; **M. Pollicott** and **R. Sharp**, Distribution of ergodic sums for hyperbolic maps; **J. Renault**, Transverse properties of dynamical systems;

B.-Z. Rubshtein, Minimal one-sided Markov shifts and their cofiltrations; **K. Schmidt**, Quotients of $\ell^\infty(\mathbb{Z}, \mathbb{Z})$ and symbolic covers of toral automorphisms.

American Mathematical Society Translations—Series 2
(*Advances in the Mathematical Sciences*), Volume 217

November 2006, 246 pages, Hardcover, ISBN-10: 0-8218-4208-0, ISBN-13: 978-0-8218-4208-9, LC 91-640741, 2000
Mathematics Subject Classification: 00B15, 05Exx, 22Dxx, 37-XX, **All AMS members US\$87**, List US\$109, Order code TRANS/217



Homotopy Theory of Schemes

Fabien Morel, *Mathematisches Institut der Universität München, Germany*

Translated by James D. Lewis.

In this text, the author presents a general framework for applying the standard methods from homotopy theory to the category of smooth

schemes over a reasonable base scheme k . He defines the homotopy category $h(\mathcal{E}_k)$ of smooth k -schemes and shows that it plays the same role for smooth k -schemes as the classical homotopy category plays for differentiable varieties. It is shown that certain expected properties are satisfied, for example, concerning the algebraic K -theory of those schemes. In this way, advanced methods of algebraic topology become available in modern algebraic geometry.

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

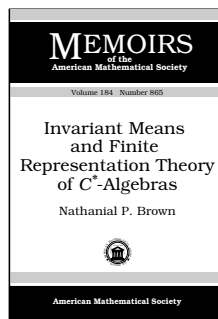
Titles in this series are copublished with Société Mathématique de France. SMF members are entitled to AMS member discounts.

Contents: Introduction; The homotopic category; Homotopic excision, homotopic purity and projective blow-ups; Homotopic classification of vector bundles; Appendix A: Review of homotopic algebra; Appendix B: Ample families of invertible bundles on a scheme; References.

SMF/AMS Texts and Monographs, Volume 12

November 2006, 104 pages, Softcover, ISBN-10: 0-8218-3164-X, ISBN-13: 978-0-8218-3164-9, LC 2006047747, 2000
Mathematics Subject Classification: 55U35, 13D15, 19E08, 19D25, **All AMS members US\$31**, List US\$39, Order code SMFAMS/12

Analysis



Invariant Means and Finite Representation Theory of C^* -Algebras

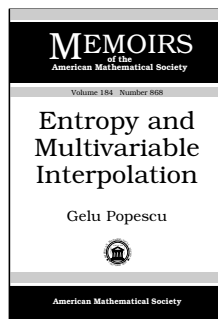
Nathaniel P. Brown,
Pennsylvania State University, State College, PA

Contents: Introduction; Notation, definitions and useful facts; Amenable traces and stronger approximation properties; Examples and special cases; Finite representations;

Applications and connections with other areas; Bibliography.

Memoirs of the American Mathematical Society, Volume 184, Number 865

October 2006, 105 pages, Softcover, ISBN-10: 0-8218-3916-0, ISBN-13: 978-0-8218-3916-4, LC 2006043005, 2000
Mathematics Subject Classification: 46L05, **Individual member US\$35**, List US\$59, Institutional member US\$47, Order code MEMO/184/865



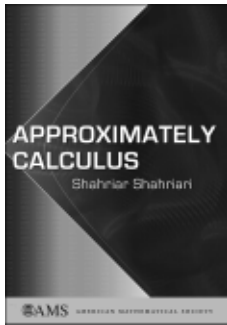
Entropy and Multivariable Interpolation

Gelu Popescu, *University of Texas at San Antonio, TX*

Contents: Introduction; Operators on fock spaces and their entropy; Noncommutative commutant lifting theorem; Geometric structure and maximal entropy solution; Maximal entropy interpolation problems in several variables; Bibliography.

Memoirs of the American Mathematical Society, Volume 184, Number 868

October 2006, 83 pages, Softcover, ISBN-10: 0-8218-3912-8, ISBN-13: 978-0-8218-3912-6, LC 2006043003, 2000
Mathematics Subject Classification: 47A57, 47A13; 47A56, 47A20, 47B35, **Individual member US\$33**, List US\$55, Institutional member US\$44, Order code MEMO/184/868



Approximately Calculus

Shahriar Shahriari, *Pomona College, Claremont, CA*

Is there always a prime number between n and $2n$? Where, approximately, is the millionth prime? And just what does calculus have to do with answering either of these questions? It turns out that calculus has a lot to do with both questions, as

this book can show you.

The theme of the book is approximations. Calculus is a powerful tool because it allows us to approximate complicated functions with simpler ones. Indeed, replacing a function locally with a linear—or higher order—approximation is at the heart of calculus. The real star of the book, though, is the task of approximating the number of primes up to a number x . This leads to the famous Prime Number Theorem—and to the answers to the two questions about primes.

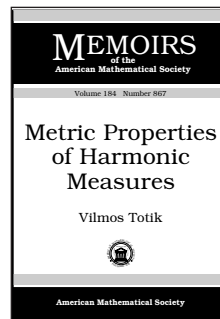
While emphasizing the role of approximations in calculus, most major topics are addressed, such as derivatives, integrals, the Fundamental Theorem of Calculus, sequences, series, and so on. However, our particular point of view also leads us to many unusual topics: curvature, Padé approximations, public key cryptography, and an analysis of the logistic equation, to name a few.

The reader takes an active role in developing the material by solving problems. Most topics are broken down into a series of manageable problems, which guide you to an understanding of the important ideas. There is also ample exposition to fill in background material and to get you thinking appropriately about the concepts.

Approximately Calculus is intended for the reader who has already had an introduction to calculus, but wants to engage the concepts and ideas at a deeper level. It is suitable as a text for an honors or alternative second semester calculus course.

Contents: Patterns and induction; Divisibility; Primes; Derivatives and approximations of functions; Antiderivatives and integration; Distribution of primes; Log, exponential, and the inverse trigonometric functions; The mean value theorem and approximations; Linearization topics; Defining integrals, areas, and arclengths; Improper integrals and techniques of integration; The prime number theorem; Local approximation of functions and integral estimations; Sequences and series; Power series and Taylor series; More on series; Limits of functions; Differential equations; Logical arguments; Hints for selected problems; Bibliography; Index.

January 2007, approximately 305 pages, Hardcover, ISBN-10: 0-8218-3750-8, ISBN-13: 978-0-8218-3750-4, LC 2006048370, 2000 *Mathematics Subject Classification*: 26A06; 11A99, 41-01, **All AMS members US\$39**, List US\$49, Order code ACALC



Metric Properties of Harmonic Measures

Vilmos Totik, *University of South Florida, Tampa, FL, and University of Szeged, Hungary*

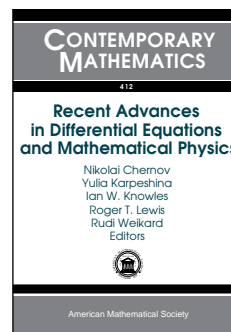
Contents: Introduction; Metric properties of harmonic measures, Green functions and equilibrium measures; Sharpness; Higher order smoothness; Cantor-type sets; Phragmén–Lindelöf type theorems;

Markov and Bernstein type inequalities; Fast decreasing polynomials; Remez and Schur type inequalities; Approximation on compact sets; Appendix; References; List of symbols; List of figures; Index.

Memoirs of the American Mathematical Society, Volume 184, Number 867

October 2006, 163 pages, Softcover, ISBN-10: 0-8218-3994-2, ISBN-13: 978-0-8218-3994-2, LC 2006043006, 2000 *Mathematics Subject Classification*: 31A15, 31C15, 26C05, 26D05, 30C10, 41A10, 42A05, **Individual member US\$38**, List US\$63, Institutional member US\$50, Order code MEMO/184/867

Differential Equations



Recent Advances in Differential Equations and Mathematical Physics

Nikolai Chernov, Yulia Karpeshina, Ian W. Knowles, Roger T. Lewis, and Rudi Weikard, *University of Alabama at Birmingham, AL*, Editors

This book brings together both new material and recent surveys on some topics in differential equations that are either directly relevant to, or closely associated with, mathematical physics.

Its topics include asymptotic formulas for the ground-state energy of fermionic gas, renormalization ideas in quantum field theory from perturbations of the free Hamiltonian on the circle, J -selfadjoint Dirac operators, spectral theory of Schrödinger operators, inverse problems, isoperimetric inequalities in quantum mechanics, Hardy inequalities, and non-adiabatic transitions.

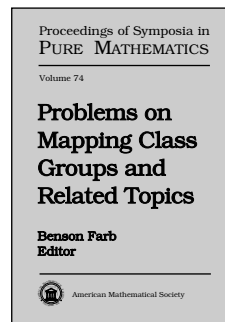
Excellent survey articles on Dirichlet-Neumann inverse problems on manifolds (by Uhlmann), numerical investigations associated with Laplacian eigenvalues on planar regions (by Trefethen), Snell's law and propagation of singularities in the wave equation (by Vasy), and random operators on tree graphs (by Aizenmann) make this book interesting and valuable for graduate students, young mathematicians, and physicists alike.

Contents: M. Aizenman, R. Sims, and S. Warzel, Fluctuation based proof of the stability of ac spectra of random operators on tree graphs; T. Aktosun and R. Weder, The Borg-Marchenko theorem with a continuous spectrum; M. H. Annaby, G. Freiling, and I. A. Soliman, Sampling theorems associated with differential operators iterated from lower order ones; W. Arendt, G. R. Goldstein, and J. A. Goldstein, Outgrowths of Hardy's inequality; A. A. Balinsky and A. E. Tyukov, On Hardy type inequalities; R. D. Benguria, A nonlinear fourth-order minimization problem; B. M. Brown, M. Jais, and P. C. Kalmbach, A variational approach to inverse problems for anisotropic systems; S. Clark and F. Gesztesy, On self-adjoint and J -self-adjoint Dirac type operators: A case study; P. Exner, Necklaces with interacting beads: Isoperimetric problems; C. Fox, V. Oleinik, and B. Pavlov, A Dirichlet-to-Neumann map approach to resonance gaps and bands of periodic networks; G. Gallavotti, Resonances and summation of divergent series; G. A. Hagedorn and A. Joye, Recent results on non-adiabatic transitions in quantum mechanics; R. Hempel, Schrödinger operators with strong magnetic fields of compact support; D. Hinton and M. L. McCarthy, Optimization of the minimum eigenvalue for a class of second order differential operators; R. Lavine, Time of arrival in quantum mechanics and the quantum zeno effect; E. H. Lieb, R. Seiringer, and J. P. Solovej, Ground-state energy of a dilute Fermi gas; L. Pestov and G. Uhlmann, The scattering relation and the Dirichlet-to-Neumann map; N. Röhrli, Recovering boundary conditions in inverse Sturm-Liouville problems; A. Rybkin, Preservation of the absolutely continuous spectrum: Some extensions of a result by Molchanov-Novitskii-Vainberg; V. Tkachenko, Expansions associated with 1d periodic differential operators of order 4; L. N. Trefethen and T. Betcke, Computed eigenmodes of planar regions; A. Vasy, Geometric optics and the wave equation on manifolds with corners.

Contemporary Mathematics, Volume 412

August 2006, 333 pages, Softcover, ISBN-10: 0-8218-3840-7, ISBN-13: 978-0-8218-3840-2, LC 2006042875, 2000
Mathematics Subject Classification: 34A55, 34B20, 35J05, 35J10, 35P15, 35R45, 81Q05, 81Q10, 81P15, 81V70, All AMS members US\$71, List US\$89, Order code CONM/412

Geometry and Topology



Problems on Mapping Class Groups and Related Topics

Benson Farb, *University of Chicago, IL*, Editor

The appearance of mapping class groups in mathematics is ubiquitous. The book presents 23 papers containing problems about mapping

class groups, the moduli space of Riemann surfaces, Teichmüller geometry, and related areas. Each paper focusses completely on open problems and directions. The problems range in scope from specific computations, to broad programs. The goal is to have a rich source of problems which have been formulated explicitly and accessibly.

The book is divided into four parts. Part I contains problems on the combinatorial and (co)homological group-theoretic aspects of mapping class groups, and the way in which these relate to problems in geometry and topology. Part II concentrates on connections with classification problems in 3-manifold theory, the theory of symplectic 4-manifolds, and algebraic geometry. A wide variety of problems, from understanding billiard trajectories to the classification of Kleinian groups, can be reduced to differential and synthetic geometry problems about moduli space. Such problems and connections are discussed in Part III. Mapping class groups are related, both concretely and philosophically, to a number of other groups, such as braid groups, lattices in semisimple Lie groups, and automorphism groups of free groups. Part IV concentrates on problems surrounding these relationships.

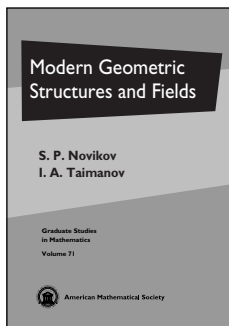
This book should be of interest to anyone studying geometry, topology, algebraic geometry or infinite groups. It is meant to provide inspiration for everyone from graduate students to senior researchers.

Contents: *I. Cohomological, combinatorial and algebraic structure:* M. Bestvina, Four questions about mapping class groups; B. Farb, Some problems on mapping class groups and moduli space; R. Hain, Finiteness and Torelli spaces; N. V. Ivanov, Fifteen problems about the mapping class groups; M. Korkmaz, Problems on homomorphisms of mapping class groups; I. Madsen, The mapping class group and homotopy theory; R. C. Penner, Probing mapping class groups using arcs; B. Wajnryb, Relations in the mapping class group; *II. Connections with 3-manifolds, symplectic geometry and algebraic geometry:* D. Auroux, Mapping class group factorizations and symplectic 4-manifolds: Some open problems; J. S. Birman, The topology of 3-manifolds, Heegaard distances and the mapping class group of a 2-manifold; S. K. Donaldson, Lefschetz pencils and mapping class groups; P. Lochak and L. Schneps, Open problems in Grothendieck-Teichmüller theory; *III. Geometry and dynamical aspects:* W. M. Goldman, Mapping class group dynamics on surface group representations; U. Hamenstädt, Geometric properties of the mapping class group; P. Hubert, H. Masur, T. Schmidt, and A. Zorich, Problems on billiards, flat surfaces and

translation surfaces; **L. Mosher**, Problems in the geometry of surface group extensions; **A. W. Reid**, Surface subgroups of mapping class groups; **S. A. Wolpert**, Weil-Petersson perspectives; *IV. Braid groups, $Out(F_n)$ and other related groups*; **S. Bigelow**, Braid groups and Iwahori-Hecke algebras; **M. R. Bridson** and **K. Vogtmann**, Automorphism groups of free groups, surface groups and free abelian groups; **F. R. Cohen**, Problems: Braid groups, homotopy, cohomology, and representations; **S. Morita**, Cohomological structure of the mapping class group and beyond; **L. Paris**, From braid groups to mapping class groups.

Proceedings of Symposia in Pure Mathematics, Volume 74

October 2006, 371 pages, Hardcover, ISBN-10: 0-8218-3838-5, ISBN-13: 978-0-8218-3838-9, LC 2006048369, 2000
Mathematics Subject Classification: 58D29, 20F38, 30F60, 14D22, 57M99, 20F34, 20F36, **All AMS members US\$71**, List US\$89, Order code PSPUM/74



Modern Geometric Structures and Fields

S. P. Novikov, *University of Maryland, College Park*, and
I. A. Taimanov, *Russian Academy of Sciences, Novosibirsk, Russia*

The book presents the basics of Riemannian geometry in its modern form as geometry of differentiable

manifolds and the most important structures on them. The authors' approach is that the source of all constructions in Riemannian geometry is a manifold that allows one to compute scalar products of tangent vectors. With this approach, the authors show that Riemannian geometry has a great influence to several fundamental areas of modern mathematics and its applications. In particular,

- Geometry is a bridge between pure mathematics and natural sciences, first of all physics. Fundamental laws of nature are formulated as relations between geometric fields describing various physical quantities.
- The study of global properties of geometric objects leads to the far-reaching development of topology, including topology and geometry of fiber bundles.
- Geometric theory of Hamiltonian systems, which describe many physical phenomena, led to the development of symplectic and Poisson geometry. Field theory and the multidimensional calculus of variations, presented in the book, unify mathematics with theoretical physics.
- Geometry of complex and algebraic manifolds unifies Riemannian geometry with modern complex analysis, as well as with algebra and number theory.

Prerequisites for using the book include several basic undergraduate courses, such as advanced calculus, linear algebra, ordinary differential equations, and elements of topology.

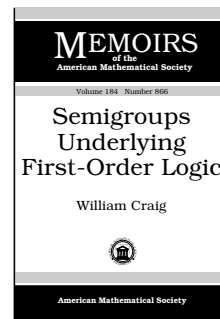
Contents: Cartesian spaces and Euclidean geometry; Symplectic and pseudo-Euclidean spaces; Geometry of two-dimensional manifolds; Complex analysis in the theory of surfaces; Smooth manifolds; Groups of motions; Tensor algebra; Tensor fields in analysis; Analysis of differential

forms; Connections and curvature; Conformal and complex geometries; Morse theory and Hamiltonian formalism; Poisson and Lagrange manifolds; Multidimensional variational problems; Geometric fields in physics; Bibliography; Index.

Graduate Studies in Mathematics, Volume 71

November 2006, 633 pages, Hardcover, ISBN-10: 0-8218-3929-2, ISBN-13: 978-0-8218-3929-4, LC 2006047704, 2000
Mathematics Subject Classification: 53-01; 57-01, **All AMS members US\$63**, List US\$79, Order code GSM/71

Logic and Foundations



Semigroups Underlying First-Order Logic

William Craig

Contents: Boolean, relation-induced, and other operations for dealing with first-order definability; Uniform relations between sequences; Diagonal relations; Uniform diagonal relations and some kinds of bisections or bisectable relations; Presentation of S_q , S_p and related structures;

Presentation of S_{pq} , S_{pe} and related structures; Appendix: Presentation of S_{pqe} and related structures; Bibliography; Index of symbols; Index of phrases and subjects; List of relations involved in presentations; Synopsis of presentations.

Memoirs of the American Mathematical Society, Volume 184, Number 866

October 2006, 263 pages, Softcover, ISBN-10: 0-8218-4149-1, ISBN-13: 978-0-8218-4149-5, LC 2006043004, 2000
Mathematics Subject Classification: 03-XX, 03Gxx, 03G25; 06F05, 20Mxx, 20M05, 20M17, **Individual member US\$50**, List US\$83, Institutional member US\$66, Order code MEMO/184/866

New AMS-Distributed Publications

Analysis



Analysis II

Claus Gerhardt, *University of Heidelberg, Germany*

Analysis II is the second and last part of an introduction to analysis which is based on the author's undergraduate course, Analysis I-III, and the more advanced course, Tensoranalysis, at Heidelberg. It comprises materials for a four-semester course, and can be used as a textbook.

The book covers elements of functional analysis, differentiation in Banach spaces, the fundamental existence theorems in analysis, ordinary differential equations, Lebesgue's theory of integration, tensor analysis, and the theory of submanifolds in semi-Riemannian spaces.

This book is intended for graduate students or for very motivated undergraduates who want to pursue studies in the fields of math or physics.

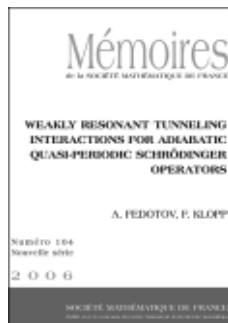
A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: Elements of functional analysis; Differentiation in Banach spaces; Existence theorems; Ordinary differential equations; Lebesgue's theory of integration; Tensor analysis; Theory of submanifolds; Bibliography; List of symbols; Index.

International Press

April 2006, 395 pages, Hardcover, ISBN-10: 1-57146-160-4, ISBN-13: 978-1-57146-160-5, 2000 *Mathematics Subject Classification*: 26Bxx, 28-XX, 34-XX, 53-XX, 58Cxx, **All AMS members US\$52**, List US\$65, Order code INPR/67

Differential Equations



Weakly Resonant Tunneling Interactions for Adiabatic Quasi-periodic Schrödinger Operators

Alexander Fedotov, *St. Petersburg State University, St. Petersburg-Petrodvorets, Russia*, and Frédéric Klopp, *Université Paris-Nord, Villetaneuse, France*

In this book, the authors study spectral properties of the one-dimensional periodic Schrödinger operator with an adiabatic quasi-periodic perturbation. They show that in certain energy regions the perturbation leads to resonance effects related to the ones observed in the problem of two resonating quantum wells. These effects influence both the geometry and the nature of the spectrum. In particular, they can lead to the intertwining of sequences of intervals containing absolutely continuous spectrum and intervals containing singular spectrum. Moreover, in regions where all of the spectrum is expected to be singular, these effects typically give rise to exponentially small "islands" of absolutely continuous spectrum.

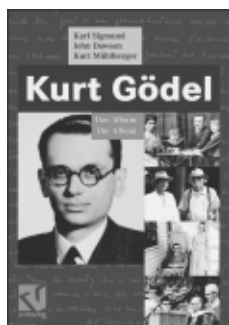
A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: Introduction; The results; The monodromy matrix; Rough characterization of the spectrum and a new monodromy matrix; The spectrum in the "non-resonant" case; Computing the monodromy matrices; Periodic Schrödinger operators; The consistent solutions; Two consistent bases; Transition matrices; Phase integrals, tunneling coefficients and the iso-energy surface; Properties of the Fourier coefficients; Combinations of Fourier coefficients; Bibliography.

Mémoires de la Société Mathématique de France, Number 104

June 2006, 105 pages, Softcover, ISBN-10: 2-85629-188-0, ISBN-13: 978-2-85629-188-7, 2000 *Mathematics Subject Classification*: 34E05, 34E20, 34L05, 34L40, **Individual member US\$34**, List US\$38, Order code SMFMEM/104

General and Interdisciplinary



Kurt Gödel The Album

Karl Sigmund, *University of Vienna, Austria*, **John Dawson**, *Pennsylvania State University, York, PA*, and **Kurt Mühlberger**, *University of Vienna, Austria*

Time magazine ranked him among the hundred most important persons of the twentieth century. Harvard

University made him an honorary doctor “for the discovery of the most significant mathematical truth of the century”. He is generally viewed as the greatest logician since Aristotle. His friend Einstein liked to say that he only went to the institute to have the privilege of walking back home with Kurt Gödel. And John von Neumann, one of the fathers of the computer, wrote: “Indeed Gödel is absolutely irreplaceable. He is the only mathematician about whom I dare make this assertion.”

This book wants to give a simple, intuitive, and easily digestible introduction to Gödel’s life and work, meant for readers interested in the human and cultural aspects of science. Its starting point was the preparation for an exhibition on Kurt Gödel, on the occasion of his hundredth birthday. An exhibition has something of a walk, and that’s exactly what the authors want to offer: a walk with Gödel. Einstein loved such walks. Gödel’s company can be enjoyed.

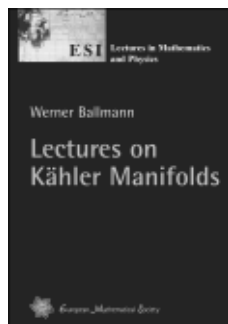
A publication of Vieweg Verlag. The AMS is exclusive distributor in North America. Vieweg Verlag Publications are available worldwide from the AMS outside of Germany, Switzerland, Austria, and Japan.

Contents: Gödel’s life; Gödel’s surroundings; Gödel’s work (Hilbert’s program, Cantor’s continuum, Einstein’s universes, Plato’s shadow).

Vieweg Monographs

April 2006, 225 pages, Hardcover, ISBN-10: 3-8348-0173-9, ISBN-13: 978-3-8348-0173-9, 2000 *Mathematics Subject Classification*: 01A60, 01A70, **All AMS members US\$33**, List US\$37, Order code VW/14

Geometry and Topology



Lectures on Kähler Manifolds

Werner Ballmann, *Universität Bonn, Germany*

These notes are based on lectures the author gave at the University of Bonn and the Erwin Schrödinger Institute in Vienna. The aim is to give a thorough introduction to the theory of Kähler manifolds with special emphasis on the differential geometric side of

Kähler geometry. The exposition starts with a short discussion of complex manifolds and holomorphic vector bundles and a detailed account of the basic differential geometric properties of Kähler manifolds. The more advanced topics are the cohomology of Kähler manifolds, Calabi conjecture, Gromov’s Kähler hyperbolic spaces, and the Kodaira embedding theorem. Some familiarity with global analysis and partial differential equations is assumed, in particular in the part on the Calabi conjecture. There are appendices on Chern-Weil theory, symmetric spaces, and L^2 -cohomology.

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

Contents: Preliminaries; Complex manifolds; Holomorphic vector bundles; Kähler manifolds; Cohomology of Kähler manifolds; Ricci curvature and global structure; Calabi conjecture; Kähler hyperbolic spaces; Kodaira embedding theorem; Appendix A. Chern-Weil theory; Appendix B. Symmetric spaces; Appendix C. Remarks on differential operators; Literature; Index.

ESI Lectures in Mathematics and Physics

July 2006, 182 pages, Softcover, ISBN-10: 3-03719-025-6, ISBN-13: 978-3-03719-025-8, 2000 *Mathematics Subject Classification*: 53C55, 32Q15, 32Qxx, 58Jxx, 53C35, **All AMS members US\$35**, List US\$44, Order code EMSEILEC/2

Number Theory



Spectre automorphe des variétés hyperboliques et applications topologiques

Nicolas Bergeron, *Unité Mixte de Recherche 8553 du CNRS, Paris, France*, and Laurent Clozel, *Université Paris-Sud, Orsay, France*

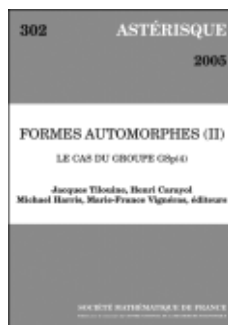
This book has two parts. The first is concerned with the differential form spectrum of congruence hyperbolic manifolds. The authors prove Selberg type theorems on the first eigenvalue of the laplacian on differential forms. The method of proof is representation-theoretic; the authors hope the different chapters also serve as an introduction to the modern theory of automorphic forms and its application to spectral questions. The second part of the book has a more differential geometric flavor; a new kind of lifting of cohomology classes is proved. The main motivation of this work is given by Arthur's conjectures; these conjectures imply strong restrictions on the spectrum of arithmetic manifolds which, in turn, imply conjectural properties on the geometry of hyperbolic manifolds. Together with precise statements of these conjectures, this text gives proofs of weak forms of them in some particular cases.

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: *Partie I. Spectre des variétés hyperboliques:* Théorème de Matsushima; Spectre du laplacien sur les quotients arithmétiques; Représentations de $GL(n)$; Représentations de $U(n, 1)$; Représentations de $U(a, b)$ ($a, b > 1$); Conséquences des Conjectures d'Arthur; Théorème de Luo-Rudnick-Sarnak; Démonstration du Théorème 1; Démonstration du Théorème 2; Démonstration du Théorème 3; *Partie II. Homologie des variétés hyperboliques:* L'espace hyperbolique complexe; Espaces symétriques associés aux groupes unitaires; Construction de la forme duale; Cohomologie L^2 réduite; Démonstrations des Théorèmes 4, 5 et 8; Bibliographie; Index des notations; Index terminologique.

Astérisque, Number 303

June 2006, 218 pages, Softcover, ISBN-10: 2-85629-186-4, ISBN-13: 978-2-85629-186-3, 2000 *Mathematics Subject Classification:* 11F75, 32Q45, 11G18, 14G35, 22E47, 22E55, 58J50, **Individual member US\$59**, List US\$66, Order code AST/303



Formes automorphes (II)

Le cas du groupe $GSp(4)$

Jacques Tilouine, *Université Paris 13, Villetaneuse, France*, Henri Carayol, *Université Louis Pasteur, Strasbourg, France*, and Michael Harris and Marie-France Vignéras, *Université Paris VII, France*, Editors

This volume, the sequel to volume 298, is devoted to automorphic forms. However, this volume deals with a narrower topic, since it only concerns automorphic representations of the group $GSp(4)$, mostly over the rationals. It deals with geometric questions (cohomology of Siegel varieties), arithmetic ones (Galois representations associated to cohomological cusp forms), and harmonic analytical ones (twisted fundamental lemma with weights). These questions had been more or less mentioned during the Paris Automorphic Semester in 2000, but the contributions gathered here are mostly later developments.

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: G. Laumon, Fonctions zêtas des variétés de Siegel de dimension trois; R. Weissauer, Four dimensional Galois representations; E. Urban, Sur les représentations p -adiques associées aux représentations cuspidales de GSp_4/\mathbb{Q} ; A. Genestier and J. Tilouine, Systèmes de Taylor-Wiles pour GSp_4 ; D. Whitehouse, The twisted weighted fundamental lemma for the transfer of automorphic forms from $GSp(4)$ to $GL(4)$.

Astérisque, Number 302

June 2006, 436 pages, Softcover, ISBN-10: 2-85629-184-8, ISBN-13: 978-2-85629-184-9, 2000 *Mathematics Subject Classification:* 11F32, 11F46, 11F70, 11F72, 11F80, 11F85, 11G18, 11G40, 11R34, 11R39, 11S37, 14C15, 14C17, 14F20, 14G10, 20G25, 22E35, **Individual member US\$112**, List US\$124, Order code AST/302