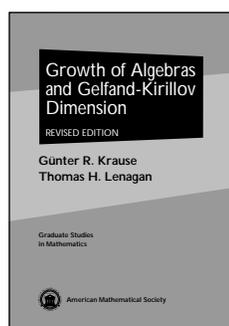


New Publications Offered by the AMS

Algebra and Algebraic Geometry

Recommended Text



Growth of Algebras and Gelfand-Kirillov Dimension

Revised Edition

Günter R. Krause, *University of Manitoba, Winnipeg, Canada*, and Thomas H. Lenagan, *University of Edinburgh, Scotland*

During the two decades that preceded the publication of the first edition of this book, the Gelfand-Kirillov dimension had emerged as a very useful and powerful tool for investigating non-commutative algebras. At that time, the basic ideas and results were scattered throughout various journal articles. The first edition of this book provided a much-needed reliable and coherent single source of information. Since that time, the book has become the standard reference source for researchers.

For this edition, the authors incorporated the original text with only minor modifications. Errors have been corrected, items have been rephrased, and more mathematical expressions have been displayed for the purpose of clarity.

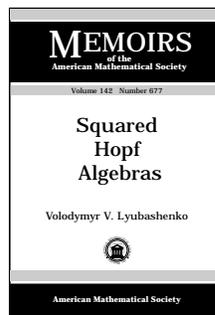
The newly added Chapter 12 provides broad overviews of the new developments that have surfaced in the last few years, with references to the literature for details. The bibliography has been updated and accordingly, almost double the size of the original one.

The faithful revision and contemporary design of this work offers time-honored expertise with modern functionality. A keenly appealing combination. So, whether for the classroom, the well-tended mathematical books collection, or the research desk, this book holds unprecedented relevance.

Contents: Growth of algebras; Gelfand-Kirillov dimension of algebras; Gelfand-Kirillov dimension of related algebras; Localization; Modules; Graded and filtered algebras and modules; Almost commutative algebras; Weyl algebras; Enveloping algebras of solvable Lie algebras; Polynomial identity algebras; Growth of groups; New developments; Bibliography; Index.

Graduate Studies in Mathematics

November 1999, 212 pages, Hardcover, ISBN 0-8218-0859-1, LC 99-39164, 1991 *Mathematics Subject Classification*: 16-XX, 17Bxx; 13Exx, 20Fxx, **All AMS members \$31**, List \$39, Order code GSM-KRAUSEN



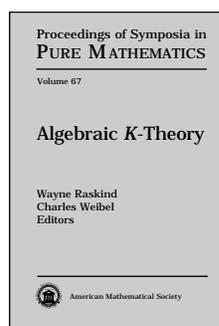
Squared Hopf Algebras

Volodymyr V. Lyubashenko, *Ukrainian National Academy of Sciences, Kiev*

Contents: Introduction; Tools; Squared coalgebras; Squared bicoalgebras; Hopf coalgebras; Quasitriangular Hopf coalgebras; Appendix A. Symmetric monoidal 2-categories; Bibliography.

Memoirs of the American Mathematical Society, Volume 142, Number 677

November 1999, 180 pages, Softcover, ISBN 0-8218-1361-7, LC 99-39861, 1991 *Mathematics Subject Classification*: 16W30, 18D15, 18E10, 17B37; 18D20, 16D90, **Individual member \$29**, List \$49, Institutional member \$39, Order code MEMO/142/677N



Algebraic K-Theory

Wayne Raskind, *University of Southern California, Los Angeles*, and Charles Weibel, *Rutgers University, New Brunswick, NJ*, Editors

This volume presents the proceedings of the Joint Summer Research Conference on Algebraic K-theory held at the University of Washington in Seattle.

High-quality surveys are written by leading experts in the field. Included is the most up-to-date published account of Voevodsky's proof of the Milnor conjecture relating the Milnor K-theory of fields to Galois cohomology. This book offers a comprehensive source for cutting-edge research on the topic.

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

Contents: J.-L. Colliot-Thélène, Conjectures de type local-global sur l'image des groupes de Chow dans la cohomologie étale; H. Esnault, Algebraic theory of characteristic classes of

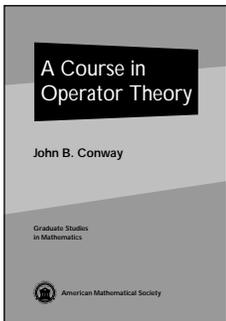
bundles with connection; **H. Gangl** and **S. Müller-Stach**, Polylogarithmic identities in cubical higher Chow groups; **T. Geisser** and **L. Hesselholt**, Topological cyclic homology of schemes; **H. Gillet** and **C. Soulé**, Filtrations on higher algebraic K -theory; **B. Kahn**, Motivic cohomology of smooth geometrically cellular varieties; **K. P. Knudson**, Integral homology of PGL_2 over elliptic curves; **E. Peyre**, Application of motivic complexes to negligible classes; **J. Rognes**, Two-primary algebraic K -theory of spaces and related spaces of symmetries of manifolds; **J. Rosenberg**, A mini-course on recent progress in algebraic K -theory and its relationship with topology and analysis; **B. Totaro**, The Chow ring of a classifying space; **V. Voevodsky**, Voevodsky's Seattle lectures: K -theory and motivic cohomology; **C. Weibel**, Products in higher Chow groups and motivic cohomology.

Proceedings of Symposia in Pure Mathematics, Volume 67

November 1999, approximately 319 pages, Hardcover, ISBN 0-8218-0927-X, 1991 *Mathematics Subject Classification*: 19-02; 19-06, 19Dxx, 19Exx, 19Jxx, 19Kxx, 19Mxx, **Individual member \$47**, List \$79, Institutional member \$63, Order code PSPUM/67N

Analysis

Recommended Text



A Course in Operator Theory

John B. Conway, *University of Tennessee, Knoxville*

Operator theory is a significant part of many important areas of modern mathematics: functional analysis, differential equations, index theory, representation theory, mathematical physics, and more. This text covers the central themes of operator theory,

presented with the excellent clarity and style that readers have come to associate with Conway's writing.

Early chapters introduce and review material on C^* -algebras, normal operators, compact operators and non-normal operators. The topics include the spectral theorem, the functional calculus and the Fredholm index. Also, some deep connections between operator theory and analytic functions are presented.

Later chapters cover more advanced topics, such as representations of C^* -algebras, compact perturbations and von Neumann algebras. Major results, such as the Sz.-Nagy Dilation Theorem, the Weyl-von Neumann-Berg Theorem and the classification of von Neumann algebras, are covered, as is a treatment of Fredholm theory. These advanced topics are at the heart of current research.

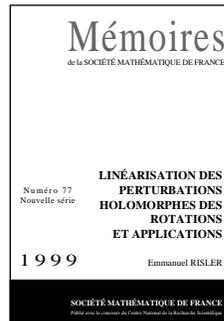
The last chapter gives an introduction to reflexive subspaces, i.e., subspaces of operators that are determined by their invariant subspaces. These, along with hyperreflexive spaces, are one of the more successful episodes in the modern study of asymmetric algebras.

Professor Conway's authoritative treatment makes this a compelling and rigorous course text, suitable for graduate students who have had a standard course in functional analysis.

Contents: Introduction to C^* -algebras; Normal operators; Compact operators; Some non-normal operators; More on C^* -algebras; Compact perturbations; Introduction to von Neumann algebras; Reflexivity; Bibliography; Index; List of symbols.

Graduate Studies in Mathematics

November 1999, approximately 387 pages, Hardcover, ISBN 0-8218-2065-6, LC 99-41229, 1991 *Mathematics Subject Classification*: 47A99, **All AMS members \$39**, List \$49, Order code GSM-CONWAYN



Linéarisation des Perturbations Holomorphes des Rotations et Applications

Emmanuel Risler

A publication of Société Mathématique de France.

The author proves a theorem on conjugacy to rotations for holomorphic maps that are close to rotations in an annulus in \mathbb{C} , under a small-divisors condition (Bruno condition), which is optimal for the problem considered. This result generalizes the theorem, due in its most precise form to J.-C. Yoccoz, on conjugacy to rotations for analytic diffeomorphisms of the circle which are close to rotations. The proof is based on a construction of a renormalization of the dynamics of the maps considered, with analytic dependence with respect to a parameter. This construction involves techniques from several complex variables, in particular the solution of a $\bar{\partial}$ -problem.

In the second part of the volume, the author extends the previous conjugacy result to complex rotation numbers. Using this extension, he then proves that for a family of maps as above depending analytically on a parameter, the correspondence between the space of parameters and the space of rotation numbers is C^∞ in the sense of Whitney.

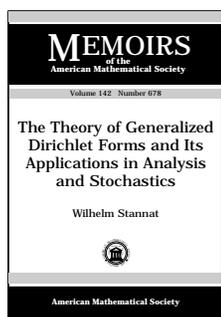
Finally he deduces from these results certain properties of singular rotation domains (Siegel discs and Herman rings) of rational maps on the Riemann sphere. Text is in French.

Distributed by the AMS in the United States, Canada, and Mexico. Orders from other countries should be sent to the SMF, Maison de la SMF, B.P. 67, 13274 Marseille cedex 09, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France. Members of the SMF receive a 30% discount from list.

Contents: Introduction; Linéarisation des perturbations holomorphes des rotations; Complexification et régularité transverse; Compléments et applications; Bibliographie.

Memoires de la Société Mathématique de France, Number 77

July 1999, 108 pages, Softcover, ISBN 2-85629-076-0, 1991 *Mathematics Subject Classification*: 32E10, 32F20, 58F23, **Individual member \$30**, List \$33, Order code SMFMEM/77N



The Theory of Generalized Dirichlet Forms and Its Applications in Analysis and Stochastics

Wilhelm Stannat, *Universität Bielefeld, Germany*

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

Contents: Introduction; Functional analytic background; Examples; Analytic potential theory of generalized Dirichlet forms; Generalized Dirichlet forms and their probabilistic counterpart; References.

Memoirs of the American Mathematical Society, Volume 142, Number 678

November 1999, 101 pages, Softcover, ISBN 0-8218-1384-6, LC 99-41230, 1991 *Mathematics Subject Classification*: 31C25, 60Jxx; 31C15, 35K05, 47D07, **Individual member \$25**, List \$41, Institutional member \$33, Order code MEMO/142/678N

Supplementary Reading

Jacobi Operators and Completely Integrable Nonlinear Lattices

Gerald Teschl, *Institut für Mathematik, Universität Wien, Vienna, Austria*

This volume can serve as an introduction and a reference source on spectral and inverse spectral theory

of Jacobi operators (i.e., second order symmetric difference operators) and applications of those theories to the Toda and Kac-van Moerbeke hierarchy.

Beginning with second order difference equations, the author develops discrete Weyl-Titchmarsh-Kodaira theory, covering all classical aspects, such as Weyl m -functions, spectral functions, the moment problem, inverse spectral theory, and uniqueness results.

Teschl then investigates more advanced topics, such as locating the essential, absolutely continuous, and discrete spectrum, subordinacy, oscillation theory, trace formulas, random operators, almost periodic operators, (quasi-)periodic operators, scattering theory, and spectral deformations. Utilizing the Lax approach, he introduces the Toda hierarchy and its modified counterpart, the Kac-van Moerbeke hierarchy. Uniqueness and existence theorems for solutions, expressions for solutions in terms of Riemann theta functions, the inverse scattering transform, Bäcklund transformations, and soliton solutions are derived.

This text covers all basic topics of Jacobi operators and includes recent advances. It is suitable for use as a text at the advanced graduate level.

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

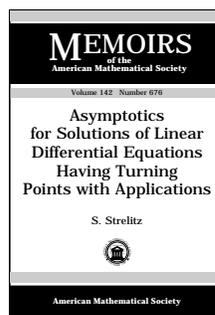
Contents: *Jacobi operators:* Jacobi operators; Foundations of spectral theory for Jacobi operators; Qualitative theory of spectra; Oscillation theory; Random Jacobi operators; Trace formulas; Jacobi operators with periodic coefficients; Reflectionless Jacobi operators; Quasi-periodic Jacobi operators and Riemann theta functions; Scattering theory; Spectral deformations-Commutation methods; *Completely integrable nonlinear lattices:* The Toda system; The initial value problem for the Toda system; The Kac-van Moerbeke system; Notes on literature; Compact Riemann surfaces-A review; Herglotz functions; Jacobi difference equations with Mathematica®; Bibliography; Glossary of notations; Index.

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Mathematical Surveys and Monographs, Volume 72

October 1999, 344 pages, Hardcover, ISBN 0-8218-1940-2, LC 99-39165, 1991 *Mathematics Subject Classification*: 39Axx, 47B39, 58F07, **All AMS members \$52**, List \$65, Order code SURV/72N

Differential Equations



Asymptotics for Solutions of Linear Differential Equations Having Turning Points with Applications

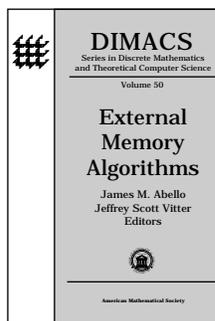
S. Strelitz, *University of Haifa, Israel*

Contents: The construction of asymptotics; Application: Existence and asymptotics of eigenvalues.

Memoirs of the American Mathematical Society, Volume 142, Number 676

November 1999, 89 pages, Softcover, ISBN 0-8218-1352-8, LC 99-41226, 1991 *Mathematics Subject Classification*: 34B10, 34L20, 34E10; 30D35, 30D15, **Individual member \$24**, List \$40, Institutional member \$32, Order code MEMO/142/676N

Discrete Mathematics and Combinatorics



External Memory Algorithms

James M. Abello, *AT&T Bell Labs-Research, Florham Park, NJ*, and Jeffrey Scott Vitter, *Duke University, Durham, NC*, Editors

We are especially proud to announce the publication of this DIMACS book—the 50th volume in this series

published by the AMS. The series was established out of a collaborative venture geared to unite the cutting-edge research

at DIMACS with the resources at the AMS to produce useful, well-designed, important mathematical and computational sciences works. This volume is a hallmark in this firmly grounded and well-received AMS series.

The AMS's 50th DIMACS volume is also particularly notable at this time: The year 1999 marks the 10th anniversary of the founding of DIMACS as a center. Participants in the DIMACS national research project are Rutgers University, Princeton University, AT&T Labs-Research, Bell Labs, Telcordia Technologies, and NEC Research Institute.

The success of the joint publishing venture between the AMS and DIMACS is excellent. We continue to work concordantly with the Center to further their goal of playing a key national leadership role in the development, application, and dissemination of discrete mathematics and theoretical computer science. This 50th DIMACS volume is in celebration of that dynamic, ongoing partnership.

About the book:

Techniques from computer science and mathematics are used to solve combinatorial problems in designing memory algorithms when associated data require a hierarchy of storage devices. These solutions employ "extended memory algorithms". The input/output (I/O) communication between the levels of the hierarchy is often a significant bottleneck in applications that process massive amounts of data. Gains in performance may be possible by incorporating locality directly into the algorithms and managing the contents of each storage level.

The relative difference in data access speeds is most apparent between random access memory and magnetic disks. Therefore, much research has been devoted to algorithms that focus on the I/O bottleneck. These algorithms are usually called "external memory", "out-of-core", or "I/O algorithms".

This volume presents new research results and current techniques for the design and analysis of external memory algorithms. The articles grew out of the workshop, "External Memory Algorithms and Visualization" held at DIMACS. Leading researchers were invited to give lectures and to contribute their work. Topics presented include problems in computational geometry, graph theory, data compression, disk scheduling, linear algebra, statistics, software libraries, text and string processing, visualization, wavelets, and industrial applications.

The vitality of the research and the interdisciplinary nature of the event produced fruitful ground for the compelling fusion of ideas and methods. This volume comprises the rich results that grew out of that process.

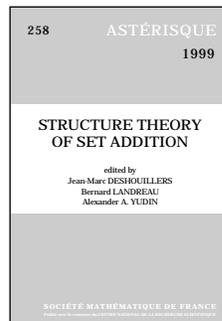
This item will also be of interest to those working in applications.

Contents: J. S. Vitter, External memory algorithms and data structures; P. B. Gibbons and Y. Matias, Synopsis data structures for massive data sets; I. Al-Furaih, T. Johnson, and S. Ranka, Calculating robust depth measures for large data sets; R. Grossi and G. F. Italiano, Efficient cross-trees for external memory; M. R. Henzinger, P. Raghavan, and S. Rajagopalan, Computing on data streams; J. Abello, P. M. Pardalos, and M. G. C. Resende, On maximum clique problems in very large graphs; A. Crauser, P. Ferragina, K. Mehlhorn, U. Meyer, and E. A. Ramos, I/O-optimal computation of segment intersections; L. Arge and P. B. Miltersen, On showing lower bounds for external-memory computational geometry problems; S. Toledo, A survey of out-of-core algorithms in numerical linear algebra; K.-P. Vo, Concrete software libraries; K. V. Shvachko, S(b)-tree library: An efficient way of

indexing data; M. Kallahalla and P. J. Varman, ASP: Adaptive online parallel disk scheduling; S. K. Das and M. C. Pinotti, Efficient schemes for distributing data on parallel memory systems; Y.-J. Chiang and C. T. Silva, External memory techniques for isosurface extraction in scientific visualization; S. T. Leutenegger and K.-L. Ma, R-tree retrieval of unstructured volume data for visualization; Index.

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science, Volume 50

December 1999, approximately 297 pages, Hardcover, ISBN 0-8218-1184-3, 1991 *Mathematics Subject Classification*: 68-06, 68Q25, 68N05, 68P05, 68R10, 68U05, 68Y20, 65F10, 65Y20, 65Y25, 68Q10, 68Q20, 68Q22, **Individual member \$45**, List \$75, Institutional member \$60, Order code DIMACS/50N



Structure Theory of Set Addition

Jean-Marc Deshouillers,
*University of Bordeaux 2,
France*, Bernard Landreau,
*University of Bordeaux 1,
Talence, France*, and
Alexander A. Yudin, *Vladimir
Pedagogical University, Russia*

A publication of Société Mathématique de France.

For a long time, additive number theory was motivated by conjectures such as those of Goldbach or Waring, and was concerned solely with the study of additive properties of *special* sequences. Then in the 1930s, it was discovered that the study of additive properties of *general* sequences was not only a beautiful subject for its own sake, but led to improvements in the study of special sequences. Thus Schnirel'man's paper founding this philosophy introduced a density on sets of integers, gave a general lower bound for the density of the sum of two sets, and applied it to the special sequence of primes, showing that every integer can be written as a sum of a uniformly bounded number of primes. Additive number theory evolved towards the definition of invariants for sets of (non-necessarily commutative) monoids and the study of the invariants for the "sum" of different sets in terms of the invariants of those sets. A new trend appeared in the 1950s, from authors such as M. Kneser and G. A. Freiman, which is sometimes described as *inverse* additive theory, i.e., knowing that the relation between the invariants of a family of sets and the invariant of their sum is extremal (or close), what can be said about the *structure* of the sets themselves? There has been renewed interest in this approach, which also has applications in other fields. This volume presents contemporary original research papers and survey articles discussing *the structure theory of set addition* and its applications to elementary or combinatorial number theory, group theory, integer programming, and probability theory.

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

Distributed by the AMS in the United States, Canada, and Mexico. Orders from other countries should be sent to the SMF, Maison de la SMF, B.P. 67, 13274 Marseille cedex 09, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France. Members of the SMF receive a 30% discount from list.

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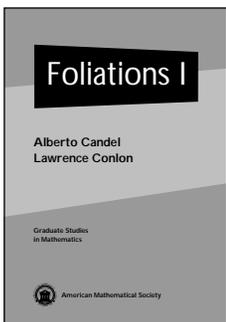
Contents: *Introduction:* G. A. Freiman, Structure theory of set addition; *Additive Number Theory:* A. Besser, Sets of integers with large trigonometric sums; Y. Bilu, Structure of sets with small sumset; A. Sárközy, On finite addition theorems; J. Steinig, On Freiman's Theorems concerning the sum of two finite sets of integers; *Combinatorial Number Theory:* J.-M. Deshouillers and G. A. Freiman, On an additive problem of Erdős and Straus, 2; J.-M. Deshouillers, G. A. Freiman, V. Sós, and M. Temkin, On the structure of sum-free sets, 2; G. A. Freiman, L. Low, and J. Pitman, Sumsets with distinct summands and the Erdős-Heilbronn conjecture on sums of residues; F. Hennecart, G. Robert, and A. Yudin, On the number of sums and differences; Y. Berkovich, Questions on set squaring in groups; S. Brodsky, On groups generated by a pair of elements with small third or fourth power; Y. O. Hamidoune, On small subset product in a group; M. Herzog, New results on subset multiplication in groups; V. F. Lev, On small sumsets in abelian groups; I. Ruzsa, An analog of Freiman's theorem in groups; *Coding Theory:* G. Cohen and G. Zémor, Subset sums and coding theory; V. F. Lev, The structure of multisets with a small number of subset sums; E. Lipkin, Subset sums of sets of residues; M. B. Nathanson and G. Tenenbaum, Inverse theorems and the number of sums and products; J.-L. Nicolas, Stratified sets; Y. Stanchescu, On the structure of sets of lattice points in the plane with a small doubling property; *Algebra:* Y. Berkovich, Non-solvable groups with a large fraction of involutions; *Integer Programming:* M. Chaimovich, New structural approach to integer programming: a survey; M. Chaimovich, New algorithm for dense subset-sum problem; A. Plagne, On the two-dimensional subset sum problem; *Probability:* J.-M. Deshouillers, G. A. Freiman, and W. Moran, On series of discrete random variables, 1: real trinomial distributions with fixed probabilities; J.-M. Deshouillers, G. A. Freiman, and A. Yudin, On bounds for the concentration function. 1.

Astérisque, Number 258

July 1999, 436 pages, Softcover, 1991 *Mathematics Subject Classification:* 05-XX, 11Bxx, 11Hxx, 11Lxx, 11Pxx, 20Cxx, 20Dxx, 20Exx, 20Fxx, 60Exx, 60Fxx, 60Qxx, 90Cxx, 94Bxx, **Individual member \$89**, List \$99, Order code AST/258N

Geometry and Topology

Recommended Text



Foliations I

Alberto Candell, *California Institute of Technology, Pasadena*, and Lawrence Conlon, *Washington University, St. Louis, MO*

This is the first of two volumes on the qualitative theory of foliations. This volume is divided into three parts. The book is extensively illustrated throughout and provides a large

number of examples.

Part 1 is intended as a "primer" in foliation theory. A working knowledge of manifold theory and topology is a prerequisite. Fundamental definitions and theorems are explained to prepare the reader for further exploration of the topic. This

section places considerable emphasis on the construction of examples, which are accompanied by many illustrations.

Part 2 considers foliations of codimension one. Using very hands-on geometric methods, the path leads to a complete structure theory (the theory of levels), which was established by Conlon along with Cantwell, Hector, Duminy, Nishimori, Tsuchiya, et al. Presented here is the first and only full treatment of the theory of levels in a textbook.

Part 3 is devoted to foliations of higher codimension, including abstract laminations (foliated spaces). The treatment emphasizes the methods of ergodic theory: holonomy-invariant measures and entropy. Featured are Sullivan's theory of foliation cycles, Plante's theory of growth of leaves, and the Ghys, Langevin, Walczak theory of geometric entropy.

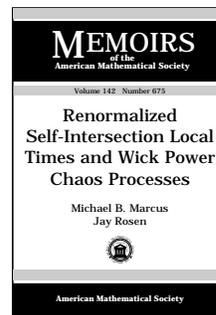
This comprehensive volume has something to offer a broad spectrum of readers: from beginners to advanced students to professional researchers. Packed with a wealth of illustrations and copious exercises at varying degrees of difficulty, this highly-accessible text offers the first full treatment in the literature of the theory of levels for foliated manifolds of codimension one. It would make an elegant supplementary text for a topics course at the advanced graduate level.

Contents: *The foundations:* Foliated manifolds; Holonomy; Basic constructions; Asymptotic properties; *Codimension one:* Basic structures; Compact leaves; General position; Generalized Poincaré-Bendixson theory; Foliations without holonomy; *Arbitrary codimension:* Foliation cycles; Foliated spaces; Growth, invariant measures and geometry of leaves; Entropy of foliations; Bibliography; Index.

Graduate Studies in Mathematics

December 1999, 394 pages, Hardcover, ISBN 0-8218-0809-5, 1991 *Mathematics Subject Classification:* 57R30, **All AMS members \$43**, List \$54, Order code GSM-CONLONN

Probability



Renormalized Self-Intersection Local Times and Wick Power Chaos Processes

Michael B. Marcus, *City College of New York, NY*, and Jay Rosen, *College of Staten Island, NY*

Contents: Introduction; Wick products; Wick power chaos processes; Isomorphism theorems; Equivalence of two versions of renormalized self-intersection local times; Continuity; Stable mixtures; Examples; A large deviation result; Appendix A. Necessary conditions; Appendix B. The case $n = 3$; Bibliography.

Memoirs of the American Mathematical Society, Volume 142, Number 675

November 1999, 125 pages, Softcover, ISBN 0-8218-1340-4, LC 99-39860, 1991 *Mathematics Subject Classification:* 60J30, 60G15; 60J55, **Individual member \$25**, List \$42, Institutional member \$34, Order code MEMO/142/675N

Previously Announced Publications

Advance Notice

Geometric Nonlinear Functional Analysis

Volume 1

Yoav Benyamini, *Technion—Israel Institute of Technology, Haifa, Israel*, and **Joram Lindenstrauss**, *Hebrew University, Jerusalem, Israel*

The book presents a systematic and unified study of geometric nonlinear functional analysis. This area has its classical roots in the beginning of the twentieth century and is now a very active research area, having close connections to geometric measure theory, probability, classical analysis, combinatorics, and Banach space theory.

The main theme of the book is the study of uniformly continuous and Lipschitz functions between Banach spaces (e.g., differentiability, stability, approximation, existence of extensions, fixed points, etc.). This study leads naturally also to the classification of Banach spaces and of their important subsets (mainly spheres) in the uniform and Lipschitz categories.

Many recent rather deep theorems and delicate examples are included with complete and detailed proofs. Challenging open problems are described and explained, and promising new research directions are indicated.

Colloquium Publications

December 1999, approximately 313 pages, Hardcover, ISBN 0-8218-0835-4, LC 99-17734, 1991 *Mathematics Subject Classification*: 46-XX, 22-XX, 28-XX, 47-XX, 52-XX, 54-XX, **All AMS members \$52**, List \$65, Order code COLL-LINDENSTRART910

Spectral Problems in Geometry and Arithmetic

Thomas Branson, *University of Iowa, Iowa City*, Editor

These are the proceedings of the NSF-CBMS Conference on "Spectral Problems in Geometry and Arithmetic" held at the University of Iowa. The principal speaker was Peter Sarnak, who has been a central contributor to developments in this field. The volume approaches the topic from the geometric, physical, and number theoretic points of view. The remarkable new connections among seemingly disparate mathematical and scientific disciplines have surprised even veterans of the physical mathematics renaissance forged by gauge theory in the 1970s.

Numerical experiments show that the local spacing between zeros of the Riemann zeta function is modelled by spectral phenomena: the eigenvalue distributions of random matrix theory, in particular the Gaussian unitary ensemble (GUE). Related phenomena are from the point of view of differential geometry and global harmonic analysis. Elliptic operators on manifolds have (through zeta function regularization) functional determinants, which are related to functional integrals in quantum theory. The search for critical points of this determinant brings about extremely subtle and delicate sharp inequalities of exponential type. This indicates that zeta functions are spectral objects—and even physical objects. This

volume demonstrates that zeta functions are also dynamic, chaotic, and more.

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

Contributors include: E. L. Basor, S.-Y. A. Chang, P. C. Yang, R. Gornet, J. McGowan, C. M. Judge, J. C. Lagarias, M. L. Lapidus, M. van Frankenhuisen, K. Okikiolu, P. Perry, Y. N. Petridis, R. Rumely, C. A. Tracy, and H. Widom.

Contemporary Mathematics, Volume 237

August 1999, 174 pages, Softcover, ISBN 0-8218-0940-7, LC 99-29632, 1991 *Mathematics Subject Classification*: 11F72, 11M36, 35P20, 53A30, 58C40, **Individual member \$22**, List \$37, Institutional member \$30, Order code CONM/237RT910

Evolution Semigroups in Dynamical Systems and Differential Equations

Carmen Chicone and **Yuri Latushkin**, *University of Missouri, Columbia*

The main theme of the book is the spectral theory for evolution operators and evolution semigroups, a subject tracing its origins to the classical results of J. Mather on hyperbolic dynamical systems and J. Howland on nonautonomous Cauchy problems. The authors use a wide range of methods and offer a unique presentation.

The authors give a unifying approach for a study of infinite-dimensional nonautonomous problems, which is based on the consistent use of evolution semigroups. This unifying idea connects various questions in stability of semigroups, infinite-dimensional hyperbolic linear skew-product flows, translation Banach algebras, transfer operators, stability radii in control theory, Lyapunov exponents, magneto-dynamics and hydro-dynamics. Thus the book is much broader in scope than existing books on asymptotic behavior of semigroups.

Included is a solid collection of examples from different areas of analysis, PDEs, and dynamical systems. This is the first monograph where the spectral theory of infinite dimensional linear skew-product flows is described together with its connection to the multiplicative ergodic theorem; the same technique is used to study evolution semigroups, kinematic dynamos, and Ruelle operators; the theory of stability radii, an important concept in control theory, is also presented. Examples are included and non-traditional applications are provided.

Mathematical Surveys and Monographs, Volume 70

September 1999, 361 pages, Hardcover, ISBN 0-8218-1185-1, LC 99-23729, 1991 *Mathematics Subject Classification*: 47D, 34C; 47B, 58F, **Individual member \$47**, List \$79, Institutional member \$63, Order code SURV/70RT910

Recommended Text

4-Manifolds and Kirby Calculus

Robert E. Gompf, *University of Texas, Austin*, and **András I. Stipsicz**, *ELTE, TTK, Budapest, Hungary*

The past two decades have brought explosive growth in 4-manifold theory. Many books are currently appearing that approach the topic from viewpoints such as gauge theory or algebraic geometry. This volume, however, offers an exposition from a topological point of view. It bridges the gap to other disciplines and presents classical but important topological techniques that have not previously appeared in the literature.

Continued

Part I of the text presents the basics of the theory at the second-year graduate level and offers an overview of current research. Part II is devoted to an exposition of Kirby calculus, or handlebody theory on 4-manifolds. It is both elementary and comprehensive. Part III offers in depth a broad range of topics from current 4-manifold research. Topics include branched coverings and the geography of complex surfaces, elliptic and Lefschetz fibrations, h -cobordisms, symplectic 4-manifolds, and Stein surfaces.

Applications are featured, and there are over 300 illustrations and numerous exercises with solutions in the book.

Graduate Studies in Mathematics, Volume 20

October 1999, 558 pages, Hardcover, ISBN 0-8218-0994-6, LC 99-29942, 1991 *Mathematics Subject Classification*: 57N13; 57R65, 53C15, **All AMS members \$52**, List \$65, Order code GSM/20RT910

Supplementary Reading

The Bieberbach Conjecture

Sheng Gong, *Academia Sinica, Beijing, People's Republic of China*

In 1919, Bieberbach posed a seemingly simple conjecture. That "simple" conjecture challenged mathematicians in complex analysis for the following 68 years! In that time, a huge number of papers discussing the conjecture and its related problems were inspired. Finally in 1984, de Branges completed the solution.

In 1989, Professor Gong wrote and published a short book in Chinese, *The Bieberbach Conjecture*, outlining the history of the related problems and de Branges' proof. The present volume is the English translation of that Chinese edition with modifications by the author. In particular, he includes results related to several complex variables. Open problems and a large number of new mathematical results motivated by the Bieberbach conjecture are included.

Completion of a standard one-year graduate complex analysis course will prepare the reader for understanding the book. It would make a nice supplementary text for a topics course at the advanced undergraduate or graduate level.

Titles in this series are co-published with International Press, Cambridge, MA.

AMS/IP Studies in Advanced Mathematics, Volume 12

July 1999, 201 pages, Hardcover, ISBN 0-8218-0655-6, LC 99-26584, 1991 *Mathematics Subject Classification*: 30C50, **All AMS members \$23**, List \$29, Order code AMSIP/12RT910

Independent Study

Iwahori-Hecke Algebras and Schur Algebras of the Symmetric Group

Andrew Mathas, *University of Sydney, NSW, Australia*

This volume presents a fully self-contained introduction to the modular representation theory of the Iwahori-Hecke algebras of the symmetric groups and of the q -Schur algebras. The study of these algebras was pioneered by Dipper and James in a series of landmark papers. The primary goal of the book is to classify the blocks and the simple modules of both algebras. The final chapter contains a survey of recent advances and open problems.

The main results are proved by showing that the Iwahori-Hecke algebras and q -Schur algebras are cellular algebras (in

the sense of Graham and Lehrer). This is proved by exhibiting natural bases of both algebras which are indexed by pairs of standard and semistandard tableaux respectively. Using the machinery of cellular algebras, which is developed in Chapter 2, this results in a clean and elegant classification of the irreducible representations of both algebras. The block theory is approached by first proving an analogue of the Jantzen sum formula for the q -Schur algebras.

This book is the first of its kind covering the topic. It offers a substantially simplified treatment of the original proofs. The book is a solid reference source for experts. It will also serve as a good introduction to students and beginning researchers since each chapter contains exercises and there is an appendix containing a quick development of the representation theory of algebras. A second appendix gives tables of decomposition numbers.

University Lecture Series, Volume 15

September 1999, 188 pages, Softcover, ISBN 0-8218-1926-7, LC 99-29310, 1991 *Mathematics Subject Classification*: 20C30, 16G99; 05E10, 20G05, 20C20, **All AMS members \$20**, List \$25, Order code ULECT/15RT910

A Classic

Lectures on Number Theory

P. G. L. Dirichlet and supplements by **R. Dedekind**

This volume is a translation of Dirichlet's *Vorlesungen über Zahlentheorie* which includes nine supplements by Dedekind and an introduction by John Stillwell, who translated the volume.

Lectures on Number Theory is the first of its kind on the subject matter. It covers most of the topics that are standard in a modern first course on number theory, but also includes Dirichlet's famous results on class numbers and primes in arithmetic progressions.

The book is suitable as a textbook, yet it also offers a fascinating historical perspective that links Gauss with modern number theory. The legendary story is told how Dirichlet kept a copy of Gauss's *Disquisitiones Arithmeticae* with him at all times and how Dirichlet strove to clarify and simplify Gauss's results. Dedekind's footnotes document what material Dirichlet took from Gauss, allowing insight into how Dirichlet transformed the ideas into essentially modern form.

Also shown is how Gauss built on a long tradition in number theory—going back to Diophantus—and how it set the agenda for Dirichlet's work. This important book combines historical perspective with transcendent mathematical insight. The material is still fresh and presented in a very readable fashion.

This book is the first in an informal sequence of works to be included within the History of Mathematics series, co-published by the AMS and the London Mathematical Society. Volumes to be published within this subset are classical mathematical works that served as cornerstones for modern mathematical thought. (For another historical translation by Professor Stillwell, see *Sources of Hyperbolic Geometry*, volume 10 in the History of Mathematics series.)

Members of the LMS may order directly from the AMS at the AMS member price. The LMS is registered with the Charity Commissioners.

History of Mathematics, Volume 16

September 1999, 275 pages, Softcover, ISBN 0-8218-2017-6, 1991 *Mathematics Subject Classification*: 11-03, **All AMS members \$39**, List \$49, Order code HMATH/16RT910