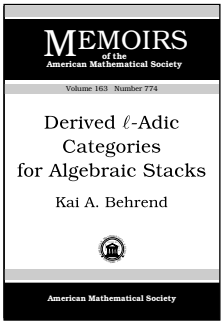
New Publications Offered by the AMS

Algebra and Algebraic Geometry



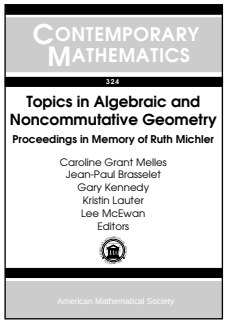
Derived ℓ-Adic Categories for Algebraic Stacks

Kai A. Behrend, *University of British Columbia, Vancouver, Canada*

Contents: Introduction; The ℓ-adic formalism; Stratifications; Topoi; Algebraic stacks; Convergent complexes; Bibliography.

Memoirs of the American Mathematical Society, Volume 163, Number 774

May 2003, 93 pages, Softcover, ISBN 0-8218-2929-7, LC 2003040432, 2000 *Mathematics Subject Classification*: 14D20, 18Gxx, **Individual member $31**, List $51, Institutional member $41, Order code MEMO/163/774N



Topics in Algebraic and Noncommutative Geometry

Proceedings in Memory of Ruth Michler

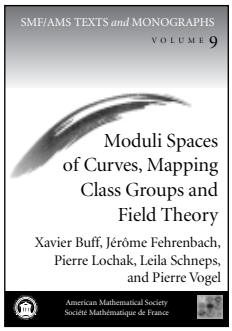
Caroline Grant Melles, *U.S. Naval Academy, Annapolis, MD*, **Jean-Paul Brasselet**, *CNRS, Marseille, France*, **Gary Kennedy**, *Ohio State University, Mansfield*, **Kristin Lauter**, *Microsoft Corporation, Redmond, WA*, and **Lee McEwan**, *Ohio State University, Mansfield*, Editors

This book presents the proceedings of two conferences, Résolution des singularités et géométrie non commutative and the Annapolis algebraic geometry conference. Research articles in the volume cover various topics of algebraic geometry, including the theory of Jacobians, singularities, applications to cryptography, and more. The book is suitable for graduate students and research mathematicians interested in algebraic geometry.

Contents: A. Iarrobino, Jr., Dr. Ruth I. Michler's research; **S. S. Abhyankar** and **A. Assi**, Jacobian pairs; **P. Aluffi**, Inclusion-exclusion and Segre classes, II; **G. Bérczi**, **L. M. Fehér**, and **R. Rimányi**, Expressions for resultants coming from the global theory of singularities; **D. Boneh** and **A. Silverberg**, Applications of multilinear forms to cryptography; **A. Campillo** and **J. Castellanos**, On Puiseux exponents for higher dimensional singularities; **V. Cossart**, Desingularization: A few bad examples in dim. 3, characteristic $p > 0$; **P. D. González Pérez**, **L. J. McEwan**, and **A. Némethi**, The zeta-function of a quasi-ordinary singularity II; **E. Hironaka**, Lehmer's problem, McKay's correspondence, and 2,3,7; **V. P. Kostov** and **O. Gabber**, On the weak Deligne-Simpson problem for index of rigidity 2; **A. E. Ksir** and **S. G. Naculich**, Elliptic fibrations and elliptic models; **K. E. Lauter**, The equivalence of the geometric and algebraic group laws for Jacobians of genus 2 curves; **D. B. Massey**, Invariant subspaces of the monodromy; **L. J. McEwan** and **A. Némethi**, Some conjectures about quasi-ordinary singularities; **A. Simis**, Two differential themes in characteristic zero; **M. A. Vitulli**, Some normal monomial ideals; **J. F. Voloch**, Surfaces in $\mathbf{P}^3$ over finite fields; **A. Yekutieli**, The continuous Hochschild cochain complex of a scheme (Survey).

Contemporary Mathematics, Volume 324

June 2003, approximately 257 pages, Softcover, ISBN 0-8218-3209-3, LC 2003043689, 2000 *Mathematics Subject Classification*: 14–06; 14B05, **All AMS members $55**, List $69, Order code CONM/324N



Moduli Spaces of Curves, Mapping Class Groups and Field Theory

Xavier Buff, *Université Paul Sabatier, Toulouse, France*, **Jérôme Fehrenbach**, *University of Nice Sophia-Antipolis, Valbonne, France*, **Pierre Lochak**, *Centre de Mathématiques de Jussieu, Université Paris VI*, **Leila Schneps**, *Université Paris VI,* and **Pierre Vogel**, *Université Paris VII*

From a review of the French edition:

A collective monograph dedicated to the new and profound relations between various theories previously considered as unrelated … A specific feature of the book, which distinguishes it from many other monographs and textbooks on the same subjects, is its nature of a "guide for the non-specialist"… it also contains full proofs of some results difficult to find elsewhere … Examples are studied in great detail … Recommended as a first reading for a non-specialist who wants to get acquainted with the subject but who does not want to get lost in its many intricacies and ramifications.
—***Mathematical Reviews***

This is a collection of articles that grew out of a workshop organized to discuss deep links among various topics that were previously considered unrelated. Rather than a typical workshop, this gathering was unique as it was structured more like a course for advanced graduate students and research mathematicians.

In the book, the authors present applications of moduli spaces of Riemann surfaces in theoretical physics and number theory and on Grothendieck's dessins d'enfants and their generalizations. Chapter 1 gives an introduction to Teichmüller space that is more concise than the popular textbooks, yet contains full proofs of many useful results which are often difficult to find in the literature. This chapter also contains an introduction to moduli spaces of curves, with a detailed description of the genus zero case, and in particular of the part at infinity. Chapter 2 takes up the subject of the genus zero moduli spaces and gives a complete description of their fundamental groupoids, based at tangential base points neighboring the part at infinity; the description relies on an identification of the structure of these groupoids with that of certain canonical subgroupoids of a free braided tensor category. It concludes with a study of the canonical Galois action on the fundamental groupoids, computed using Grothendieck-Teichmüller theory. Finally, Chapter 3 studies strict ribbon categories, which are closely related to braided tensor categories: Here they are used to construct invariants of 3-manifolds which in turn give rise to quantum field theories. The material is suitable for advanced graduate students and researchers interested in algebra, algebraic geometry, number theory, and geometry and topology.

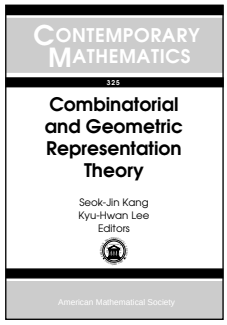
This item will also be of interest to those working in number theory and geometry and topology.

SMF members are entitled to AMS member discounts.

Contents: X. Buff, **J. Fehrenbach**, and **P. Lochak**, Elements of the geometry of moduli spaces of curves; **L. Schneps**, Fundamental groupoids of genus zero moduli spaces and braided tensor categories; **P. Vogel**, Witten-Reshetikhin-Turaev invariants and quantum field theories.

SMF/AMS Texts and Monographs, Volume 9

June 2003, 131 pages, Softcover, ISBN 0-8218-3167-4, 2000 *Mathematics Subject Classification*: 32G15, 20F34, 11R32, 20F36, **All AMS members $35**, List $44, Order code SMFAMS/9N



Combinatorial and Geometric Representation Theory

Seok-Jin Kang, *Korea Institute for Advanced Study, Seoul*, and **Kyu-Hwan Lee**, *University of Toronto, ON, Canada*, Editors

This volume presents the proceedings of the international conference on Combinatorial and Geometric Representation Theory. In the field of representation theory, a wide variety of mathematical ideas are providing new insights, giving powerful methods for understanding the theory, and presenting various applications to other branches of mathematics. Over the past two decades, there have been remarkable developments. This book explains the strong connections between combinatorics, geometry, and representation theory. It is suitable for graduate students and researchers interested in representation theory.

Contents: H. H. Andersen, Twisted Verma modules and their quantized analogues; **S. Ariki**, On tameness of the Hecke algebras of type B; **G. Benkart** and **D. Moon**, Tensor product representations of Temperley-Lieb algebras and their centralizer algebras; **J. F. Carlson**, **Z. Lin**, **D. K. Nakano**, and **B. J. Parshall**, The restricted nullcone; **W. J. Haboush**, Projective embeddings of varieties of special lattices; **G. James**, Representations of general linear groups; **S.-J. Kang** and **J.-H. Kwon**, Fock space representations for the quantum affine algebra $U_q(C_2^{(1)})$; **M. Kashiwara**, Realizations of crystals; **H. Nakajima**, t-analogs of q-characters of quantum affine algebras of type A_n, D_n; **A. Ram**, Skew shape representations are irreducible.

Contemporary Mathematics, Volume 325

May 2003, 189 pages, Softcover, ISBN 0-8218-3212-3, LC 2002041753, 2000 *Mathematics Subject Classification*: 05Exx, 14Lxx, 16Gxx, 17Bxx, 20Cxx, 20Gxx, 81Rxx, **All AMS members $39**, List $49, Order code CONM/325N

Bases cristallines des groupes quantiques

Masaki Kashiwara, *Research Institute for the Mathematical Sciences, Kyoto University, Japan*

Since their introduction by Drinfeld and Jimbo in 1985 in the studies of exactly solvable models, quantum enveloping algebras have been one of the most important tools to describe new symmetries.

For $q = 0$, there is a good base (the so-called *crystal base*) of the representation of a quantum enveloping algebra $U_q(\mathfrak{g})$ of a semi-simple Lie algebra $\mathfrak{g}$. A modified action of root vectors sends the crystal base to itself, thus providing a rich combinatorial structure. Therefore one can reduce many properties of representation to the combinatorics of crystal bases.

In this book, the author presents crystal bases and their applications to multiplicities and weights of the tensor products of two representations.

A publication of the Société Mathématique de France. Distributed by the AMS in North America. 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.

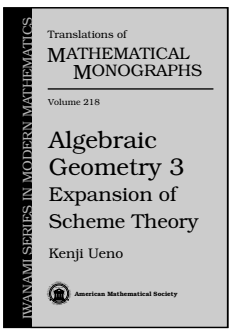
Contents: Représentations de l'algèbre quantique $U_q(\mathfrak{sl}_2)$; Bases cristallines des $U_q(\mathfrak{sl}_2)$-modules; L'algèbre enveloppante quantique $U_q(\mathfrak{g})$; Bases cristallines des $U_q(\mathfrak{g})$-modules; Cas de $\mathfrak{gl}_n$; Bases globales des $U_q(\mathfrak{g})$-modules; Base cristalline $B(\infty)$ de l'algèbre $U_q^-(\mathfrak{g})$; Réalisation des bases cristallines par des chemins; Cristaux et groupe de Weyl; Bibliographie; Index des notations; Index terminologique.

Cours Spécialisés—Collection SMF, Number 9

January 2003, 115 pages, Softcover, ISBN 2-85629-126-0, 2000 *Mathematics Subject Classification*: 17B37, **Individual member $30**, List $33, Order code COSP/9N

Recommended Text

Independent Study



Algebraic Geometry 3

Expansion of Scheme Theory

Kenji Ueno, *Kyoto University, Japan*

Algebraic geometry plays an important role in several branches of science and technology. This is the third of three volumes by Kenji Ueno on scheme theory, the most natural form of algebraic geometry. This, in addition to *Algebraic Geometry 1* and *Algebraic Geometry 2*, makes an excellent textbook for a second course in algebraic geometry.

In this volume, the author goes beyond introductory notions and presents the theory of schemes and sheaves with the goal of studying the properties necessary for the full development of modern algebraic geometry. The main topics discussed in the book include dimension theory, flat and proper morphisms, regular schemes, smooth morphisms, completion, and Zariski's main theorem. Ueno also presents the theory of algebraic curves and their Jacobians, and the relation between algebraic and analytic geometry, including Kodaira's Vanishing Theorem.

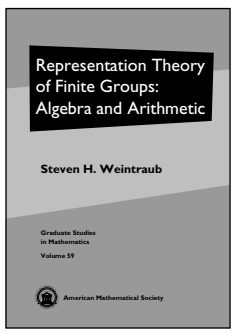
The book contains numerous exercises and problems with solutions. It is suitable for a graduate course on algebraic geometry or for independent study.

Contents: Fundamental properties of scheme theory; Algebraic curves and Jacobi varieties; Algebraic geometry and analytic geometry; Overview and references; Solutions to problems; Solutions to exercises; Index.

Translations of Mathematical Monographs (*Iwanami Series in Modern Mathematics*), Volume 218

July 2003, approximately 240 pages, Softcover, ISBN 0-8218-1358-7, LC 99-22304, 2000 *Mathematics Subject Classification*: 14–01, **All AMS members $31**, List $39, Order code MMONO/218N

Recommended Text



Representation Theory of Finite Groups: Algebra and Arithmetic

Steven H. Weintraub, *Lehigh University, Bethlehem, PA*

We explore widely in the valley of ordinary representations, and we take the reader over the mountain pass leading to the valley of modular representations, to a point from which (s)he can survey this valley, but we do not attempt to widely explore it. We hope the reader will be sufficiently fascinated by the scenery to further explore both valleys on his/her own.

—from the Preface

Representation theory plays important roles in geometry, algebra, analysis, and mathematical physics. In particular, representation theory has been one of the great tools in the study and classification of finite groups. There are some beautiful results that come from representation theory: Frobenius's Theorem, Burnside's Theorem, Artin's Theorem, Brauer's Theorem–all of which are covered in this textbook. Some seem uninspiring at first, but prove to be quite useful. Others are clearly deep from the outset. And when a group (finite or otherwise) acts on something else (as a set of symmetries, for example), one ends up with a natural representation of the group.

This book is an introduction to the representation theory of finite groups from an algebraic point of view, regarding representations as modules over the group algebra. The approach is to develop the requisite algebra in reasonable generality and then to specialize it to the case of group representations. Methods and results particular to group representations, such as characters and induced representations, are developed in depth. Arithmetic comes into play when considering the field of definition of a representation, especially for subfields of the complex numbers. The book has an extensive development of the semisimple case, where the characteristic of the field is zero or is prime to the order of the group, and builds the foundations of the modular case, where the characteristic of the field divides the order of the group.

The book assumes only the material of a standard graduate course in algebra. It is suitable as a text for a year-long graduate course. The subject is of interest to students of algebra, number

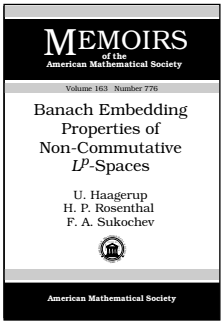
theory and algebraic geometry. The systematic treatment presented here makes the book also valuable as a reference.

Contents: Introduction; Semisimple rings and modules; Semisimple group representations; Induced representations and applications; Introduction to modular representations; General rings and modules; Modular group representations; Some useful results; Bibliography; Index.

Graduate Studies in Mathematics, Volume 59

July 2003, approximately 232 pages, Hardcover, ISBN 0-8218-3222-0, 2000 *Mathematics Subject Classification*: 20C05, 20C15, 20C20; 20–01, **All AMS members $36**, List $45, Order code GSM/59N

Analysis



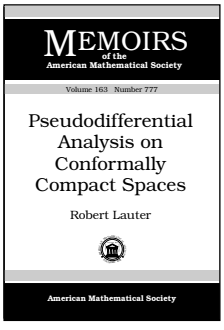
Banach Embedding Properties of Non-Commutative L^p-Spaces

U. Haagerup, *SDU Odense University, Denmark*,
H. P. Rosenthal, *University of Texas, Austin*, and
F. A. Sukochev, *Flinders University of South Australia, Adelaide*

Contents: Introduction; The modulus of uniform integrability and weak compactness in $L^1(\mathcal{N})$; Improvements to the main theorem; Complements on the Banach/operator space structure of $L^p(\mathcal{N})$-spaces; The Banach isomorphic classification of the spaces $L^p(\mathcal{N})$ for $\mathcal{N}$ hyperfinite semi-finite; $L^p(\mathcal{N})$-isomorphism results for $\mathcal{N}$ a type III hyperfinite or a free group von Neumann algebra; Bibliography.

Memoirs of the American Mathematical Society, Volume 163, Number 776

May 2003, 68 pages, Softcover, ISBN 0-8218-3271-9, LC 2003040431, 2000 *Mathematics Subject Classification*: 46B20, 46L10, 46L52, 47L25, **Individual member $27**, List $45, Institutional member $36, Order code MEMO/163/776N



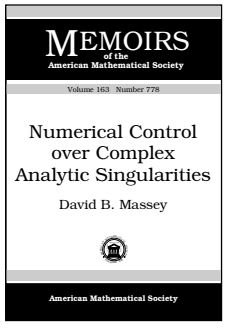
Pseudodifferential Analysis on Conformally Compact Spaces

Robert Lauter, *University of Mainz, Germany*

Contents: *Part 1. Fredholm theory for* 0*-pseudodifferential operators:* Review of basic objects of 0-geometry; The small 0-calculus and the 0-calculus with bounds; The b-c-calculus on an interval; The reduced normal operator; Weighted 0-Sobolev spaces; Fredholm theory for 0-pseudodifferential operators; *Part 2. Algebras of* 0*-pseudodifferential operators of order* 0*:* C^*-algebras of 0-pseudodifferential operators; Ψ^*-algebras of 0-pseudodifferential operators; Appendix A. Spaces of conormal functions; Bibliography; Notations; Index.

Memoirs of the American Mathematical Society, Volume 163, Number 777

May 2003, 92 pages, Softcover, ISBN 0-8218-3272-7, LC 2003040426, 2000 *Mathematics Subject Classification*: 58J40, 58J05, 58J35, 47G30, 46K10, 46L45, **Individual member $31**, List $51, Institutional member $41, Order code MEMO/163/777N



Numerical Control over Complex Analytic Singularities

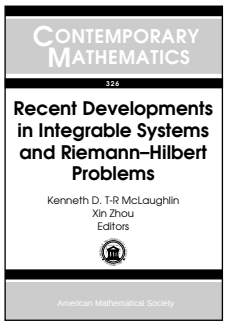
David B. Massey,
Northeastern University, Boston

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

Contents: Overview; *Part I. Algebraic Preliminaries: Gap Sheaves and Vogel Cycles:* Introduction; Gap sheaves; Gap cycles and Vogel cycles; The Lê-Iomdine-Vogel formulas; Summary of Part I; *Part II. Lê Cycles and Hypersurface Singularities:* Introduction; Definitions and basic properties; Elementary examples; A handle decomposition of the Milnor fibre; Generalized Lê-Iomdine formulas; Lê numbers and hyperplane arrangements; Thom's a_f condition; Aligned singularities; Suspending singularities; Constancy of the Milnor fibrations; Another characterization of the Lê cycles; *Part III. Isolated Critical Points of Functions on Singular Spaces:* Introduction; Critical avatars; The relative polar curve; The link between the algebraic and topological points of view; The special case of perverse sheaves; Thom's a_f condition; Continuous families of constructible complexes; *Part IV. Non-Isolated Critical Points of Functions on Singular Spaces:* Introduction; Lê-Vogel cycles; Lê-Iomdine formulas and Thom's condition; Lê-Vogel cycles and the Euler characteristic; Appendix A. Analytic cycles and intersections; Appendix B. The derived category; Appendix C. Privileged neighborhoods and lifting Milnor fibrations; References; Index.

Memoirs of the American Mathematical Society, Volume 163, Number 778

May 2003, 268 pages, Softcover, ISBN 0-8218-3280-8, LC 2003040369, 2000 *Mathematics Subject Classification*: 32B15, 32C35, 32C18, 32B10, **Individual member $43**, List $72, Institutional member $58, Order code MEMO/163/778N



Recent Developments in Integrable Systems and Riemann–Hilbert Problems

Kenneth D. T-R McLaughlin, *University of North Carolina, Chapel Hill* and *University of Arizona, Tucson*, and **Xin Zhou**, *Duke University, Durham, NC*, Editors

This volume is a collection of papers presented at a special session on integrable systems and Riemann-Hilbert problems. The goal of the meeting was to foster new research by bringing together experts from different areas. Their contributions to the volume provide a useful portrait of the breadth and depth of integrable systems.

Topics covered include discrete Painlevé equations, integrable nonlinear partial differential equations, random matrix theory, Bose-Einstein condensation, spectral and inverse spectral theory, and last passage percolation models. In most of these articles, the Riemann-Hilbert problem approach plays a central role, which is powerful both analytically and algebraically.

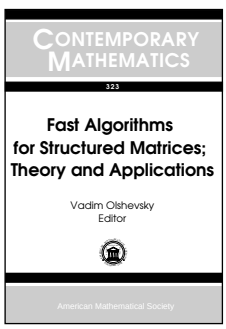
The book is intended for graduate students and researchers interested in integrable systems and its applications.

Contents: J. Baik, Riemann-Hilbert problems for last passage percolation; **R. Beals**, **D. H. Sattinger**, and **J. Szmigielski**, Inverse scattering and some finite-dimensional integrable systems; **D. J. Kaup** and **H. Steudel**, Recent results on second harmonic generation; **M. Kovalyov** and **A. H. Vartanian**, On long-distance intensity asymptotics of solutions to the Cauchy problem for the modified nonlinear Schrödinger equation for vanishing initial data; **W. M. Liu** and **S. T. Chui**, Integrable models in Bose-Einstein condensates; **A. H. Vartanian**, Long-time asymptotics of solutions to the Cauchy problem for the defocusing non-linear Schrödinger equation with finite-density initial data. I. Solitonless sector.

Contemporary Mathematics, Volume 326

May 2003, approximately 198 pages, Softcover, ISBN 0-8218-3203-4, 2000 *Mathematics Subject Classification*: 35Q15, 35Q51, 35Q53, 35Q55, 35P25, 15A52, 05E10, 05E15, 34E05, **All AMS members $39**, List $49, Order code CONM/326N

Applications



Fast Algorithms for Structured Matrices; Theory and Applications

Vadim Olshevsky, *University of Connecticut, Storrs*, Editor

One of the best known fast computational algorithms is the fast Fourier transform method. Its efficiency is based mainly on the special structure of the discrete Fourier transform matrix. Recently, many other algorithms of this type were discovered, and the theory of structured matrices emerged.

This volume contains 22 survey and research papers devoted to a variety of theoretical and practical aspects of the design of fast algorithms for structured matrices and related issues. Included are several papers containing various affirmative and negative results in this direction. The theory of rational interpolation is one of the excellent sources providing intuition and methods to design fast algorithms. The volume contains several computational and theoretical papers on the topic. There are several papers on new applications of structured matrices, e.g., to the design of fast decoding algorithms, computing state-space realizations, relations to Lie algebras, unconstrained optimization, solving matrix equations, etc.

The book is suitable for mathematicians, engineers, and numerical analysts who design, study, and use fast computational algorithms based on the theory of structured matrices.

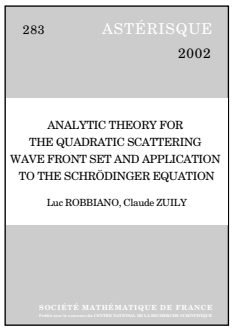
This volume is a joint publication of the American Mathematical Society and the Society for Industrial and Applied Mathematics.

Contents: V. Olshevsky, Pivoting for structured matrices and rational tangential interpolation; **G. Heinig**, Inversion of Toeplitz-plus-Hankel matrices with arbitrary rank profile; **D. Fasino** and **L. Gemignani**, A Lanczos-type algorithm for the QR factorization of Cauchy-like matrices; **D. Fasino**, **N. Mastronardi**, and **M. Van Barel**, Fast and stable algorithms for reducing diagonal plus semiseparable matrices to tridiagonal and bidiagonal form; **A. Olshevsky**, **V. Olshevsky**, and **J. Wang**, A comrade-matrix-based derivation of the eight versions of fast cosine and sine transforms; **D. A. Bini**, **L. Gemignani**, and **B. Meini**, Solving certain matrix equations by means of Toeplitz computations: algorithms and applications; **F. T. Luk** and **S. Qiao**, A fast singular value algorithm for Hankel matrices; **D. Calvetti**, **L. Reichel**, and **F. Sgallari**, A modified companion matrix method based on Newton polynomials; **J. Hendrickx**, **R. Vandebril**, and **M. Van Barel**, A fast direct method for solving the two-dimensional Helmholtz equation, with Robbins boundary conditions; **C. Di Fiore**, Structured matrices in unconstrained minimization methods; **N. Ito**, **W. Schmale**, and **H. K. Wimmer**, Computation of minimal state space realizations in Jacobson normal form; **A. Mayo**, High order accurate particular solutions of the biharmonic equation on general regions; **T. Wen**, **A. Edelman**, and **D. Gorsich**, A fast projected conjugate gradient algorithm for training support vector machines; **V. Olshevsky** and **M. A. Shokrollahi**, A displacement approach to decoding algebraic codes; **M. Bollhöfer** and **V. Mehrmann**, Some convergence estimates for algebraic multilevel preconditioners; **D. Noutsos**, **S. S. Capizzano**, and **P. Vassalos**, Spectral equivalence and matrix algebra preconditioners for multilevel Toeplitz systems: a negative result; **W. F. Trench**, Spectral distribution of Hermitian Toeplitz matrices formally generated by rational functions; **D. Fasino** and **S. S. Capizzano**, From Toeplitz matrix sequences to zero distribution of orthogonal polynomials; **K. R. Driessel**, On Lie algebras, submanifolds and structured matrices; **H. Dym**, Riccati equations and bitangential interpolation problems with singular Pick matrices; **V. Bolotnikov**, **A. Kheifets**, and **L. Rodman**, Functions with Pick matrices having bounded number of negative eigenvalues; **Yu. M. Arlinskiĭ**, **S. Hassi**, **H. S. V. de Snoo**, and **E. R. Tsekanovskiĭ**, One-dimensional perturbations of selfadjoint operators with finite or discrete spectrum.

Contemporary Mathematics, Volume 323

June 2003, approximately 448 pages, Softcover, ISBN 0-8218-3177-1, 2000 *Mathematics Subject Classification*: 68Q25, 65Y20, 65F05, 65F10, 65G50, 65M12, 15A57, 15A18, 47N70, 47N40, **All AMS members $69**, List $99, Order code CONM/323N

Differential Equations



Analytic Theory for the Quadratic Scattering Wave Front Set and Application to the Schrödinger Equation

Luc Robbiano, *CNRS, Université de Versailles, France*, and **Claude Zuily**, *Université de Paris-Sud, Orsay*

In this book, the authors consider the microlocal propagation of analytic singularities for the solutions of the Schrödinger equation with variable coefficients. Following R. Melrose and J. Wunsch, they introduce a $\mathbb{R}^n$ compactification and a cotangent compactification. They define by FBI transform an analytic wave front set on this cotangent bundle. The main part of this paper is to prove the propagation of microlocal analytic singularities in this wave front set.

A publication of the Société Mathématique de France. Distributed by the AMS in North America. 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.

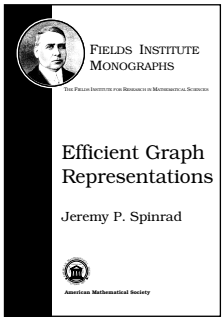
Contents: Introduction; The geometrical context; The analytic *qsc* wave front set; The Laplacian and its flow; Statements of the main results and reductions; Proof of Theorem 4.6; Proof of Theorem 4.7; Proof of Theorem 4.8; Proof of Theorem 4.9; Appendix; Bibliography.

Astérisque, Number 283

January 2003, 128 pages, Softcover, ISBN 2-85629-131-7, 2000 *Mathematics Subject Classification*: 35J10, 35A20, 35A27, 35A18, 35A21, **Individual member $30**, List $33, Order code AST/283N

Discrete Mathematics and Combinatorics

Supplementary Reading



Efficient Graph Representations

Jeremy P. Spinrad, *Vanderbilt University, Nashville, TN*

This monograph is the first to deal with graph representation as a field of study. It is written from both a mathematical and computer science perspective. Synthesizing the two traditions opens a number of interesting new research areas. Some individual classes of graphs are important, but are not adequately covered in any current text. This book gives a much more current view of important algorithmic developments in intersection graph classes than is currently available and includes a large number of new open problems.

It deals with the questions that arise from storing a graph in a computer. Different classes of graphs admit different forms of computer representations, and focusing on the representations gives a new perspective on a number of problems. For a variety of classes of graphs, the book considers such questions as existence of good representations, algorithms for finding representations, questions of characterizations in terms of representation, and how the representation affects the complexity of optimization problems. General models of efficient computer representations are also considered.

The book is designed to be used both as a text for a graduate course on topics related to graph representation and as a monograph for anyone interested in research in the field of graph representation. The material is of interest both to those focusing purely on graph theory and to those working in the area of graph algorithms.

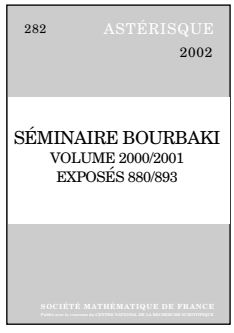
This item will also be of interest to those working in applications.

Contents: Explanatory remarks; Introduction; Implicit representation; Intersection and containment representations; Real numbers in graph representations; Classes which use global information; Visibility graphs; Intersection of graph classes; Graph classes defined by forbidden subgraphs; Chordal bipartite graphs; Matrices; Decomposition; Elimination schemes; Recognition algorithms; Robust algorithms for optimization problems; Characterization and construction; Applications; Glossary; Survey of results on graph classes; Bibliography; Index.

Fields Institute Monographs, Volume 19

April 2003, 342 pages, Hardcover, ISBN 0-8218-2815-0, 2000 *Mathematics Subject Classification*: 05C62, 05C17, 05C50, 05C85, 05–00, 05–02, 68R10, 68W01, 68P05, 68Q30, 68–01, **All AMS members $76**, List $95, Order code FIM/19N

General and Interdisciplinary



Séminaire Bourbaki

Volume 2000/2001 Exposés 880/893

As in the preceding volumes of this seminar, one finds here fourteen survey lectures on topics of current interest: four lectures on algebraic geometry, two on probability, classical or free, one on Riemannian geometry, one on non-commutative geometry, one on (non-)integrability of Hamiltonian systems, one on L-functions and random matrices, one on Langlands functoriality, one on polylogarithms, one on geometric quantization and one on equations of hydrodynamics. Among the authors are leading French mathematicians P. Cartier, M. Vergne, M. Audin, G. Henniart, and others.

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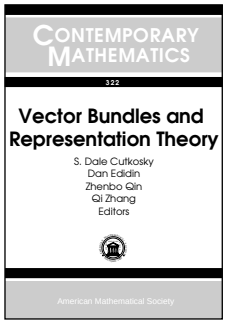
to the SMF, Maison de la SMF, B.P. 67, 13274 Marseille cedex 09, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France. Members of the SMF receive a 30% discount from list.

Contents: *Novembre 2000:* **L. Bonavero**, Factorisation faible des applications birationnelles; **M. Brunella**, Courbes entières dans les surfaces algébriques complexes; **M. Émery**, Espaces probabilisés filtrés: de la théorie de Vershik au mouvement brownien, via des idées de Tsirelson; **M. Herzlich**, L'inégalité de Penrose; *Mars 2001:* **M. Audin**, Intégrabilité et non-intégrabilité de systèmes hamiltoniens; **P. Cartier**, Fonctions polylogarithmes, nombres polyzêtas et groupes pro-unipotents; **A. Chambert-Loir**, Thèorémes d'algébricité en géométrie diophantienne; **P. Michel**, Répartition des zéros des fonctions L et matrices aléatoires; **M. Vergne**, Quantification géométrique et réduction symplectique; *Juin 2001:* **P. Biane**, Entropie libre et algèbres d'opérateurs; **G. Henniart**, Progrés rècents en fonctorialité de Langlands; **E. Peyre**, Points de hauteur bornée et géométrie des variétés; **G. Skandalis**, Géométrie non commutative, opérateur de signature transverse et algèbres de Hopf; **C. Villani**, Limites hydrodynamiques de l'équation de Boltzmann.

Astérisque, Number 282

December 2002, 443 pages, Softcover, ISBN 2-85629-130-9, 2000 *Mathematics Subject Classification*: 14Exx, 14J29, 32Q45, 37F75, 60G05, 60G25, 60G42, 60G44, 53C21, 58J35, 58J60, 83C30, 83C57, 34–XX, 37Jxx, 37K10, 53Dxx, 70G45, 11J82, 40B05, 17B01, 33E20, 34M35, 14G40, 11Gxx, 11F66, 11M36, 15A52, 22–XX, 53–XX, 46L54, 46L10, 22E55, 22E50, 14G05, 11G35, 16S38, 16W30, 57T05, 76D05, 76P05, **Individual member $62**, List $69, Order code AST/282N

Geometry and Topology



Vector Bundles and Representation Theory

S. Dale Cutkosky, **Dan Edidin**, **Zhenbo Qin**, and **Qi Zhang**, *University of Missouri, Columbia*, Editors

This volume contains 13 papers from the conference on "Hilbert Schemes, Vector Bundles and Their Interplay with Representation Theory". The papers are written by leading mathematicians in algebraic geometry and representation theory and present the latest developments in the field.

Among other contributions, the volume includes several very impressive and elegant theorems in representation theory by R. Friedman and J. W. Morgan, convolution on homology groups of moduli spaces of sheaves on K3 surfaces by H. Nakajima, and computation of the S^1 fixed points in Quot-schemes and mirror principle computations for Grassmannians by S.-T. Yau, et al.

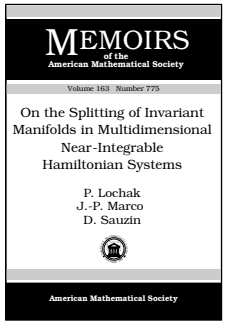
The book is of interest to graduate students and researchers in algebraic geometry, representation theory, topology and their applications to high energy physics.

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

Contents: **R. Friedman** and **J. W. Morgan**, Minuscule representations, invariant polynomials, and spectral covers; **S. Hosono**, **B. H. Lian**, **K. Oguiso**, and **S.-T. Yau**, Fourier-Mukai partners of a K3 surface of Picard number one; **J. Li**, Moduli spaces associated to a singular variety and the moduli of bundles over universal curves; **H. Nakajima**, Convolution on homology groups of moduli spaces of sheaves on K3 surfaces; **W.-P. Li**, **Z. Qin**, and **Q. Zhang**, Curves in the Hilbert schemes of points on surfaces; **X. Wu**, Limiting linear subspaces on non-reduced schemes; **B. P. Purnaprajna**, Geometry of canonical covers of varieties of minimal degree with applications to Calabi-Yau threefolds; **W. Wang**, Universal rings arising in geometry and group theory; **D. Burns**, **Y. Hu**, and **T. Luo**, HyperKähler manifolds and birational transformations in dimension 4; **N. M. Kumar**, **C. Peterson**, and **A. P. Rao**, Standard vector bundle deformations on $\mathbb{P}^n$; **B. H. Lian**, **C.-H. Liu**, **K. Liu**, and **S.-T. Yau**, The S^1 fixed points in Quot-schemes and mirror principle computations; **W. Li**, The semi-infinity of Floer (co)homologies; **R. Friedman** and **J. W. Morgan**, Automorphism sheaves, spectral covers, and the Kostant and Steinberg sections.

Contemporary Mathematics, Volume 322

May 2003, approximately 256 pages, Softcover, ISBN 0-8218-3264-6, 2000 *Mathematics Subject Classification*: 14C05, 14D20, 14F05, 14J28, 17B10, 20C05, 32L05, 57R99, **All AMS members $55**, List $69, Order code CONM/322N



On the Splitting of Invariant Manifolds in Multidimensional Near-Integrable Hamiltonian Systems

P. Lochak and **J.-P. Marco**, *University of Paris*, and **D. Sauzin**, *Astronomie et Systems Dynamiques, Paris*

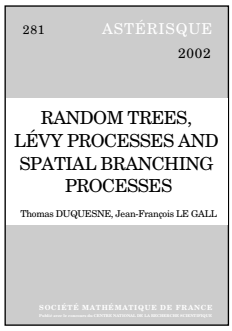
This item will also be of interest to those working in analysis.

Contents: Introduction and some salient features of the model Hamiltonian; Symplectic geometry and the splitting of invariant manifolds; Estimating the splitting matrix using normal forms; The Hamilton-Jacobi method for a simple resonance; Appendix. Invariant tori with vanishing or zero torsion; Bibliography.

Memoirs of the American Mathematical Society, Volume 163, Number 775

May 2003, 145 pages, Softcover, ISBN 0-8218-3268-9, LC 2003040368, 2000 *Mathematics Subject Classification*: 70H08, 70H09, 37J40, 37D10, 34C37, **Individual member $33**, List $55, Institutional member $44, Order code MEMO/163/775N

Probability



Random Trees, Lévy Processes and Spatial Branching Processes

Thomas Duquesne, *Université de Paris-Sud, Orsay*, and **Jean-François Le Gall**, *École Normale Supérieure, Paris*

In the book, the authors investigate the genealogical structure of general critical or subcritical continuous-state branching processes. Analogously to the coding of a discrete tree by its contour function, this genealogical structure is coded by a real-valued stochastic process called the height process, which is itself constructed as a local time functional of a Lévy process with no negative jumps. They present a detailed study of the height process and of an associated measure-valued process called the exploration process, which plays a key role in most applications. Under suitable assumptions, it is proven that whenever a sequence of rescaled Galton-Watson processes converges in distribution, their genealogies also converge to the continuous branching structure coded by the appropriate height process. The authors apply this invariance principle to various asymptotics for Galton-Watson trees and then use the duality properties of the exploration process to compute explicitly the distribution of the reduced tree associated with Poissonnian marks in the height process and the finite-dimensional marginals of the so-called stable continuous tree. This last calculation generalizes to the stable case a result of Aldous for the Brownian continuum random tree. Finally, they combine the genealogical structure with an independent spatial motion to develop a new approach to superprocesses with a general branching mechanism. In this setting, they derive certain explicit distributions, such as the law of the spatial reduced tree in a domain, consisting of the collection of all historical paths that hit the boundary.

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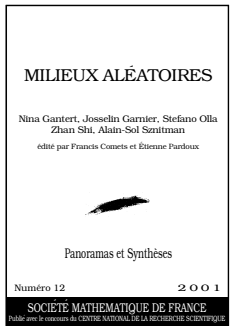
Contents: Introduction; The height process; Convergence of Galton-Watson trees; Marginals of continuous trees; The Lévy snake; Bibliography; Notation index; Index.

Astérisque, Number 281

October 2002, 146 pages, Softcover, ISBN 2-85629-128-7, 2000 *Mathematics Subject Classification*: 60J80, 60J25, 60G57, 60F17, 60G52, **Individual member $30**, List $33, Order code AST/281N



Milieux aléatoires

Nina Gantert, *Universität Karlsruhe, Germany*, **Josselin Garnier**, *Univsité Paul Sabatier, Toulouse, France*, **Stefano Olla**, *Univsité de Paris 9-Dauphine, France*, **Zhan Shi**, *Université de Paris VI, France*, and **Alain-Sol Sznitman**, *Mathematick, ETH-Zentrum, Zürich, Switzerland*

Random media are natural models for nonhomogeneous materials which possess some kind of statistical regularity. The study of stochastic processes in random media is currently an active field of research, and new techniques have recently been developed, including mathematical forms of renormalization. Those techniques apply to models which are much more delicate than exactly soluble ones or even reversible ones.

The session, "États de la Recherche", presented the state of the art in the field and brought it to a large portion of the scientific community. Based on the notes of the courses delivered during the session, this volume is composed of five articles and a general introduction, where all basic notions from probability theory are defined. The introduction and the style of the articles make the volume readable by nonspecialists.

The article by Alain Sznitman studies the survival of Brownian motion moving among randomly located obstacles, and the ballistic behavior of the random walk in random media on the $d \geq 2$-dimensional lattice. This illustrates the role of atypical pockets in the medium and of abnormally small eigenvalues. The second article, by Zhan Shi, presents the analysis via stochastic calculus of Sinaï's random walk and of the one dimensional diffusion in a Brownian potential. Nina Gantert studies the random walk on a random Galton-Watson tree, in particular, the probability of rare events. Stefano Olla studies random homogenization, taking the point of view of the environment seen from the particle, as well as applications to interacting particle systems. In the last article, Josselin Garnier studies wave propagation in random media, the competition between nonlinear and random effects, and solitons in this framework.

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Contents: Introduction générale; **A.-S. Sznitman**, Milieux aléatoires et petites valeurs propres; **N. Gantert**, Galton-Watson trees as random environments; **Z. Shi**, Sinai's walk via stochastic calculus; **S. Olla**, Central limit theorems for tagged particles and for diffusions in random environment; **J. Garnier**, Wave propagation in one-dimensional random media.

Panoramas et Synthèses, Number 12

December 2002, 159 pages, Softcover, ISBN 2-85620-127-9, 2000 *Mathematics Subject Classification*: 60K37, 82D30, 60F10, 82C44, **Individual member $30**, List $33, Order code PASY/12N