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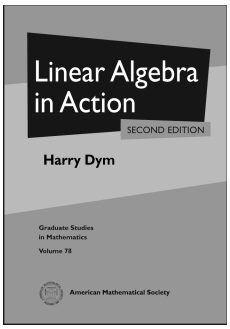
Algebra and Algebraic Geometry



Linear Algebra in Action

Second Edition

Harry Dym, *Weizmann Institute of Science, Rehovot, Israel*

It is a wonderful book: very accessible and rigorous [at] the same time, containing basic and not-so-basic facts, discussing many (sometimes unexpected) applications… Given that and the wonderful way this book was written and organized, I think it can be used by many readers: engineering students, mathematics students, research mathematicians, and researchers in any other field where linear algebra is applied. I strongly recommend this book to anyone interested in "working" linear algebra.

—***MAA Reviews***

Linear algebra permeates mathematics, perhaps more so than any other single subject. It plays an essential role in pure and applied mathematics, statistics, computer science, and many aspects of physics and engineering. This book conveys in a user-friendly way the basic and advanced techniques of linear algebra from the point of view of a working analyst. The techniques are illustrated by a wide sample of applications and examples that are chosen to highlight the tools of the trade. In short, this is material that many of us wish we had been taught as graduate students.

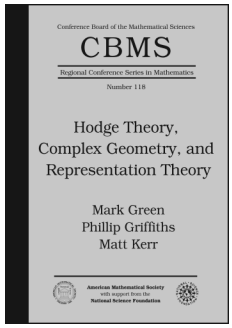
Roughly the first third of the book covers the basic material of a first course in linear algebra. The remaining chapters are devoted to applications drawn from vector calculus, numerical analysis, control theory, complex analysis, convexity and functional analysis. In particular, fixed point theorems, extremal problems, matrix equations, zero location and eigenvalue location problems, and matrices with nonnegative entries are discussed. Appendices on useful facts from analysis and supplementary information from complex function theory are also provided for the convenience of the reader.

In this new edition, most of the chapters in the first edition have been revised, some extensively. The revisions include changes in a number of proofs, either to simplify the argument, to make the logic clearer or, on occasion, to sharpen the result. New introductory sections on linear programming, extreme points for polyhedra and a Nevanlinna-Pick interpolation problem have been added, as have some very short introductory sections on the mathematics behind Google, Drazin inverses, band inverses and applications of SVD together with a number of new exercises.

Contents: Vector spaces; Gaussian elimination; Additional applications of Gaussian elimination; Eigenvalues and eigenvectors; Determinants; Calculating Jordan forms; Normed linear spaces; Inner product spaces and orthogonality; Symmetric, Hermitian and normal matrices; Singular values and related inequalities; Pseudoinverses; Triangular factorization and positive definite matrices; Difference equations and differential equations; Vector valued functions; The implicit function theorem; Extremal problems; Matrix valued holomorphic functions; Matrix equations; Realization theory; Eigenvalue location problems; Zero location problems; Convexity; Matrices with nonnegative entries; Appendix A. Some facts from analysis; Appendix B. More complex variables; Bibliography; Notation index; Subject index.

Graduate Studies in Mathematics, Volume 78

February 2014, approximately 607 pages, Hardcover, ISBN: 978-1-4704-0908-1, LC 2013029538, 2010 *Mathematics Subject Classification:* 15-01, 30-01, 34-01, 39-01, 52-01, 93-01, **AMS members US$72.80**, List US$91, Order code GSM/78.R



Hodge Theory, Complex Geometry, and Representation Theory

Mark Green, *University of California, Los Angeles, CA*, **Phillip Griffiths**, *Institute of Advanced Study, Princeton, NJ*, and **Matt Kerr**, *Washington University, St. Louis, MO*

This monograph presents topics in Hodge theory and representation theory, two of the most active and important areas in contemporary mathematics. The underlying theme is the use of complex geometry to understand the two subjects and their relationships to one another—an approach that is complementary to what is in the literature. Finite-dimensional representation theory and complex geometry enter via the concept of Hodge representations and Hodge domains. Infinite-dimensional representation theory, specifically the discrete series and their limits, enters through the realization of these representations through complex geometry as pioneered by Schmid, and in the subsequent description of automorphic cohomology. For the latter topic, of particular importance is the recent work of Carayol that potentially introduces a new perspective in arithmetic automorphic representation theory.

The present work gives a treatment of Carayol's work, and some extensions of it, set in a general complex geometric framework.

Additional subjects include a description of the relationship between limiting mixed Hodge structures and the boundary orbit structure of Hodge domains, a general treatment of the correspondence spaces that are used to construct Penrose transforms, and selected other topics from the recent literature.

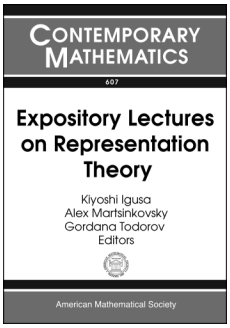
This item will also be of interest to those working in geometry and topology.

A co-publication of the AMS and CBMS.

Contents: The classical theory: Part I; The classical theory: Part II; Polarized Hodge structures and Mumford-Tate groups and domains; Hodge representations and Hodge domains; Discrete series and $\mathfrak{n}$-cohomology; Geometry of flag domains: Part 1; Geometry of flag domains: Part II; Penrose transforms in the two main examples; Automorphic cohomology; Miscellaneous topics and some questions; Bibliography; Index; Notations used in the talks.

CBMS Regional Conference Series in Mathematics, Number 118

December 2013, approximately 305 pages, Softcover, ISBN: 978-1-4704-1012-4, 2010 *Mathematics Subject Classification:* 14M15, 17B56, 22D10, 32G20, 32M10; 14D07, 14M17, 17B45, 20G99, 22E45, 22E46, 22F30, 32N10, 32L25, 32Q28, 53C30, **All Individuals US$52**, List US$65, Institutional member US$52, Order code CBMS/118



Expository Lectures on Representation Theory

Kiyoshi Igusa, *Brandeis University, Waltham, MA*, and **Alex Martsinkovsky** and **Gordana Todorov**, *Northeastern University, Boston, MA*, Editors

This volume contains the proceedings of the Maurice Auslander Distinguished Lectures and International Conference, held April 25–30, 2012, in Falmouth, MA.

The representation theory of finite dimensional algebras and related topics, especially cluster combinatorics, is a very active topic of research. This volume contains papers covering both the history and the latest developments in this topic. In particular, Otto Kerner gives a review of basic theorems and latest results about wild hereditary algebras, Yuri Berest develops the theory of derived representation schemes, and Markus Schmidmeier presents new applications of arc diagrams.

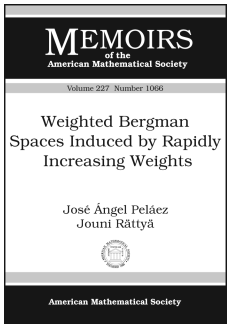
This item will also be of interest to those working in discrete mathematics and combinatorics.

Contents: B. Huisgen-Zimmermann, Fine and coarse moduli spaces in the representation theory of finite dimensional algebras; **O. Kerner**, More representations of wild quivers; **I. Herzog**, Phantom morphisms and Salce's lemma; **K. Yamagata** and **O. Kerner**, Morita theory, revisited; **F. M. Bleher**, Universal deformation rings of group representations, with an application of Brauer's generalized decomposition numbers; **Y. Berest**, **G. Felder**, and **A. Ramadoss**, Derived representation schemes and noncommutative geometry; **A. B. Buan**, Classifying torsion pairs for tame hereditary algebras and tubes; **C. Chaio**, Problems solved by using degrees of irreducible morphisms; **J. Kosakowska** and **M. Schmidmeier**, Arc diagram varieties.

Contemporary Mathematics, Volume 607

February 2014, approximately 227 pages, Softcover, ISBN: 978-0-8218-9140-7, LC 2013030296, 2010 *Mathematics Subject Classification:* 16G10, 16G20, 16G60, 16G70, 20C20, 16W25, 14L30, **AMS members US$71.20**, List US$89, Order code CONM/607

Analysis



Weighted Bergman Spaces Induced by Rapidly Increasing Weights

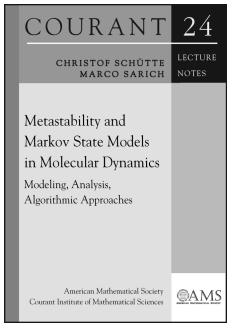
José Ángel Peláez, *Universidad de Málaga, Spain*, and **Jouni Rättyä**, *University of Eastern Finland, Joensuu, Finland*

Contents: Preface; Basic notation and introduction to weights; Description of q-Carleson measures for A^p_ω; Factorization and zeros of functions in A^p_ω; Integral operators and equivalent norms; Non-conformally invariant space induced by T_g on A^p_ω; Schatten classes of the integral operator T_g on A^2_ω; Applications to differential equations; Further discussion; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 227, Number 1066

January 2014, 124 pages, Softcover, ISBN: 978-0-8218-8802-5, 2010 *Mathematics Subject Classification:* 30H20; 47G10, **Individual member US$46.20**, List US$77, Institutional member US$61.60, Order code MEMO/227/1066

Applications



Metastability and Markov State Models in Molecular Dynamics

Modeling, Analysis, Algorithmic Approaches

Christof Schütte, *Freie Universität Berlin, Germany, and Zuse Institut Berlin, Germany*, and **Marco Sarich**, *Freie Universität Berlin, Germany*

Applications in modern biotechnology and molecular medicine often require simulation of biomolecular systems in atomic representation with immense length and timescales that are far beyond the capacity of computer power currently available. As a consequence, there is an increasing need for reduced models that describe the relevant dynamical properties while at the same time being less complex. In this book the authors exploit the existence of metastable sets for constructing such a reduced molecular dynamics model, the so-called Markov state model (MSM), with good approximation properties on the long timescales.

With its many examples and illustrations, this book is addressed to graduate students, mathematicians, and practical computational scientists wanting an overview of the mathematical background for the ever-increasing research activity on how to construct MSMs for very different molecular systems ranging from peptides to

proteins, from RNA to DNA, and via molecular sensors to molecular aggregation. This book bridges the gap between mathematical research on molecular dynamics and its practical use for realistic molecular systems by providing readers with tools for performing in-depth analysis of simulation and data-analysis methods.

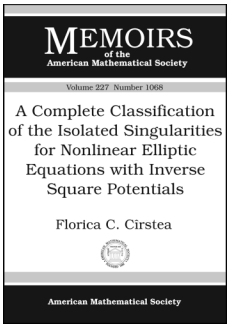
Titles in this series are co-published with the Courant Institute of Mathematical Sciences at New York University.

Contents: Transfer operator approach to conformation dynamics; Dynamics; Metastability; Transfer operators and generators; Projected transfer operators; Transition path theory; Concluding remarks; Some mathematical aspects of transfer operators; Definition of exit rates; Bibliography.

Courant Lecture Notes, Volume 24

January 2014, approximately 133 pages, Softcover, ISBN: 978-0-8218-4359-8, 2010 *Mathematics Subject Classification:* 60J20, 60-08, 47D07, 60J70, 92-08, **AMS members US$27.20**, List US$34, Order code CLN/24

Differential Equations



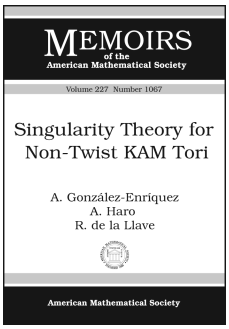
A Complete Classification of the Isolated Singularities for Nonlinear Elliptic Equations with Inverse Square Potentials

Florica C. Cîrstea, *University of Sydney, Australia*

Contents: Introduction; Main results; Radial solutions in the power case; Basic ingredients; The analysis for the subcritical parameter; The analysis for the critical parameter; Illustration of our results; Appendix A. Regular variation theory and related results; Bibliography.

Memoirs of the American Mathematical Society, Volume 227, Number 1068

January 2014, 85 pages, Softcover, ISBN: 978-0-8218-9022-6, 2010 *Mathematics Subject Classification:* 35J60, 35B40; 35J25, 35B33, **Individual member US$42.60**, List US$71, Institutional member US$56.80, Order code MEMO/227/1068



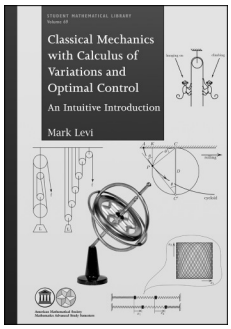
Singularity Theory for Non-Twist KAM Tori

A. González-Enríquez and **A. Haro**, *Universitat de Barcelona, Spain*, and **R. de la Llave**, *Georgia Institute of Technology, Atlanta, GA*

Contents: *Part 1: Introduction and preliminaries:* Introduction; Preliminaries; *Part 2: Geometrical properties of KAM invariant tori:* Geometric properties of an invariant torus; Geometric properties of fibered Lagrangian deformations; *Part 3: KAM results:* Nondegeneracy on a KAM procedure with fixed frequency; A KAM theorem for symplectic deformations; A Transformed Tori Theorem; *Part 4: Singularity theory for KAM tori:* Bifurcation theory for KAM tori; The close-to-integrable case; *Appendices:* Appendix A. Hamiltonian vector fields; Appendix B. Elements of singularity theory; Bibliography.

Memoirs of the American Mathematical Society, Volume 227, Number 1067

January 2014, 115 pages, Softcover, ISBN: 978-0-8218-9018-9, 2010 *Mathematics Subject Classification:* 37J20, 37J40, **Individual member US$45.60**, List US$76, Institutional member US$60.80, Order code MEMO/227/1067



Classical Mechanics with Calculus of Variations and Optimal Control

An Intuitive Introduction

Mark Levi, *Pennsylvania State University, University Park, PA*

This is an intuitively motivated presentation of many topics in classical mechanics and related areas of control theory and calculus of variations. All topics throughout the book are treated with zero tolerance for unrevealing definitions and for proofs which leave the reader in the dark.

Some areas of particular interest are: an extremely short derivation of the ellipticity of planetary orbits; a statement and an explanation of the "tennis racket paradox"; a heuristic explanation (and a rigorous treatment) of the gyroscopic effect; a revealing equivalence between the dynamics of a particle and statics of a spring; a short geometrical explanation of Pontryagin's Maximum Principle, and more.

In the last couple of chapters, aimed at more advanced readers, the Hamiltonian and the momentum are compared to forces in a certain static problem. This gives a palpable physical meaning to some seemingly abstract concepts and theorems. With minimal prerequisites consisting of basic calculus and basic undergraduate physics, this book is suitable for courses from an undergraduate to a beginning graduate level, and for a mixed audience of mathematics, physics and engineering students. Much of the enjoyment of the subject lies in solving almost 200 problems in this book.

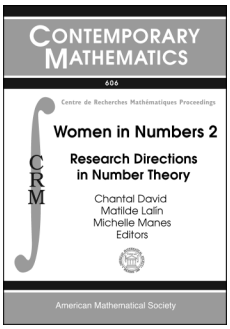
This item will also be of interest to those working in mathematical physics.

Contents: One degree of freedom; More degrees of freedom; Rigid body motion; Variational principles of mechanics; Classical problems of calculus of variations; The conditions of Legendre and Jacobi for a minimum; Optimal control; Heuristic foundations of Hamiltonian mechanics; Bibliography; Index.

Student Mathematical Library, Volume 69

February 2014, approximately 316 pages, Softcover, ISBN: 978-0-8218-9138-4, LC 2013030550, 2010 *Mathematics Subject Classification:* 34-XX, 37-XX, 49-XX, 70-XX, 00A07, **AMS members US$33.60**, List US$42, Order code STML/69

Number Theory



Women in Numbers 2

Research Directions in Number Theory

Chantal David, *Concordia University, Montreal, Quebec, Canada*, **Matilde Lalín**, *University of Montreal, Quebec, Canada*, and **Michelle Manes**, *University of Hawaii, Honolulu, HI*, Editors

The second Women in Numbers workshop (WIN2) was held November 6–11, 2011, at the Banff International Research Station (BIRS) in Banff, Alberta, Canada. During the workshop, group leaders presented open problems in various areas of number theory, and working groups tackled those problems in collaborations begun at the workshop and continuing long after.

This volume collects articles written by participants of WIN2. Survey papers written by project leaders are designed to introduce areas of active research in number theory to advanced graduate students and recent PhDs. Original research articles by the project groups detail their work on the open problems tackled during and after WIN2. Other articles in this volume contain new research on related topics by women number theorists.

The articles collected here encompass a wide range of topics in number theory, including Galois representations, the Tamagawa number conjecture, arithmetic intersection formulas, Mahler measures, Newton polygons, the Dwork family, elliptic curves, cryptography, and supercongruences.

WIN2 and this proceedings volume are part of the Women in Numbers network, aimed at increasing the visibility of women researchers' contributions to number theory and at increasing the participation of women mathematicians in number theory and related fields.

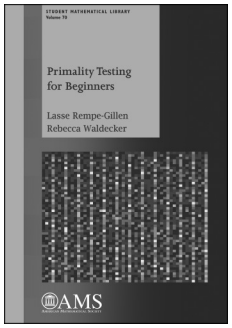
This book is co-published with the Centre de Recherches Mathématiques.

Contents: J. Johnson-Leung, The local equivariant Tamagawa number conjecture for almost abelian extensions; **R. Davis**, Images of metabelian Galois representations associated to elliptic curves; **R. Bellovin**, **S. A. Garthwaite**, **E. Ozman**, **R. Pries**, **C. Williams**, and **H. J. Zhu**, Newton polygons for a variant of the Kloosterman family; **J. Anderson**, **J. S. Balakrishnan**, **K. Lauter**, **J. Park**, and **B. Viray**, Comparing arithmetic intersection formulas for denominators of Igusa class polynomials; **A. Salerno**, An algorithmic approach to the Dwork family; **A. Silverberg**, Ranks "cheat sheet"; **A. Silverberg**, Fully homomorphic encryption for mathematicians; **M.-J. Bertin** and **M. Lalín**, Mahler measure of multivariable polynomials; **M.-J. Bertin**, **A. Feaver**, **J. Fuselier**, **M. Lalín**, and **M. Manes**, Mahler measure of some singular $K3$-surfaces; **S. Akhtari**, **C. David**, **H. Hahn**, and **L. Thompson**, Distribution of squarefree values of sequences associated with ellitpic curves; **S. Chisholm**, **A. Deines**, and **H. Swisher**, Recent advances for Ramanujan type supercongruences.

Contemporary Mathematics, Volume 606

January 2014, 206 pages, Softcover, ISBN: 978-1-4704-1022-3, LC 2013027435, 2010 *Mathematics Subject Classification:* 11G05, 11G40, 11N37, 11R06, 11R11, 11T24, 11Y16, 14J28, 33C20, 94A60,

AMS members US$60.80, List US$76, Order code CONM/606



Primality Testing for Beginners

Lasse Rempe-Gillen, *University of Liverpool, United Kingdom*, and **Rebecca Waldecker**, *Martin-Luther-Universität Halle-Wittenberg, Germany*

How can you tell whether a number is prime? What if the number has hundreds or thousands of digits? This question may seem abstract or irrelevant, but in fact, primality tests are performed every time we make a secure online transaction. In 2002, Agrawal, Kayal, and Saxena answered a long-standing open question in this context by presenting a deterministic test (the AKS algorithm) with polynomial running time that checks whether a number is prime or not. What is more, their methods are essentially elementary, providing us with a unique opportunity to give a complete explanation of a current mathematical breakthrough to a wide audience.

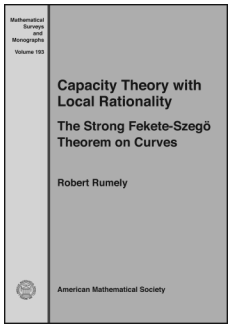
Rempe-Gillen and Waldecker introduce the aspects of number theory, algorithm theory, and cryptography that are relevant for the AKS algorithm and explain in detail why and how this test works. This book is specifically designed to make the reader familiar with the background that is necessary to appreciate the AKS algorithm and begins at a level that is suitable for secondary school students, teachers, and interested amateurs. Throughout the book, the reader becomes involved in the topic by means of numerous exercises.

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

Contents: Introduction; *Foundations:* Natural numbers and primes; Algorithms and complexity; Foundations of number theory; Prime numbers and cryptography; *The AKS algorithm:* The starting point: Fermat for polynomials; The theorem for Agrawal, Kayal, and Saxena; The algorithm; Open questions; Solutions and comments to important exercises; Bibliography; List of symbols; Index.

Student Mathematical Library, Volume 70

February 2014, approximately 248 pages, Softcover, ISBN: 978-0-8218-9883-3, LC 2013032423, 2010 *Mathematics Subject Classification:* 11-01, 11-02, 11Axx, 11Y11, 11Y16, **AMS members US$31.20**, List US$39, Order code STML/70



Capacity Theory with Local Rationality

The Strong Fekete-Szegö Theorem on Curves

Robert Rumely, *University of Georgia, Athens, GA*

This book is devoted to the proof of a deep theorem in arithmetic geometry, the Fekete-Szegö theorem with local rationality conditions. The prototype for the theorem is Raphael Robinson's theorem on totally real algebraic integers in an interval, which says that if $[a, b]$ is a real interval of length greater than 4, then it contains infinitely many Galois orbits of algebraic integers, while if its length is less than 4, it contains only finitely many. The theorem shows this phenomenon holds on algebraic curves of arbitrary genus over global fields of any characteristic, and is valid for a broad class of sets.

The book is a sequel to the author's work *Capacity Theory on Algebraic Curves* and contains applications to algebraic integers and units, the Mandelbrot set, elliptic curves, Fermat curves, and modular curves. A long chapter is devoted to examples, including methods for computing capacities. Another chapter contains extensions of the theorem, including variants on Berkovich curves.

The proof uses both algebraic and analytic methods, and draws on arithmetic and algebraic geometry, potential theory, and approximation theory. It introduces new ideas and tools which may be useful in other settings, including the local action of the Jacobian on a curve, the "universal function" of given degree on a curve, the theory of inner capacities and Green's functions, and the construction of near-extremal approximating functions by means of the canonical distance.

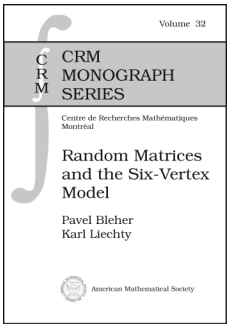
This item will also be of interest to those working in algebra and algebraic geometry and analysis.

Contents: Variants; Examples and applications; Preliminaries; Reductions; Initial approximating functions: Archimedean case; Initial approximating functions: Nonarchimedean case; The global patching construction; Local patching when $K_v \cong \mathbb{C}$; Local patching when $K_v \cong \mathbb{R}$; Local patching for nonarchimedean RL-domains; Local patching for nonarchimedean K_v-simple sets; $(\mathfrak{X}, \vec{s})$-Potential theory; The construction of oscillating pseudopolynomials; The universal function; The local action of the Jacobian; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 193

January 2014, approximately 448 pages, Hardcover, ISBN: 978-1-4704-0980-7, LC 2013034694, 2010 *Mathematics Subject Classification:* 11G30, 14G40, 14G05; 31C15, **AMS members US$95.20**, List US$119, Order code SURV/193

Probability and Statistics



Random Matrices and the Six-Vertex Model

Pavel Bleher, *Indiana University-Purdue University Indianapolis, IN*, and **Karl Liechty**, *University of Michigan, Ann Arbor, MI*

This book provides a detailed description of the Riemann-Hilbert approach (RH approach) to the asymptotic analysis of both continuous and discrete orthogonal polynomials, and applications to random matrix models as well as to the six-vertex model. The RH approach was an important ingredient in the proofs of universality in unitary matrix models. This book gives an introduction to the unitary matrix models and discusses bulk and edge universality. The six-vertex model is an exactly solvable two-dimensional model in statistical physics, and thanks to the Izergin-Korepin formula for the model with domain wall boundary conditions, its partition function matches that of a unitary matrix model with nonpolynomial interaction. The authors introduce in this book the six-vertex model and include a proof of the Izergin-Korepin formula. Using the RH approach, they explicitly calculate the leading and subleading terms in the thermodynamic asymptotic behavior of the partition function of the six-vertex model with domain wall boundary conditions in all the three phases: disordered, ferroelectric, and antiferroelectric.

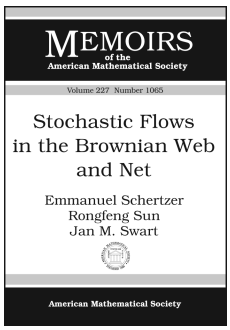
This item will also be of interest to those working in mathematical physics.

Titles in this series are co-published with the Centre de Recherches Mathématiques.

Contents: Unitary matrix ensembles; The Riemann-Hilbert problem for orthogonal polynomials; Discrete orthogonal polynomials on an infinite lattice; Introduction to the six-vertex model; The Izergin-Korepin formula; Disordered phase; Antiferroelectric phase; Ferroelectric phase; Between the phases; Bibliography.

CRM Monograph Series, Volume 32

December 2013, 224 pages, Hardcover, ISBN: 978-1-4704-0961-6, LC 2013032106, 2010 *Mathematics Subject Classification:* 60B20; 82B23, **AMS members US$78.40**, List US$98, Order code CRMM/32



Stochastic Flows in the Brownian Web and Net

Emmanuel Schertzer, *Université Pierre et Marie Curie, Paris, France*, **Rongfeng Sun**, *National University of Singapore, Singapore*, and **Jan M. Swart**, *Academy of Sciences of the Czech Republic, Praha, Czech Republic*

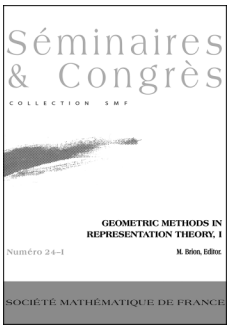
This item will also be of interest to those working in mathematical physics.

Contents: Introduction; Results for Howitt-Warren flows; Construction of Howitt-Warren flows in the Brownian web; Construction of Howitt-Warren flows in the Brownian net; Outline of the proofs; Coupling of the Brownian web and net; Construction and convergence of Howitt-Warren flows; Support properties; Atomic or non-atomic; Infinite starting mass and discrete approximation; Ergodic properties; Appendix A. The Howitt-Warren martingale problem; Appendix B. The Hausdorff topology; Appendix C. Some measurability issues; Appendix D. Thinning and Poissonization; Appendix E. A one-sided version of Kolmogorov's moment criterion; References; Index.

Memoirs of the American Mathematical Society, Volume 227, Number 1065

January 2014, 160 pages, Softcover, ISBN: 978-0-8218-9088-2, LC 2013035390, 2010 *Mathematics Subject Classification:* 82C21; 60K35, 60K37, 60D05, **Individual member US$51.60**, List US$86, Institutional member US$68.80, Order code MEMO/227/1065

New AMS-Distributed Publications



Geometric Methods in Representation Theory I

Michel Brion, *Université Grenoble I, St. Martin d'Heres, France*, Editor

This volume contains the expanded versions of lecture notes and of some seminar talks presented at the 2008 Summer School, Geometric Methods in Representation Theory, which was held in Grenoble, France, from June 16–July 4, 2008. They give an overview of representation theory of quivers, chiefly from a geometric perspective. The methods and results cover a wide range of topics in algebraic geometry (punctual Hilbert schemes, geometric invariant theory, symplectic geometry), representation theory (Hall algebras, Kac-Moody algebras, quantum groups), homological methods (intersection cohomology, equivariant cohomology, derived categories of coherent sheaves).

The lecture notes include introductory texts to fundamental aspects of the domain: quiver representations, punctual Hilbert schemes, Hall algebras, as well as more specialized texts on Nakajima varieties, Haiman's work, moment graphs and representations, canonical and crystal bases of Hall algebras, and representations in Fock spaces. The ten articles cover recent advances in various directions. In view of the diverseness of the topics, the reader is invited to consult the introductions of the texts for detailed overviews of their respective contents.

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Contents: J. Bertin, The punctual Hilbert scheme: An introduction; **M. Brion**, Representations of quivers; **V. Ginzburg**, Lectures on Nakajima's quiver varieties; **I. Gordon**, Haiman's work on the n! theorem, and beyond; **J. C. Jantzen**, Moment graphs and representations; **B. Leclerc**, Fock space representations of $U_q(\widehat{\mathfrak{sl}}_n)$.

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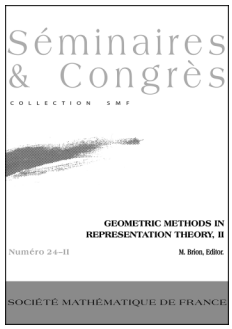
Algebra and Algebraic Geometry



Geometric Methods in Representation Theory II

Michel Brion, *Université Grenoble I, St. Martin d'Heres, France*, Editor

This second volume contains expanded versions of lecture notes for O. Schiffman's course, as well as ten research or survey articles, presented at the 2008 Summer School, Geometric Methods in Representation Theory (Grenoble, France, June 16–July 4, 2008).

These texts give an overview of the representation theory of quivers, chiefly from a geometric perspective. The methods and results cover a wide range of mathematical domains: algebra and representation theory (Hall algebras, canonical and crystal bases, cluster categories, modular representations), algebraic geometry (flag varieties, moduli spaces, symplectic singularities), and homological methods (perverse sheaves, exceptional collections). In view of the diverseness of the topics, the reader is invited to consult the introductions of the texts for detailed overviews of their respective contents.

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

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Contents: O. Schiffmann, Lectures on Hall algebras; **O. Schiffmann**, Lectures on canonical and crystal bases of Hall algebras; **K. Baur**, Cluster categories, m-cluster categories and diagonals in polygons; **A. Boralevi**, On simplicity and stability of the tangent bundle of rational homogeneous varieties; **L. Evain**, Intersection theory on punctual Hilbert schemes and graded Hilbert schemes; **D. Juteau**, **C. Mautner**, and **G. Williamson**, Perverse sheaves and modular representation theory; **I. Losev**, On the structure of the category $\mathcal{O}$ for W-algebras; **M. Perling**, Examples for exceptional sequences of invertible sheaves on rational surfaces; **O. Serman**, Orthogonal and symplectic bundles on curves and quiver representations; **D. A. Shmelkin**, Some remarks on Nakajima's quiver varieties of type A; **M. Lehn** and **C. Sorger**, A symplectic resolution for the binary tetrahedral group; **F. Vaccarino**, Moduli of linear representations, symmetric products and the non commutative Hilbert scheme.

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Analysis

Recent Trends in Analysis

Proceedings of the Conference in Honor of Nikolai Nikolski, Bordeaux, 2011

Alexander Borichev, *University of Marseille, France*, **Kenneth R. Davidson**, *University of Waterloo, Canada*, **Stanislas Kupin**, *University of Bordeaux, France*, **Gilles Pisier**, *Pierre and Marie Curie University, Paris, France*, **Florian-Horia Vasilescu**, *University of Lille, France*, and **Vasily Vasyunin**, *Steklov Institute of Mathematics, St. Petersburg, Russia*, Editors

The volume contains the proceedings of the conference held in Bordeaux in 2011 to honor the 70th birthday of Nikolai Nikolski. It gathers some of the most relevant contributions presented, written by first-rate analysts. Below is a list of the main subjects covered:

- function spaces and reproducing kernels
- Toeplitz and Hankel operators
- spectral synthesis
- spectral theory
- semigroups of operators
- singular integral operators
- functional models
- rational and meromorphic approximations
- Fourier analysis

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Contents: V. Adamyan and **B. Pavlov**, Modified analytic perturbation procedure and chain rule for scattering matrices; **A. Baranov**, **Y. Belov**, **A. Borichev**, and **D. Yakubovich**, Recent developments in spectral synthesis for exponential systems and for non-self-adjoint operators; **A. Baranov** and **D. Sarason**, Quotient representations of inner functions; **L. Baratchart**, Rational approximation, meromorphic approximation, extremal domains, weak asymptotics, non-Hermitian orthogonality; **A. Böttcher**, Best constants for Markov type inequalities in Hilbert space norms; **A. Brudnyi**, Stein-like theory for Banach-valued holomorphic functions on the maximal ideal space of H^∞ and the operator corona problem of Sz.-Nagy; **S. A. Denisov**, Multidimensional L^2 conjecture: A survey; **L. Golinskii** and **S. Kupin**, On discrete spectrum of complex perturbations of finite band Schrödinger operators; **M. Haase**, The functional calculus approach to operator cosine functions; **Y. I. Lyubarskii** and **E. Malinnikova**, Composition operators on model spaces; **H. Queffélec**, Approximation numbers of classes of symbolic operators; **F. Shamoyan**, On the Fourier coefficients of functions of bounded type on the unit torus; **S. Treil**, Sharp A_2 estimates of Haar shifts via Bellman function; **M. Veraar**, Embedding results for γ-spaces; **A. Volberg** and **B. D. Wick**, Bergman-type singular integral operators on metric spaces.

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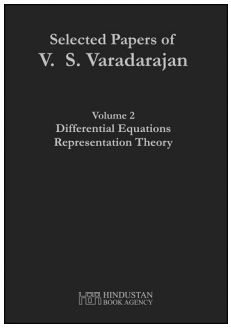
General Interest



Selected Papers of V. S. Varadarajan

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